

The World Bank / GPOBA

**Jordan Water and Wastewater
Output-Based Aid Study**

Feasibility of an OBA Scheme (Task 1 Report)

Final - April 2010

COWI

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1 Introduction

The Global Partnership on Output-Based Aid (GPOBA) is a multi-donor trust fund which aims to fund, design, demonstrate and document Output-Based Aid (OBA) approaches to support the sustainable delivery of basic services to those least able to afford them and to those currently without access.

MCC is a US Government agency that allocates US foreign aid to well-governed developing countries. MCC and the Government of Jordan (GOJ) are developing a project for improvement of the water and wastewater services in Zarqa Governorate. The project includes a component which will extend wastewater collection laterals into city neighbourhoods that currently receive water distribution but are not connected to proper sewage collection.

In this context GOJ has requested GPOBA funding for an OBA Study which will look at the barriers to access to proper sewage collection for poor domestic households and the possible role OBA approaches in improving access to those least able to afford it.

The World Bank / GPOBA have awarded the contract for the assignment 'Jordan Water and Wastewater Output-Based Aid Study' to COWI A/S (the Consultant).

The overall objective of the assignment is to improve access of poor domestic households to water and sanitation in the Zarqa Governorate and thereby contribute to improved health, environment, and economic opportunities for residents. An equally important objective is to educate GOJ and MCC about OBA for application to future projects in Jordan and other countries.

The main tasks for the Consultant are the following:

Task 1 - Feasibility of OBA Scheme.

Under this Task, the Consultant will develop an understanding the political, legal and regulatory environment, collect data on the present water and sanitation situation, characterize the non connected households, establish a financial model for household connections, and assess the affordability of connecting and the financing options available. Furthermore, the Consultant will estimate the level of an output based aid subsidy to improve access amount poor households and recommend institutional arrangements for its implementation.

Task 2 - Recommend Implementation Arrangements

Under this Task, the Consultant will propose an appropriate targeting mechanisms for low income households, define the outputs against which payments will be made, establish a time plan for implementation of connections, propose an efficient monitoring and output verification procedure, and provide recommendations on the flow of funds between GPOBA, MCC, GOJ, local authorities and private operators and the division of responsibilities between key institutions.

Task 3 - Present findings to key stakeholders

Under this Task, the Consultant will present findings of the to GOJ and MCC staff.

The above activities will result in the following outputs:

Inception Report, including initial findings of the Consultant and an outline for the Final Report(s)

Draft and Final Report for Task 1, presenting the findings and recommendations for Tasks 1

Draft and Final Report for Task 2, presenting the findings and recommendations for Tasks 2

Presentations, the first to consult on the preliminary findings and recommendations under Task 1, the second to present the draft final findings and recommendations under Tasks 1 and 2

The present report constitutes the Draft Task 1 Report 'Feasibility of an OBA Scheme' under the consultancy.

The report is structured as follows:

- Section 1 'Introduction' (this section) gives the background to the assignment.
- Section 2 'The political, legal and regulatory environment', presents the consultant's understanding of the political, legal and regulatory environment for water and wastewater connections.
- Section 3 'The present water and sanitation situation', presents the collected data on the present water and sanitation situation in Zarqa.
- Section 4 'The non connected households', provides a characterization of those Zarqa Governorate residents who do not have water and wastewater connections.
- Section 5 'The financial model', presents key outputs of the financial and economic modelling of household connections.
- Section 6 'Affordability assessment', provides an estimate of the affordability qualify the estimate of the total subsidy amount necessary.
- Section 7 'Project financing options', assess the households' available options for financing the connection fee over a number of months or years.

- Section 8 'Estimating necessary subsidy', provides an estimate of the necessary unit and aggregate subsidy amount.
- Finally, Section 9 'Recommend institutional arrangements for implementation' provides the consultants preliminary view on the recommended implementation arrangements for implementation (including the appropriate service provider and appropriate verification agent) which will be further detailed in the Task 2 report

Furthermore, the report includes the following Appendices:

- Appendix A - Stakeholders met
- Appendix B - Workshop with GOJ and MCC
- Appendix C - Map of existing and planned sewerage network in Zarqa
- Appendix D - Cost of Water Supply Connections
- Appendix E - Wastewater Connection 5m in asphalt + 5m in soil inside plot
- Appendix F - Wastewater Connection 30m in asphalt + 5m in soil inside plot

2 The political, legal and regulatory environment

The present section presents the consultant's understanding of the political, legal and regulatory environment for water and wastewater connections.

2.1 Legislative and policy framework

2.1.1 The Water Authority Law

The central law in the water sector is the Water Authority Law (Law No. 18, 1988), which defines the responsibilities and duties of the Water Authority of Jordan (WAJ).

The key section of the Water Authority law with respect to tariff determination is Article 10 f.:

'The Board shall undertake the following duties and responsibilities: ... Recommend to the Council of Ministers tariffs for connections, subscriptions, price rates and deposit fees that should be collected for various water and public wastewater uses'.

Hence, any change in tariffs or fees is a decision by the Council of Ministers.

The key section of the Water Authority law with respect to obligations to pay tariffs and connection fees is Article 21 C.:

'Notwithstanding what is stated in any other legislation, no governmental department, official or private corporation, or any natural or corporate body is exempted from the Authority's fees or charges for supplying, water or rendering services or from the costs of construction or pipe laying or from the contribution to the costs of any project or from the prices and fees charged for services rendered by the Authority, according to the provisions of this Law.'

2.1.2 Jordan's Water Strategy

The 2009 policy document Jordan's Water Strategy 2008-2022 in its summary of goals and actions presents the following intentions:

'We will revise the bulk tariff setting mechanism to reflect the real value of water. Low tariffs encourage waste and low-value uses and provide no incentive for efficient water distribution and use by water delivery authorities and customers. As fiscal constraints reduce the level of public funding available for subsidies, users will have to pay a larger share of the costs of delivery. However, an efficient mechanism to supply water for low-income families should accompany any adjustment in municipal water tariffs.'
(Goal 4 for water demand)

'Jordan will set wastewater charges, connection fees, sewerage taxes and treatment fees to cover at least the operation and maintenance costs plus part of the investment cost. The ultimate aim is for a full cost recovery to be achieved within five years.'
(Goal 7 for institutional reform)

'We will pay particular attention to the needs of the poor while improving commercial practices. In an environment of increasing water tariffs, we need to be sure that the poor are not disadvantaged. Targeted subsidies within the water sector may be required to strengthen the social safety net.'
(Goal 7 for institutional reform)

'We will expand the role of the private sector. Management contracts, concessions and other forms of private sector participation in water utilities shall be considered and adopted as appropriate. Micro-PSPs, as in the example of Madaba, will be used for performance-based outsourcing of operational tasks to achieve rapid improvements.'
(Goal 7 for institutional reform)

'We will encourage and expand the private sector's role in the distribution of retail water, wastewater, treated effluent and irrigated water. Emphasis shall be placed on the social benefits in conjunction with the private investments.'
(Goal 7 for institutional reform)

Hence, the 2009 policy document Jordan's Water Strategy 2008-2022 points towards (i) gradually moving towards cost covering tariffs and charges; (ii) with targeted subsidies for the poor; and (iii) involvement of the private sector through performance-based contracting.

Nevertheless water tariffs are politically very sensitive and the current system of increasing block tariffs which are not inflation adjusted and have remained unchanged for a number of years means that average water tariffs are below cost recovery.

2.1.3 The constitution

Finally, it should be noted that the principle of equality is vested in Article 6 of the Constitution:

(i) Jordanians shall be equal before the law. There shall be no discrimination between them as regards to their rights and duties on grounds of race, language or religion.

(ii) The Government shall ensure work and education within the limits of its possibilities, and it shall ensure a state of tranquillity and equal opportunities to all Jordanians.

Although some interpret this as being contrary to any price differentiation or subsidy arrangement not generally provided, there are many precedence examples of donor funded projects addressing specific geographic areas and having a pro-poor focus.

2.2 WAJ policies

The Water Authority Law has been detailed in Council of Ministers ordinance # 66 of 1994 'The Wastewater Ordinance' (amended by ordinance #74 of 2001) for wastewater and Council of Ministers ordinance # 67 of 1994 'The Wastewater Ordinance' (amended in 2003) for drinking water.

2.2.1 WAJ policy on water supply connections

The required documents when approaching WAJ to request a domestic water supply subscription are:

- Full completion of the construction works prior to requesting the permanent domestic subscription
- A copy of the registration document for the owner; a lease contract for the lessee
- A permit of occupation or a substituting document to the same effect
- A copy of the zoning plan.
- An ID document.
- A certificate of old building for a real estate constructed before 1.5.1987.

This means that houses that are not legally recognized by the municipality do not qualify for a water supply subscription. This e.g. has the effect that separate apartments build as extensions to existing houses but without the required building permits need to be legalized with the municipal authorities prior to requesting a separate domestic water supply subscription.

Subject to a household fulfilling the above requirements, the procedures for obtaining a domestic water supply subscription are:

- 1 A water subscription form is completed by the competent employee at the relevant department.
- 2 The subscription file is referred to the Inspection Controller in order to implement a real inspection of the venue

- 3 After the inspection, a report is produced by the Controller and is signed for inspection truth
- 4 The file is referred to the Head of the Design and Supervision Division in order to design the water line (define the track and the diameter)
- 5 The file is referred to the Head of the Subscription Division to verify documents and decide if the pipe cost is to be paid by the citizen or on the account of the Authority
- 6 The file is referred to the Collection Division to issue a statement to the effect of full settlement of the water fees and any other issues pertinent to collection
- 7 The file is referred to the Accounting Division in order to decide fees
- 8 The Director of Subscriber Unit legalizes the file and co-signs the agreement with the Citizen.

The connection fees for domestic water supply connection are:

Subscription type	Region	Apartment area	Connect Fee (JD)
Residential	Amman governorate	150 m ² or less	180
		Above 150 m ²	180 + 1 JD for each m ² above 150 m ²
	Outside Amman governorate	150 m ² or less	150
		Above 150 m ²	150 + 1 JD for each m ² above 150 m ²
Non-residential	All governorates	Less than 100 m ²	150
		Above 100 m ²	275

Hence, a typical household in Zarqa will pay 150 JD in connection fee.

This includes WAJ extending the water supply system to 1 meter inside the plot, the subscription fees for a domestic meter, insurance deposit, and stamp duty for the water agreement.

Furthermore, it should be noted that Zarqa Water Authority can and does enforce user payment through discontinuation of services to non-paying customers.

2.2.2 WAJ policy on wastewater connections

In order to provide a real estate with the sewage system service, the area must be served by the sewage network. Within three months as from the date of publishing the announcement in the Official Gazette, the Citizen must report to the Subscription Application Division of the Water Authority in order to connect his/her real estate with the sewage system. Connection with the sewage system is mandatory in order to avoid sanitary troubles.

The required documents when approaching WAJ to request a domestic wastewater connection are:

- A zoning plan showing the type of zoning or providing it in writing by the Municipality on the estimation form.
- An occupation permit or a profession license (if possible).

Subject to a household fulfilling the above requirements, the procedures for obtaining a domestic waste water connection are:

- 1 The real estate owner reports to the Subscription Application Division of the Water Authority to proceed with the connection steps
- 2 The Authority Controller inspects the real estate and calculates the real space of the building, and the zoning type in order to calculate fees
- 3 The Controller prepares the file of subscription to the sewage system and encloses the connection plan. If the real estate has not been studied, a surveyor studies it and the competent engineer designs the connection line.
- 4 The application file is signed by the Head of the Subscription Application Division and the Director of Subscribers' Directorate
- 5 Fees set according to the real inspection of the Authority are paid
- 6 The Applicant concludes an agreement with one of the 21 contractors accredited by the Water Authority of Zarqa to implement the connection works
- 7 The Authority inspectors supervise the implementation process
- 8 Procedures are completed to calculate the service fees on the water bill.

The connection fees for domestic wastewater connections consist of the following elements:

- a) A connection fee:
 - A fee determined as 25% of the so called 'net value of the real estate' as estimated by the Water Authority will be collected from the owner

- In case of a building added to the real estate that has been connected to the sewage network, a fee of 25% will be collected from the net value estimated by the Water Authority thereof

Depending on the area and type of residence the so-called 'net value of the real estate' is between 2-5 JD per m². The table below shows the resulting connection fees.

Type of area and use	Fees (JD/m ²)			
	Amman*	Zarqa	Russaifeh & Hash-meieh	Other Zarqa zones
Residence A – Special green residence	1.75	1.25	1	1
Residence B	1.5	1	0.875	0.75
Residence C	1.25	0.75	0.75	0.625
Residence D	1	0.75	0.625	0.5
Residence E	1	0.75	0.5	0.5
Refuges	1	0.75	0.5	0.5

Hence the connection fee for a 150 m² house is between 75 JD and 187.5 JD depending on the quality and location.

b) A connection application fee of between 5 and 20 JD depending on the Residence Zoning Area (not the same as the Development Area Class)

c) A Stamp Fees of JD 10

This connection fee includes:

- For new extensions of the wastewater net: WAJ extending the wastewater system up to 0,5 meter outside the plot (excluding the last manhole)
- For non-connected households in areas with existing wastewater systems: WAJ does not cover any construction costs and the household will hence have to cover the full construction cost of the extension from the nearest main.

In new service areas, where several immediately adjacent households are not connected, there may be opportunities for them to share a part of the construction costs.

2.3 Implications for the OBA scheme

The GOJ in their policy statements are committed to targeted subsidies for the poor and involvement of the private sector through performance-based contracting - the two central elements in an OBA connection scheme.

Although some interpret the constitutional provisions on equal treatment as being contrary to any price differentiation or subsidy arrangement not generally provided, there are many precedence examples of donor funded projects addressing specific geographic areas and having a pro-poor focus.

Furthermore, the Ministry of Social Development administers the Fund for National Aid which provided direct income subsidies to poor households based on a survey based poverty mapping.

It should also be noted that the 2009 policy document Jordan's Water Strategy 2008-2022 in its section on Water Pricing and Cost Recovery states: "We will structure different fees for different geographical areas. This shall be assessed for each geographical area as a function of the cost to deliver water to the area, end uses and effluent quality and will be subject to economic and social considerations."

Concern has also been raised as to whether the wording of Article 21C of the Water Law prevents WAJ from waiving connection fees or household payment of connection costs. While this may be an issue for the connection fees there appears to be significant precedence for donor funded projects including at least a part of the construction costs of the connections. Furthermore, as will be argued in subsequent sections waiving the connection fee is not a prerequisite for an OBA intervention.

The general view is nevertheless that a targeted subsidy mechanism would require approval by the Council of Ministers.

Finally, it should be noted that while the regulatory processes for tariff design are clear, it is also politically sensitive and the measures for ensuring cost covering tariffs (e.g. through inflation indexation of tariffs or an independent regulator) are inadequate.

3 The present water and sanitation situation

The present section presents the collected data on the present water and sanitation situation in Zarqa.

