Households' Affordability and Willingness to Pay for Water and Wastewater Services in Ramallah and Al-Bireh District, Palestine

By

BEESAN OSAMA SHONNAR

Student Number: 1005162

Supervised by: Dr. Maher Abu-Madi

A research thesis submitted in partial fulfillment of the requirements for the Masters Degree in Water Engineering from the Faculty of Graduate studies, Water Institute Studies, at Birzeit University - Palestine

June, 2007

Households' Affordability and Willingness to Pay for Water and Wastewater Services in Ramallah and Al-Bireh District, Palestine

By

BEESAN OSAMA SHONNAR

Student No.:1005162

This thesis was prepared under the supervision of Dr. Maher Abu-Madi and has been approved by all members of the Examination Committee.

Chairman of Committee	**Dr. Maher Abu-Madi**
Member	**Dr. Rashed Al Sa'ed**
Member	**Prof. Basem Makhoul**

Date of Defense: 9/ June / 2007

The findings, interpretations, and conclusions expressed in this study do not necessarily express the views of Birzeit University, the views of individual members of the MSc Committee or the views of their respective employers.

DEDICATION

TO MY WONDERFUL SUPPORTING PARENTS

TO MY DAUGHTERS (LAMEES & LAILA)

TO MY SISTER & BROTHERS

TO MY FRIENDS (SAMAR, WAFA)

MAY THIS THESIS ENLIGHT THEIR WAY TO MORE SUCCES

ACKNOWLEDGMENTS

My deep gratitude to My adorable Parents, Daughters, Brothers and sister, for their support and care. My Parents had been so patient and tender during the preparation of this study, I cannot be more grateful to them. They have supported and inspired me through their ideals, ideas, values and love from the very beginning. I guess I owe them everything. My Daughters deserve to be thanked sincerely. As well my Brothers and Sister, for their continuous support and encouragement.

My Supervisor Dr. Maher Abu-Madi for his time, great advises and continuous supervision who helped me. I deeply appreciate the enormous effort that he has offered me, without his help, support, and patience, the completion of this thesis was not possible. I extend my gratitude to Dr. Rashed Al Sa'ed, and to Prof. Basem Makhoul for their valuable comments as members of the examination committee.

The PWA is my employer, my source of data, especially the colleagues in The Technical Affairs Department, and in the Regulatory Department who never stopped feeding me up with all new developments in the field of my study, so many thanks goes to Mr. Kamal Issa,. I am grateful to Dr. Ihab Bargouthi, and Mr. Raslan Yaseen who supported me and advised me so often on how to proceed. All my colleagues are thanked deeply. Deep and sincere thanks go to all the

institutions, who gave me feed back mainly: Jerusalem Water Undertaking, Palestinian Hydrology Group, West Bank Water Department.

ABSTRACT

This study has analyzed and evaluated the current water pricing policies in Ramallah and Al-Bireh District, which do not satisfy the full cost recovery principle. An important aspect in analyzing the current pricing policies was calculating the true cost/ benefit values for investment, operation & maintenance, unaccounted for water and depreciation in order to determine the efficiency of the current tariffs in water utilities. Moreover it looked for Public affordability and willingness to pay that should be assessed towards judging the sufficiency of these policies. Area under study is the center of West Bank, precisely Ramallah and Al-Bireh District; under the occurring political situation it was difficult to move within the district. The current increasing block tariff system applied by Jerusalem Water Undertaking (JWU), and the other providers in the district was in range of (4 -7) NIS/m^3, the majority of the population surveyed did not understand how the block system functions and most of them replied that they were not willing to pay any higher amount than 5 NIS/m^3 for water services, whereas the same sample replied that they were willing to pay a higher price for disposal of the wastewater.

Consequently, conducting this study was difficult as it was based on a field survey involving the distribution of a questionnaire and an analysis of the results in order to build a model that showed a valid understanding of the affordability and willingness of consumers to pay their water bills.

The main objectives of this research were to evaluate of the current tariffs for water and wastewater services, suggest modifications if needed, and find the factors affecting tariffs.

These were achieved by conducting a questionnaire survey that covers 400 household, analyses of the results using SPSS software, and then two models were constructed to check the hypothesis based on both categorical data analysis, in addition to multiple linear regression.

Results analysis revealed that the current tariffs need adjustment and that the proposed variables were significant to willingness of consumers to pay for water and wastewater fees. It can be said that the socio-economic status of residents had no significant impact on their willingness to pay for wastewater or water significantly. However, there were many other determinants that affect consumer willingness to pay for the water services, such as: Knowledge of price paid per cubic meter of water, cost of emptying cesspits for inhabitants who rely on cesspits for sewage collection , availability of water from other sources, and the payment methods used to settle the bills. The percentage of what was paid for water bills to the total income ranged from 4.99% to 5.89%, which did not contradict with the hypothesis stating that 3-5 % of the income was spent on water bills. The analysis also showed that income was not a variable of influence, as it had a confidence value not less than 0.05 which was the opposite of the hypothesis.

Table of Contents

List of Figures

List of Maps

List of Tables

Chapter 1: Introduction

1.1 Background of the research

The existing water supply systems in Palestine were characterized by high leakage, intermittent supply, and thus need rehabilitation. In addition, about 54.7% of the Palestinian territories lack for sewerage networks and wastewater treatment systems (PCBS, 2006). This was mainly attributed to lack of financial resources for the construction and operation and maintenance of these systems. The financial performance of both sectors was characterized by over–reliance on external financial aids and lack of local financing. However, these communities paid for water and sanitation. The existing tariff systems employed a block structure.

Water and wastewater services were considered as an economic good, this implied a price, prices were derived from tariffs and tariffs were suggested and formulated in accordance with the adopted water policy. Still all water projects have the same economic components as any other project: investment, operation and maintenance, depreciation, losses (Un-accounted for water), costs, benefits … etc.

Water fees for domestic water supply varied considerably among different localities. Tariffs ranged between 1.0-1.2 $/m^3 in Ramallah area. In Ramallah area for example where water tariffs were highest, water is conveyed long distances and/or pumped from deep wells (EMwater, 2004).

The already planed wastewater treatment plant (extended aeration system) for the urban areas in Palestine revealed that the tariff for wastewater treatment would be 6 NIS/m^3 if full cost recovery would be fulfilled (this cost is 1 to 1.3 higher than the cost of 1 m^3 of drinking water). If only O&M cost is to be recovered, the tariff would be 2 NIS/m^3 (EMwater, 2004).

The average household cost of conventional sewage may range from $ 300-1,000. This was clearly too expensive for many households with annual incomes well below US$ 300. If a septic tank with 5 m^3 volume installed, its capital cost would be 1,000 $ for installation, and pumping it for O&M once every 3-1/2 years will cost 2.08 $/month.

It should be mentioned that the water pricing policy was based on political decision, and the above economic components were taken slightly into consideration, which resulted in the fact that cost were not fully recovered (Plaut, 2000; PWA, 2005; Hind, 2003). In addition the policy did not take into consideration the affordability and willingness of people to pay (PWA, 2005; Hind, 2003).

This thesis discussed the current water and wastewater services situation in terms of tariff financial information for the past five years, as the data for the years (2005) until now is not ready. The aim of this discussion is to evaluate the current situation, and predict an appropriate situation for the future by utilizing the analysis of the current data. The next step, was formulating a questionnaire, which

was filled by a representative sample of 400 households, questionnaire were analyzed using SPSS depending on logistic regression.

1.2 Aim of Research

The main goal was to provide guidelines for Palestinian policy-makers to develop an accountable water pricing policy based on recovery of costs and willingness of people to pay.

1.3 Research Objectives

The objectives of this research were:

a) To evaluate the existing tariffs for water and wastewater services.

b) To estimate the existing costs for water and wastewater services in Ramallah and Al-Bireh district.

c) To assess the affordability of beneficiaries to pay for water and wastewater services.

d) To elicit the willingness of beneficiaries to pay for water and wastewater services.

e) Understand the various incentives that drive public decisions and willingness to pay.

1.4 Methodology

To achieve the objectives of this study, the following methodology was adopted:

- Conduction of a detailed literature review to collect and analyze all available studies, technical reports and published data on willingness to pay

and affordability in Palestinian and international published scientific papers and reports.

- Evaluation of available technical data on current tariffs and water and wastewater prices.
- Questionnaire development and distribution to investigate the social and economical aspects of Ramallah and Al-Bireh District community concerning their affordability, and willingness to pay for water and wastewater services.
- Application of SPSS software package to develop a model that can suggest the most relevant factors affecting household's affordability, and willingness to pay.

1.5 Hypothesis

The main hypotheses in this thesis were:-

a) Current water pricing policies are not sufficient, and needs adjustments (PICCR, March 2003).

b) It is assumed that the following factors affect the willingness to pay for

- Water Services :

Income, water supply source, monthly water bill ,times buying from other sources, knowledge of price paid per m^3, what do you think of illicit connections ,means of paying water bill (Hoehn, 2000).

- Wastewater Services:

Income, water supply source, monthly water bill, times buying from other sources, knowledge of price paid per m^3, suitable monthly average bill of

sewage ,method of sewerage collection , how many times you empty your cesspits ,cost of emptying the cesspit per month.

c) It is assumed that water bill is in the range adopted by the World Bank which is 3-5% to of the total household income (Merret, 2001).

1.6 Limitations

The main constraints that hinged my study were: Data availability, time, and experience in the field of policy formulation and in water economy, in addition to public awareness; as people are not much familiar with water problems. Collecting data was not an easy job as the mentality is to store the data, and not to share it. The time in which I conducted my study was tight, so it was limited to Ramallah and Al-Bireh District instead of the West Bank.

1.7 Thesis Outline

This thesis was composed of seven chapters. Chapter (1)"Introduction" described the contents and the structure of this research, including research objectives hypothesis methodology …etc. Chapter (2) "Study Area" described the Ramallah and Al-Bireh District, with a brief about water and wastewater services. Chapter (3) "Literature Review" defines terminology of Importance, discussed some numbers, in addition it discussed the contingent valuation method which was used as the theory of this research. Chapter (4) "Approach and Methodology" this chapter discussed the method followed in this research, and what was the

economic trend followed to fulfill the objectives. As well, the formulation process of the questionnaire was illustrated in this chapter, how the numbers were obtained, what was the feed back after pilot testing of the questionnaire, the criteria under which the questionnaire was distributed. Chapter (5) "Data Analysis and Results" this was the stage following the distribution and filling of the Questionnaire. This was done by using the statistical program SPSS, in this chapter the results of the analysis of each question was illustrated, in addition the results of normal regression were shown. Chapter (6)" Discussion" in this chapter all the data obtained from the analysis was justified in relation to objectives and hypothesis, and was discussed to find whether the current situation pricing policies were sufficient or not. Chapter (7) "Conclusions & Recommendations" this final chapter, here conclusions and recommendations based on results and discussions were formulated.

Chapter 2: Study Area

2. Introduction

2.1 Ramallah and Al-Bireh District

In the hilly region of central West Bank, ten miles north of Jerusalem, lie the twin cities of Ramallah and Al-Bireh. Built on several hills at an altitude of 900 meters above sea level, Ramallah–Al-Bireh district enjoys a moderate temperate climate. Ramallah- Al-Bireh district was considered as the future economical capital of the state Palestine, where the urban population is connected to water and sanitation services.

Map (1) West Bank Location in Palestine

South of Al-Bireh city is Al-'Amari refugee camp and to its north is the town of Birzeit (known for its university, the largest on the West Bank), and the Jalazoun refugee camp .This district is inhabited with around 205,448 persons [though the projected population of 2006 is 290,401] with a total number of households 34,000. These are allocated into three types of communities: Urban 34.1%, Rural 59.5%, Refugee Camps 6.4% (PCBS, 1997). Ramallah is one of the two major Palestinian seats of power. The central Palestinian governing institutions are located within Ramallah, including: Offices of the Legislative Council, the executive branch and a large number of Palestinian West Bank security forces' headquarters. The total number of communities is 80, but when services are discussed the number decreases to 72 according to Palestinian Water Authority. The West Bank population household percent served with water services 86.7%, whereas 9.2% depend on water tanks, and the population household percent served with domestic wells and springs are 8.1% and 1.0% respectively (PCBS, 2005). The West Bank population served with wastewater services is 34.7%, whereas 56.1% depend on porous cesspits, and the households served with tight cesspits is 8.4%, while only 0.8% depends on other methods (PCBS, 2005). The whole district has only two wastewater treatment plants, as Ramallah Municipality has rehabilitated the old treatment plant to serve the city, whereas Al-Bireh Municipality has its own treatment plant, which was built in 1998 and operated in 2000.

2.2 Water and Wastewater Services in the District

2.2.1Water Supply

Water needs of users are met through different water systems. There are three major types of supply sources in the West Bank are:

- Israeli company (Mekorot),
- The amounts pumped from wells,
- The amounts discharged from springs.

Ramallah and Al- Bireh district had around 91.5% housing units connected to public networks, whereas 5.0% were using private system, while only 3.0% had no piped water, and only 0.1% did not make a statement about their source of water. The amounts purchased from Mekorot for Ramallah and Al-Bireh (including Jerusalem) District were 13,900,000, 14,955,200, 16,379,200, 16,094,700, and 16,047,500 m^3 in the years 2001, 2002, 2003, 2004, and 2005 respectively. Whereas, the amounts pumped from wells for the same period were 1,970,000 m3 in the year 2001, 1,989,600 m^3 in the year 2002, 2,108,400 m^3 in the year 2003, 2,294,600 m^3 in the year 2004, and 2,637,200 m^3 in the year 2005. The amounts of spring discharge were 879,600 m^3/yr for the year 2001, 2,070,700 m^3/yr for the year 2002, 2,051,900 m^3/yr for the year 2003, 1,450,700 m^3/yr in the year 2004, and 1,471,100 m^3/yr in the year 2005 (PCBS, 2005).

The daily per capita consumption for JWU (the numbers for the other utilities are shown in appendix A) was:

2001	**98.5**
2002	**90.78**
2003	**83.43**
2004	**92.14**

Roof or ground water tanks of 1-2 m^3 were filled at supply hours, to supplement irregular piped water supply, this would suggest that the service level of good water quality was insufficient. The price of water charged by vendors 20 NIS/m^3 (US$4.3 per m^3) is one of the highest in the world, and about four times higher than the average tariff of piped water in the Southern West Bank the highest in the ME" region 5 NIS/m^3 (US$1.18 per m^3), and mainly attributed to water scarcity and movement restrictions (World Bank, 2003).The average water price in JWU is:

2001	**4.77 NIS /m^3**
2002	**4.57 NIS/ m^3**
2003	**5.69 NIS/ m^3**
2004	**6.15NIS/m^3**

In Ramallah and Al-Bireh District, there were two main institutions working in water sector, as suppliers: West Bank Water Department, Jerusalem Water Undertaking. In addition to the Palestinian Hydrology Group; who mainly is

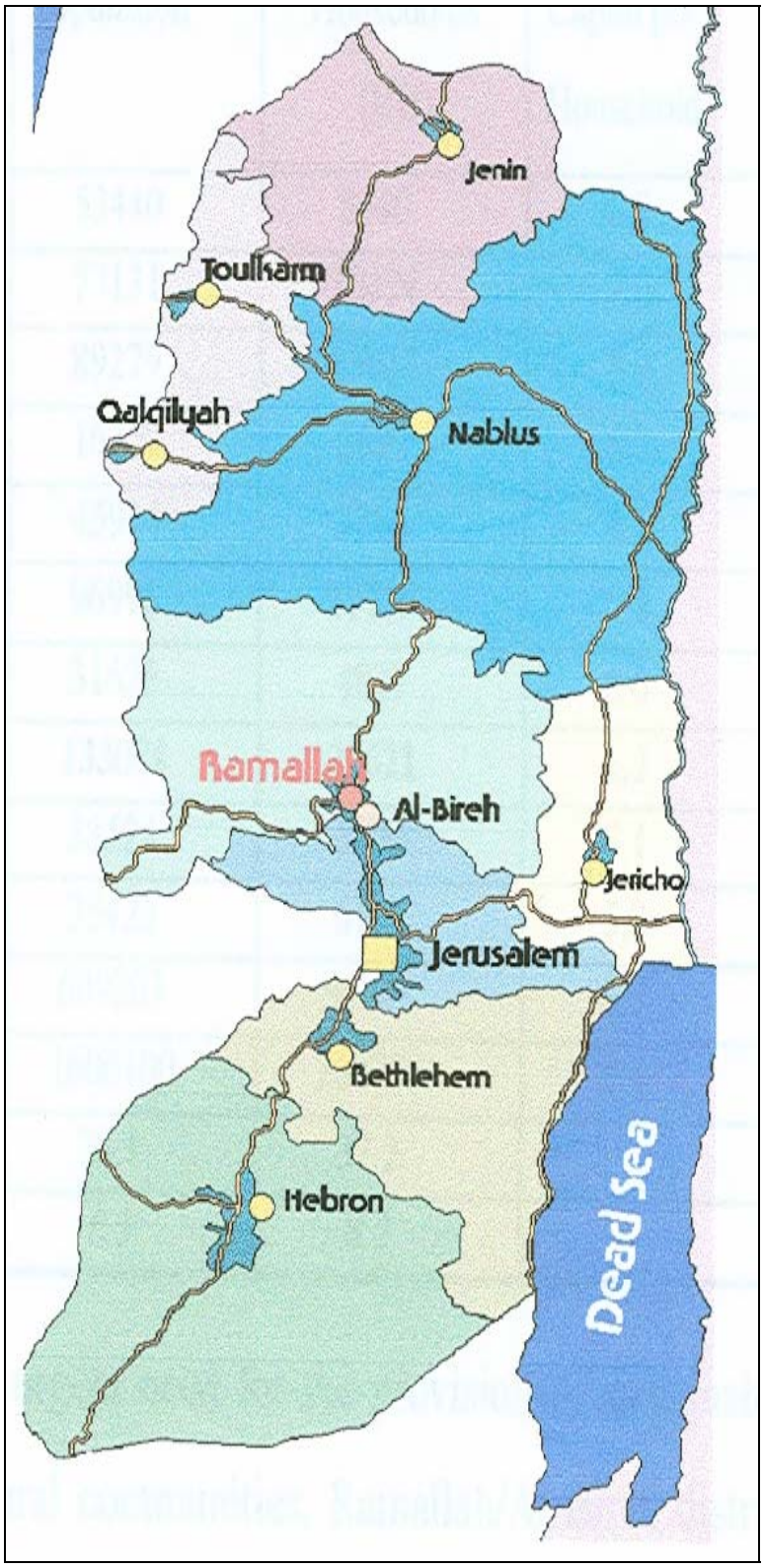
concerned with conducting researches, and executing the results in micro-scale projects, about how to improve the service, and to execute projects that would help in minimizing water shortages in rural areas, such as water harvesting.