3.1 Introduction to the Water Sector in Brief

Government administration of water supply in Jordan started in the late fifties with the creation of the Central Water Authority (CWA). At that time and up to the early nineties all water supplies were based on groundwater.

In 1965, CWA was amalgamated into a newly founded organisation, the Natural Resources Authority (NRA). In 1977 the Jordan Valley Authority (JVA) was authorised by law to carry out groundwater investigations and development in the Jordan Valley. In 1983 the Water Authority law was enacted and WAJ assumed the responsibility of groundwater administration, management and development. The concerned directorate of NRA and that of the JVA were transferred to WAJ in 1984. Both WAJ and JVA came under the umbrella of a newly founded ministry, the Ministry of Water and Irrigation (MWI) in 1988.

Currently, MWI/WAJ is in charge of groundwater administration including issue of licenses and permits for abstraction of groundwater in accordance with current groundwater legislation. Furthermore, they are responsible for providing municipal water supplies to all population centres in Jordan, and the collection and treatment of their wastewater.

The Hashemite Kingdom of Jordan has 12 groundwater resources of which 11 are renewable. There are also a number of surface water resources, mainly in the Jordan Valley.

All the 12 groundwater basins have wells sunk in and pumps installed. The pumps have a total capacity to abstract more than the safe yield of the reservoirs. The average annual abstraction from all basins exceeds the renewable average of recharge and stands at 160% (2007) of that average. The 11 renewable groundwater reservoirs are estimated to have a combined sustainable yield of 266 million m³ per year with an average abstraction of 434 million m³ per year¹. Over pumping varies from reservoir to reservoir and is as high as 221% in the major ones.

¹ Salameh and haddadin, 2006

There are extensive non-renewable reservoirs in the sandstone formation underlying almost the entire area of the country. The water quality of these reservoirs varies and is known to be fresh in the Disi-Mudawwara area. A project for abstraction of water from the Disi reservoir is currently on the way.

Surface water potential in Jordan is estimated at 692 million m³ per year. Because of the aridity in the eastern, south-eastern and southern basins, and because of other economic and geographic constraints, only about 484 million m³ per year (2007) or 70% of this potential can be developed economically.

3.2 Water supply in Zarqa

Zarqa rely entirely on groundwater from a number of well sites as indicated in the below water audit table. The water is generally distributed to the consumers without any further treatment than disinfection.

Zarqa Water Authority serves 135,000 subscribers, assessed to represent approximately 1,000,000 persons or about 98% of the potential consumers, with potable water. The remaining 2% is by ZWA assessed to represent some 2,500 households living in the areas of: Zarqa borders, Hallabat, Hashmeyeh, Beirein and Azraq; Generally areas outside the project area of Russeifa/Zarqa. The people not connected to the piped water supply get water from water tankers or private wells².

When a new customer apply for a water supply connection, the water utility, here ZWA, will install the connection pipe to 1.0m inside the plot area, from where it will have to be made by the landlord at his own cost.

From the below table it can be seen that the NRW within the Zarqa water supply system was 48.4% in 2006 increasing to 54.5% in 2007 and 53.6% in 2008.

² Data and information under this paragraph are according to ZWA 06.04.2010

Table 1 Calculation of NRW in Zarqa water supply from 2006 to 2008

IWA Water Balance Categories			Description	2008 m ³	2007 m ³	2006 m ³	
System input			Water Imports				
			Water from private wells	1,429,018	1,787,666	1,443,118	
			Water from Azraq P.S. to Azraq villages	1,381,392	2,308,360	2,044,998	
			Water from Aqep w ellfield to Kiridour	2,246,230	1,691,431	1,171,691	
			Water from Khaw P.S. to Zarqa res.		6,598,306	4,708,232	
			From Khaw pipeline after Tamw een	8,003,522	1,138,301	742,664	
			Total water imported	13,060,162	13,524,064	10,110,703	
			Internal water sources				
			Azraq wells	5,639,401			
			Hashemyeh wells	3,431,825	2,870,832	3,198,110	
			U'rjarn wells	2,122,710	2,402,972	2,917,540	
			Halabat w ells	6,241,567	3,992,525	2,094,900	
			Zarqa w ells	4,488,601	5,079,236	4,434,390	
			Mrhib wells	766,263	847,071	1,025,540	
			Um Rummana w ells	20,393	25,524	27,010	
			Birain w ells	755,821	877,006	566,783	
			Tamw een wells	2,488,068	2,710,835	2,296,280	
			Kiridour w ells	8,261,617	8,458,516	9,745,959	
			Sarout spring	56,301	58,810	64,670	
			Al 'Alouk spring	33,617	39,729	39,500	
Ain Qunayeh spring	523,932	302,616	326,330				
Rusaifa w ells	3,492,319	4,007,105	3,024,029				
Basateen w ells	122,430	319,052	721,267				
Phospat w ells	483,742	437,428	542,104				
Desert w ells	146,035	163,961	0				
Total internal water sources	39,074,642	32,593,218	31,024,412				
Total system input	52,134,804	46,117,282	41,135,115				
Authorised consumption	Billed autirised consumption	Billed metered consumption	Revenue water	Quantity billed according to the billing system	19,379,983	20,277,246	18,904,882
			Water tanker sales (w ith revenue)	109,505	88,996	79,416	
			Water exported to other gov. (ekskl. exp.to Khaw)	4,694,673	613,977	2,097,623	
			Total billed metered consumption	24,184,161	20,980,219	21,081,921	
			Chught illegal cases (post authorized)	0	0	139,595	
	Total billed unmetered consumption	0	0	139,595			
	Total revenue water	24,184,161	20,980,219	21,221,516			
	Unbilled authorised consumption	Unbilled metered consumption	Desert w ells	146,035	163,961	0	
			Water tanker supply (free of charge)	18,969	12,291	8,978	
			Distribution for life stocks - (metered at w ell - free)	133,333	958,500	0	
Distribution to conservative area			192,369				
Total unbilled metered consumption			490,706	1,134,752	8,978		
Unbilled unmetered consumption	Flushing of netw ork	931,513	829,877	0			
	Total unbilled unmetered consumption	931,513	829,877	0			
Total authorized consumption	25,606,380	22,944,848	21,230,494				
Total Non-Revenue Water				27,950,643	25,137,063	19,913,599	
Total Non-Revenue Water %				53.6%	54.5%	48.4%	

Source: JV DC Water and Environment, Engicon/CAH and ZWA

Both WAJ and some consultants working for the water sector in Zarqa³ confirm that the NRW is still in the order of 54%. ZWA state the following reasons for such high “losses”:

- Bad quality of some of the pipes.
- Illegal connections.

³ MCC Beneficiary Study, EcoConsult March 2010

- Many incorrect/broken meters (both bulk meters and household meters).

A further reason for high loss could be the hilly and undulating landscape and insufficient zoning as indicated in the TOR for the MCC feasibility studies.

The scarcity of water sources combined with the high NRW press the water utility to introduce intermittent supply, which in turn make consumers install rooftop tanks to ensure a more stable supply (see picture below). Figure 1 indicates the extent of intermittent supply and how often people get water in Zarqa. It is seen that two third of subscribers get water maximum two times a week. It further indicates that maximum 2.5% of the connected population gets water every day.

The household surveys further indicate that about 40% get 24 hours supply when they have the supply. It is not mentioned which of the subscribers have 24 hours supply, whether it is household only getting water few days a week or whether it is people in the better supply end. Visit to some of the refuge camps and densely populated areas however indicates that some of the areas with supply once a week gets the supply from the night between Thursday and Friday up to 10:00 a.m. Friday morning. During such supply period the pressure is very low, probably because most houses have rooftop tanks, which will start to be filled up when ZWA open the supply.

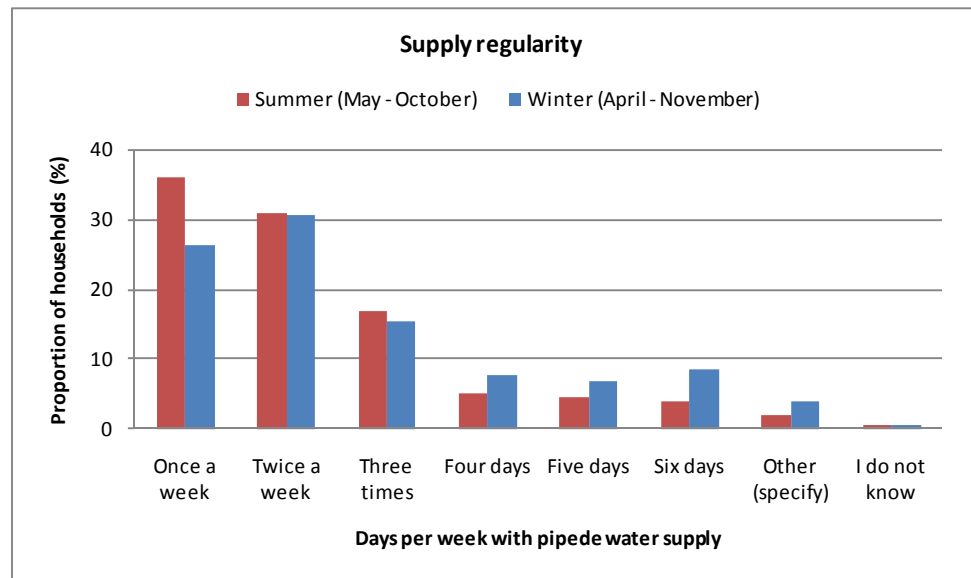


Figure 1 Extend of intermittent water supply service showing how often people get water during a week, Source: DOS 2009 Survey

The intermittent water supply is probably a key determining factor in the low level of water consumption in Zarqa. The figure below shows the per capita consumption based on the actual number of persons in the individual household (DoS 2009 Survey data). The median water consumption of 82 lpcd is likely to be a better estimate than the average of 116 lpcd, as a small number of HH appears to have misunderstood the survey question as yearly water consumption instead of quarterly.

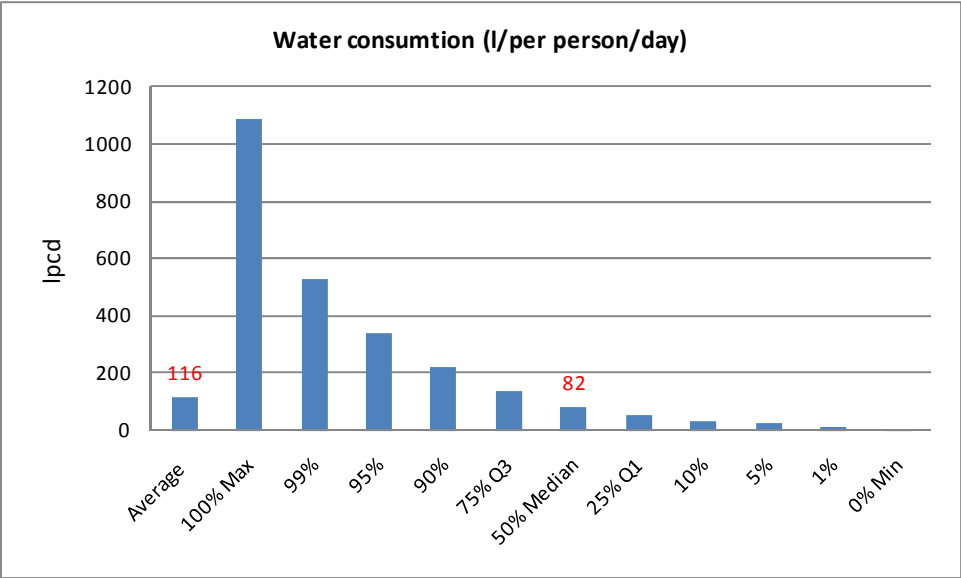


Figure 2 Water consumption per capita, Source: DOS 2009 Survey

Other sources that supplement piped water supply appear to be of limited importance with purchase of water from water treatment shops being used by 33% of households but accounting for less than 2% of their consumption, and purchase of tanker truck water and bottled water each being used by less than 4% of households (DoS 2009 Survey data). In contrast, people living outside areas presently covered by piped water supply system rely mainly on wells (free) and tanker trucks.

According to the legislation every licensed apartment shall have an individual water meter installed provided by ZWA, but paid by the landlord. It is not possible to divide the supply on more meters to one licensed apartment. Even if it houses more families on different units, e.g. floors. With the steeply graduated water tariff system in the higher consumption blocks, calculated according to the meter reading and not the number of people connected, it causes a financial burden for a number of the families living in an extended family systems commonly used, especially in the lower income areas. Such large households will often reach the higher water tariff blocks (consumption of more than 40-50 m³/quarter).



Water tanks on rooftop in Zarqa



Separate water meters on house with three individual flats in Zarqa

Other families, living basically in the same way, have, where it has been physically possible to divide in more licensed apartments, got more meters and in such way reduced the tariff (see above picture).

Figure 3 shows that close to 40% of the households are connected to a meter measuring the water consumption of two or more households. This percentage could be higher as some of the houses stated with one meter could represent more households.

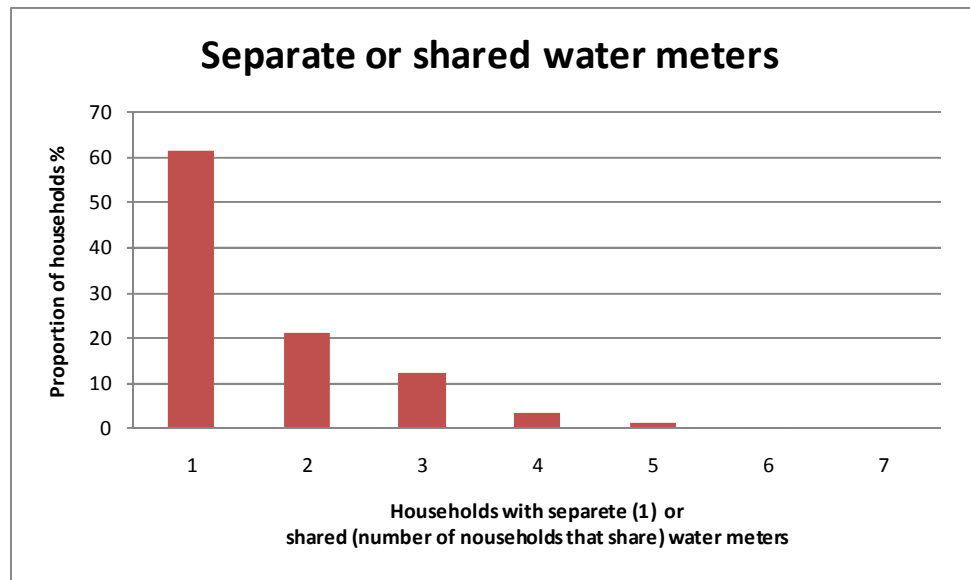


Figure 3 Percentage of shared water meters and number of households per meter, Source: DOS 2009 Survey

The many challenges Zarqa Water Authority is facing with water shortage causing intermittent supply with supply only few days a week to many subscribers, very high NRW etc., surprisingly enough do not give the expected complaints about the reliability of the supply services. One reason could be that all households have rooftop tanks and have adapted to the intermittent supply situation.

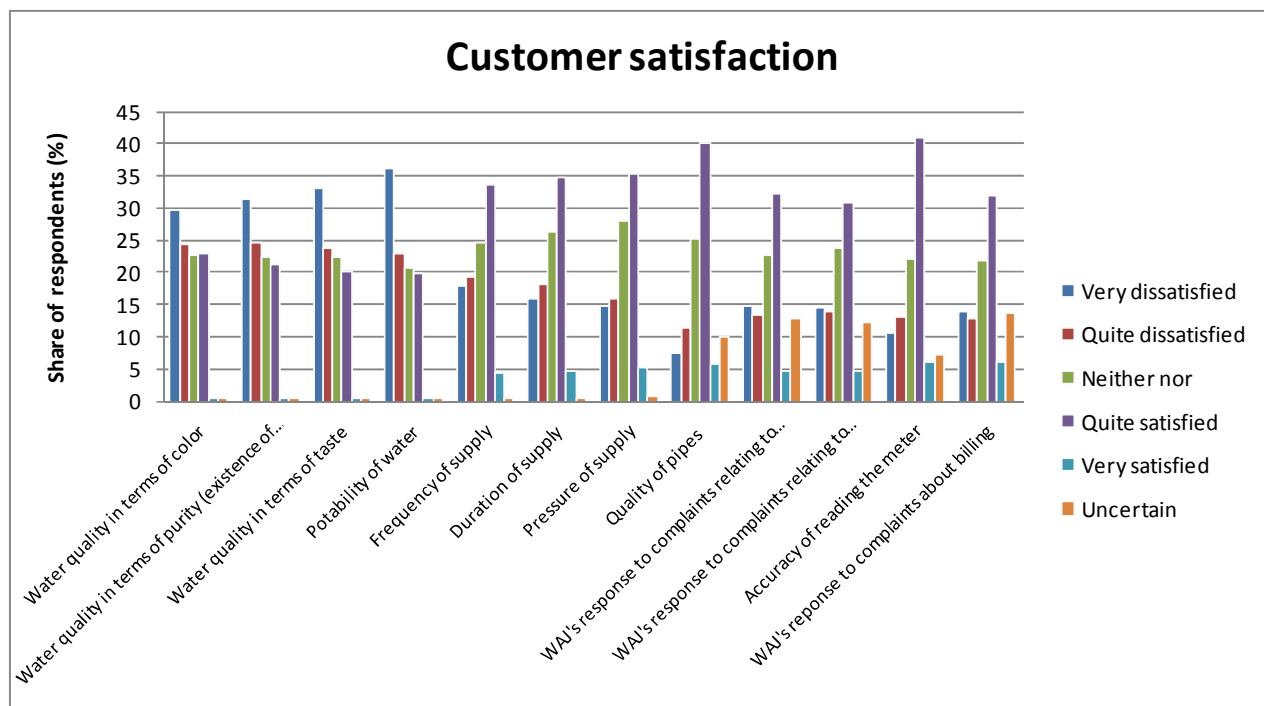


Figure 4 Customers satisfaction with the existing water supply services, Source: DOS 2009 Survey

However, when it comes to the water quality, such as colour, purity, taste and smell, people are very dissatisfied with the water. Such problems could very well be a result of the intermittent supply, which could leave parts of the network with stagnant water for periods and give vacuum, or at least no pressure, in parts of the net, causing infiltration of sewage and other pollution from the surrounding soils.

3.3 Wastewater and Sanitation in Zarqa

The sewer system in Zarqa, Russeifa and Hashemiyah has a total of some 853 km sewer pipes in dimensions from Ø200 to Ø1000mm, most of them made of concrete. The system covers approximately 90% of the Russeifa area and 50-60% of the Zarqa area. The Hashemiyah township is covered almost 100%. The sewerage system is designed as a separate collection system not sized for storm water⁴.

The ongoing MCC programme intends to extend the network to existing build up areas meaning an almost 100% coverage of households within the Russeifa and Zarqa town boundaries.

A map of the existing network area and the expected network extension under the MCC Compact is attached as Appendix C

⁴ Feasibility Study, Environmental and Social Impact Assessment and Detailed Designs and Bidding Documents for Zarqa Governorate Wastewater System Reinforcement and Expansion Project. MWH, February 2010

Out of the 135,000 subscribers to the water supply system 92,000 are presently connected to the wastewater system and registered as wastewater subscribers. This is based on the customer register.

Zarqa Water Authority estimates that:

- About 2,650 existing water supply subscribers that are presently not connected to the waste water system are in areas served by the existing system and could in principle connect
- An estimated 1,500 existing water supply subscribers that are presently not wastewater subscribers have connected illegally to the waste water system and should go through a process of having their connections legalized (if technically acceptable) or reinstalled (if technically inadequate)
- An estimated 13,300 households are in areas that are not presently covered by the network, but will be able to connect after the MCC sewerage system extension project
- The remaining households are in areas that are further from the existing sewerage system and may be covered in the longer term

Generally, WAJ/ZWA constructs only the collector pipes in the streets. In many cases (probably depending of the financier) they have, however, also included the connection pipe to existing houses up to 0.5m outside the plot boundary, where the pipe is plugged. It is then the house owners' responsibility to construct an Ø600mm inspection manhole outside the plot and the connection pipe to the house, Ø150mm concrete pipe.

Houses built after the collector pipe has been laid will have to pay the entire connection pipe from the collector in the street up to the house. In most cases such a connection is very expensive as the applicant will have to pay for a connection chamber in the street, laying of pipes in paved areas with re-establishment of the pavement, inspection chamber just outside the plot area and the pipe and connection to the house inside the plot.

Households not connected to the sewerage system have a type of on-side sanitation systems consisting of various types of cesspits (septic tanks, collection tanks etc.) with seepage systems for the liquid. The solids are removed by private tankers, typically 2-3 times/year.

As described in Section 4 below the major reason for not connecting stated in the 2009 DoS Survey was that there was no nearby wastewater collector. In areas where people could connect the following reasons were given:

- They generally consider it too expensive
- Special cases where it will be very expensive (the house is below the main sewer requiring pumping, the house is far from the main pipe etc.)
- Long distance to the collector pipe
- Special soil conditions e.g. rock

Another reason in areas with service is according to ZWA that a number of the unconnected households are already connected by illegal connections.

It is not well defined when a house/plot is considered covered by an existing sewerage system. Some houses will have to construct rather long pipes in the road to get a connection. The houses on the below picture is such an example on houses placed along a secondary road behind the road with the main collector. The houses on that road existed when the main pipe was laid, but no nearby manhole was made for their connection. The four houses had to pay in combination 4,000 JD for the connection pipe through asphalt and concrete structures as can be seen on the picture.



Four houses which have jointly covered the cost of a long connection to the nearest sewerage line

Hence, there is a risk that low income households are deterred from connecting to existing sewerage networks by high access costs.

All wastewater collected in the sewerage system is treated in the newly constructed Khirbit Es Samra BOT WWTP. The charge for leading wastewater to the Khirbit Es Samra BOT WWTP is fixed at 0.160 JD/m³ (74% of the total cost of wastewater collection and treatment). It should be noted that only households with consumption above 100 m³ per quarter pay a tariff which covers this charge.

Wastewater collected by tankers from the cesspits should in principle also be treated in a WWTP. It is, however, difficult to ensure that this actually happens and the households served by cesspits may create environmental hazards:

- Seepage from simple soak away pits could infiltrate ground water resources
- Insufficient disposal by operators of trucks emptying cesspits may cause pollution of surface water

- Inadequate maintenance and lack of timely emptying combined with heavy rainfall may cause local health risk

3.4 The economics of ZWA

The table below shows the 2008 accounts of ZWA.

Zarqa 2008 accounts (JOD)	Total	Water	Wastewater	Water tankers	Dessert wells
Revenues					
Operational revenues	10.180.761	8.441.779	1.697.290	41.692	
Non operational revenues	1.819.287	1.164.821	654.466		
Total revenues	12.000.048	9.606.600	2.351.756	41.692	-
Expenditures					
Wages and salaries	2.150.952	1.634.813	444.106	12.928	59.105
Electricity	3.392.992	3.299.738	93.254		
Water imports	4.086.524	4.086.524			
Wastewater treatment plant	2.615.154		2.615.154		
Vehicle maintenance	514.413	278.196	207.417	25.427	3.375
Network maintenance	873.122	799.570	69.866		3.686
A&G expenses	441.343	361.902	75.028	4.413	
Other expenses	404.697	322.998	28.256	32.119	21.325
Total expenditures	14.479.197	10.783.741	3.533.081	74.887	87.491
Cost recovery	83%	89%	67%	56%	0%

It is seen that the total cost recovery is 83% reflecting 89% cost recovery for water and 67% cost recovery for wastewater. The key cost component for wastewater is the payment to Khirbit Es Samra BOT wastewater treatment plant.

The collection rate in 2008 was 72%, a figure which according to ZWA has improved during 2009.

Nevertheless, the combination of high NRW, low cost recovery and low collection rate is a major management challenge to ZWA. It is against this background that corporatization and external management expertise is being contemplated.

3.5 Corporatization and management contract

The transaction design for a tender for a management contract for ZWA is presently being prepared.

The first step is a corporatization of ZWA which requires PM approval of the assignment of assets. Subject to corporatization, the management contract for Zarqa Water Company (ZWC) will be tendered in Q3 2010 with possible start of the management contract in Q1 2011.

The transaction design is not finalized but the current thinking is that the management contractor will be responsible for:

- Operations & maintenance of all assets

- Coordination of all capital investments

The management contractor for ZWC will hence not be required to implement own investments, but will have a central role in coordinating the parallel donor funded investments (MCC, EC, Japan, China). This is important as the donor funded assets will be operated and maintained by the management contractor after completion of the investments.

The management contractor is likely to be remunerated with a combination of a fixed fee and a performance based fee. The present thinking concerning the performance indicators is that they will include Annual Water Sales, Operational Cash Surplus and Continuity of Supply Time.

The existing staff will initially be seconded to the management contractor, but in light of the age distribution some may opt for early retirement.

4 The non connected households

The present section provides a characterization of those Zarqa Governorate residents who do not have water and wastewater connections.

4.1 Reasons for non connection

The main reason for not being connected stated in the 2009 DoS Survey was lack of network in the area. However, the second most important reason given was affordability constraints and the third most important reason given was 'not considered necessary', which implicitly may reflect affordability concerns.

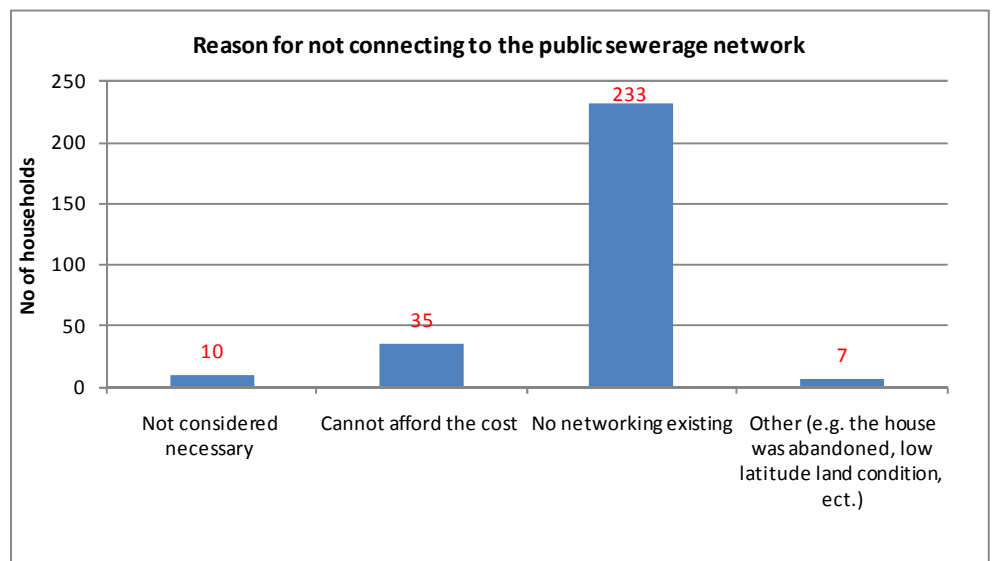


Figure 5 Reason that people do not connect to the sewer system, Source: DoS 2009 Survey

4.2 Income level of non connected households

The GFA Study on Socio Economic Baseline Survey in the Water Supply and Wastewater sector cites the following household income and expenditure data from the 2006 HEIS study.

According to this study, average household income and expenditure in Zarqa in 2006 was about 25% below national average at 4,681 JD and 5,955 JD respectively.

2006 Average Household Income (JD/year)

	Per household	Per person
Zarqa	4,681	840
Jordan	6,220	1,084

2006 Average Household Expenditure (JD/year)

	Per household	Per person
Zarqa	5,955	1,065
Jordan	7,522	1,307

This is higher than the household income reported in the Household Survey conducted by the Department of Statistics (DoS) in 2009, where average reported income is about 300 JD/month or 3,600 JD/year.

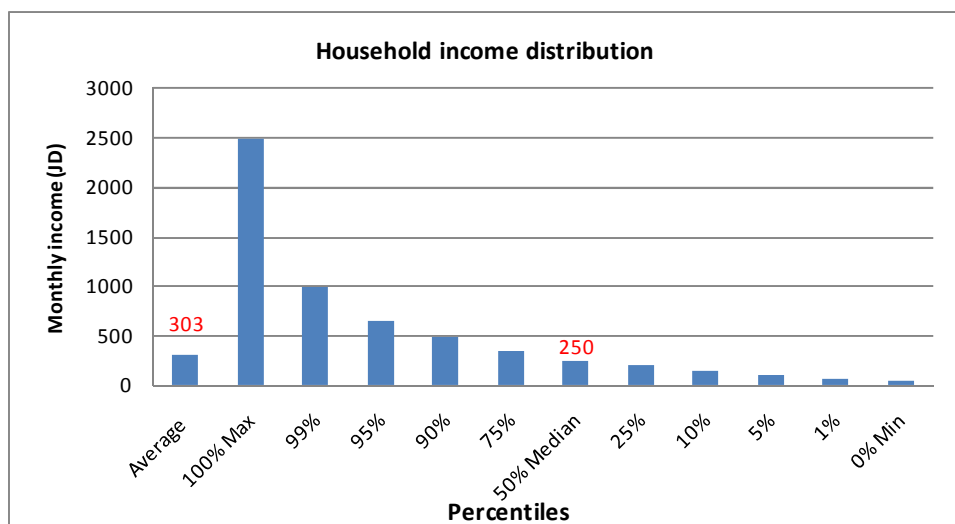


Figure 6 Household income distribution, Source: DoS 2009 Survey

It is noted from the 2009 DoS Survey that the median reported income is 250 JD/month or 3,000 JD/year, reflecting that a substantial group of households have income below the calculated average.