Rainwater harvesting and wastewater treatment and reuse were among the alternative options for developing new water resources in the area. However, the implementation of large scale water harvesting projects would be more or less difficult as the Israelis are controlling that such as in Wadi Al Far'a (ARIJ, 2005).

Ramallah and Al-Bireh District, had four main utilities (with an Increasing Block Structure Tariff) that supplied the population with water, these were:

1. **Jerusalem Water Undertaking (JWU)**

JWU were of operation extends over 600 Km^2 with around 41,500 subscription serving almost 250,000 people. In addition to the northern part of Jerusalem, the service area of JWU covered the central and eastern parts of Ramallah and Al-Bireh Governorate (Map 3). The length of the distribution network was approximately 1,000 km made up from steel and ductile iron pipes (JWU Official Web Site, 2005). JWU was established in the early sixties of the last century, under the Jordanian Mandate, with the aim of providing water to the districts of Ramallah, Al-Bireh, and Jerusalem. JWU had five wells in Ein Samia area, and another one in Shibteen. These wells are not sufficient to fulfill the district water requirements. Thus JWU was forced to buy additional water from Mekorot which is an Israeli company.



Map (2) Ramallah and Al-Bireh District location in the West Bank

Map (3) Communities of Ramallah and Al-Bireh District Served By JWU

2. West Bank Water Department (WBWD)

The department was established after 1967 war, to facilitate the management of water sector under Israeli mandate and civilian administration period, it owns wells all over West Bank, and still it sells water in different utilities among other tasks it used to perform.

Only a few communities got their water services from the department. The average price adopted by WBWD is 2.1 NIS\m^3. WBWD wells were insufficient in fulfilling the water needs in some areas, thus WBWD was forced to buy the water from Mekorot.

3. Birzeit Municipality

The Municipality buys bulk amount of water needed from (JWU), and sells it to inhabitants of the Municipality, and to Birzeit University.

4. Betoniya Municipality

The Municipality buys bulk amounts from (JWU), and sells it to inhabitants of the Municipality, and to Ramallah industrial zone.

2.2.2 Sanitation

About 45.3% of households in the Palestinian territories and about 34.7% in the West Bank had sewage networks (PCBS, 2006). In Ramallah and Al-Bireh District about 19.1% of the localities population had public sewage system; whereas about 77.5% had cesspits, 3.1 % had no sewage system.

The average household cost of conventional sewage might range from US$ 300-1,000. This is clearly too expensive for many households with annual incomes well below US$ 300 (PWA, Personal communication).

In the district, Al-Bireh Municipality had built a wastewater treatment plant, it was located at a distance of 1.5 km down stream the Wade Al–Ein to the east of Al-Bireh city, which was based on extended aeration treatment technology, the load that the plant can bear an inflow of 3,200m^3/day, the plant was in operation since 2000. The effectiveness of the existing urban sewage collection and treatment facilities was usually constrained by limited capacity, poor maintenance practices,

process malfunctioning, and lack of experienced or properly trained staff. Raw or partially treated wastewater was discharged into wades where it was used for irrigation purposes. The fees for sewage disposal were collected within the water bill, as cooperation had been made with Jerusalem Water Undertaking.

The most common wastewater treatment system used in rural areas was the cesspit tank soil to absorption system. The septic tank removes settleable and floatable solids from the wastewater, and the soil absorption field filters and treats the clarified septic tank effluent. Removing solids from the wastewater in the septic tank protects the soil absorption system from clogging and premature failure. In addition to removing solids, the septic tank also permits digestion of a portion of the solids and stores the undigested portion, the system was designed to provide treatment and disposal for normal domestic sewage. No non-biodegradable material should be introduced into the wastewater treatment and disposal system. Plastic and paper (except toilet paper) were examples of non-biodegradable materials that should not be placed down the drain. Normal amounts of dirt and small non biodegradable debris (buttons, dental floss, etc,) from washing will inevitably get into the system. These solids would be retained in the septic tank until it would be pumped during its normal maintenance. Oils and grease should not be placed down the drain in excess quantities. Because septic tanks are buried and are out of sight, many homeowners forget that septic systems require periodic maintenance. Failure to pump-out the septic tank is possibly the greatest single

cause of septic system failure. After several years of use, a build-up of bottom sludge and floating scum would reduce the effective capacity of the system).

2.3 Current Situation of the West Bank

The West Bank is under Israeli occupation since 1967. The main policies of occupation aimed at depriving Palestinians from their right of sovereignty over natural resources mainly water, because of such policies, in addition to the national (local) factors, there were a biased pricing policies between Palestinian and Israeli communities, on the other hand discrepancies in pricing policies within Palestinian Communities were recorded.

After Oslo II peace accords, in 1996, the Palestinian Water Authority (PWA) was established based on a presidential declaration. PWA had a main task of regulating water sector among other issues. The powers and authorities of the PWA as a legal body for the water and sanitation sectors are still very weak as of political and technical factors. This is quite clear with regard to the power to issue and enforce regulations; the authority to plan and control how and when sanitation services will be provided, the ability to license, train, or certify persons involved in system design, installation, maintenance, and residual disposal. The PWA had done a huge effort up to now, playing the role of regulator, still PWA could not enforce the application of a unified tariff policy due to certain problems, such as:

1. Providing Water depends on availability of an appropriate source of energy, to operate pumping station, some utilities use fuel, others depend on electricity in both cases the price differs.
2. Availability of water source , this implies that if utility owns the source it governs most of operation and maintenance costs , whereas buying water in bulk could case the customer price to be different.
3. Old and leaking networks, it was not easy for PWA to provide funds, for the sake of building new networks or rehabilitating old ones, the compensation of leaking networks would be bared by the customer, which causes the price to be a leakage dependent to a certain degree.
4. Availability of pumps spares parts, and the fact that the adopted prices are not recoverable, which once again implies for prices discrepancies.

Water pricing policy in Palestine was formulated by Palestinian Water Authority (PWA). The current pricing policy was based primarily on water costing and service delivery on a national scale .Still PWA does not subsidize prices. At present, some of the water and wastewater service providers or utilities recover the operation and maintenance costs. However, none of these utilities recovered the full costs (capital and operational). This situation was not solely due to existing socio-economic factors or to public affordability, as there were other internal and external factors within the utilities and their surrounding environment (PWA, 2003). Due to difficulties in predicting future demand from the current per-capita consumption, it was vitally important to develop scenarios that can help

forecasting. Thus, the choice of developing a vital pricing policy was necessary; this step would help in conserving the present resources and might initiate searching for new ones .The Water Law of 2002 provided for the establishment of a unified tariff system for all water sector utilities. Further, the law entrusted the Water Authority with preparing draft laws and regulations and issuing directives related to the water sector. It also entrusted the Cabinet of Ministers, upon recommendation by the Water Council, with issuing regulations related to application of the law. With the aim of limiting price discrepancies for water in the various governorates on the one hand, and protecting the consumer from unjustified price hikes on the other, the Palestinian Water Authority prepared broad guidelines for a tariff policy, setting down what was known as the "tariff system." This "system" was made up of two components. The first component of the draft system delineated criteria to be adhered to in setting water prices. In formulating these criteria, the Water Authority aimed to achieve the following main goals:

- To enable each water department to recover all of its expenditure.
- To encourage economical use of water resources.
-To maintain prices that low-income families are able to endure.

The second component of the draft "tariff system" was entitled "Procedures for Tariff Implementation," and it aimed to delineate the practical measures that regional utilities must take to implement the water tariff system. This component included a detailed description of what must be done when designing the tariff, as

well as models of the tariff that would be used. The Water Authority distributed the details of this system to the local authority councils to elicit their comments. A disadvantage of this proposed "tariff system," was its lack of legal strength. In practice, there was no unified system for the water tariff applied by all local authorities and regional utilities. Application of the aforementioned system—once it is authorized-calls for participation on the part of the Palestinian Water Authority, as the main regulatory body for the water sector, and the Ministry of Local Government, as the body responsible for the local authorities that supply residents with water. Aiming to achieve implementation, the Water Authority reached an understanding with the Ministry of Local Government, that a unified tariff system would be applied once the requisite legal measures were taken. To cope with the large task before the Palestinian Water Council to put in place and authorize water policy, it has held two meetings lately in order to work out this issue among other topics of importance.

2.4 Current Tariffs in Ramallah & Al-Bireh

The Tariff financial information in Ramallah and Al-Bireh district in the period 2001-2004 only were obtained from the Palestinian Water Authority (as the data for the next two years are not yet formally available due to technical reasons) and then analyzed, tables and graphs were prepared in systematic manner in order to be able to compare certain variables (See Appendix A, all tables for the period were shown). Mainly five figures for each year were prepared and discussed, the

data, the figures and the chosen terms are based on an excel sheet program, that was built by water tariff department in PWA with the help of donors, and these are:

Revenues efficiency = (Billed Revenue / Billed Water Sold)*100 %

Average Selling Prices = (Total Billed Water Sold/ Total Water Sold)

Average Cost versus Selling Prices & Average Unit Revenues

Average O&M Unit Cost = ((Total Expenses–Fixed Assets Depreciation) / Total Water Sold)

Selling Prices = (Billed Water Sold / Total Water Sold)

Average Unit Revenues= (Sum of revenues / Total Water Sold)

Billed Revenue versus Total Sold

Expenses Percent Comparison:

- O&M Expenses / Total Expenses) *100%
- (O&M Expenses +other Expenses)/Total Expenses) *100%
- (O&M Expenses + Other Expenses + Depreciation)/Total Expenses) * 100 %

Figure (2-1) revealed the most efficient community in collecting revenues (meaning that the billed revenue /billed water sold percent is highest) is Birzeit Municipality, Jerusalem Water Undertaking comes in the second position, and Betoniya Municipality comes third. It is worth mentioning that in the year 2001 data for Bani Zeid Municipality were not available, and all the numbers in the figure and the next four figures are obtained from Table A5 in appendix A.

Figure (2-2) showed that Betoniya Municipality had the highest Average selling Prices (Billed Water Sold / Total Water Sold), were JWU comes next,

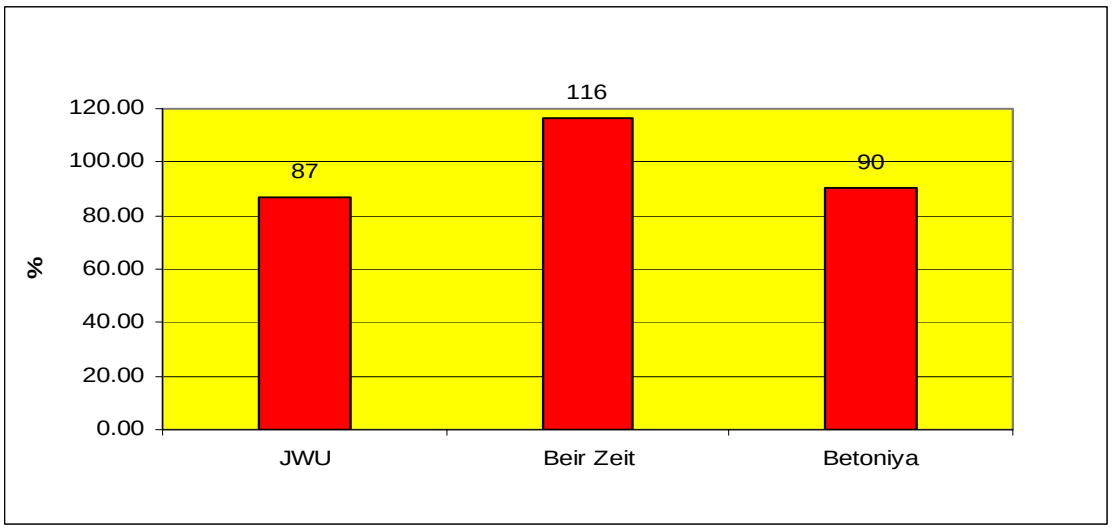


Figure 2-1 Revenue Efficiency in Ramallah & Al-Bireh in2001

and then Birzeit Municipality, again data for Bani Zeid Municipality were not available.

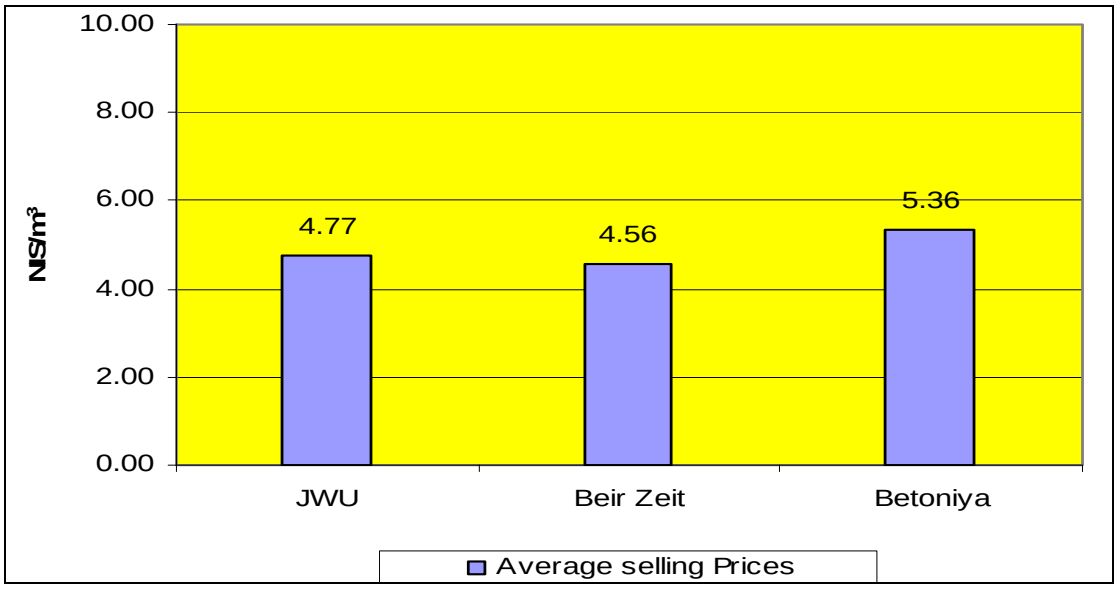


Figure 2-2 Average Selling Prices in Ramallah and Al-Bireh in 2001

Figure (2-3) for the same year showed that for the three utilities always average operation and maintenance unit cost, and average unit revenues was higher than the average selling prices in the three communities.

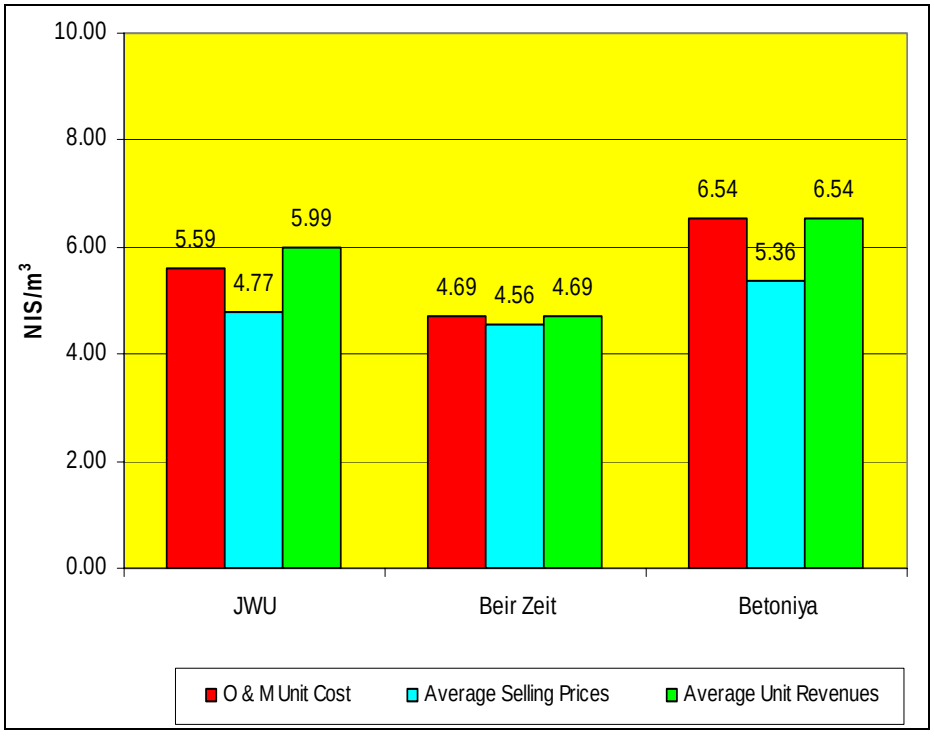


Figure 2-3 Average Cost Versus Selling Prices and Average Unit Revenues in Ramallah and Al-Bireh in 2001

When comparing the Revenues versus total water sold in figure (2-4) the descending order of utilities would be: Birzeit, Betoniya, Jerusalem Water Undertaking, and again no data available for Bani Zeid.

Finally, Jerusalem Water Undertaking had the highest numbers in expenses percents

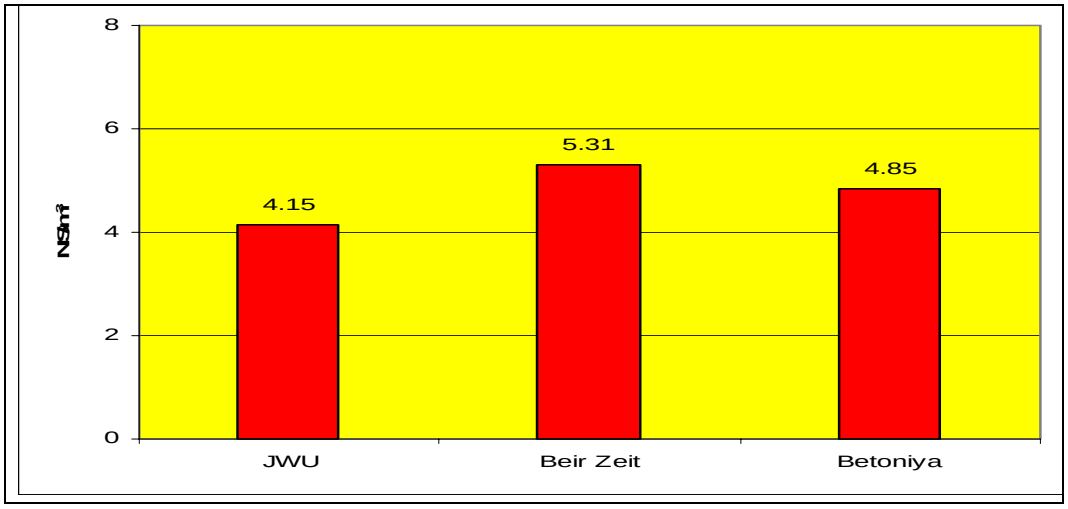


Figure 2-4 Billed Revenue versus Total Sold In Ramallah and Al-Bireh 2001

comparison, next comes Betoniya, then Birzeit, this is illustrated in figure (2-5).

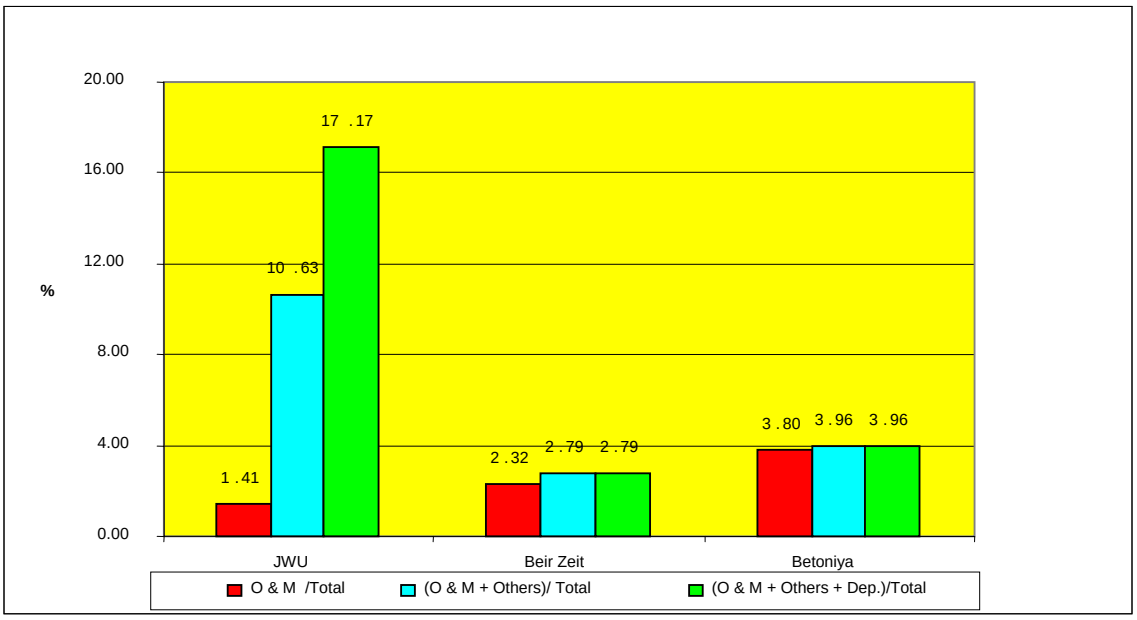


Figure 2-5 Expenses Percents Comparison in Ramallah & Al-Bireh in 2001

Figure (2-6), revealed that the most efficient community in collecting revenues (meaning that the billed revenue /billed water sold percent is highest) is Betoniya Municipality; Jerusalem Water Undertaking came in the second position. Third

came Birzeit Municipality, and West Bani Zeid Municipality came last. The explanation of having Betoniya in the first rank might be that too many new buildings were built , and these were inhabited fastly, which might cause the revenues efficiency trend to change from that prevailed in 2001.

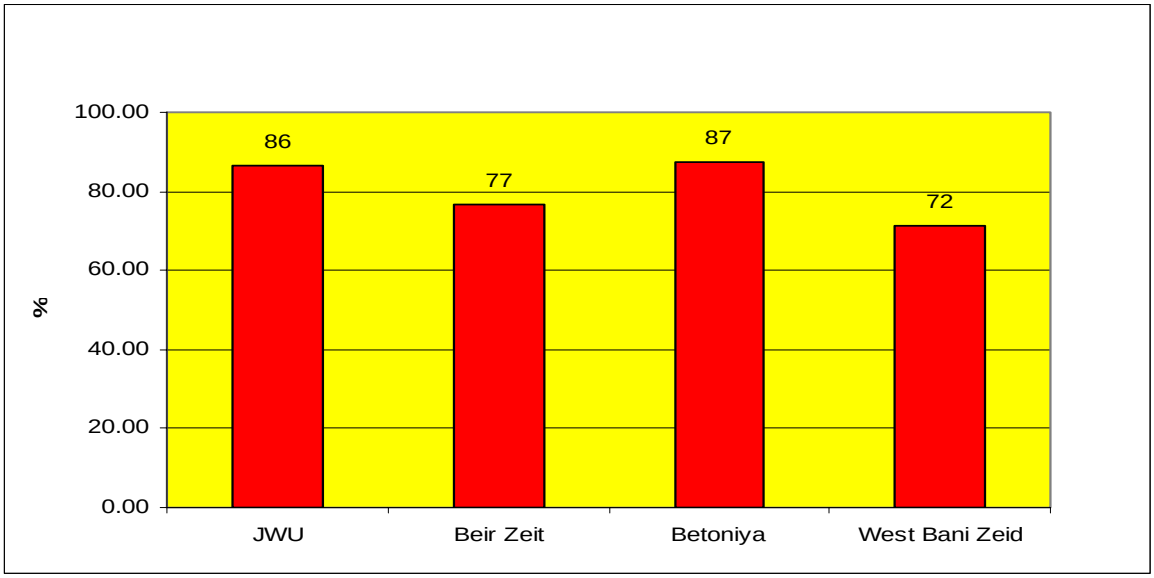


Figure 2-6 Revenues Efficiency in Ramallah & Al-Bireh in 2002

Figure (2-7), that showed the average selling prices (Billed Water Sold / Total Water Sold) in the year 2002, would give the following results: Birzeit Municipality had the highest average selling prices, whereas West Bani Zeid Municipality came next, and then Betoniya Municipality, in the last position came JWU.

Figure (2-8) for the same year showed that Birzeit Municipality had the highest average unit revenue, and the highest average selling prices then come West Bani Zeid, Betoniya Municipality came in the third rank; whereas Jerusalem Water

Undertaking came last. As for O& M Unit cost the municipalities in descending order were: Betoniya, JWU, Birzeit, and West Bani Zeid.

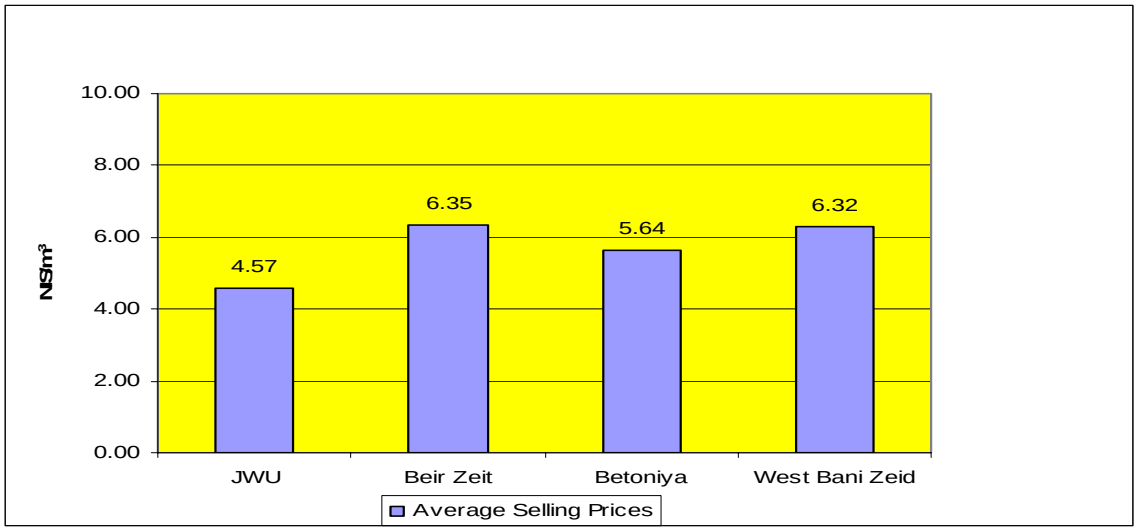


Figure 02-7Average Selling Prices in Ramallah and Al-Bireh 2002

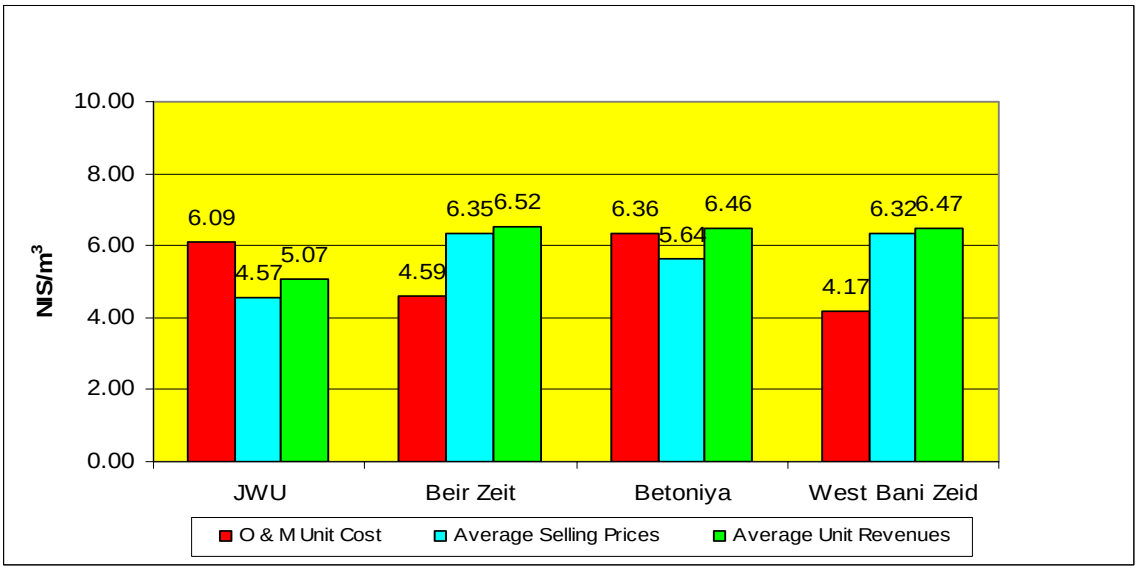


Figure 2-8 Average Cost versus Selling Prices and Average Unit Revenues 2002

When comparing the Revenues versus Total Sold in Figure (2-9) the descending order of utilities would be: Betoniya, Birzeit, and West Bani Zeid, and JWU.

Finally, Jerusalem Water Undertaking had the highest numbers in expenses percents comparison, next came West Bani Zeid Municipality, Betoniya Municipality in the third rank, then Birzeit with constant numbers, see Figure (2-10).

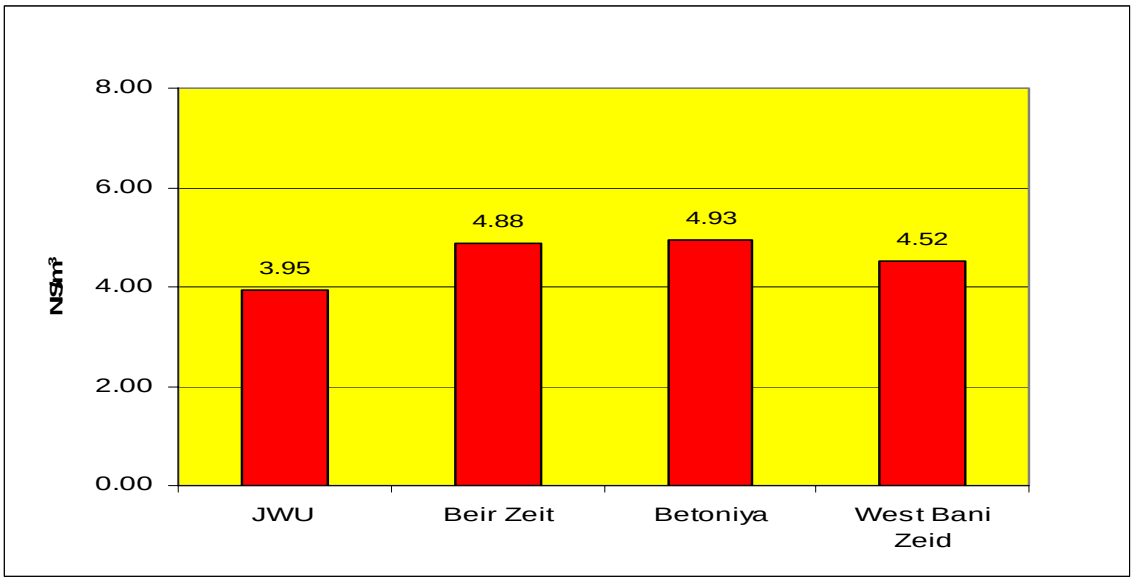


Figure 2-9 Billed Revenue versus Total Sold in Ramallah and Al-Bireh 2002

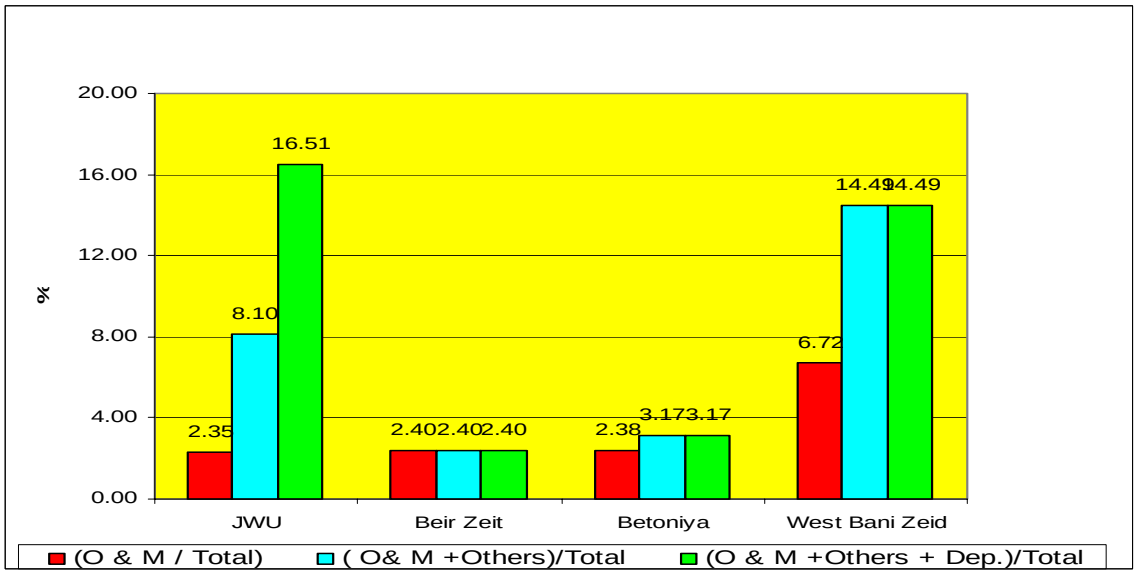


Figure 2-10 Expenses Percents Comparison in Ramallah and Al-Bireh 2002

Figure (2-11), revealed that the most efficient community in collecting revenues (meaning that the billed revenue /billed water sold percent are highest) was: Birzeit Municipality; Jerusalem Water Undertaking and Betoniya came in the second position. West Bani Zeid Municipality came third.