The 2009 DoS Survey furthermore enables stratification on households presently connected to sewerage, not connected due to lack of sewerage in area and not connected due to stated affordability constraints.

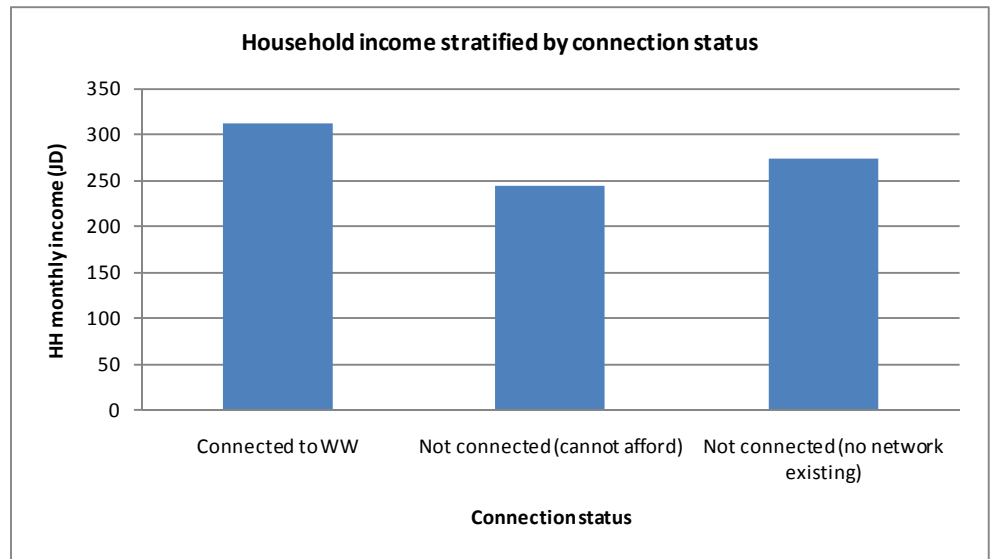


Figure 7 Household income distribution stratified by connection status, Source: DoS 2009 Survey

It is noted that households stating affordability constraints as the reason for not connecting have average reported household income of about 20% below the households presently connected to the sewerage system.

Households stating lack of network in area as the reason for not connecting also have a lower average reported household income which may reflect that they are located in outer areas of the city.

Furthermore, there appears to be a clear link between income and level of connection.

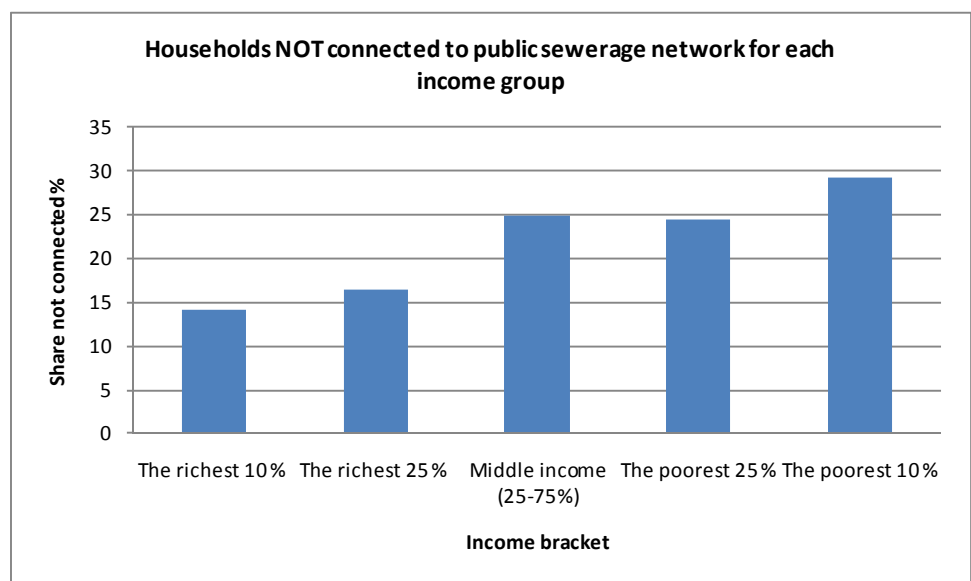


Figure 8 Share of non connected by income bracket, Source: DoS 2009 Survey

4.3 The cost of alternative solutions

The non connected households rely on septic tanks with an average annual cost of emptying cesspits of 81 JD and a median cost of 50 JD.

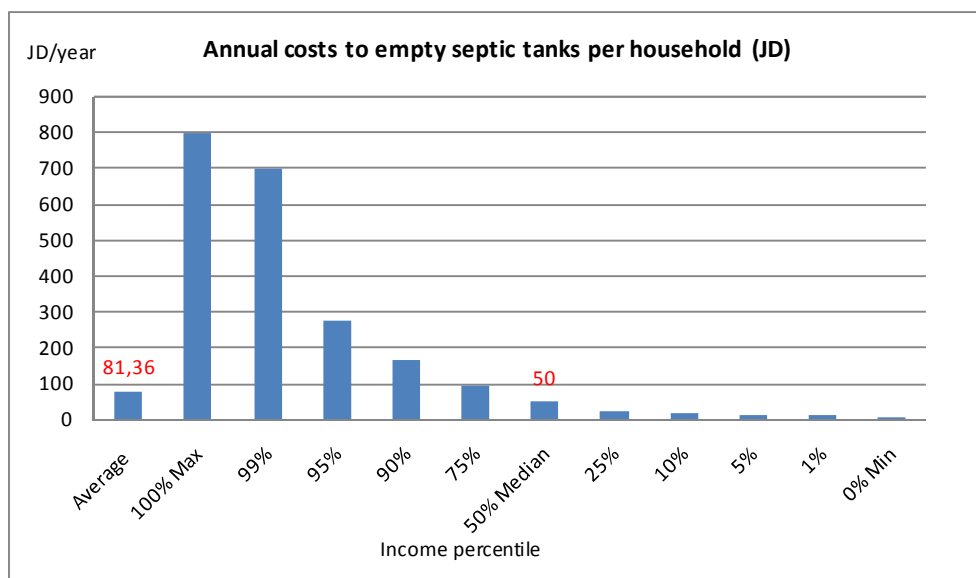


Figure 9 Annual cost of septic tank by income percentile, Source: DoS 2009 Survey

4.4 Implication for the OBA scheme

Among the households in areas with network in the DOS 2009 survey, affordability constraints were the main reason cited for not being connected.

The households citing affordability constraints have average reported household income 20% below connected households and there appears to be a clear link between income and level of connection.

Hence, while lack of accessible network in area continues to be the main barrier to connection, there is a group of households for whom the access costs in themselves are the main barrier. Therefore it is likely that universal access cannot be attained from network expansion alone but would need to be supported by a targeted effort to connect the low income households in areas with existing networks or where network expansions are planned.

5 The financial model

The present section presents key outputs of the financial and economic modeling of household connections.

5.1 Analysed interventions

The following interventions have been analyzed:

- 1 Connection to sewerage (existing water supply customer connects to sewerage)
- 2 Splitting of shared meters (extended household converts 1 to 2 WS meters)
- 3 Connection to water supply (household not presently connected to water supply connects)

For each of these interventions we have assessed the economics from the customer point of view and from ZWA's point of view.

Furthermore, we have assessed whether the intervention is suitable for OBA, recognizing that OBA is a strategy for explicit performance based subsidies for delivery of basic services, and hence it should be possible to argue:

- why the subsidy is provided
- who is receiving the subsidy
- what is being subsidized and with how much
- how can the payment of the subsidy be directly linked to the establishment of connections for eligible households

For the intervention(s) recommended for OBA a detailed financial and economic analysis is presented.

5.2 Connection to sewerage (existing water supply customer connects to sewerage)

5.2.1 Economics from customer viewpoint

For an average household with a water consumption of 50 m³/month, connection to sewerage looks like a good idea for most households if you disregard the construction costs. The net saving from the difference between the cost of cess-pit emptying (typically 50 JD/year) and the increased tariff (12 JD/year) will be able to pay back the 150 JD connection fee over a 4 year period.

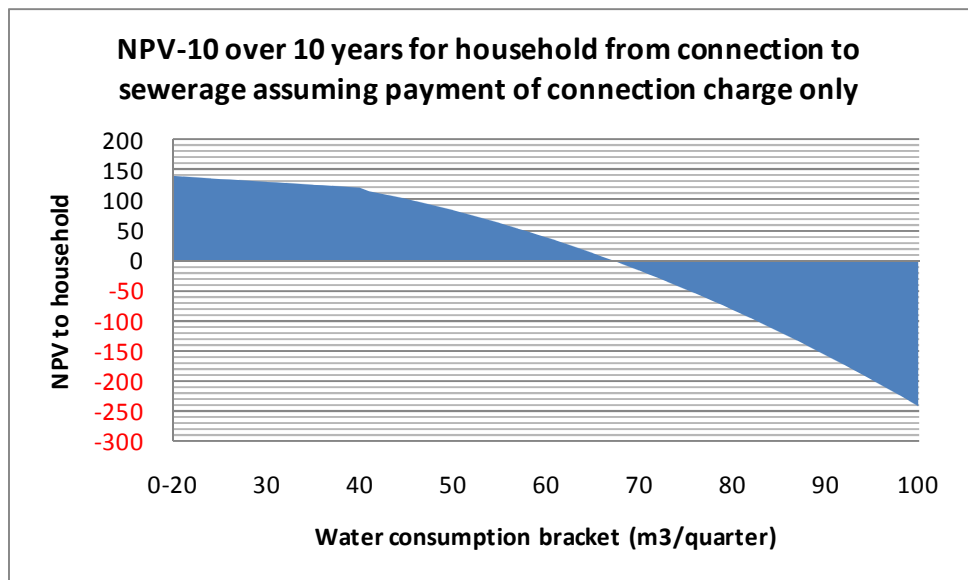


Figure 10 Economics of connecting individual household to sewerage system by water consumption bracket (connection charge only), Source: Tariff schedule and own calculations

But including the limited investment costs within plot the boundaries (typically 400 JD) changes the economics radically

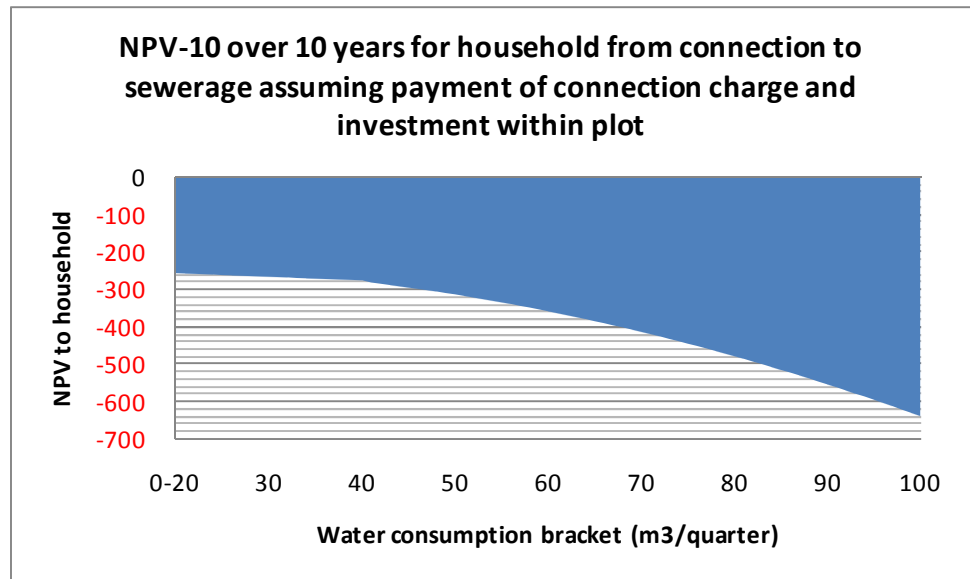


Figure 11 Economics of connecting individual household to sewerage system by water consumption bracket (connection charge and investment within plot area), Source: Tariff schedule and own calculations

Furthermore, non connected households on existing sewerage lines are expected to also pay investment cost outside the plot.

5.2.2 Economics from ZWA viewpoint

Only households with consumption above 100 m³ per quarter pay a tariff which covers the 0.160 JD/m³ charge for sending wastewater to the Khirbit Es Samra BOT WWTP and only households with consumption above 130 m³ per quarter pay a tariff which covers the full O&M costs.

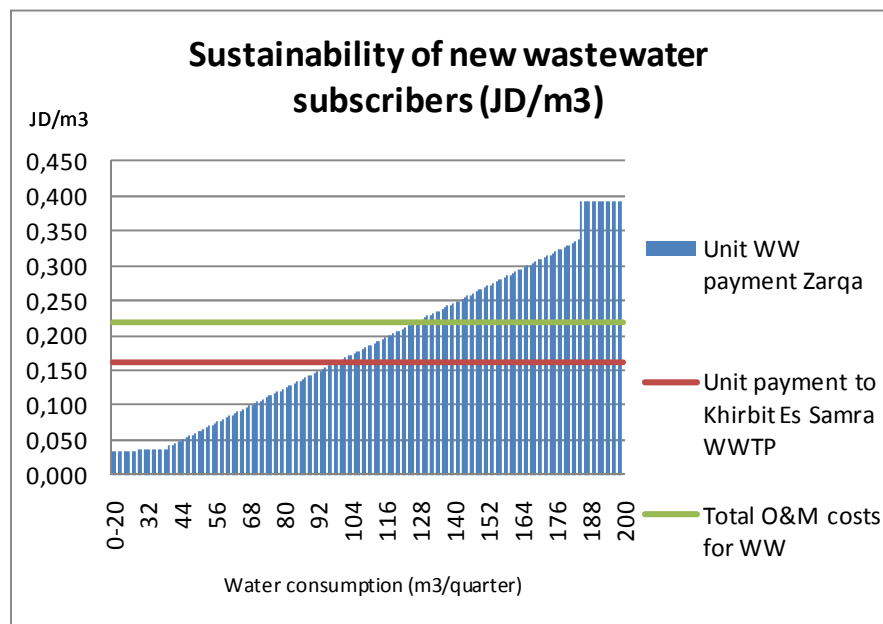


Figure 12 Tariff revenue and marginal cost for ZWA of connecting individual household to sewerage system by water consumption bracket, Source: Tariff schedule and own calculations

But as seen from the graph below the 150 JD connection charge compensates for the marginal operating loss (0.17 JD/m³ covering Khirbit Es Samra BOT WWTP + electricity costs + network maintenance costs).

The decline between zero and 40 m³ per quarter is a consequence of the volume independent tariff for consumption between zero and 20 m³ per quarter.