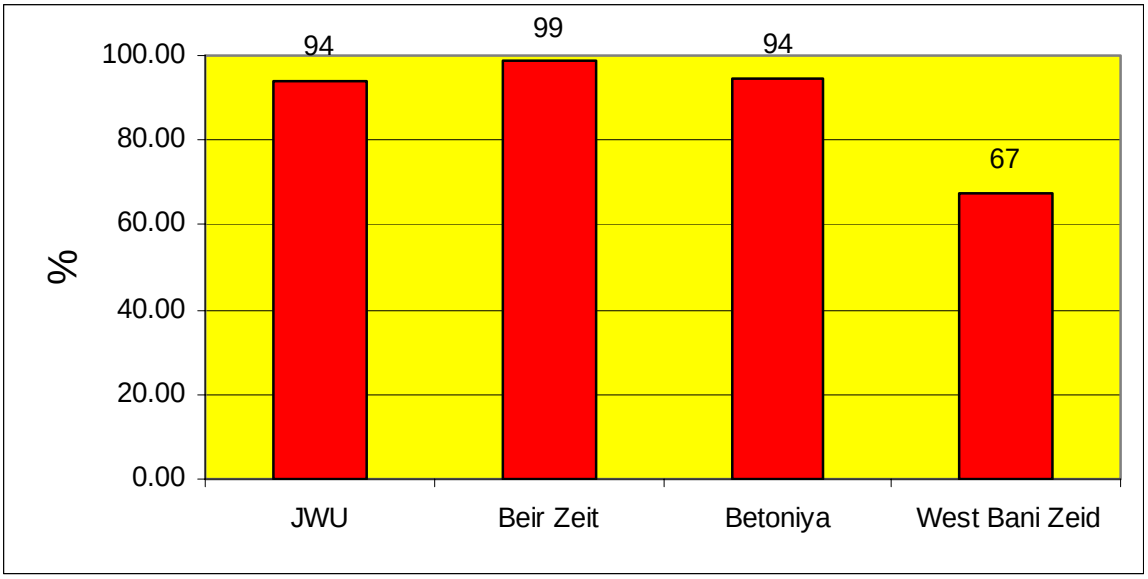


Figure 2-11 Revenues Efficiency in Ramallah and Al-Bireh in 2003

Figure (2-12), showed the average selling prices (Billed Water Sold /Total Water Sold) in the year 2003, would give the following results: West Bani Zeid Municipality had the highest Average selling prices, Betoniya Municipality came next, and then JWU, whereas Birzeit Municipality had the lowest average selling price.

Figure (2-13) showed that Birzeit Municipality had the highest average unit revenue, and the highest average O&M Unit cost prices, then came JWU .For average unit revenue, West Bani Zeid municipality came third and Birzeit Municipality came last, but for O&M unit cost the case is the opposite where

Birzeit Municipality came third, and West Bani Zeid came last. For the average selling prices the ascending order is West Bani Zeid, Betoniya, JWU, Birzeit. When comparing the Revenues versus Total Sold in figure (2-14) the descending order of utilities would be: Betoniya, Birzeit, JWU, and West Bani Zeid.

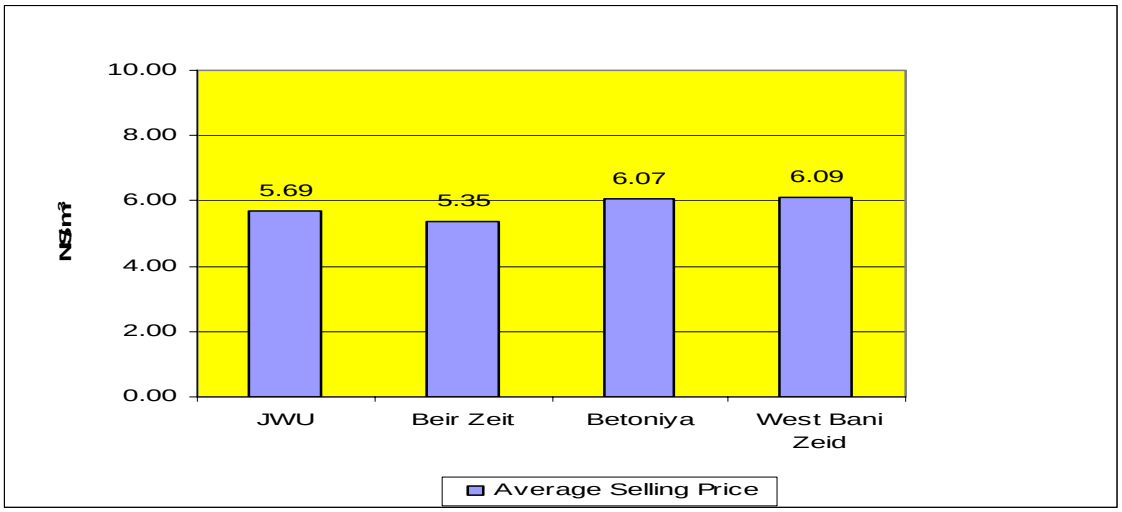


Figure 2-12 Average Selling Prices in Ramallah and Al-Bireh 2003

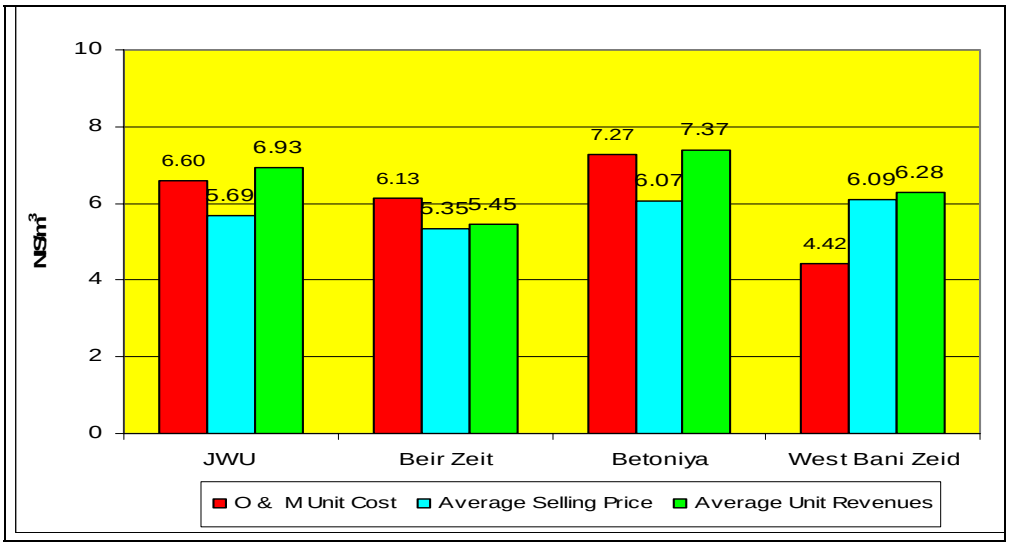


Figure 2-13Average Cost Versus Selling Prices and Average Unit Revenues in Ramallah and Al-Bireh 2003

Finally, Jerusalem Water Undertaking has the highest numbers in expenses percents comparison, next comes West Bani Zeid Municipality, Betoniya Municipality in the third rank, then Birzeit . It is worth mentioning that both Birzeit and West Bani Zeid municipalities have a constant number for all the expenses percents ,which is (1.40) for Birzeit Municipality and (3.95) for West Bani Zeid Municipality , this is illustrated in Figure (2-15).

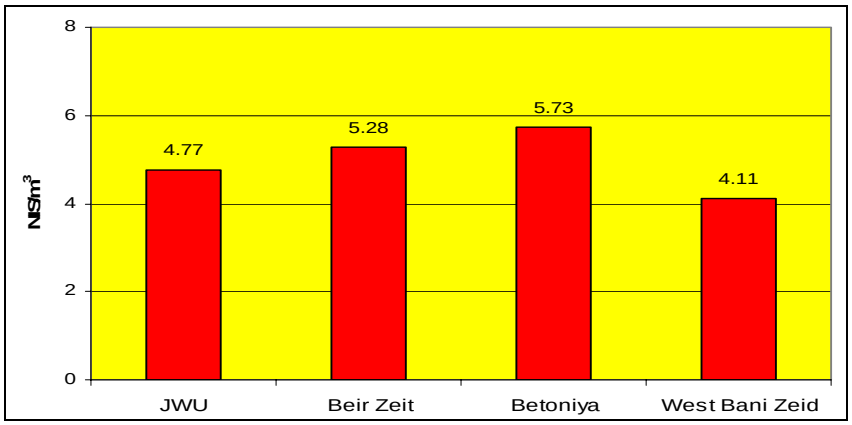


Figure 2-14 Billed Revenue versus Total Sold in Ramallah & Al-Bireh 2003

By analyzing Figure (2-16), which showed the revenues efficiency in the year 2004, it revealed that the most efficient community in collecting revenues (meaning that the billed revenue /billed water sold percent is highest) was: West Bani Zeid Municipality, Betoniya Municipality came in the second position; Jerusalem Water Undertaking and. came third, then Birzeit Municipality.

Different from the other years PWA prepared a comparison of least &maximum

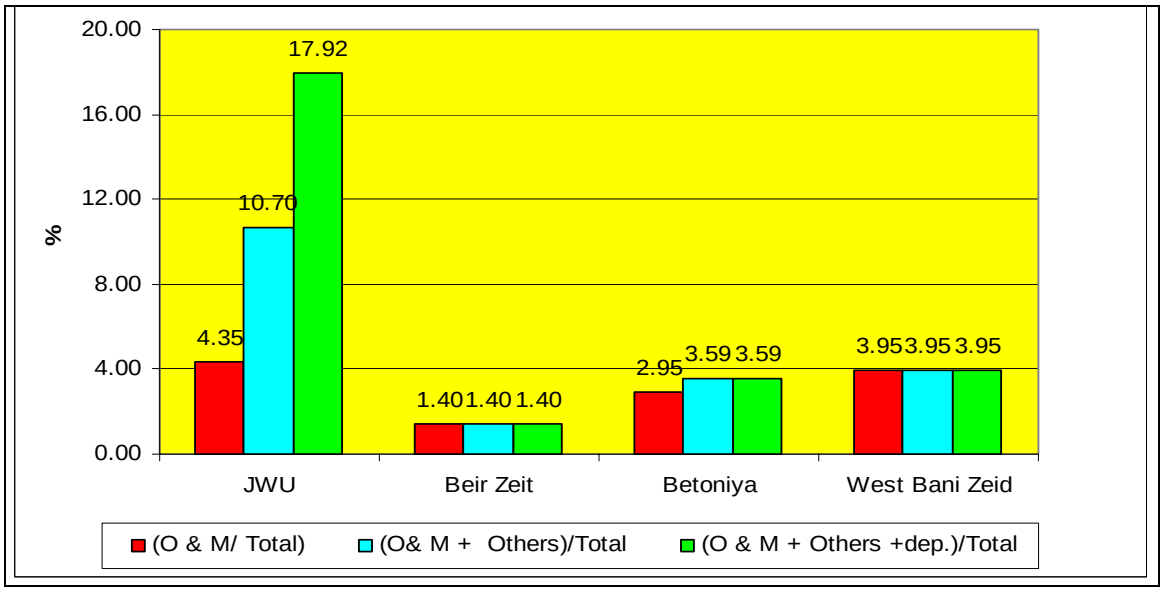


Figure 2-15 Expenses Percents Comparison in Ramallah &Al-Bireh 2003

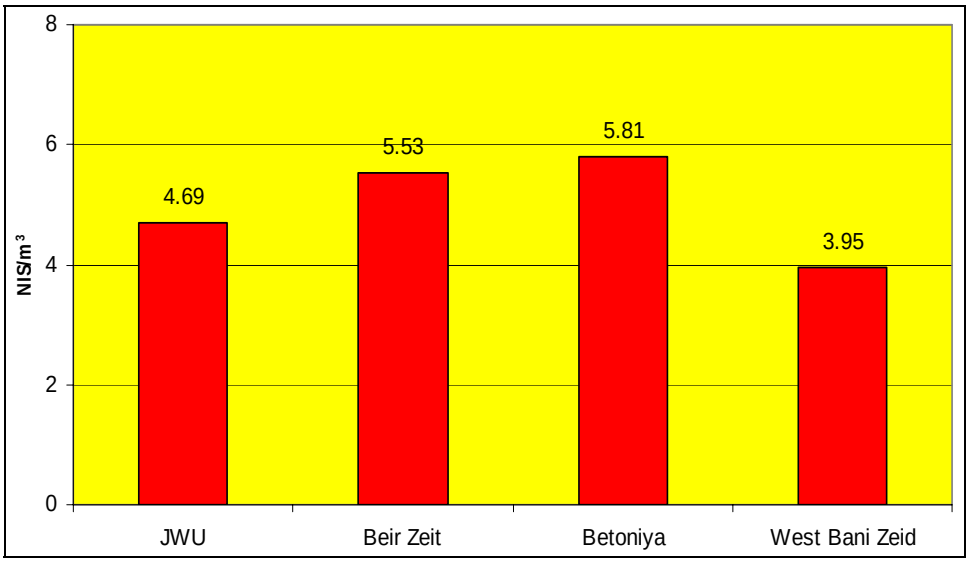


Figure 2-16 Revenue Efficiency in Ramallah and Al-Bireh 2004

Selling prices versus Average selling prices for the year 2004; these were shown in Figure (2-17) on the net page which speaks for itself.

Figure (2-18) for the same year showed that Birzeit Municipality has the highest average unit revenue, then came Betoniya Municipality, JWU, and finally West

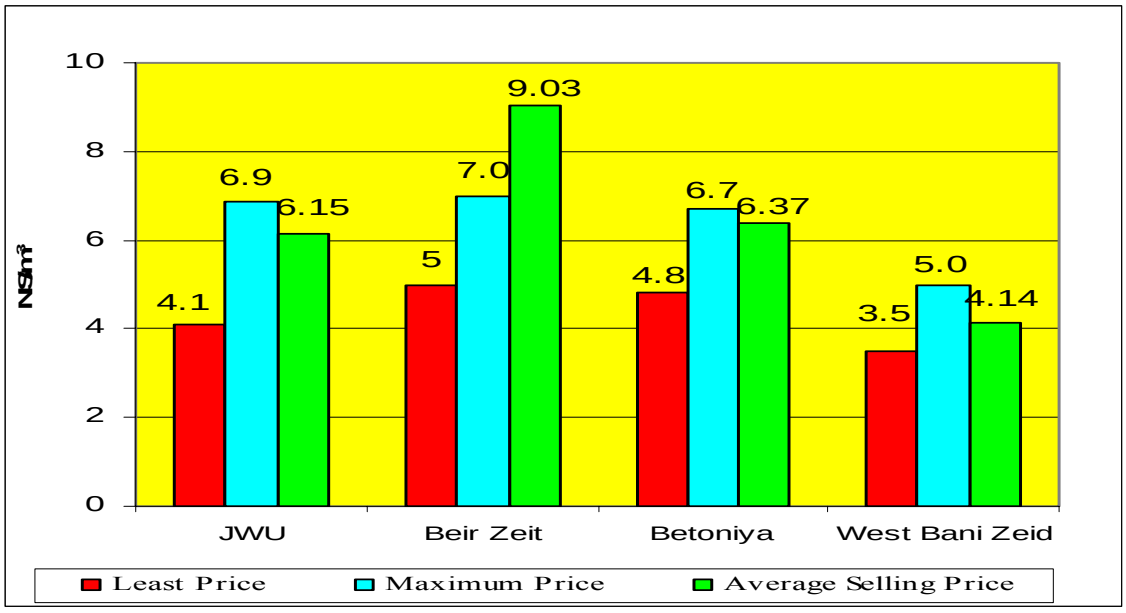


Figure 2-17 Least and Maximum Prices versus Average Selling Price in Ramallah and Al-Bireh 2004

Bani Zeid. But for O&M unit cost the case was : Betoniya Municipality, JWU, Birzeit Municipality, finally West Bani Zeid. For the average selling prices the ascending order is West Bani Zeid, JWU, Betoniya, then Birzeit.

When comparing the Revenues versus Total Sold in figure (2-19) the descending order of utilities would be: Betoniya, Birzeit, JWU, and West Bani Zeid. Finally, JWU had the highest numbers in expenses percents comparison (not including (O&M/Total) percent), next came Birzeit Municipality West Bani Zeid Municipality, Betoniya Municipality in the final rank. It was

worth mentioning that both Birzeit and West Bani Zeid and Betoniya municipalities had a constant number for l the expenses percents, which was 7.75

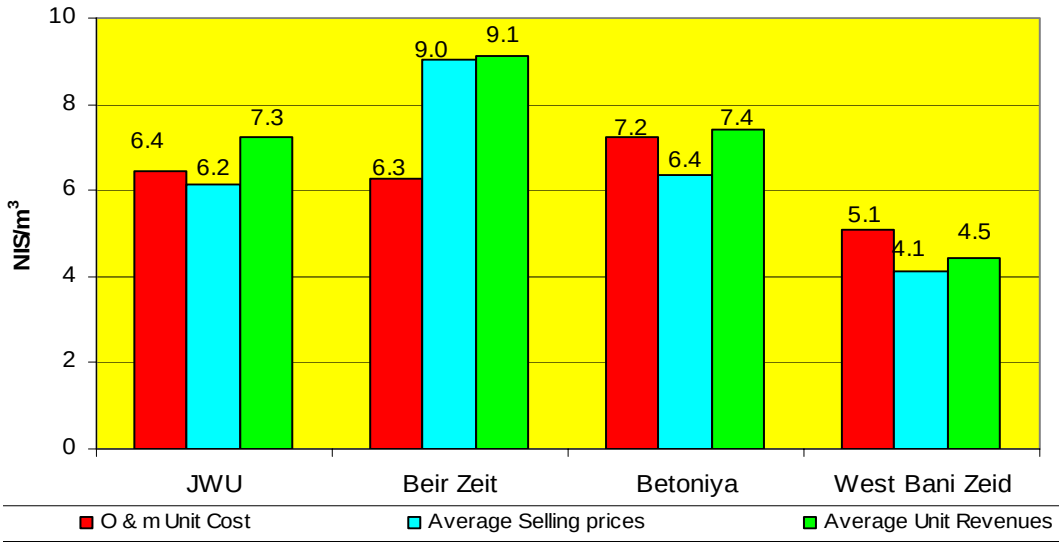


Figure 2-18 Average Cost versus Selling Prices and Unit Revenues in Ramallah and Al-Bireh 2004

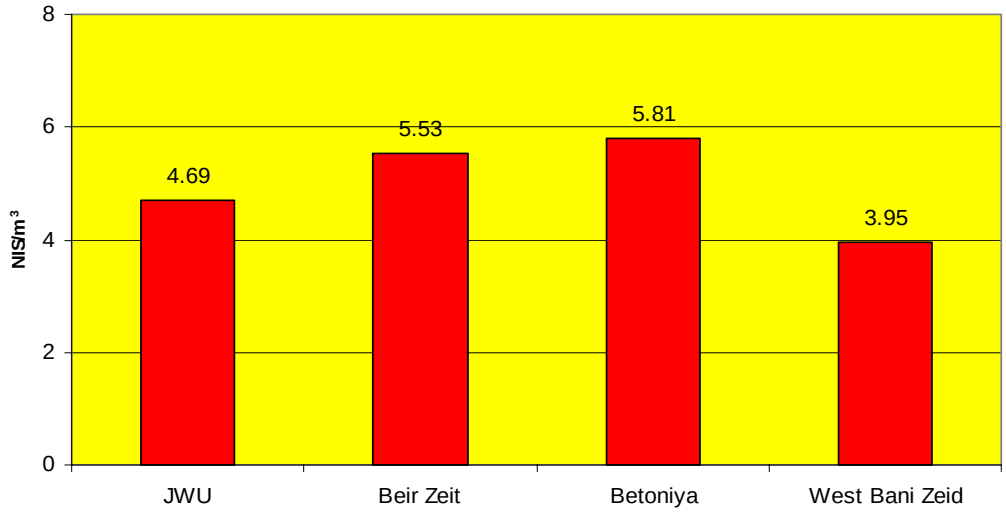


Figure 2-19 Billed Revenue versus Total Sold in Ramallah and Al-Bireh 2004

for Birzeit Municipality and 4.54 for West Bani Zeid Municipality, and 3.76 for Betoniya this was illustrated in figure (2-20).

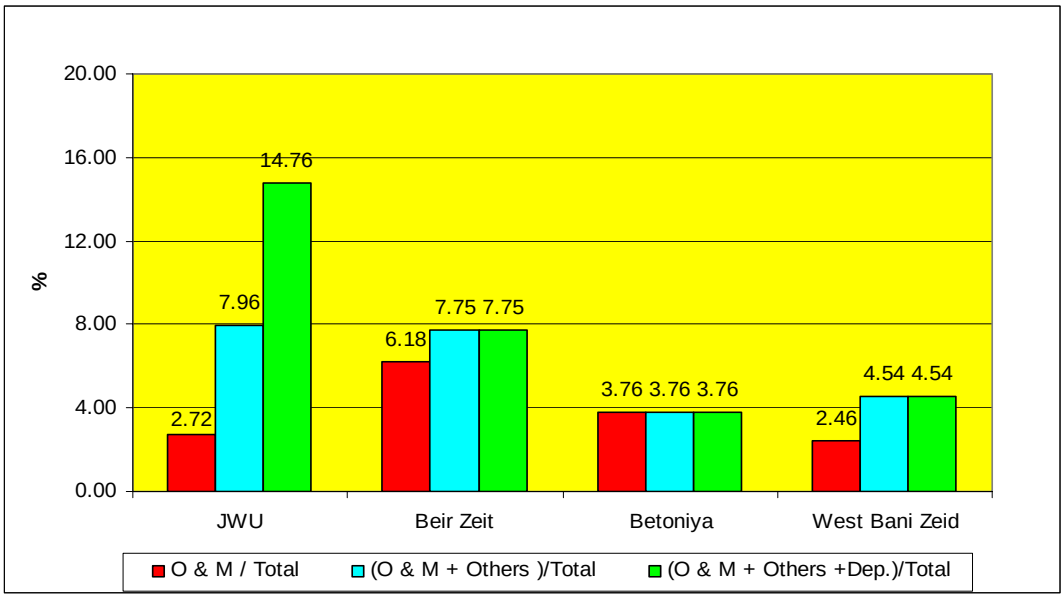


Figure 02-20 Expenses Percents Comparison in Ramallah and Al-Bireh 2004

Results of comparing chart in study period are presented in Chapter Six.

Chapter 3: Literature Review

3.1 Past Trends and Ongoing Challenges

3.1.1 Past Trends

Historically, service costs had been widely shielded from consumers, paid for instead by donor agencies and government budgets. Supplying water and providing sanitation services had an inherent financial cost not only with regards to capital investments but also during the operation and maintenance, rehabilitation and expansion phases. These financial costs were reasonably straight forward to identify and potentially match in order to recover costs.

However, experience had shown that when funds from government and donors were cancelled or reduced, most existing community water and sanitation systems were threatened with collapse. But the truth remains that adequate cost recovery was still one of the major obstacles towards sustainable drinking water supply in developing countries which was our case (PWA, Personal Communications).

3.1.2 On-Going Challenges

1. High levels of unaccounted-for, or unbilled, water made cost recovery much difficult (SYKE, 2004).
2. Often existing tariff structures were ineffective in capturing a system's recurring costs and promoting water conservation. They might also exclude the poorest of the poor from service provision (Cardone and Fonseca, 2003)

3. Meters or other gauges of consumption were a critical component of cost recovery, although it should be noted that in areas with abundant supply, the cost of installing and maintaining meters may be less cost-effective (World Bank, 2001).
4. Effectively designed subsidies are targeted at the poor, to improve access to net worked services in pre-urban areas, and provide access to safe quantities in rural areas (Cardone and Fonseca, 2003).
5. Output-based tariffs and subsidies can be a challenge in a political environment that is resistant to reform and accountability of service-provider finances and accounting processes (ISSA, 2004).
6. Designing a flexible billing cycle that accommodates the needs of the poor (with regards to seasonal income, non-regular income, etc.) While allowing for the service provider to maintain steady income to meet expenses can be a challenge (World Bank, 2001).
7. High administrative costs can arise in billing for water, and providing information to consumers about the system (JWU, 2002).
8. Problems can also arise where there is limited training and follow up with partners to expand expertise and encourage autonomy (Bargothi, 2004).
9. Monitoring and evaluation for effectiveness at the system level is often inadequate, this means that problems are not corrected in a timely way (ISSA, 2004).

Recovery is a vital aspect of sustainability, and there are some common aspects that apply regardless of the management structure, geography, or size of the services under consideration (PWA, Personal Communications, 2004).

3.2 Identifying Costs

The following costs are included:

- Financial costs; Financial costs were the most tangible, because they arose directly from the construction, maintenance and use of water and sanitation facilities. A useful way to consider financial costs was to group them into three main categories: Operating costs, capital costs, cost of servicing capital (Cardone and Fonseca, 2003).
- Economic costs; the goal of economic analysis was to consider the impact of decisions regarding resource allocation (both financially and with regards to the water resource) on individuals, society, and the environment. The economic cost of a particular allocation reflects the non – market value of the decision-makers, in relation to other values, or options. This type of cost might not always have a concrete financial cost equivalent, which often makes it hard to identify in a tangible way (Cardone and Fonseca, 2003).
- Costs of sustaining service (support costs).

Include institutional capacity building and skills training at local, regional and national levels, and also include built-in incentives to prevent a local;' brain drain'

once technical and administrative staff are trained- and until a critical mass of people is trained (Cardone and Fonseca, 2003).

3.3 Planning for Financing and Cost Recovery

Cost recovery at both the project and the program levels contributed to sustainability, and planning for it required an appropriate strategy. Indeed, it would help to define orientations and processes, as well as determine a structure upon which the management of a service would operate in a short and long term perspective (Cardone and Fonseca, 2003).

Full cost recovery has not been achieved by water suppliers for both domestic and agricultural use. Even though some utilities have achieved operation and maintenance cost recovery, it should be pointed out that none has achieved the full cost recovery of both the operation and maintenance and capital costs. This situation is not solely due to the existing socio-economic factors or to the affordability of payment of the public, as there are other internal and external factors within the utilities and their surrounding environment (Barghothi, 2004)

3.4 Recovering Costs: Tariffs, Subsidies and Financial Support Mechanisms

Tariffs, subsidies, and financial support mechanisms could all contribute towards sustained service delivery while raising consumer awareness for the financial, economic and environmental aspects of providing such service.

3.4.1 Tariffs

A tariff structure is a set of procedure rules used to determine the conditions of service and the monthly bills for water users in various categories or classes. From an economic efficiency perspective, the problem with a fixed-charge system was that consumers had absolutely no incentive to economize on water use since each additional cubic meter came free of charge (Makino, 2002). A uniform volumetric charge had the advantage that it was easy for the consumer to understand, in part because this is how most other commodities were priced. Two-part tariffs have an important role to play in enabling water utilities to simultaneously achieve economic efficiency and cost recovery objectives (Cardone and Fonseca, 2003). Scarce subsidy resources might be more effectively used to reduce the initial cost of new connections, rather than to lower volumetric charges to existing users.

Tariffs determine the level of revenues that service providers receive from users. They are designed for different purposes, and often contain some elements to address poverty (Cardone and Fonseca, 2003). The goals of a tariff vary and may include:

- Raising enough revenues to cover specific costs.
- Making access to drinking water affordable for different income groups, which should take into account the ability to pay for a service and the fact that there are major impacts for health, well-being and poverty alleviation targets. The tariff should not be too high to drive consumers to unsafe alternatives or to decrease daily use to dangerous levels.

- Sending appropriate price signals to users about the relationship between water uses and water scarcity;
- Fairness as perceived by the consumers.

Generally, tariffs in developing countries had at least one thing in common: they were set well below the level needed to cover even operation and maintenance costs. Research had shown that low tariffs were set largely for political, rather than practical, purposes (World Bank, 2003). In fact, political interference had been found to be a significant barrier to effective cost recovery, as was mentioned earlier concerning case in Palestine.

Tariffs were generally set through national or state policy, although the public or private sector could also calculate them for an individual project, sometimes at the community level. Whether set by the public or private sector, tariffs could be designed within a policy framework that addresses the needs of the poorest (Cardone and Fonseca, 2003). However, without better data and accounting systems and with no right tools to calculate costs that may have been originally set decades ago, it is difficult to make progress in tariff designs. User fees are generally charged for the ongoing costs of supply, while connection fees to a network or installation costs for pumps were charged separately.

3.4.2 Subsidies

Under the direct subsidy approach, governments pay part of the water bill of poor households that meet certain eligibility criteria (Foster et al, 2000).It was generally

agreed that in poor areas of middle and low income countries, subsidies were necessary to cover basic amounts of water usage by poor customers. However, in a networked system, the poorest were not a part of the network in the first place, and many benefits accrue also to wealthier consumers. Different types of subsidies achieve different purposes (Cardone and Fonseca, 2003).

Significant research had been conducted over the last several years on subsidies and their effectiveness, with the conclusion that subsidies should be provided only as part of a poverty reduction framework, and should be used, generally, to promote access to basic water and sanitation services rather than providing ongoing support for consumption. There were the following types of subsidies:

1. Direct subsidies are an increasingly popular means of making infrastructure services more affordable to the poor (Foster et al, 2000).
2. Cross subsidies occurs when one customer pays more than the cost of service so that another customer can pay less. Cross-subsidies can be an effective way of achieving social goals, while ensuring that water and sanitation utilities as a whole are self-financing. One of the most common types of cross-subsidy is the increasing-block tariff (Foster et al, 2000).
3. Output-based subsidies (OBA) refers to the approach in which the government contracts to a third party the delivery of a service to consumers for which public funds, complemented in some cases by user fees, are paid contingent on the actual delivery of these services as determined in performance-based contracts with public or private providers. It aims to encourage providers to

deliver the services the government wants by tying some or all of the payments to the delivery of specified outputs or outcomes. It also seeks to enhance accountability for the use of public funds by focusing on measurable outputs or results. OBA approaches have been used in many sectors (Foster et al, 2000).

A water utility might receive subsidies from other agencies. These could include direct subsidies such as capital grants from senior levels of government or indirect subsidies as might occur if a municipal water utility were to receive services from the city's legal department without charge (Kushner and Renzetti, 2004).

3.5 Other Financial Support Mechanisms

In developing countries, most of the financing for the water supply and sanitation sector comes from the domestic public sector, followed by external aid. Other sources include small-scale domestic private providers, international private sector, international and local non-governmental organizations and neighborhoods, communities and households (Cardone and Fonseca, 2003). Donors should be held accountable for their commitment to increase aid to the water and sanitation services sector. Providing financial assistance, whether for rehabilitation or a new project, could have lasting impacts, but there was the need to raise awareness of the support costs that would guarantee a sustainable service provision (PWA, 2004). Small loans or grants could also make a strong difference in covering some of the costs of serving the poor. Some projects cover future replacement costs in

their tariffs. In these cases, this part of the payments could be used as savings or as guarantees for possible credit (World Bank, 2001).

3.6 Willingness to Pay

Willingness to pay (WTP) is an expression of the demand for a service, and it is a strong prerequisite for sustainable cost recovery because it is the materialization of users' satisfaction and of their desire to contribute to its functioning. Field experience showed that there was not a systematic correlation between willingness and ability to pay (Cardone and Fonseca, 2003). It is necessary to find out the conditions that affect demand and the desire of people to contribute to the service economically. Direct techniques for the estimation of WTP were based on the observation of what people actually do in order to ensure water provision (including how much money they had to pay for it). The indirect ways drew conclusions from users' responses to hypothetical questions about their willingness to pay for WSS services. WTP studies were carried out to understand what level of services people want, why, and how much they are willing to pay for it. In terms of sustainability, giving value to the water would lead to resource conservation and facilitate sustainable practices by allowing the market to set the monetary value on water (Hope and Garod, 2004).

3.7 Case in Palestine

The administration of water resources, supply of water and provision of wastewater services in Palestine had a long and complicated history. In 1967 all

water resources in the occupied Palestinian Territories became under Israeli control. Israeli water companies were given a key role in the planning, implementing and operation of water projects to the degree that an Israeli company Mekorot was still drilling wells in the territories to sell water to Palestinians (SYKE, 2004). In reality, the water crisis was not chiefly one of insufficient supply, but of uneven and inequitable distribution.

The water conflict hinged on the argument that availability of the water to West Bank Palestinians, particularly pricing and distribution, was controlled by policies of the Israeli occupation in the West Bank and had not been equivalent to the more favorable water policies applied to Israelis and Israeli settlers (PHG, 2004). In addition, the water crisis and conflict were not unique to the West Bank and Israel. Though 'Palestinian control' is in effect in Ramallah, how much, how effective, and how it functions amidst a sea of areas that are not under full control by the Palestinian Authority, made Ramallah a most interesting city to observe. Israeli and Palestinian sovereignty issues could both complicate and illustrate the situation of the water conflict.

3.8 Methodology*:* Contingent Valuation

The contingent valuation (CV) method would be used to elicit households' willingness to pay for water and wastewater services. The CV method was criticized by some as unreliable because it depended on what respondents say rather than what they do (Snell, 1997; Abu-Madi, 2003). Nevertheless, CV had

gained increased acceptance amongst academics and policy makers as a versatile and powerful methodology for estimating respondents' WTP (Hanneman and Kanninen, 1996; Whittington, 1998; Vaughan et al., 1999; Hanley, 2001). According to Johansson (1999), elicitation of respondents' WTP could be done in several different ways: (i) in an open-ended question, (ii) in a single referendum question, or (iii) in the form of bidding game. In an open-ended question, the respondent was asked to state the maximum amount that he/she is willing to pay, while in the referendum format, the respondent is presented with a posted price that he/she is asked to accept or reject. The bidding game was a repeated process, which tries to bracket the respondent's maximum WTP by presenting higher and higher values (bids). A lower value for the WTP could be bracketed in a similar manner (Johansson, 1999). Most CV studies that have compared estimates of WTP obtained have found that dichotomous (Yes/No) choice yields higher estimates than open-ended format (Snell, 1997; Hanley, 2001; Emre et al., 2002; Abu-Madi, 2003).

Therefore, bid values would be selected based upon the pilot testing of questionnaire to ensure a bid range that approximately covers: (i) current tariffs, (ii) the operational costs, and (iii) the total costs (including investment). However, responses to the CV question provided only qualitative information about WTP. Thus, from the raw responses alone, one cannot obtain a quantitative measure of WTP. Therefore, this research would employ two methodologies for analysis of the filed survey. The first was descriptive that presented households' WTP as

frequencies (count and percentile). The second embedded the data in a model in an attempt to link the qualitative responses to monetary and other stimuli that induced them (Hanemann and Kanninen, 1996). Households' responses would be analyzed using models for discrete (qualitative) dependent variables, where we might relate the probability of making a certain choice ("pay" or "not pay") to some explanatory variables (independents).