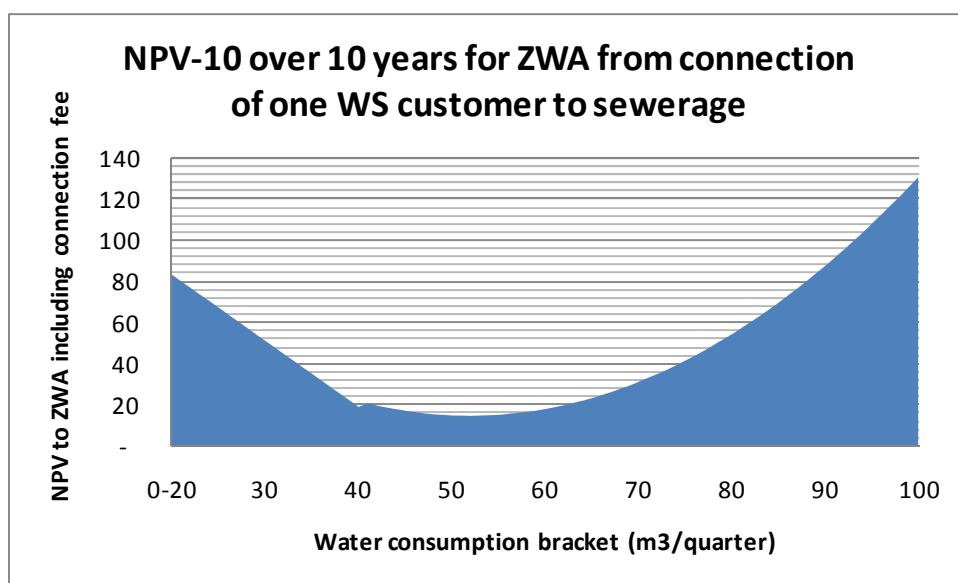


Figure 13 Economics for ZWA of connecting individual household to sewerage system by water consumption bracket (including revenue from connection charge), Source: Tariff schedule and own calculations

5.2.3 Suitability for OBA

OBA suitability check	Comment	Evaluation
Why	To enable poor households to access joint sewerage and thereby reducing the potential environmental hazards caused by inadequately constructed or maintained cesspits	+
Who	Households presently not connected but close to existing or planned network	+
What	Unaffordable cost of construction of connection outside plot for all	+

	plus unaffordable part of cost inside plot for the poorest	
How	Private contractors would establish connections under performance based contracts	+

The intervention is suitable for OBA.

5.3 Splitting of shared meters (extended household converts 1 to 2 WS meters)

5.3.1 Customer viewpoint

Based on the DOS household survey 61% of households have separate meters, 21% of households share a meter with another household and 18% of households share a meter with more than one other household.

The average total consumption for an extended household where 2 households share 1 meter is 50 m³ per quarter, hence these households have significantly lower consumption than the average household.

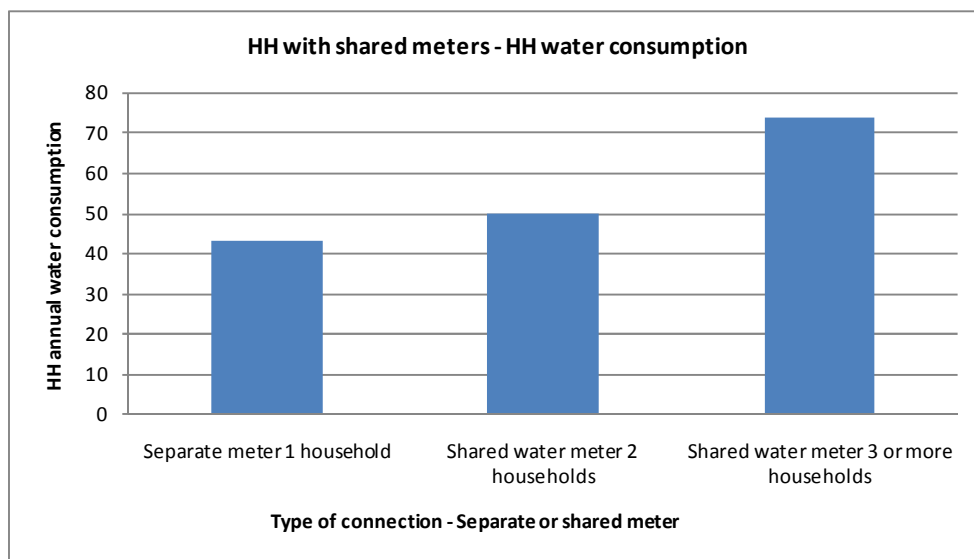


Figure 14 Water consumption by households with individual and shared meters, Source: DoS 2009 Survey

But as seen from the figure below conversion to separate meters is only economically viable for larger consumption levels.

To understand this implication of the increasing block tariff one may look at two double households:

- Double Household A consumes 50 M3/quarter.

Today they pay 14 JD/quarter. After splitting they will pay 2 times 6.5 JD/quarter. The annual saving of 4 JD is insufficient to finance the cost of splitting the meter.

- Double Household B consumes 100 m3/ quarter

Today they pay 56 JD/quarter. After splitting they will pay 2 times 14 JD/quarter. The annual saving of 110 JD is more than sufficient to finance the cost of splitting the meter.

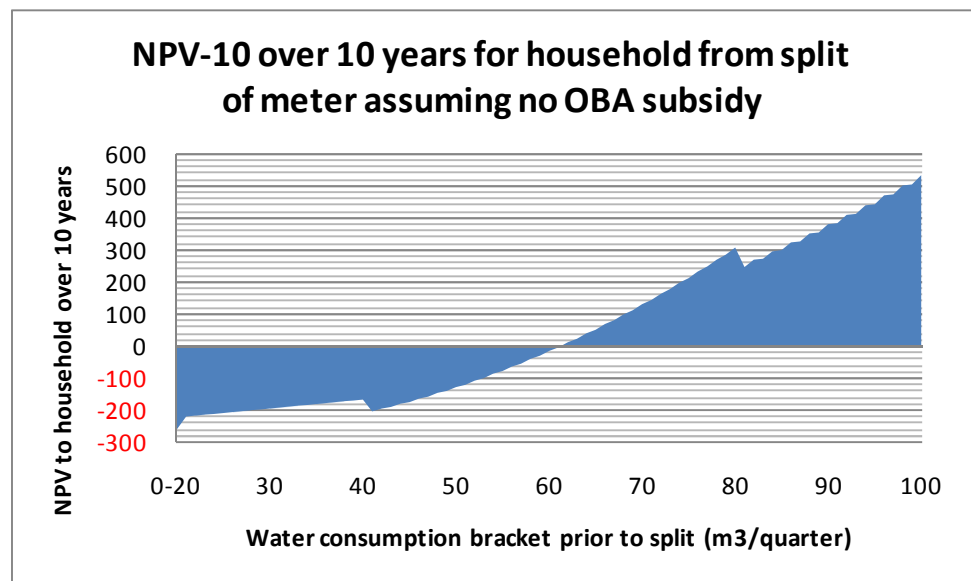


Figure 15 Economics for household of dual meter in two individual meters by water consumption bracket, Source: DOS 2009 Survey and own calculations

For comparison, when 3 households are sharing a connection the break even for splitting the connection in three individual connections is about 80 m3 in initial consumption.

5.3.2 ZWA viewpoint

The splitting of the meter is a zero-sum game between the household and ZWA (apart from limited investment costs of 33 JD and licensing fee if the apartment was not previously licensed of 0.4 JD/m2 in the poorer areas). The gain of the household from conversion is a loss to WAJ and vice versa.

5.3.3 Suitability for OBA

OBA suitability check	Comment	Evaluation
Why	Difficult to define in terms of improved access as there is none.	-
Who	Low consumption households sharing a meter.	(+)
What	If only investment costs and licensing fees are subsidized this will be insufficient to enable a shift. If connection fees are subsidized this will effectively be an operational subsidy for ZWA	-
How	Under the existing division of responsibility ZWA would split the meters.	-

The intervention is not suitable for OBA. In particular the benefits of the intervention are very hard to define in terms of improved access.

Furthermore, it should be noted that the (unconfirmed) reports about incorrect/broken household meters questions the sustainability of meter exchange interventions unless they are backed by an enforcement mechanism which reduces the incentives for forcefully breaking meters.

5.4 Connection to water supply (household not presently connected to water supply connects)

5.4.1 Customer viewpoint

Households presently not connected to the water supply system and in proximity of the water supply system would need to pay the connection fee of 150 JD and the limited construction costs inside the plot in the order of 73 JD (5m excavation in soil and a water meter installation).

A household with a consumption of 50 m³ per quarter would subsequently have to pay 11 JD/quarter in tariffs (assuming no wastewater connection), which would also be their increased recurrent cost (assuming that they previously have relied on wells).

5.4.2 ZWA viewpoint

According to ZWA no non connected households are within the distance of the existing water supply system where ZWA would normally consider a connection technically and economically viable (maximum 200 meter), but a limited number of households are between 300 and 500 meter from the existing water supply system.

It should also be noted that the problem of water rationing with intermittent supply and low pressure will only become worse for each new customer added to the water supply system if accompanying investments in NRW reduction and supply improvements are not made.

5.4.3 Suitability for OBA

OBA suitability check	Comment	Evaluation
Why	Improved access to water supply for targeted households - but will compete with existing households for limited resources	(+)
Who	Very limited target group for connection subsidies unless costly system expansions to new areas precedes intervention	-
What	Cost of access for households beyond the limit normally considered technically and financially viable by ZWA	(-)
How	Private contractors would establish connections under performance based contracts	+

The intervention is not suitable for OBA. In particular the lack of a target group of unconnected households is an issue.

It should be noted that this conclusion is specific to the conditions in Zarqa and that OBA interventions in water supply could be relevant in governorates with less than full connection coverage of households in areas with existing water supply systems.

5.5 Financial and economic analysis of recommended intervention

The table below presents the financial cash flows for the recommended intervention where existing water supply customer connects to sewerage.

The calculation assumes investment costs of 400 JD inside plot and 1,000 JD outside plot) and an OBA subsidy covering the full cost of the investment outside plot boundaries and 3/4 of the investment inside the plot boundaries.

Household (Marginal cost of connecting to WW if already connected to WS)										
Year	1	2	3	4	5	6	7	8	9	10
Water consumption (m3/year)	200	200	200	200	200	200	200	200	200	200
Wastewater charge (JD/year)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)
Saving on emptying of cesspit	50	50	50	50	50	50	50	50	50	50
Connection charge (JD)	(150)									
Investment within .5 m of plot boundary (JD)	(1,000)									
Investment beyond .5 m of plot boundary (JD)	(400)									
GPOBA grant (JD)	1,300									
Cash flow (JD)	(212)	38	38	38	38	38	38	38	38	38
Accumulated cash flow (JD)	(212)	(174)	(136)	(98)	(60)	(22)	16	54	92	130
FIRR (10 years)	10,8%									
Pay back	7 years									
Grant rate	84%									
WAJ (Marginal implication of a new WW customer already connected to WS)										
Year	1	2	3	4	5	6	7	8	9	10
Water consumption (m3/year)	200	200	200	200	200	200	200	200	200	200
Wastewater charge (JD/year)	12	12	12	12	12	12	12	12	12	12
Payment to Khirbit Es Samra BOT WWTP	(32)	(32)	(32)	(32)	(32)	(32)	(32)	(32)	(32)	(32)
Payment for electricity and network maintenance	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Connection charge (JD)	150									
Investment within .5 m of plot boundary (JD)										
Investment beyond .5 m of plot boundary (JD)										
GPOBA grant (JD)										
Cash flow (JD)	128	(22)	(22)	(22)	(22)	(22)	(22)	(22)	(22)	(22)
Accumulated cash flow (JD)	128	106	84	62	40	18	(4)	(26)	(48)	(70)
FIRR (10 years)	9,7%									
NPV (10%)	1									
Pay back										
Grant rate	0%									

Under the applied subsidy assumptions the connection becomes a reasonable project for both the household and WAJ.

The non-financial benefits of increasing the connection rate to the wastewater system can be divided between those accruing to households directly, those accruing to ZWA and those accruing to the wider community. These are summarised in the table below.

Summary Benefits of Increased Connectivity to the Wastewater Network

	Financial	Health	Economic	Other
Private Household	<p>Reduced expenditure on vault emptying</p> <p>Reduced loss of earnings through illness</p>	<p>Reduced exposure to pathogens – reduced incidence of preventable water-related illness</p>	<p>Increased productivity in family business</p> <p>Increased land and house values</p>	<p>Increased convenience, privacy, status</p> <p>Less disputes with neighbours</p>
ZWA	<p>Improved liquidity through up front revenue from connection fee</p>			<p>Better, more comprehensive relationship with customers</p> <p>Improved compliance with regulation</p>
Public/ societal	<p>Reduced public expenditure on curative health services</p> <p>Improved efficiency of public subsidy.</p>	<p>Reduced exposure to pathogens – reduced incidence of preventable water-related illness</p>	<p>Reduction in productive days lost through illness</p> <p>Increase in productivity of workforce protected from endemic preventable water-related disease.</p> <p>Increased agricultural productivity due to less pollution</p> <p>Additional water quantities for reuse</p>	<p>Reduced social tension</p> <p>Improvement in the 'status' of poorer communities</p>

The exact monetary value of the non-financial benefits is difficult to quantify and this will not be attempted here. However, recent work by WHO suggests that the benefit-cost ratio of investments in giving everyone access to a sewage connection in their houses (when coupled with provision of adequate water supply) in the Eastern Mediterranean (low adult, low child mortality) region which includes Jordan are high, in the order of US\$15 per US\$ invested⁵.

⁵ Evaluation of the Costs and benefits of water and sanitation improvements at the global level, Guy Hutton and Laurence Haller, WHO (2004)

6 Affordability assessment

The present section provides an estimate of the affordability qualify the estimate of the total subsidy amount necessary.

6.1 Tariffs

The typical water consumption in Zarqa is 50 m³ per quarter or less.

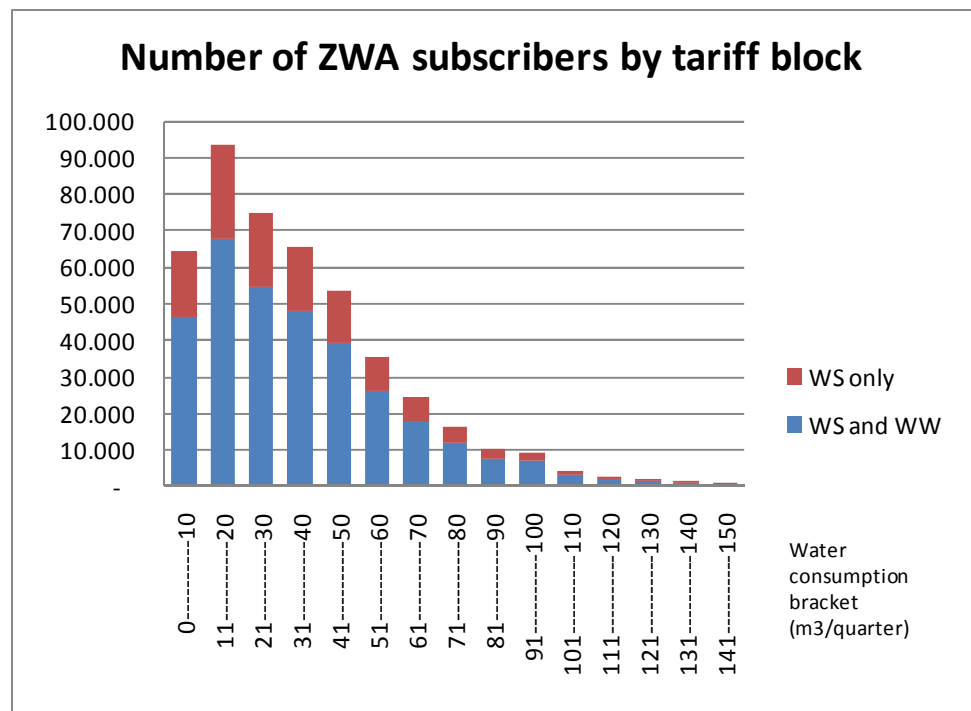


Figure 16 Distribution of ZWA water supply customers by consumption bracket, Source: ZWA customer data

With the current system of increasing block tariffs this means that most households have total tariff payments in the order of 15 JD per quarter or less.