To accomplish this goal, two models were created that includes all predictor variables that were useful in predicting the response variable. Several methods were available for selecting independent variables. One was the forced entry method where any variable in the variable list was entered into the model. The other was the stepwise method were regression can test the fit of the model after each coefficient was added or deleted. Stepwise regression was used in the exploratory phase of research or for purposes of pure prediction, not theory testing (Menard, 1995). Exploratory testing made no a-priori assumptions regarding the relationships between the variables, thus the goal is to discover relationships. Theory testing is the testing of priori theories or hypotheses where selection of the variables is based on theory, not on a computer algorithm (which is the method used in this research). Menard (1995) writes, "There appears to be general agreement that the use of computer-controlled stepwise procedures to select variables is inappropriate for theory testing because it capitalizes on random variations in the data and produces results that tend to be idiosyncratic and

difficult to replicate in any sample other than the sample in which they were originally obtained".

Multiple linear regressions (MLR) are the extension of simple linear regression (SLR) to the case of multiple explanatory variables. The goal of this relationship is to explain as much as possible of the variation observed .The use of MLR might also be indicated by the residuals from a simple linear SLR. Residuals may indicate there is a temporal trend (suggesting time as an additional explanatory variable), a spatial trend (suggesting spatial coordinates as explanatory variables), or seasonality (suggesting variables which indicate which season the data point was collected in). Analysis of a residuals plot may also show that patterns of residuals occur as a function of some categorical grouping representing a special condition. These special cases will only be revealed by plotting residuals versus a variety of variables in a scatter plot if the variable is continuous, in grouped box plots if the variable is categorical. Seeing these relationships should lead to definition of an appropriate explanatory variable and its inclusion in the model if it significantly improves the fit (Helsel and Hirsch, 2002).

The MLR model will be denoted:

$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k + \varepsilon$

Where y is the response variable

B_0 is the intercept

B_1 is the slope coefficient for the first explanatory variable

B_2 is the slope coefficient for the second explanatory variable

B_k is the slope coefficient for the kth explanatory variable, and

ε is the remaining unexplained noise in the data (the error).

It is important to use graphical tools to diagnose deficiencies in MLR. The residuals plots are very important: normal probability plots of residuals, residuals versus predicted (to identify curvature or heteroscedasticity), residuals versus time sequence or location (to identify trends), and residuals versus any candidate explanatory variables not in the model (to identify variables, or appropriate transformations of them, which may be used to improve the model fit) (Helsel and Hirsch, 2002).One of the major issues in multiple regressions is the appropriate approach to variable selection. The benefit of adding additional variables to a multiple regression model is to account for or explain more of the variance of the response variable. The cost of adding additional variables is that the degrees of freedom decreases, making it more difficult to find significance in hypothesis tests and increasing the width of confidence intervals. A good model will explain as much of the variance of y as possible with a small number of explanatory variables. Therefore the choice of whether to add a variable is based on a "cost-benefit analysis", and variables enter the model only if they make a significant improvement in the model. There are at least two types of approaches for evaluating whether a new variable sufficiently improves the model. The first approach uses partial F or t-tests, and when automated is often called a "stepwise" procedure. The second approach uses some overall measure of model quality. The latter has many advantages. So step one was to test the hypotheses, then

modifications on the original model were performed to predict the real set of variables. When MLR model does not fit, categorical data analysis could be used. Categorical variables are those whose possible values are not along a continuous scale, but may take on only one of a discrete number of values classed into one of several categories. To easily inspect the relationship between two categorical variables, the data are recorded as a matrix of counts. The matrix is composed of two categorical variables, one assigned to the columns and one to the rows. Both variables will take on several possible values (Helsel and Hirsch, 2002).

Contingency tables measure the association between two nominal categorical variables. Because they are nominal there is no natural ordering of either variable, so that categories may be switched in assignment from the first to the second row, etc. without any loss in meaning. The Kruskal-Wallis test was introduced as a nonparametric test for differences in medians among 3 or more groups. The response variable in that case was continuous. The test will be applied to data which are ordinal; the response variable can only be recorded as belonging to one of several ordered categories. All observations in the same response category (row) are tied with each other. The test takes on its most general form in this situation, as a test for whether a shift in the distribution has occurred, rather than as a test for differences in the median of continuous data (Helsel and Hirsch, 2002).

When both row and column variables are ordinal, testing for differences in distribution of the row categories among the columns, without ignoring the correlation structure of the data (do increases in the column variable coincide with increases or decreases in the row variable?) This additional information contained in the correlation structure of ordinal variables can be evaluated with a rank correlation test such as Kendall's tau.

It should be beard in mind:

1. Contingent Valuation is a non market valuation method.
2. Research showed that benefits, measured by willingness to pay are significant under a wide range of cultural and demographic conditions.
3. Non market valuation was an effective and flexible tool for assessing economic demands, project efficiency, and financial viability.
4. Several factors were linked to variations in the size of WTP.

One factor was the quality of water service. Poor quality and unreliable service diminished willingness to pay. A second factor was the availability of alternative supplies. A third factor was household characteristics such as income, number of family members, age, and gender (Hoehn, 2000). Basically these factors were used as the core of the questionnaire formulation process as described later in this chapter.

3.8.1 Factors Affecting Willingness to Pay

Various factors were believed to influence WTP. The most significant appears to be perceived convenience and amenity of the proposed scheme. This means how convenient it was for consumers to use the service at its point of delivery. This convenience was closely related to the level of service and the existence of any alternatives. If the level of service was perceived as being too low or if very cheap alternatives were close at hand then consumers would be less WTP for the new service. Also the socio-economic status of the household or community would play an important role, whether the family size was large or small, what the average income level of each household is. If a significant amount of time could be saved by the new service, for example having a water point close to the house rather than several hundred meters away, then WTP increases but only in proportion to the value placed on women's time (as they likely to do the collecting) and the extent to which they are involved in making the decision. There were also the perceived health benefits of public health improvements but these do not always increase WTP in the early stages when consumers remain to be convinced of the benefits (Franceys, 1997). These factors included policy, environment, and technical as well as administrative and organizational factors .The impact of each factor could vary a great deal and was subject to prevailing conditions. In practice, the consumer applies only one or two criteria to his or her decision, but these criteria are different in different cases.

3.8.2 Factors Affecting Affordability

Tariffs for fresh and wastewater services should have four objectives:

1. Affordable to the households purchasing these services;
2. Cover fully the direct and overhead costs of service production, thereby eliminating the dependence of the water Authority on local or national government subsidy;
3. Underpin the quest for sustainability by encouraging water conservation;
4. Simulate the protection of the environment from pollution.

The first of these objectives might conflict with the other three; this inconsistency could be resolved by a combination of low pricing for households' basic water needs and government subsidy targeted to families in special needs. The affordability criterion was derived from World Bank recommendations. The Bank suggested that the combined tariff for fresh-and wastewater services should be set such that monthly payments by households should not exceed 3% of average household income. Alternatively, the tariff should be set that monthly payments do not exceed 5 percent of the average income of the thirtieth percentile, counted up from the poorest individuals, of total income distribution. The second criterion had the strength of specifically recognizing that water and sanitation services should be affordable to those on relatively low income (Merritt, 2001) .According to PHG and PWA unofficial surveys the Palestinian households pay around one third of their incomes for water and wastewater services .In assessing tariff levels, a clear

distinction had to be made between average tariffs for all users which was the relevant concept in assessing the financial viability of utilities, and tariffs for an average household which was the most relevant concept in assessing affordability. Pricing policies in many parts of the region emphasized affordability by setting prices low enough so that water bills remain relatively low. Water policies in the area had rarely been designed as part of an overall demand-management program and rarely result in prices that reflect the true value of the water (Abu-Safieh, et al, 1999).

In assessing community demand for improved services, a rigorous willingness-to-pay (or "contingent valuation") study should identify which households had both willingness and the ability to pay higher prices for improved services. This was not an easy task. Survey respondents might understand the costs and expected benefits of the improved services; how much they and others would be expected to pay for the improved service; and which institutions would be responsible for delivering those services. Because the scenario was hypothetical, respondents may have an incentive to overstate their effective demand (in the hopes of bringing a project to their community), or may understate their demand in an effort to keep prices for the improved services low (Whittington et al, 2000).

"Willingness to charge" is also as important as "willingness to pay" when considering tariffs. An immediate shift from low-level tariff rate to a very high-level rate (e.g. more than 100% increase) might not be accepted by decision makers .Therefore, testing willingness to charge was also as important as

willingness to pay in some countries. Even where a substantial proportion of households did express effective demand (willingness and ability to pay) for improved services, it was often hard to convince decision makers to raise service prices and, in turn, levels of service. One strategy might be to conduct revealed preference research that documents how much households already pay for the often inadequate services they receive. In some cases, this amount had been shown to equal what would be necessary to provide substantially improved services. Another strategy was to transition gradually to tariffs that cover a substantial proportion of service delivery costs.

It was also important for each water system to evaluate the needs of its community and to ensure that their water rates were affordable for all households in the community. Utilities should examine their specific rate structures, conservation programs, and other practices to determine if they could enhance the affordability of water service without jeopardizing the financial integrity of the water system itself. The increase in household water bills, coupled with the prospect for further increases as new regulations were implemented and aging infrastructure was replaced, makes it likely that the affordability of water service would continue to be of great concern to the public and decision makers.

Chapter 4: Approach and Methodology

4.1 Questionnaire Formulating

A field survey was carried out based on a designed questionnaire, aiming at obtaining more data about the willingness and affordability of the population.

The technique of applying field surveys by using questionnaires is not new; statistical models using the SPSS software was employed to study potential correlations between households' income and their expenditure on water and wastewater services. These expenditures are based on the current as well as the various proposed tariffs. The analysis of this model will help in the assessment of current policies.The data were entered and analyzed using multiple linear regression analysis, then checking the hypotheses.

The field survey has been conducted in the Ramallah and Al-Bireh District. This survey covered 400 households representing the various categories of the Palestinian communities; cities, towns, villages, and refugee camps.

A questionnaire has been developed and pilot-tested on (50) households prior to conducting the actual survey. The questionnaire consisted of (51) questions under (5) main groups:-

1. Social questions.
2. Financial questions.
3. Water services related questions.
4. Wastewater services related questions.

5. Public awareness questions.

The answers of these questions were formulated in reference to specific resources. The answer of questions regarding income was formulated based on the average range of the World Bank, as PCBS has assumed a higher average. The age ranges where taken from PCBS, whereas the range of answers of the monthly water consumption is based on JWU block system. The questions aiming at measuring willingness to pay (50, 51) where formulated as follows:

Question 50: According to JWU the minimum block is less than 10 m^3, as the percent population consuming minimum is small the tariff of this block is assumed to be the minimum, the next range which is from (6-8) is assumed based on the minimum consumption, and so on. If the consumer is willing to pay only 5 NIS/ m^3 (which is currently the case, there was no need to ask for the next range) still, the question, with all the answers options, was read clearly to the respondents.

Question 51: Al-Bireh Municipality officials stated that the price per cubic meter applied is (1.2) NIS/m^3, but under bridging project, JWU is the institution responsible for collecting wastewater bills. JWU collects the bills for a 10% percent of the total amount collected, so it was assumed that the minimum is (2NIS/m^3) and the same process applied in question 50 was applied in for this question.

Too many references, discussing the methodology of formulating questionnaires were checked. Main issues were summarized in order to be included in the questionnaire; it was found that any questionnaire used for measuring willingness

to pay, should contain questions about: i) background information of the respondents such as age, education, gender, and number of inhabitants per household (ii) household's income and expenditures, (iii) expenditures on water and wastewater, (iv) water consumption, (v) respondent's perception on the reliability and tariff of the water and wastewater services, (vi) WTP questions, and (vii) other relevant information (Merret,2001).

Participants were carefully selected to represent a cross-section of socioeconomic backgrounds and a range of water and wastewater conditions. The questionnaire was put in English and then translated to Arabic as not all respondents have good command of English language. The discussions focused on participants' experiences with water and wastewater services, the perceived quality of the services, the characteristics of services that were important to participants, and the language they used to describe their experiences. Being a resident of the district, and aware of the living standards prevailing, the below two questionnaire format were put in English (Appendix B). The first format was put to be pilot tested on about 50 persons, and then it was modified to the second format, in which some questions were modified, and others were added.

4.2 Bases of Distributing the Modified Questionnaire.

A representative sample is chosen by using the following equation.

$$n = \frac{N}{1 + Ne^2} \quad ;$$

Where e =0.05

N: Total no. of households in Ramallah and Al-Bireh District.

n: Sample Size.

By checking the Palestinian Central Bureau of Statistics, it was revealed that the total number of household in Ramallah District according to Palestinian Central Bureau of Statistics (PCBS, see Appendix A) is 34,785, which means a sample of 400 households should be taken. This sample is a random one, thus 400 questionnaire forms were distributed, filled and analyzed.

Ramallah District has around 80 localities, these are classified to urban, rural , camps (see Appendix A), thus the questionnaire was distributed in numbers proportional to the percent a locality forms out of the total . In other words 26 questionnaire forms should be distributed in camps, 136 in urban area, and 238 in rural areas; this was the base of the field survey.

During the process of distribution and filling attention was paid to:

1. The questionnaire should be filled without bias.
2. The importance of research should be clarified.
3. The choice of household is random (every fifth house).

- <u>Using Demographic Distribution according to PCBS:</u>

    1. The percent of Refugee Camps in Ramallah was 6.4%

    → (6.4% * 400) ≈ 26 Questionnaires were distributed in the following camps: a.Birzeit b.AL Jalazon c.Qalndyia d. Alama'ri e.Qadora

2. The percent of rural communities was 59.5%

→ (59.5 5% * 400) ≈ 238 Questionnaires were distributed in the rural communities (under assumption 15 random communities are chosen) of:

a.Ein Erik b. Abu Kash c. Betein d. Surda e. Kubar f. Aljania g. Belein h. Kufr Naiemh i. Safa j. Abu shekeidem k. Jefna n. Ein Yabrood l. Ein Senyia o. Deir ghasaneh (Bani Zeid) p. Deir El Sudan.

3. The percent of urban communities is 34.1%

→ (34.1% * 400) ≈ 136 Questionnaires were distributed in the following urban communities (under assumption 4 main municipalities are chosen): a.Ramallah b. AlBierh c. Betuniya d. Birzeit

4.3 Feed Back on Pilot Testing Questionnaire.

The process of distributing the pilot testing questionnaire took 10 days time, the respondents were chosen randomly, from different economic and social backgrounds, they were not guided through the filling process, instead they were asked to read and answer the questions as they understand it .In addition they were asked to highlight the vague questions and to add notes if they have any, many questions were modified, as the feedback was that some questions are repeated , others were omitted, a third group were re-structured.

4.4 Difficulties in Distributing the Modified Questionnaire.

The pilot tested questionnaire was modified according to received feed back, and then was translated into Arabic. It is worth mentioning that filling the questionnaires was not an easy process, the people were not so cooperative, for too many reasons.

One of the reasons mainly is: they thought that it has something to do with income taxes, so they refused to give any data. Others thought that the water prices are going to get higher, which is something they refuse as they consider the prices to pay high already. A third reason for not cooperating is low public awareness. Many people thought that there are a very complicated problem in water and wastewater sectors, still some people thought that there is no problem in one of the sectors(especially in wastewater sector). The final group stated that they do not know.

4.5Questionnaires and Data Collection

The data collection effort consisted of designing contingent open-ended questionnaire, selecting an appropriate sample for the survey, and administering the survey effort. Qualitative research provided an understanding residents' experience with water and wastewater services and contributed to development of a questionnaire that communicated unambiguously with respondents. Quantitative research consisted of a survey of Ramallah households. The qualitative work demonstrated that Ramallah residents were aware of water and wastewater

services that the services were important, but they did not accept that the services were economic goods. Fifty questionnaire samples were pilot tested in order to receive feedback which was used to modify the form, and to make it easier for respondents to deal with it. The questionnaire was designed to be administered as a door-to-door personal interview.

Respondents were drawn from localities where the final survey was expected to be conducted. Pre-testing sought to identify potential ambiguities in the questionnaires. The descriptions needed to contain enough detail about a proposed water or wastewater program to be credible.

Two SPSS models were applied for both types of services; the first model is multiple linear regressions, and the second is categorical data analysis, both models for each type of service is illustrated in chapter five.

Chapter 5: Data Analysis and Results

5. Introduction

The survey obtained completed questionnaires from 400 households in Ramallah and Al-Bireh District. Approximately 23 localities responded to the questionnaires. Total of 205,448 inhabitants live in Ramallah and Al-Bireh District, this number was distributed in 34,785 households (according to PCBS statistics).The age of respondents is shown in figure (5-1).

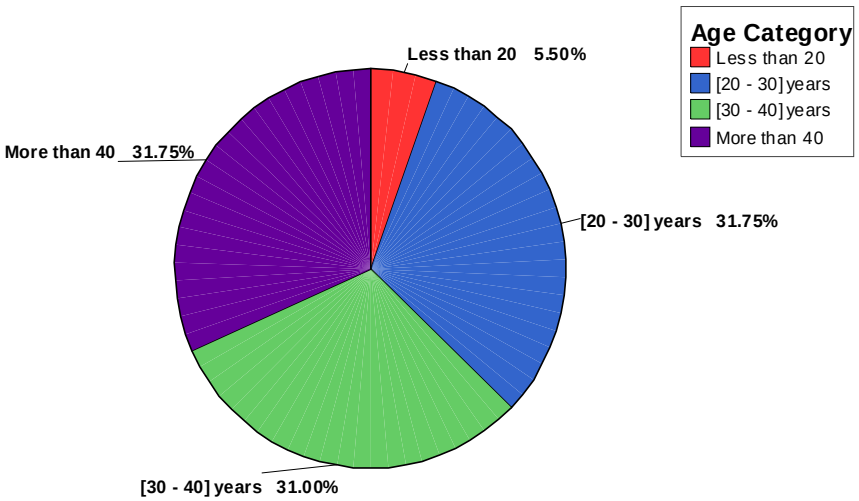


Figure 5-1 Age Category

Of respondents, 24.06% had completed a primary education and 16.04 had completed diploma whereas 29.82% completed university degree, as shown in figure (5-2).