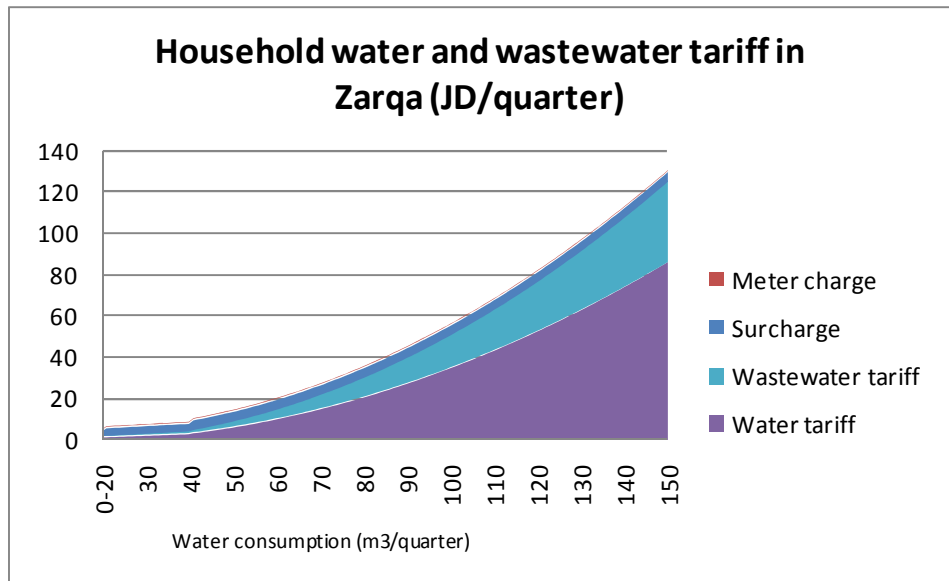


Figure 17 Combined water and wastewater tariff by water consumption bracket, Source: Tariff schedule and own calculations

Based on the 2009 DoS survey we have analysed the actual tariffs paid by households in different income brackets.

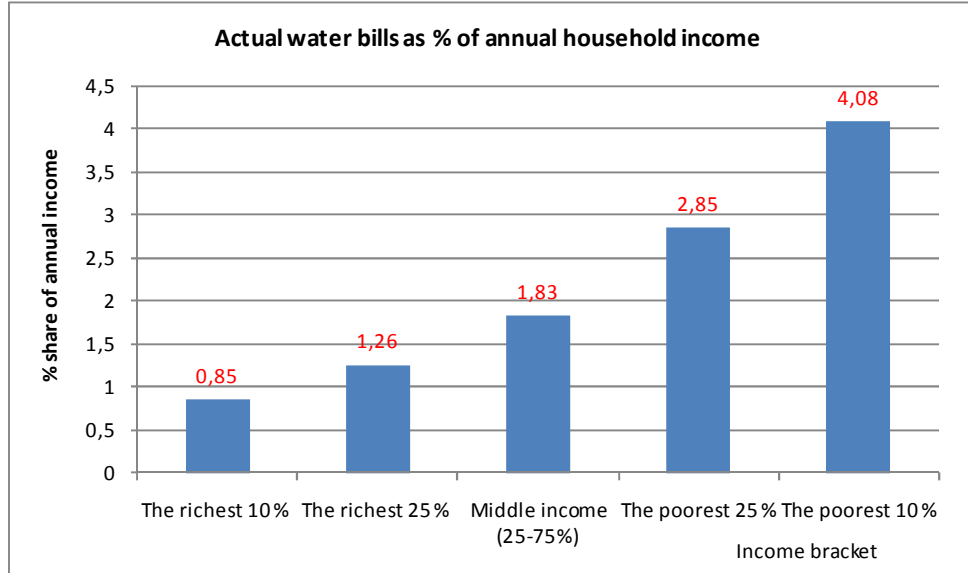


Figure 18 Actual water bill as share of income by income brackets, Source: DoS 2009 Survey and own calculations

With the lowest income decentile paying 4% of income for water and sanitation services, which is reasonable in an international perspective, the conclusion is that current tariffs are affordable even for the poorest households.

6.2 Connection costs to sewerage system

The one time cost of a connection to the sewerage system has three components:

- ZWA connection fee of 150 JD (paid by all)
- Construction costs within own plot in the order of 400 JD (paid by all)
- Construction costs outside own plot in the order of 1,000 JD (paid by non-connected households in areas with existing sewerage systems)

Based on the 2009 DoS survey we have analysed the cost of connection to sewerage system for households in different income brackets.

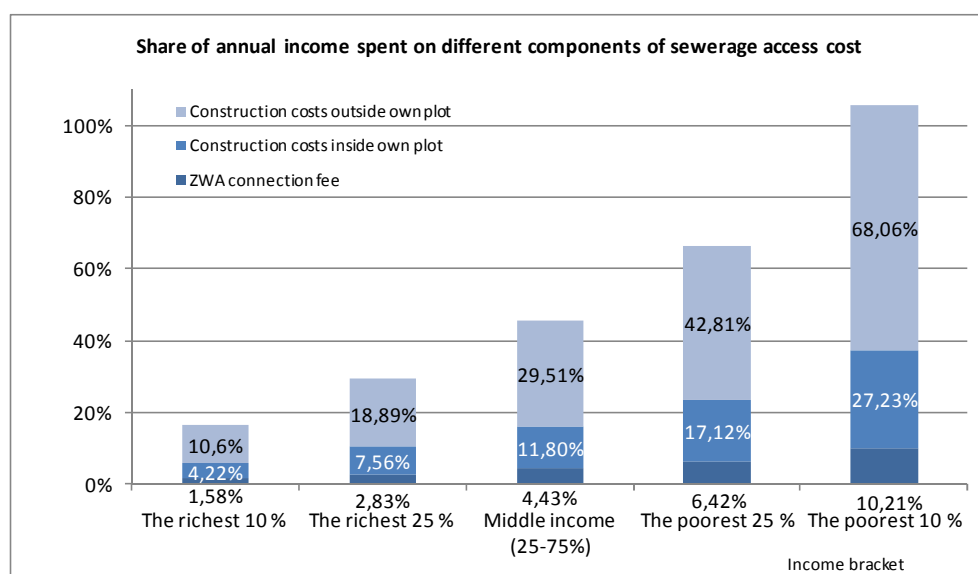


Figure 19 Cost of wastewater connection as share of annual income by income bracket, Source: DOS 2009 Survey and own calculations

It is noted that:

- the ZWA connection fee appears to be affordable for all households
- the construction costs within own plot will be difficult to afford if you are a low income household
- the construction costs outside own plot (to be paid by non-connected households in areas with existing sewerage systems) will be difficult to afford for any but the richest households or medium income households who can split the costs of a joint connection

6.3 Cost of splitting water meters

The onetime cost for splitting a joint water meter in two individual meters is:

- 150 JD in connection fee + 33 JD in investment costs + 20 JD licensing fee (if the apartment was not previously licensed)

This is 5% of annual household income for the average household and 11% of household for the poorest 10% of households (assuming that the two households only have one income). If the households have two incomes the amount is halved for each.

As noted above the action of splitting water meters is financially viable for high consumption households but financially non viable for low consumption households (most households with shares meter).

Hence, the barrier appears to be a combination of lack of economic incentives and in some cases lack of appropriate planning permits for the additional households, rather than an affordability issue per se.

6.4 Cost of connecting to the water supply system

The onetime cost for connecting a non connected household to the water supply system is:

- 150 JD in connection fee and construction costs inside the plot in the order of 73 JD

This is 6% of annual household income for the average household and 13% of household for the poorest 10% of households.

6.5 Implications for OBA scheme

Tariffs appear to be affordable with most households paying combined water and wastewater tariffs in the order of 1-3% of household income and the poorest 10% paying in the order of 4% of household income.

The ZWA connection fees for water and wastewater are in the order of 3% of average household income each which also appears to be affordable.

On the other hand, the construction cost related to connection to joint wastewater - in particular for non-connected households in areas with existing wastewater systems - is substantial compared to average household income and therefore likely to be a real barrier for the poorer households.

The cost of connecting to water supply for non connected households is affordable when viewed in the context of the improved service it provides.

The cost of splitting joint water meter is in principle affordable - but for most households there is no economic incentive to do so.

Although the above conclusion is primarily drawn on the basis of the 2009 DoS household survey with the risks of strategic representation which is always in-

herent in stated preferences and income figures, the conclusion appears to be robust. Furthermore, the 2009 DoS survey is quite comprehensive and it is not very likely that significantly more reliable information would result from additional and more focused data collection.

Therefore, the consultant does not recommend further affordability and willingness-to-pay studies to complement existing data.

7 Project financing options

The present section assesses the households' available options for financing the connection fee over a number of months or years. Furthermore, the local contractors' ability to provide pre-financing under a performance based contract is assessed.

7.1 Households

The Zarqa Water Authority offers households connecting to the joint sewerage system (new connection or legalisation of existing connection for which fee was not paid) a financing arrangement for the connection fee comprising down payment and 3 equal monthly instalments. This arrangement is presently used by about half of the connecting households.

For water supply a longer credit is available in the situation where a household is requesting re-installment of service after disconnection of water connection due to non payment. In this case a financing arrangement for the missing payments comprising down payment and up to 5 monthly instalments may be authorized by the director of ZWA. Subject to separate authorization by the general director of WAJ a financing arrangement for the missing payments comprising down payment and up to 11 monthly instalments is possible.

It is our preliminary impression that most households and definitely the poorer households do not have access to longer term financing for connections than the terms offered by ZWA.

7.2 Contractors

Interviews were conducted with 6 of the 21 contractors certified by the ZWA. The purpose of this was to establish their interest in and capacity to undertake performance based contracting and to assess their ability to carry pre-financing risk under an OBA project.

7.2.1 Interest in undertaking a larger number of sewerage connections with performance based payments under the OBA project

All contractors interviewed responded that they in principle would be interested in undertaking a larger number of sewerage connections (100-300) with performance based payments (payment being made partly after completion of the work to agreed standards).

However, the contractors also underlined that access to finance was the main limitations on the contractors' abilities to undertake performance based contracting for larger contracts and that this would only be possible for them if payments could include a partial prepayment and milestone payment element.

In this context, the contractors stated that a 20% payment element after verification of completed connections (compared to the present 10%) should be possible.

7.2.2 Present payment schedule

The normal payment schedule when working on larger contracts for public clients (e.g. Zarqa Water Authority) is 10-15% down payment (against bank guarantee), the majority of the payment against milestones and finally 10% after completion and supervision of the work. For small contracts (below 30,000 JD) payment is often just upon completion.

The small individual connection contracts with private households for sewerage connections follow a Government Template Agreement, which however does not define the payment terms. The normal payment schedule when working for private households is one third in down payment and the remaining 2/3 upon completion. Sometimes delayed payment is accepted and sometimes the cost is not recoverable.

7.2.3 Working capital finance

The contractors finance the work performed until they are paid through own funds, supplier credits and for larger government contracts bank loans. Some contractors have no experience with bank loans.

When working for public clients a 3 month payment period is usual.

Bank loans have a cost of 10-25% p.a. depending on the relation between the contractor and the bank.

Shorter supplier credits (months) are typically free of visible costs. Longer supplier credits (12 months) have a visible cost in terms of a 10% price increase.

The contractors generally perceive the public sector clients as a better credit risk than the households.

7.2.4 Guarantees and warranties

Contractors are normally asked to provide 3 types of guarantees:

- Bank guarantee against any prepayment
- 10% good performance guarantee during the construction phase
- 5% maintenance guarantee for the first year of operation after completion

7.2.5 Supervision of construction work

The supervision is performed by Zarqa Water Authority and is typically initiated by the contractor requesting supervision to confirm that a contractual milestone has been reached.

7.3 Implication for OBA Scheme

The non connected households have limited access to financing and an instalment scheme for the ZWA connection fee which goes beyond the presently offered 1+3 months (e.g. to 1+11 months available for re-installment of water connections) could be helpful if households in parallel are asked to co-finance the construction cost.

The key financial barrier for households however appears to be the high and varying construction costs. Based on interviews with contractors it is clear that contractors offer informal credit arrangements to households, but also that they perceive households as a higher credit risk.

Under an OBA scheme the contractors can be asked to carry more pre-financing risk than today, but this would require their credit risk exposure on the households to be limited to a minor part of the total construction cost (the household co-financing).

8 Estimating necessary subsidy

The present section provides an estimate of the necessary unit and aggregate subsidy amount.

8.1 The cost of connections

8.1.1 Estimated cost of households' water and wastewater connections

Key water supply and wastewater stakeholders have been visited to get costs estimates of water and wastewater household connections. It is known that hardly two connections are exactly similar; it has therefore been the intention to obtain costs for what could be called typical connections relevant for most existing and potential ZWA customers.

The length of both a water supply and a wastewater household connection inside the housing plot will typically be from just few meters up to about 10-15 meters with an average of about 5 meters. The distance from the boundary of the housing plot to the main pipe/collector varies much more and can be as long as 30-50 meters. However, a typical length here could also be 5 meters.

Water supply

When a new consumer apply for a water supply connection, ZWA will assess the application and approve it if they consider that the applicant's plot is covered by the existing water supply network. There is no exact legislation defining when a house/plot is covered by the existing network. But experience indicates up to 180-200 meters. If longer the ZWA will normally not approve the application.

When the application has been approved, ZWA will install the connection pipe from the main pipe to 1.0 meter inside the housing plot. From here the landlord will have to pay up to the house.

ZWA will provide the water meter, but will charge the cost of 8 JD to the landowner. The construction cost of a connection from 1.0 meter inside the plot will be 70-80 JD depending of the length.

A simple Bill of Quantity for such a connection is shown in Appendix D.

It is mentioned above that quite a large number of households use shared meters as they live in housing blocks with one license only. Some of these consumers/households could reduce their water bill if they got an individual meter. It would, however, require that their living area is registered as individually licensed apartments.

Licensing fees differ from one municipality to another, and there are several municipalities and districts in Zarqa Governorate with different fees. For example licensing in Zarqa municipality varies between 0.40 JD/m² to 1.25 JD/m² of building area, while in Russaifa the fee varies between 0.24 JD/m² to 0.90 JD/m² of building area. It is assessed that fee for the focus areas of the present project, the poor areas, lay in the lower end of the ranges of about 0.40 JD/m² of building area.

The cost for the split will be 53 JD covering the cost of a 50 m² apartment license and a new water meter installation.

A simple Bill of Quantity for such a split is shown in Appendix D.

Wastewater

A number of central stakeholders (MWI/WAJ officials, MOP officials, MCC employees, local consultants etc.) and relevant study reports⁶ have indicated a general wastewater connection at 3-400 JD inside the plot area and 900-1000 JD outside the plot in the street.

In order to have such costs verified, 6 local certified contractors selected by ZWA were interviewed in March 2010. A few simple Bills of Quantities had been prepared to be filled-in by the contractors. The following two were agreed to be representative examples of a cheap short connection and an expensive long connection:

- 5 m asphalt in road, 5m from manhole to house
- 30 m asphalt in road, 5m from manhole to house

The following unit prices were stated for both Bills (fairly consistently among contractors):

- Work in asphalt 75 JD/m (all inclusive)
- Work in soil 50 JD/m (all inclusive)
- 900Ø manhole 400 JD
- 600Ø manhole 250 JD
- Connection to house 150 JD

This results in the following connection prices (excluding the connection fee to Zarqa Water Authority):

- Cheap short connection 400 JD on site + 1,025 JD in road
- Expensive long connection 400 JD on site + 3,050 JD in road

⁶ GFA study report

The cheap short connection is shown on the chart below using the rounded and conservative figures of 400 JD investment cost inside the plot and 1,000 JD investment cost outside the plot for budgeting purposes.

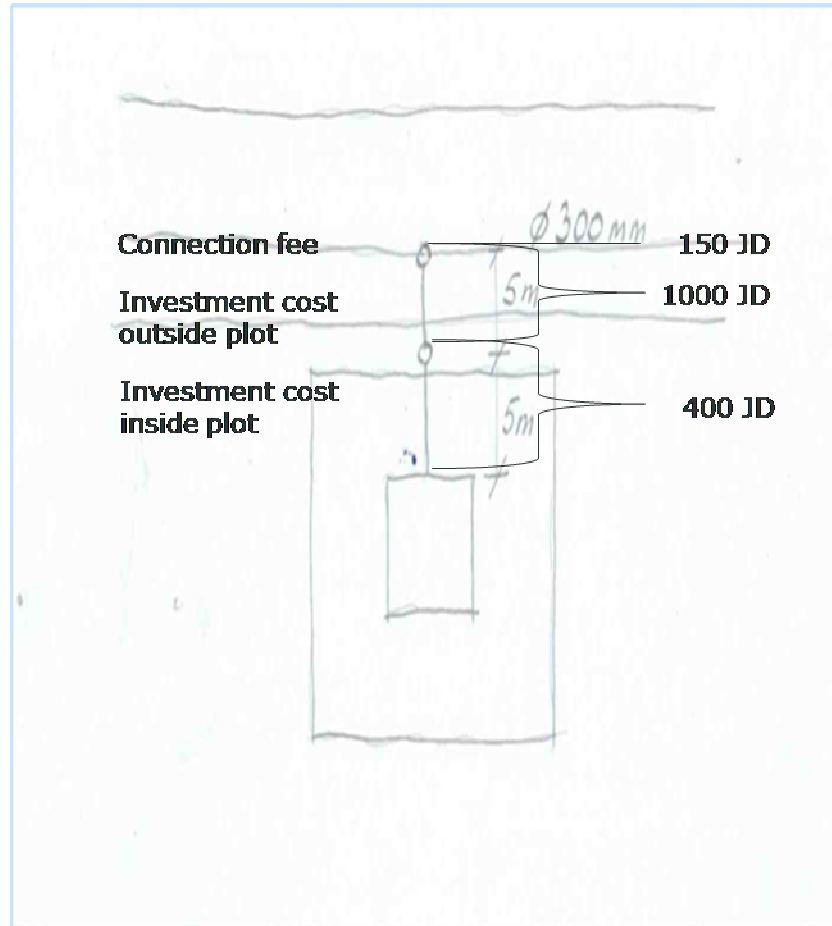


Figure 20 Illustration of key elements in the costing of a wastewater connection, Source: Interviews and own calculations

Filled-in Bill of Quantities for the two representative examples are attached as Appendices E and F.

The above prices were based on the contractors making one household connection per contract, which is the standard procedure today.

The contractors were asked to cite potential price reduction from the above if a contract for 10 or 100 connections was awarded. The stated price reductions were 5-20% for 10 connections and 10-30% for 100 connections. This indicates that individual contracting by the households is an expensive solution and that significant savings can be obtained through competitive tendering of larger groups of connections.

Furthermore, the contractors were asked about the typical implementation time for the two types of connections. The ranges provided were 2-3 days and 7-10 days respectively for the two connections.

8.1.2 Number of subscribers per connection

In Section 3.2 it was mentioned that the number of water supply subscribers does not necessarily indicate the number of households connected/served. It would be more correct to say that it indicates the number of licensed apartments connected, as only such a unit is entitled to a water meter. It would also be wrong to say that the number of connections to the main pipe would be the number of subscribers as one connection could serve more than one subscriber. The following three main connection groups exist:

- 1 A connection serving a one family house. Almost all such houses have one connection only.
- 2 A connection serving a housing block with more families, but only one apartment license. Such a block has a potential for more future subscribers, but will probably retain only one connection.
- 3 A connection serving a housing block with more families and more licensed apartments. Such a block will have a meter and consequently a subscriber for each licensed apartment.

It is generally said that 98% of the Jordan population are served by water network, and this is also applicable to Zarqa governorate, but this does not mean that 98% of the house holds are having subscription with WAJ, because some of them may have shared meters as mentioned above.

8.2 Estimated subsidy for the recommended intervention

A possible OBA intervention in wastewater connections could be along the following lines:

- For the estimated 2,650 non connected households close to an existing sewerage line:
 - All households would still pay the connection fee to WAJ (possibly with a need for longer instalment plan for poor households)
 - The OBA intervention would pay the construction cost of the part of the connection more than 0.5m from the plot boundary
 - Average and wealthy households would still pay the construction cost from 0.5m outside the plot up to the house
 - Poor households would be eligible for a subsidy paid by the OBA intervention for a part of the construction cost from 0.5m outside the plot up to the house but would be requested to provide the remaining (minor) part to signal interest in the connection.

- For the estimated 13,000 households which will be close to new sewerage lines financed by the MCC Compact:
 - All households would still pay the connection fee to WAJ (possibly with a need for longer instalment plan for poor households)
 - The MCC Compact investment in network extension would pay the construction cost of the part of the connection more than 0.5m from the plot boundary (to be confirmed)
 - Average and wealthy households would still pay the construction cost from 0.5m outside the plot up to the house
 - Poor households would be eligible for a subsidy paid by the OBA intervention for a part of the construction cost from 0.5m outside the plot up to the house but would be requested to provide the remaining (minor) part to signal interest in the connection. Alternatively, the full construction cost would be paid by the OBA Intervention.

Assuming that 50% of the 2,650 non connected households close to an existing sewerage line are poor and that 25% of the 13,000 households in the new serviced areas are poor, the economics would be:

- For the estimated 2,650 non connected households close to an existing sewerage line:
 - 2,650 households would pay the 150 JD connection fee to WAJ
 - The OBA intervention would pay the on average [1,000] JD construction cost of the part of the connection more than 0.5m from the plot boundary for all 2,650 households
 - Average and wealthy households (50% of 2,650), would still pay the [400 JD] construction cost from 0.5m outside the plot up to the house
 - Poor households (50% of 2,650), would be eligible for an OBA subsidy for [75-100%] of the construction cost from 0.5m outside the plot up to the house but would pay the remaining [0-25%] up front
 - It is assumed that the non connected households in existing service areas are not immediately adjacent and therefore will not be able to reduce construction costs by sharing a connection.
- For the estimated 13,000 households which will be close to new sewerage lines financed by the MCC Compact
 - 13,000 households would pay the 150 JD connection fee to WAJ
 - The MCC Compact investment in network extension would pay the on average [1,000] JD construction cost of the part of the connection

more than 0.5m from the plot boundary for all 13,000 households (to be confirmed)

- Average and wealthy households (75% of 13,000), would still pay the [400 JD] construction cost from 0.5m outside the plot up to the house
- Poor households (25% of 13,000), would be eligible for an OBA subsidy for [75-100%] of the construction cost from 0.5m outside the plot up to the house but would pay the remaining [0-25%] up front
- It is assumed that the non connected households in new service areas are immediately adjacent and therefore will be able to reduce construction costs by sharing one connection per three households.

Based on these assumptions, the unit subsidy and costs are calculated in the table below.

	OBA Intervention Subsidy		MCC Compound Investment		Household self financing		Total unit cost	
	JD	USD	JD	USD	JD	USD	JD	USD
Existing service areas - poor household	1.300	1.820	0	0	250	350	1.550	2.170
Existing service areas - non-poor household	1.000	1.400	0	0	550	770	1.550	2.170
New service areas - poor household	300	420	1.000	1.400	250	350	1.550	2.170
New service areas - non-poor household	0	0	1.000	1.400	550	770	1.550	2.170

Furthermore, the total project costs are calculated below.

	OBA Intervention Subsidy		MCC Compound Investment		Household self financing		Total project cost	
	JD (mill)	USD (mill)	JD (mill)	USD (mill)	JD (mill)	USD (mill)	JD (mill)	USD (mill)
Existing service areas - poor household	1,7	2,4	-	-	0,3	0,5	2,1	2,9
Existing service areas - non-poor household	1,3	1,9	-	-	0,7	1,0	2,1	2,9
New service areas - poor household	0,3	0,5	1,1	1,5	0,8	1,1	2,2	3,1
New service areas - non-poor household	-	-	3,3	4,6	1,8	2,5	5,0	7,1
Total	3,4	4,7	4,3	6,1	3,7	5,1	11,4	15,9

The applied assumptions concerning investment costs, households and connections are stated below. In particular it is assumed that the relatively few non-connected households spread over a wide area in the existing service areas will

need one connection per household whereas the larger group of more contiguously located households in the new service areas will share one connection between three households. All households will pay the connection fee individually.

Item	Assumption		Area	Status	Share	Number of households	Households per connection	Target number of connections
Connection charge	150		Existing service areas	Poor	50%	2.650	1	1.325
Investment beyond ,5 m of plot boundary	1000			Non poor	50%	2.650	1	1.325
Investment w ithin ,5 m of plot boundary	400		New service areas	Poor	25%	13.000	3	1.083
Household corinance share of investment w ithin plot boundary	25%			Non poor	75%	13.000	3	3.250

Total subsidy under the OBA Intervention for the combined project would be in the order of 3.4 million JD (4.7 million USD) assuming that the MCC Compact investment in network extension would pay the construction cost of the part of the connection more than 0.5m from the plot boundary for all households in the new service areas.

The Co-payment by households for the combined project would be in the order of 3.7 million JD (5.1 million USD).

9 Recommend institutional arrangements for implementation

The present section 9 provides the consultant's preliminary view on the recommended implementation arrangements (including the appropriate service provider and appropriate verification agent). This will be further detailed in the Task 2 report.

The combination of a group of households who can not pay the full cost of wastewater connections and 21 private service providers of whom some may be able and willing to take on additional performance risk, is good basis for an OBA intervention using performance-based subsidies to complement or partly replace the user paid part of the connection costs.

9.1 Draft division of responsibilities between key institutions

For the recommended OBA intervention in wastewater described above we envision the following institutional arrangements for implementation:

- The project implementation would be closely coordinated with the implementation of the network expansion under the MCC Compact
- The key actors would be:
 - Zarqa Water Authority or upon corporatization Zarqa Water Company (ZWC) and after signature of the management contract the Management Contractor (MC) acting on behalf of ZWC having the central co-ordinator role
 - An independent fiduciary agent disbursing the OBA funds
 - Private contractors implementing the connections under performance based contracts with ZWA/ZWC/MC
 - An independent monitoring and verification agent verifying the delivery of outputs prior to disbursements of OBA funds

The key steps during implementation would be:

- 1 ZWA/MC competitively tenders a set of output based framework contracts among the 21 certified contractors for batches of household connections
- 2 A contractor would commit to implement e.g. [200-400] connections within a limited timeframe of e.g. one year based on fixed unit prices for the key units (per meter work in paved areas, per meter in non paved areas, standard manhole). Alternatively the contractor would take a risk on the volumes inside the plot and bid on the unit cost of a full connection inside the plot and unit prices for key components outside the plot.
- 3 Assuming that all 2,650 are both interested and technically feasible to connect under the terms this could be 13 lots of 200 connections each.
- 4 All non connected households are informed of the opportunity to connect
- 5 Interested household contacts ZWA (or subsequently the ZWC managed by the MC) and are subsequently allocated one of the contractors holding the framework contracts
- 6 Contractor visits household makes drawing and fills our volumes in BoQ which is approved by ZWA prior to digging
- 7 ZWA supervises construction and approves completion
- 8 The contractor would be paid quarterly based on completed connections against certificate of completion and BoQ approved by ZWA with [20%] being paid after completion of full contract

9.2 Proposed targeting mechanisms for low income households

A key challenge will be to design a targeting mechanism to identify each poor household that should receive the additional OBA subsidy for construction costs inside their plot.

In the existing service areas geographic/self-selection targeting could in principle be used as the relatively few non-connected households in existing areas have selected not to connect and thereby signaled that they have an affordability constraint.

This approach will however not be applicable in the new service areas as many households here are likely to be willing to connect under the terms that most households in existing service areas have previously accepted (connection fee + investment costs inside plot).

Therefore a proxy-means testing would be preferable to ensure that the proposed eligibility criteria will be perceived as fair and socially acceptable.

Limiting the establishment of connections benefiting from the OBA Intervention to households fulfilling poverty eligibility criteria to be verified by proxy-means testing for individual households is however only economically feasible if an existing government or donor sponsored poverty identification mechanism is in operation in the area covered by the OBA project which can be used as a proxy for the OBA project.

The Ministry of Social Development administers the Fund for National Aid which provided direct income subsidies to poor households based on a survey based poverty mapping. This would be a key candidate for proxy-means testing mechanism and will be further explored in the Task 2 report. At the same time the possibility of applying a simpler geographic targeting mechanism will be investigated.

9.3 Definition of outputs against which payments will be made

A possible set of milestones against which OBA subsidies would be paid and a preliminary percentage allocation among these milestones of the subsidy payment is presented below.