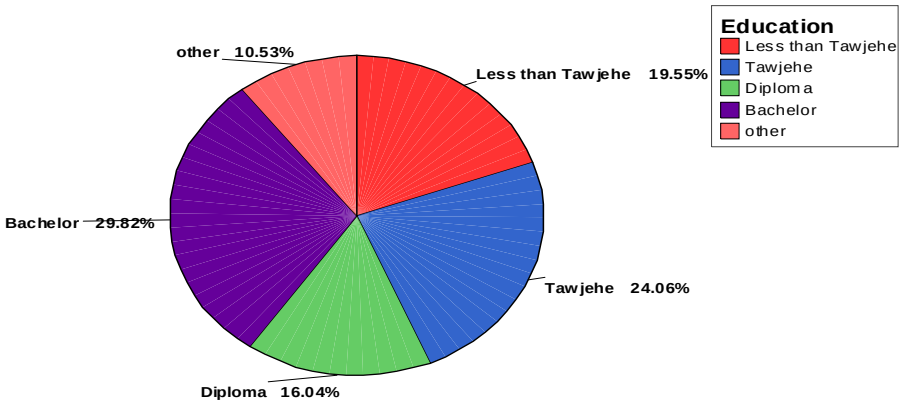


Figure 5-2 Education Categories

The social status of the districts community is illustrated in figure (5-3)

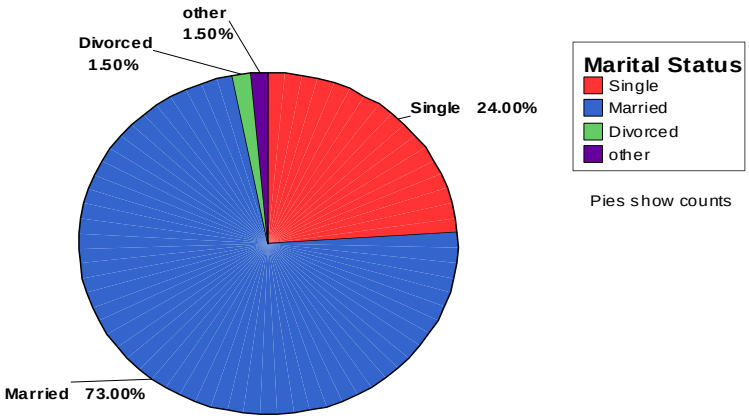


Figure 5-3 Marital Status

Figure 5-4 shows that the ratio of water bill to income .it can be said that the ratio decrease with increasing income.

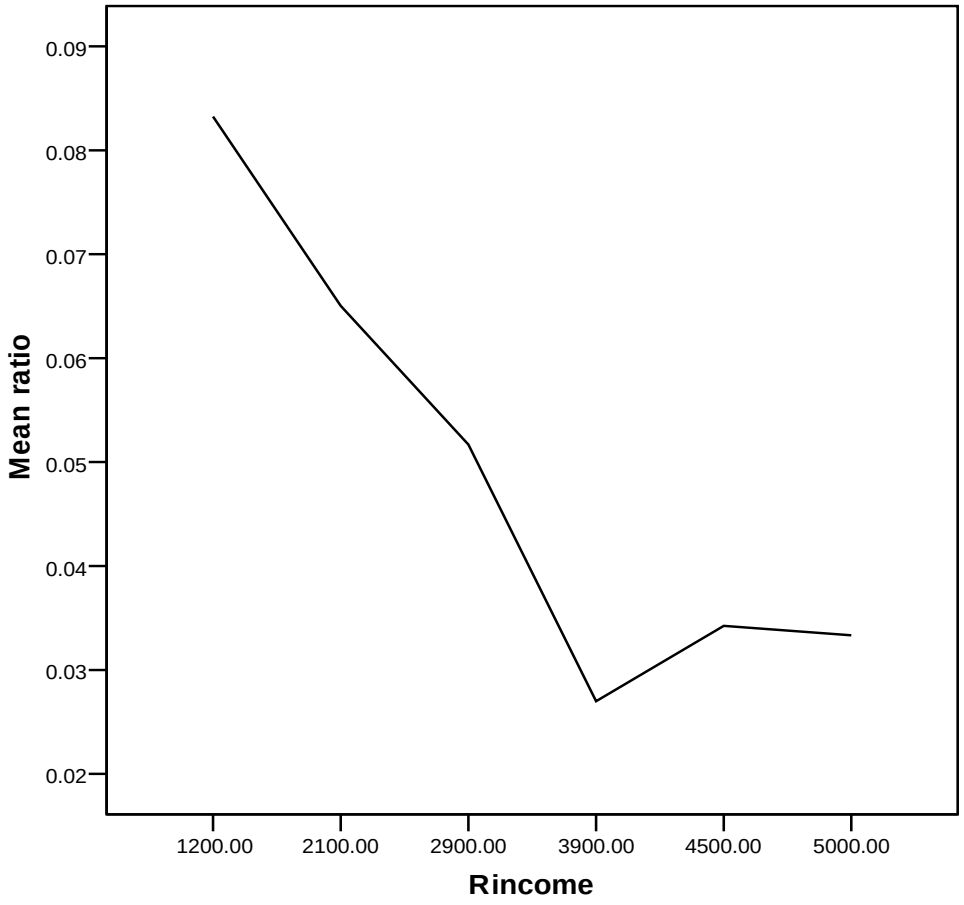


Figure 5-4 Ratio of Water Bill to Income

This can be explained by the wide variation of the income, the percentage of amount paid to water to the total income will range from 4.99% to 5.89%. The chart (Fig.5-5) shows that the ratio of wastewater bill to water bill to income decrease by increasing income.

Low income people were not served by the wastewater network and were forced to use cesspits for the disposal of wastewater

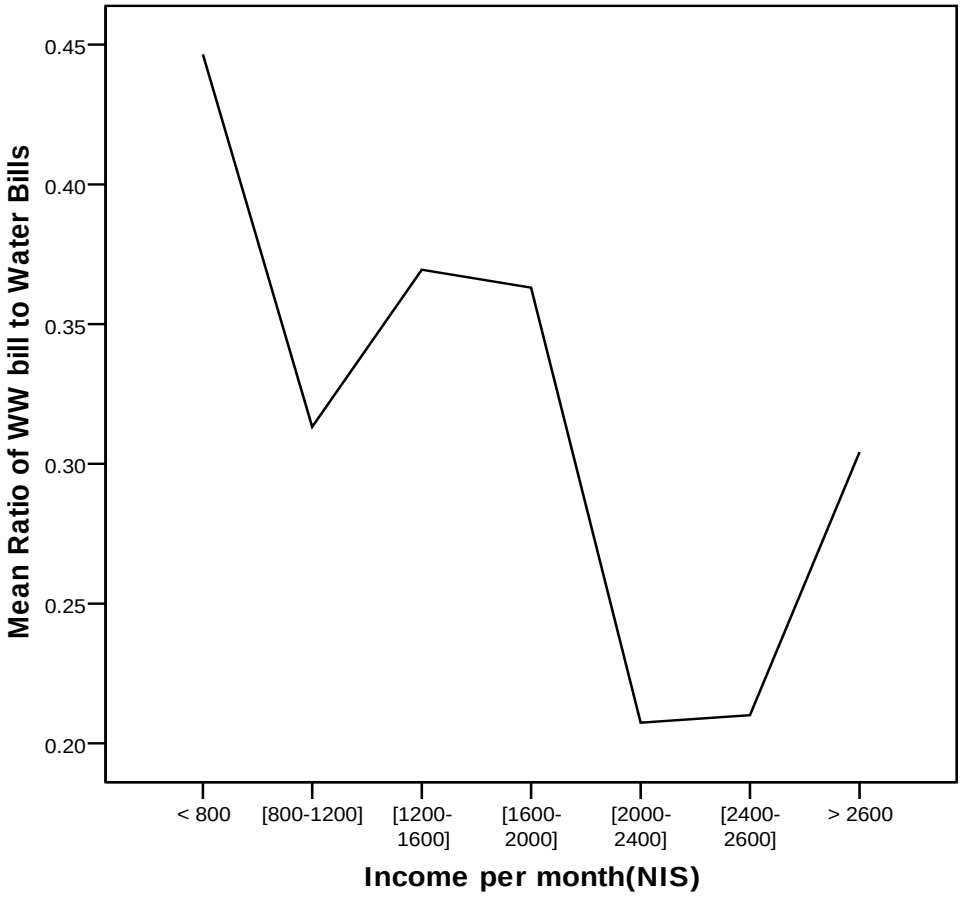


Figure 5-5 Ratio of Wastewater Bill to Income

Whereas high income people had the privilege of being connected to wastewater network, the disposal of wastewater had a tariff as percent of water.

The ratio of WTP for 1 m^3 of water to income in figure (5-6) shows that for higher incomes the WTP of people gets less, this is justified by the fact that people want grantees for a better quality service for their money.

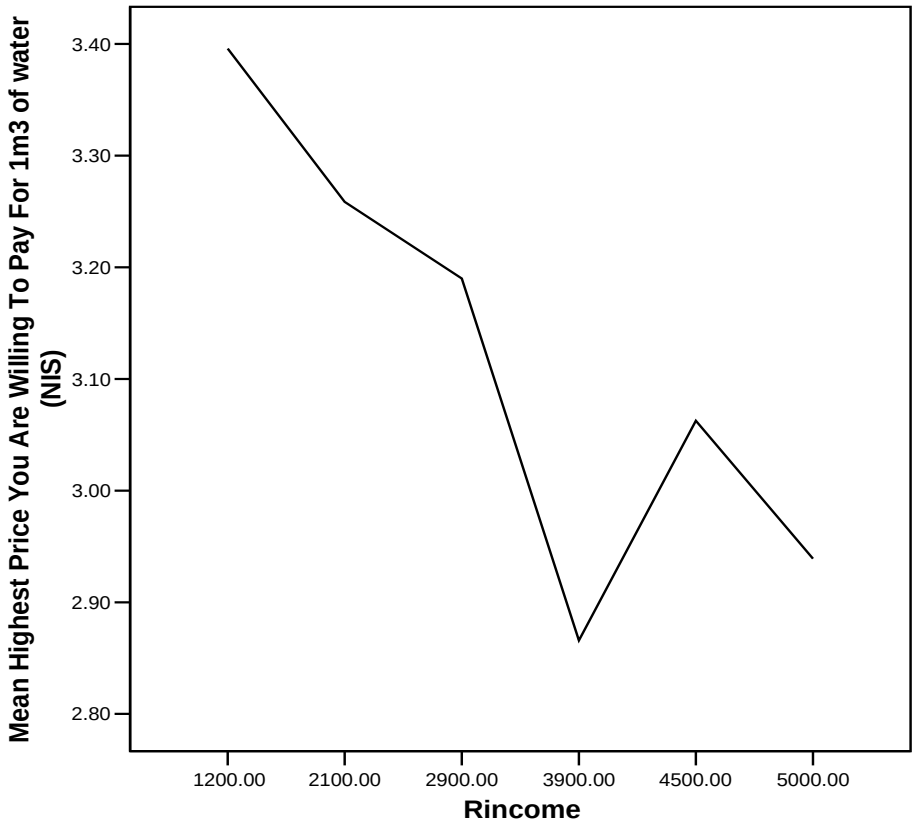


Figure 5-6 Ratio of WTP for Water to Income

People who are connected to water networks, and who had never had a problem in water supply, are unwilling to pay as much as the people who are not connected and who relies on cisterns for water usage. These results can also show that the majority of the disconnected people are from low income level.

The ratio of WTP to income is shown in the following figure.

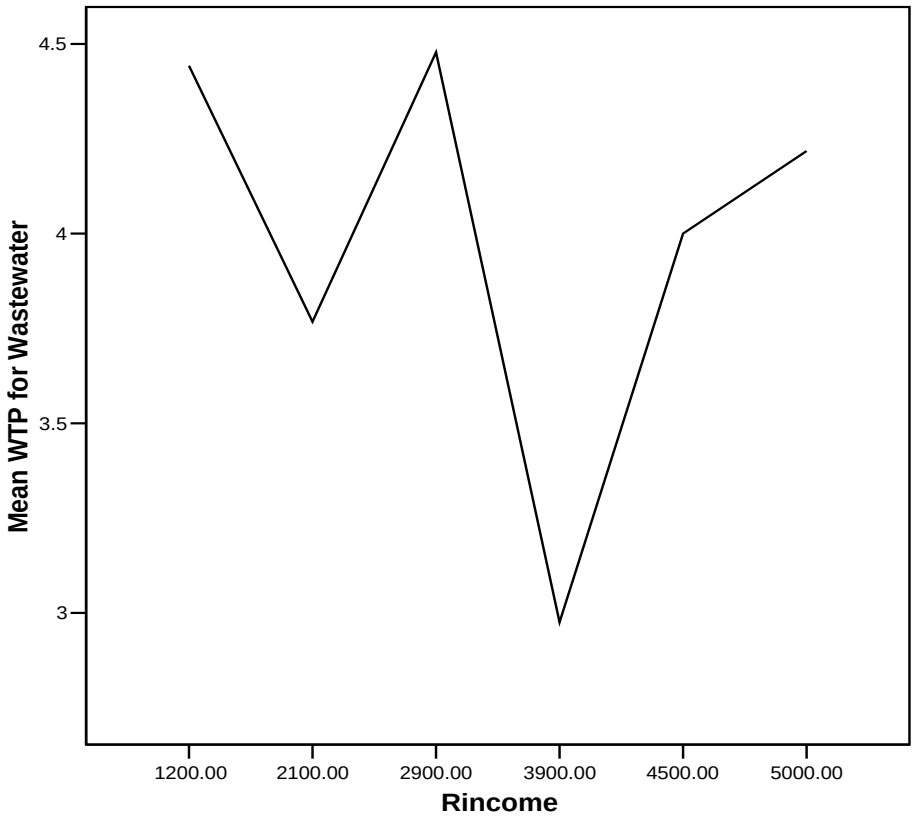


Figure 5-7 Ratio of WTP for Wastewater to Income

My analysis for that was the difference in the harm and impact of the sewer collection on the people. That is people who can notice the impact, were willing to pay a big portion of their income to take away the harm. While the people who cannot see the harm, who were mainly connected to a sewer network were unwilling to pay as well.

5.1Willingness to Pay for Wastewater Services

Analysis for determining significant factors influencing the WTP for wastewater services is illustrated below

5.1.1 Multiple Linear Regression Analysis for Wastewater Services

Assumptions:

1- Dependent variables (DV), independent variables (IV) are normally distributed.

2- Error terms are normally distributed with zero mean and constant variance.

3- Error terms is dependent of the standardized predicted value

A prediction for the quantity of how much price the respondents are willing to pay for wastewater is obtained from studying the following:

> Income, water supply source, monthly water bill, knowledge of price paid per m^3, suitable monthly average bill of sewage, method of sewerage collection, how many times you empty your cesspits ,cost of emptying the cesspit /month

Therefore, (how much price the respondents are willing to pay for wastewater =WTP) is the dependent variable and the other variables should be entered as independent variables. Multi co-linearity tests were conducted to make sure that there is no linear relationship between the independent variables. Outlier detection method using studentiezd deleted residual were conducted in order to remove the outlier from this model. No transformation for DV and IV had been applied in order to meet the assumption of normality, linearity of the IV and DV since the

data are qualitative data. The results are set with caution since the data are categorical (ordinal data).The stepwise method was applied to get the strongest relationship between dependent variable and independent variables which set the mechanism of on (10%) significant level. The nominal measurement question were recoded to be (0.1) for each category as a dummy variable.

Results were as follows: R = %51.9%, R^2 = 26.9%, R^2adj = 25.5%, $F_{1, 312}$ =, P-value = 0.066

Table 1 Model Summary for the MLR of Wastewater

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
5	.511(e)	.261	.249	2.964	.007	2.879	1	313	.091
6	.519(f)	.269	.255	2.952	.008	3.399	1	312	.066

In other words, the predictive capacity of the model is significant, and explains over (26.9%) of the variance in the DV. Looking at the "coefficients" table, it could be seen that the equation for the regression line was:

wtp ***= 1.843+0.013**** *(cost of empty…)* ***+0.434****(knowledge of price…)+* ***2.011****Q45_3+ 0.29*(monthly water bill) – 0.158*(income per month(NIS))* ***+ 0.665*Q45_1***

Table 2 Coefficients for the MLR of Wastewater

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
5	(Constant)	1.960	.616		3.182	.002
	cost of Emptying the Cesspit/month (NIS)	.013	.001	.455	9.147	.000
	Knowledge of price paid per m3	.491	.196	.123	2.503	.013
	q45_3	1.743	.810	.106	2.152	.032
	Monthly Water Bill(NIS)	.285	.121	.119	2.363	.019
	Income per month(NIS)	-.145	.086	-.083	-1.697	.091
6	(Constant)	1.843	.617		2.987	.003
	cost of Emptying the Cesspit/month (NIS)	.013	.001	.464	9.324	.000
	Knowledge of price paid per m3	.434	.198	.109	2.196	.029
	q45_3	2.011	.820	.122	2.453	.015
	Monthly Water Bill(NIS)	.290	.120	.121	2.412	.016
	Income per month(NIS)	-.158	.086	-.091	-1.848	.066
	q45_1	.665	.361	.092	1.844	.066

a Dependent Variable: WTP for Wastewater

With other variables held constant, **(cost of empty…)** were positively related to **WTP,** increasing by 0.013 for every extra unit of **(cost of empty…)**, **(knowledge of price…)** were positively related to **WTP,** increasing by 0.434 if the respondent knew the price. **Q45_3** were positively related to **WTP,** increasing by 2.011 for choosing the third choice of question **45. (Monthly water bill)** were positively related to **WTP,** increasing by 0.29 for every extra unit of **(monthly water bill). (Income per month (NIS))** were negatively related to **WTP,** decreasing by 0.158

for every extra unit of **(income per month (NIS)). Q45_3** were positively related to **WTP,** increasing by 0,665 for choosing the first choice of question **45.**

The residual analysis is shown in figure (5-8).