No.	Disbursement	Condition and Means of Verification
1.	Prepayment: 15 pct. of OBA grant less retention payment	Request for prepayment received including performance guarantee in acceptable form from a recognized bank.
2.	60 pct. of the OBA grant amount less retention payment and any prepayment	Completion of 60% of contractual connections Certificate of commissioning and report from verifying agent
3.	30 pct. of the OBA grant amount less retention payment and any prepayment	Completion of 90% of contractual connections Certificate of commissioning and report from verifying agent
4.	10 pct. of OBA grant amount less retention payment and any prepayment	Completion of 100% of contractual connections Certificate of commissioning and report from verifying agent
5.	Retention payment	Report from verifying agent stating that there are no claims on contractor liability for the executed works

Furthermore, output based minimum requirements (e.g. compliance with existing norms) and the maximum scope (longest accepted distance from network) of an eligible connection will have to be defined.

9.4 Time plan for implementation of connections

A tentative time schedule for implementation of connection is shown below.

The key assumption is contracting with 10 parallel contractors who each has capacity to make 250 connections per year and that the network extension is ready in the first areas from Q2 2012.

	2012				2013				2014				TOTAL
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Physical Progress													
Existing service areas - poor household		400	400	400	125								1.325
Existing service areas - non-poor household	625	225	225	225	25								1.325
New service areas - poor household						200	200	200	200	200	83		1.083
New service areas - non-poor household					475	425	425	425	425	425	542	108	3.250

The time schedule would naturally have to be closely coordinated with the timing of construction of the Compact-funded water and wastewater laterals and pipes in a joint time schedule.

9.5 Proposed monitoring and output verification procedure

The table below provides preliminary ideas for verifiable indicators for the intermediate and final outputs listed in Section 9.3 above.

Output Responsible	Output (intermediate/final)	Indicator
<i>Contractor</i>	Request for prepayment	Performance guarantee in acceptable form from a recognized bank.
	Completion of 60% of contractual connections	Certificate of commissioning from ZWA and report from verifying agent
	Completion of 90% of contractual connections	Certificate of commissioning from ZWA and report from verifying agent
	Completion of 100% of contractual connections	Certificate of commissioning from ZWA and report from verifying agent
	Retention payment	Report from verifying agent stating that there are no claims on contractor liability for the executed works

The formal commissioning of the new connections is suggested to take place with the presence of the household, which may then certify to their functionality.

In a broader context a larger number of indicators are called for. This is so, in part to be able to monitor project outcome against government and Millennium Development Goals targets, in part to enable to benchmark the results of the project against other OBA schemes.

9.6 Recommend flow of funds

The chart below provides a visual representation of the consultant's preliminary proposal for a flow of funds model between MCC, WAJ/ZWC and private operators.

Contractual Arrangements and Funds Flow

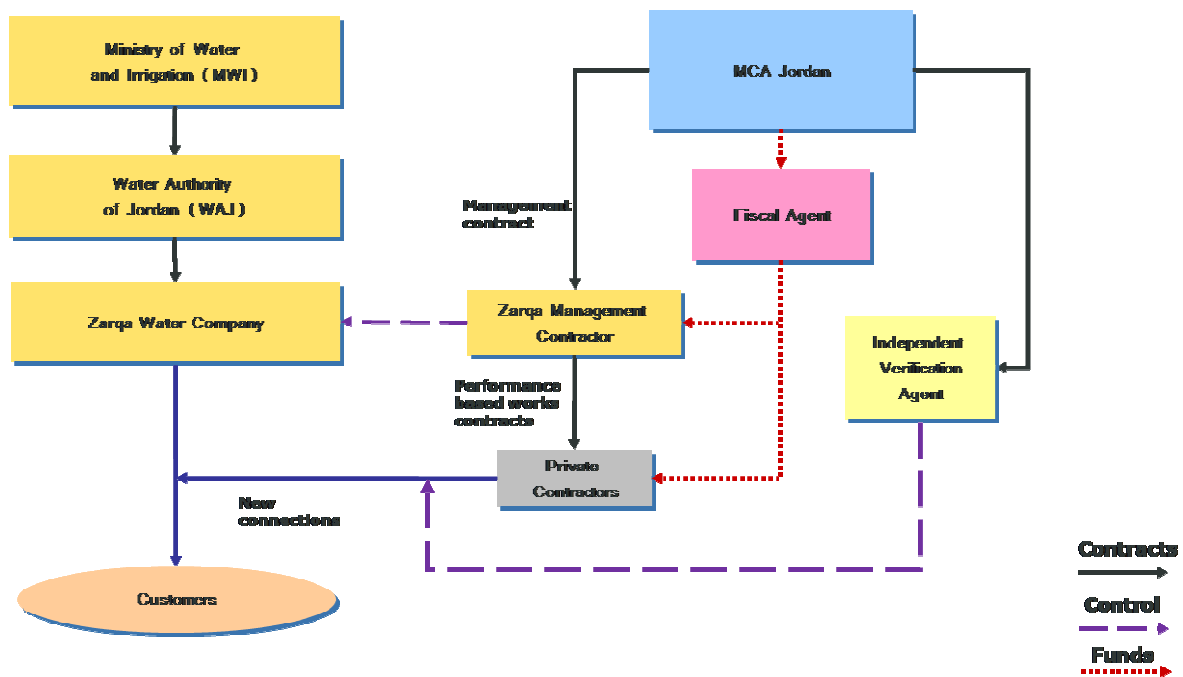


Figure 21 Initial proposal for contractual arrangement and funds flow

The envisioned Funds Flow is based on the following premises:

- The OBA subsidy is financed by MCC through MCA Jordan.
- The OBA subsidy funds are held in an escrow account managed by an independent third party. The most obvious choice would be the Fiscal Agent contracted by MCA Jordan to disburse funds for the Compact projects after verification by an Independent Engineer.
- The OBA subsidies are disbursed to the contractors by the Fiscal Agent after the Independent Verification Agent has verified the completion of the works. The Independent Verification Agent could in principle be the Independent Engineer used for the Compact projects.
- The Contractors will be contracted by the Management Contractor on behalf of Zarqa Water Company. The Contractors will be requested to provide partial pre-financing of their works.

We think this model will balance efficiency and accountability and reuse existing institutions to the extent possible.

Appendix A - Stakeholders met

The following stakeholders have been interviewed during the work:

- Ministry of Water and Irrigation
 - Mohammad Ababneh, Project manager
 - Basim Talfeh, PMU director
 - Dr. Rabab Al Tac, Legal department
 - Rala Ammari
 - Achmed Mahfouz, Finance department
 - Ekhlass Nassar, Subscription department

- Zarqa Water Authority
 - Nabil Zoubi, Director
 - Several other key staff

- Ministry of Planning and International Coordination (MCU)
 - Mohye Al Deen Al Shbool, Deputy director
 - Abdelhakim Shibli, Economist
 - Tamer Al-Assa'd, Project coordinator
 - Paul Pleva, MCC consultant

- MWH (Consultants - P2 Zarqa wastewater study)
 - Sebouh Lebejian, Project Manager
 - Ayham Obaidat
 - Patrick Ray, Economist

- Dorsch (GTZ Consultants - Zarqa performance improvement program)
 - Stephan Kugler, Team coordinator
 - Yasser Jairi, System analyst

- Ecoconsult (Consultants - MCC Beneficiary Study)
 - Ra'ed Daouod
 - Razan Quossous

- Contractors certified by ZWA
 - Annarges Company / Abu Diyaa
 - Jamal Obeh Abu Muhsen Company
 - Ali Smadi Company
 - Ayman Abu Muhsen & Partner Company
 - Mazen Amarin Company
 - Hazar /Abu Ra'ed Company

Appendix B - Workshop with GOJ and MCC

The first workshop with GOJ and MCC under the World Bank/GPOBA financed assignment 'Jordan Water and Wastewater Output-Based Aid Study' was conducted in the Ministry of Water and Irrigation, Amman, on Thursday 25 March 2010.

The purpose of the workshop was to present the consultant's understanding of the situation as well as their preliminary ideas for the scope of an OBA intervention, and to receive feedback from the key stakeholders prior to writing the Task 1 Report.

The participants were:

- Mohammad Ababneh, WAJ
- Ekhlass Nassar, WAJ

- Mohye Al Deen Al Shbool, MCA-J
- Abdelhakim Shibli, MCA-J
- Tamer Al-Assa'd, MCA-J
- Ruba Atallah, MCA-J

- Paul Pleva, MCC
- Jay Scheerer, MCC
- Barry Deren, MCC
- Kumar Ranganathan, MCC
- Zaidoon Khouni, MCC

- Carsten Glenting, COWI
- Leo Jensen, COWI

Appendix C - Map of existing and planned sewerage network in Zarqa

Appendix D - Cost of Water Supply Connections

Cost of WS Connecting - Zarqa Bill of Quantities

5m from 1m inside plot to building.

Item	Unit	Rate	Quantity	Amount
Trench depth	m	1.00		
Length of connection soil	m	5.00		
Length of connection asphalt	m	N/A		
Excavation in soil, 1.0 m depth	m	8.00	5.00	40.00
Pipes (dia 20mm)	m	incl	0.00	0.00
Sand (pipe bedding and surrounding)	m	incl	0.00	0.00
Backfill	m	incl	0.00	0.00
Pipe installation (skilled labour)	m	incl	0.00	0.00
Water meter, 20mm	Unit	25.00	1	25.00
Water meter installation	Unit	8.00	1	8.00
Total works				73.00

Cost for split of shared meter

License cost set at 0.4 JOD/m² in the poor areas

Estimated 50 m² apartment

Item	Unit	Rate	Quantity	Amount
Water meter installation	Unit	8.00	1	8.00
Water meter, 20mm	Unit	25.00	1	25.00
Apartment license	m ²	0.40	50.00	20.00
Total works				53.00

Appendix E - Wastewater Connection

5m in asphalt + 5m in soil inside plot

Cost of Connecting - Zarqa Bill of Quantities

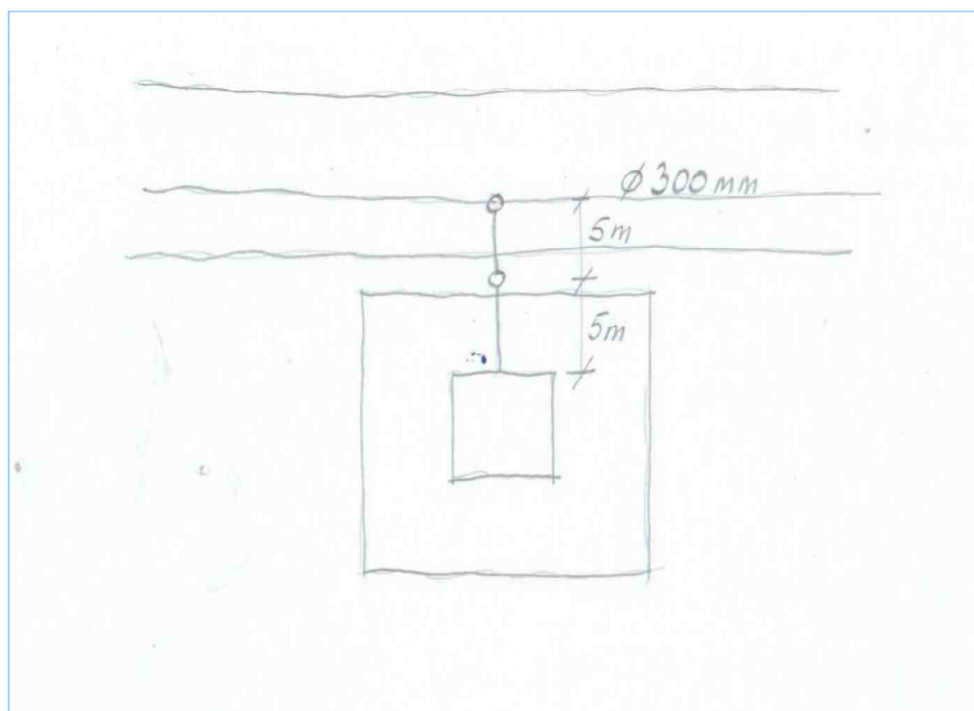
5m in asphalt outside plot and 5m from inspection chamber to building.

Trench depth	m	2.50		
Length of connection soil	m	5.00		
Length of connection asphalt	m	5.00		
Total Length	m	10.00		
Item	Unit	Rate	Quantity	Amount
Excavation in soil, 2.5 m depth	m	50.00	5.00	250.00
Excavation in asphalt (road), 2.5m depth	m	75.00	5.00	375.00
Pipes (dia 150mm concrete)	m	incl	10.00	0.00
Sand (pipe bedding and surrounding)	m	incl	10.00	0.00
Backfill	m	incl	10.00	0.00
Pipe installation (skilled labour)	m	incl	10.00	0.00
Connection to the main, Ø900	Unit	400.00	1.00	400.00
Inspection chamber 0.5m outside plot, ø600	Unit	250.00	1.00	250.00
Connection at building	Unit	150.00	1.00	150.00
Engineering Drawings	Sum		1.00	0.00
Total works, admin and taxes per connection(i=g+h)				1,425.00
Percentage reduction for 10 similar connections	%	5-20	In road	1,025.00
Percentage reduction for 100 similar connections	%	10-30	In plot	400.00

Notes:

- The prices are for normal soil conditions. Breaking-up possible rocks will be added to the cost
- Most main pipes in Zarqa are Ø200mm, which requires Ø900mm manholes
- The Ø600mm inspection chamber is included in the road cost

Sketch of household wastewater connection



Appendix F - Wastewater Connection

30m in asphalt + 5m in soil inside plot

Cost of Connecting - Zarqa Bill of Quantities

30m in asphalt outside plot and 5m from inspection chamber to building.

Trench depth	m	2.50		
Length of connection soil	m	5.00		
Length of connection asphalt	m	30.00		
Total Length	m	35.00		
Item	Unit	Rate	Quantity	Amount
Excavation in soil, 2.5 m depth	m	50.00	5.00	250.00
Excavation in asphalt (road), 2.5m depth	m	75.00	30.00	2,250.00
Pipes (dia 150mm concrete)	m	incl	35.00	0.00
Sand (pipe bedding and surrounding)	m	incl	35.00	0.00
Backfill	m	incl	35.00	0.00
Pipe installation (skilled labour)	m	incl	35.00	0.00
Connection to the main, Ø900	Unit	400.00	1.00	400.00
Inspection chamber 0.5m outside plot, ø900	Unit	400.00	1.00	400.00
Connection at building	Unit	150.00	1.00	150.00
Engineering Drawings	Sum		1.00	0.00
Total works, admin and taxes per connection(i=g+h)				3,450.00

Percentage reduction for 10 similar connections	%	5-20	In road	3,050.00
Percentage reduction for 100 similar connections	%	10-30	In plot	400.00

Notes:

The prices are for normal soil conditions. Breaking-up possible rocks will be added to the cost

Most main pipes in Zarqa are Ø200mm, which requires Ø900mm manholes

The Ø900mm inspection chamber is included in the road cost

Sketch of household wastewater connection