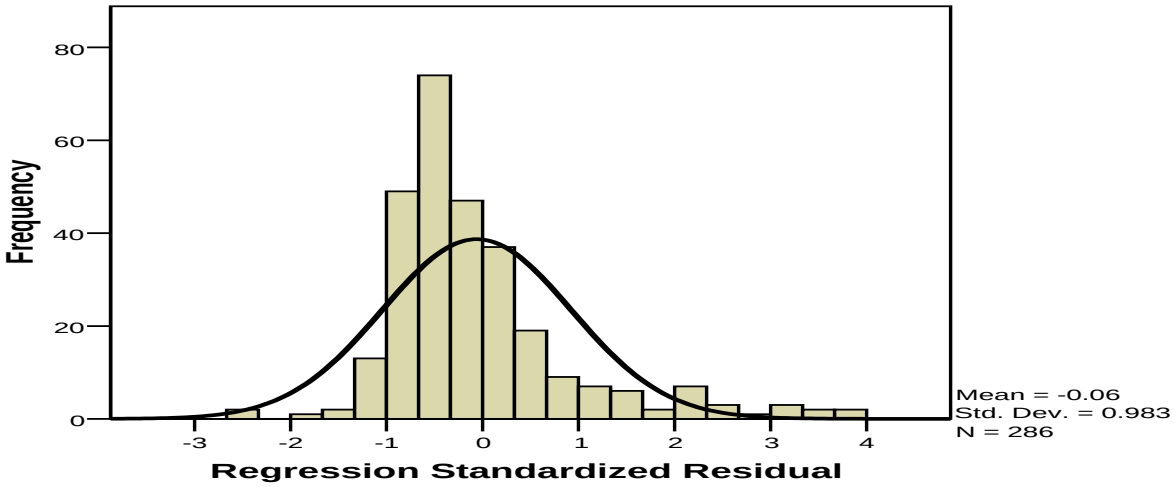


Figure 5-8 Residual Analysis WTP for Wastewater

Performing the residual analysis helped in plotting the graphs shown below, but the above graph showed how the residual values were distributed (the number of times a particular value appears was shown on the y-axis). Ideally, most values should be exactly zero, because this would mean that the model fits the data perfectly. However, the next best thing is for most values to be close to zero and evenly spread on either side of zero, with more extreme values becoming less common. This pattern was the familiar normal distribution. Looking at the graph, it could be seen that the distribution was not perfectly normal, but it was acceptably close (it did not deviate drastically from the normal).

The graph below showed the normal probability plot of the standardized residuals. It compares the observed values with those predicted by the model. If the variable is normally distributed, the points should appear on or close to the diagonal line. This is certainly acceptably close.

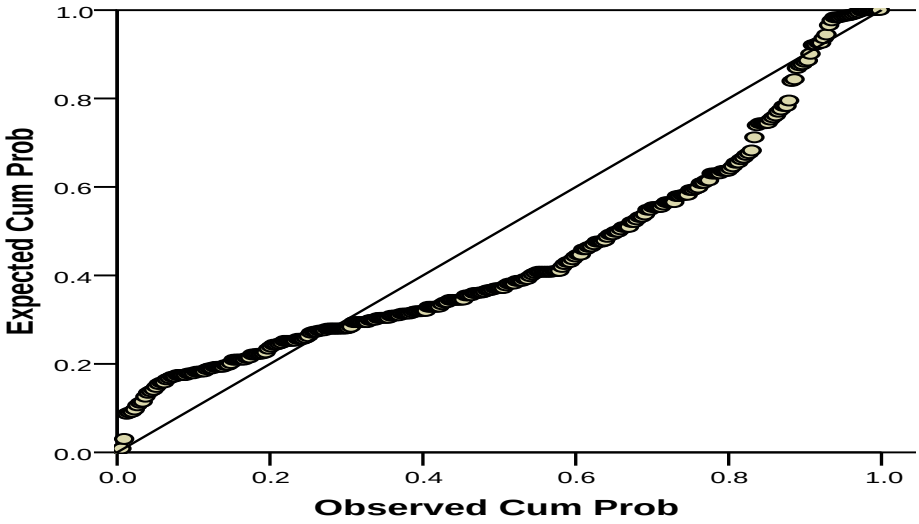


Figure 5-9 The normal probability plot of the standardized residuals

The graph below showed the relationship between the standardized residuals and the DV. There was no clear relationship between these two variables, so the graph showed a random distribution of points spread all over the area.

5.1.2Categorical Data Analysis for Wastewater Services

WTP for wastewater - water supply source

- No significant relation: Likelihood ratio test
- The Ho assumed that the relation are independent
- Result there is no significant relation

- Nominal independent and ordinal dependent

Table 3 Cross Tab Results for Water Supply Source

		Water Supply Source				Total
		piped water	Wells	Vendors	others	
WTP for Wastewater	2	138	2	0	1	141
	4	111	3	0	0	114
	7	35	2	0	0	37
	10	15	0	0	0	15
	13	9	0	0	1	10
	14	12	0	1	0	13
Total		320	7	1	2	330

Table 4 Chi-Square Tests for Water Supply Source

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43.339(a)	15	.000
Likelihood Ratio	15.945	15	.386
Linear-by-Linear Association	4.218	1	.040
N of Valid Cases	330		

a 18 cells (75.0%) have expected count less than 5. The minimum expected count is .03.

Table 5 Symmetric Measures for Water Supply Source

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Phi	.362			.000
	Cramer's V	.209			.000
Ordinal by Ordinal	Kendall's tau-b	.062	.055	1.089	.276
	Spearman Correlation	.067	.059	1.223	.222(c)
Interval by Interval	Pearson's R	.113	.091	2.064	.040(c)
N of Valid Cases		330			

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on normal approximation.

WTP for Wastewater - Monthly Water Bill (NIS)

- Significant relation: Linear by linear association test.
- The Ho assumed that the relations are independent.
- Result there is significant relation.

- Ordinal dependent and ordinal Independent.

Table 6 Cross tab Results for Monthly Water Bill (NIS)

		Monthly Water Bill(NIS)							Total
		.00	<=50	[51 - 100]	[101 - 200]	[201 - 250]	[251- 300]	> 300	
WTP for Wastewater	2	1	19	54	35	7	12	8	136
	4	0	12	36	37	6	10	12	113
	7	0	4	7	11	4	5	2	33
	10	0	1	4	3	2	3	2	15
	13	0	0	3	4	1	1	1	10
	14	0	2	2	0	2	2	4	12
Total		1	38	106	90	22	33	29	319

Table 7 Chi-Square Tests for Monthly Water Bill (NIS)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.201(a)	30	.358
Likelihood Ratio	33.210	30	.314
Linear-by-Linear Association	12.307	1	.000
N of Valid Cases	319		

a 28 cells (66.7%) have expected count less than 5. The minimum expected count is .03.

Table 8 Symmetric Measures for Monthly Water Bill (NIS)

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Phi	.318			.358
	Cramer's V	.142			.358
Ordinal by Ordinal	Kendall's tau-b	.160	.047	3.353	.001
	Spearman Correlation	.189	.056	3.419	.001(c)
Interval by Interval	Pearson's R	.197	.061	3.572	.000(c)
N of Valid Cases		319			

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on normal approximation.

WTP for Wastewater - Knowledge of price paid per m^3

- No significant Relation: Kruskal Walis test
- The Ho assumed that the relation are independent

- Result there is no significant relation
- Nominal independent and ordinal dependent

Table 9 NPar Tests for Knowledge of price paid per m3

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
WTP for Wastewater	330	4.21	3.421	2	14
Knowledge of price paid per m3	398	1.8038	.87057	.90	4.00

Table 10 Kruskal-Wallis Test for Knowledge of price paid per m3

Ranks

	Knowledge of	N	Mean Rank
WTP for Wastewater	yes	165	156.71
	No	73	168.62
	Does Not Matter	90	175.44
	Total	328	

Table 11 Test Statistics for Knowledge of price paid per m3

Test Statistics [a,b]

	WTP for Wastewater
Chi-Square	2.790
df	2
Asymp. Sig.	.248

a. Kruskal Wallis Test

b. Grouping Variable: Knowledge of price paid per m3

WTP for Wastewater - Suitable Monthly Average Bill of Sewage (NIS)

- Significant relation: Linear by linear association test.
- The Ho assumed that the relation is independent.
- Result there is significant relation.
- Ordinal dependent and ordinal independent.

Table 12 Cross tab Results for Suitable Monthly Average Bill of Sewage (NIS)

		Suitable Monthly Average Bill of Sewage(NIS)								Total
Count		0	<= 15	[16-25]	[26-35]	[36-45]	[46-55]	[56-65]	>65	
WTP for Wastewater	2	12	72	13	9	7	11	4	13	141
	4	10	26	11	9	7	20	9	22	114
	7	0	5	8	5	3	7	1	8	37
	10	2	1	1	0	0	3	4	4	15
	13	1	3	0	2	0	2	0	2	10
	14	1	1	1	3	1	1	0	5	13
Total		26	108	34	28	18	44	18	54	330

Table 13 Chi-Square Tests Suitable for Monthly Average Bill of Sewage (NIS)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	82.133(a)	35	.000
Likelihood Ratio	83.327	35	.000
Linear-by-Linear Association	21.208	1	.000
N of Valid Cases	330		

a 30 cells (62.5%) have expected count less than 5. The minimum expected count is .55.

Table 14 Symmetric Measures for Monthly Average Bill of Sewage (NIS)

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Phi	.499			.000
	Cramer's V	.223			.000
Ordinal by Ordinal	Kendall's tau-b	.258	.043	6.091	.000
	Spearman Correlation	.314	.051	5.996	.000(c)
Interval by Interval	Pearson's R	.254	.054	4.754	.000(c)
N of Valid Cases		330			

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on normal approximation.

WTP for Wastewater - Method of Sewerage Collection

- No Significant relation: Kruskal-Wallis test.
- The Ho assumed that the relation are independent.

- Result there is no significant relation.
- Ordinal dependent and nominal independent

Table 15 NPar Tests for Method of Sewerage Collection

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
WTP for Wastewater	330	4.21	3.421	2	14
Method of Sewarage collection	387	1.6951	.55295	1.00	3.00

Table 16 Kruskal-Wallis Test for Method of Sewerage Collection

Ranks

	Method of Sewarage	N	Mean Rank
WTP for Wastewater	Sewrage Network	108	164.31
	Cesspits	205	158.50
	Other	10	208.80
	Total	323	

Table 17 Test Statistics for Method of Sewerage Collection

Test Statistics [a,b]

	WTP for Wastewater
Chi-Square	3.248
df	2
Asymp. Sig.	.197

a. Kruskal Wallis Test

b. Grouping Variable: Method of Sewarage collection

WTP for Wastewater - How Many Times You Empty Your Cesspit

- No Significant relation: Linear by linear association Test.
- The Ho assumed that the relation is independent.
- Result there is significant relation.
- Ordinal dependent and nominal independent.

Table 18 Cross tab Results for How Many Times You Empty Your Cesspit

		How Many Times You Empty Your Cesspit								Total
		.00	1.00	1.50	2.00	3.00	4.00	5.00	6.00	
WTP for Wastewater	2	56	57	0	18	8	2	0	0	141
	4	17	49	1	28	13	1	2	3	114
	7	6	14	0	9	4	2	2	0	37
	10	3	4	0	3	2	3	0	0	15
	13	2	4	0	1	1	2	0	0	10
	14	4	3	0	2	0	3	1	0	13
Total		88	131	1	61	28	13	5	3	330

Table 19 Chi-Square Tests for How Many Times You Empty Your Cesspit

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	79.754(a)	35	.000
Likelihood Ratio	69.118	35	.001
Linear-by-Linear Association	20.253	1	.000
N of Valid Cases	330		

a 34 cells (70.8%) have expected count less than 5. The minimum expected count is .03.

Table 20 Symmetric Measures Tests How Many Times You Empty Your Cesspit

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Phi	.492			.000
	Cramer's V	.220			.000
Ordinal by Ordinal	Kendall's tau-b	.250	.047	5.301	.000
	Spearman Correlation	.288	.054	5.457	.000(c)
Interval by Interval	Pearson's R	.248	.061	4.639	.000(c)
N of Valid Cases		330			

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on normal approximation.

5.2 Willingness to Pay for Water Services

5.2.1 Multiple Linear Regression Analysis for Water Services

Assumptions:
1- DV and IV are normally distributed.

2- Error terms are normally distributed with zero mean and constant variance.

3- Error terms is dependent of the standardized predicted value

We want to predict quantity of how much price the respondent are willing to pay for 1 m^3 of water from:

Income, water supply source, monthly water bill, times buying from other sources, knowledge of price paid per m^3 , what do you think of illicit connections, means of paying water bill. Therefore, (how much price the respondent are willing to pay for $1m^3$ water = WWTP) is our dependent variable and the other variables should be entered as independent variables. Multi co linearity tests were conducted to make sure that there is no linear relationship between the independent variables. Outlier detection method using studentiezd deleted residual were conducted in order to remove the outlier from this model. No transformation for DV and IV had been applied in order to meet the assumption of normality, linearity of the IV and DV since the data are qualitative data. The results were set with caution since the data were categorical (ordinal data). The stepwise method was applied to get the strongest relationship between dependent variable and independent variables which set the mechanisms of on (10%) significant level. The nominal measurement question were recoded to be (0.1) for each category as a dummy variable. Results are as follows:

$\mathbf{R}$ = 36.6%, $\mathbf{R^2}$ = 13.4%, $\mathbf{R^2_{adj}}$ = 12.2%, $F1_{,\mathbf{348}}$ =2.901, **P-value** =0.089

Table21 Model Summary for the MLR of Water

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
4	.356(d)	.127	.117	2.78380	.018	7.174	1	349	.008
5	.366(e)	.134	.122	2.77625	.007	2.901	1	348	.089

a Predictors: (Constant), q44_4
b Predictors: (Constant), q44_4, Knowledge of price paid per m3
c Predictors: (Constant), q44_4, Knowledge of price paid per m3, Monthly Water Bill(NIS)
d Predictors: (Constant), q44_4, Knowledge of price paid per m3, Monthly Water Bill(NIS), q42_3
e Predictors: (Constant), q44_4, Knowledge of price paid per m3, Monthly Water Bill(NIS), q42_3, q16_3
f Dependent Variable: Highest Price You Are Willing To Pay For 1m3 of water(NIS)

Table 22 Coefficients for the MLR of Water

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
4	(Constant)	1.693	.444		3.814	.000
	q44_4	7.339	1.496	.247	4.905	.000
	Knowledge of price paid per m3	.597	.174	.173	3.436	.001
	Monthly Water Bill(NIS)	.301	.105	.145	2.860	.004
	q42_3	1.170	.437	.135	2.678	.008
5	(Constant)	1.681	.443		3.797	.000
	q44_4	7.365	1.492	.248	4.935	.000
	Knowledge of price paid per m3	.588	.173	.171	3.388	.001
	Monthly Water Bill(NIS)	.299	.105	.144	2.848	.005
	q42_3	1.144	.436	.132	2.623	.009
	q16_3	1.697	.997	.085	1.703	.089

a Dependent Variable: Highest Price You Are Willing To Pay For $1m^3$ of water(NIS)

In other words, the predictive capacity of the model was significant, and it explained over (13.4%) of the variance in the DV. Looking at the "coefficients" table, it could be seen that the equation for the regression line is:

wwtp = 1.170 + 7.365 * **q44_ 4** + 0.588 * **(knowledge of price…)** +

0.299***(monthly water bill)** + 1.144 * **q42_3** + 1.697* **q16_3**

The regression was not strong fit ($\mathbf{R^2_{adj}}$ = 12.2%), and the overall relationship was significant ($F_{1,312}$ =2.901 , p<0.10) this type of information indicated that the overall model was a weak predictor and the data set were weak since they were not on scale measurement. With other variables held constant, **(monthly water bill)** were positively related to **WTP,** increasing by 0.29 for every extra unit of **(monthly water bill). (knowledge of price…)** were positively related to **WTP,** increasing by 0.434 if the respondent knew the price. **Q44_4** were positively related to **WWTP,** increasing by 7.365 for choosing the fourth choice of question **Q44_4. Q42_3** were positively related to **WWTP,** increasing by 1.144 for choosing the third choice of question **Q42_3. Q16_3** were positively related to **WWTP,** increasing by 1.697 for choosing the third choice of question **Q42_3.** Performing the residual analysis will give you the graphs shown, but the graph below showed how the residual values are distributed (the number of times a particular value appears is shown on the y-axis). Ideally, we want most values to be exactly zero, because this would mean that our model fits the data perfectly. However, the next best thing is for most values to be close to zero and evenly spread on either side of zero, with more extreme values becoming less common. This pattern is the familiar Normal distribution. Looking at the graph, we can see that the distribution is certainly not perfectly normal (the normal curve is drawn on

the graph in the output to help you judge this), but it is certainly acceptably close (it doesn't deviate drastically from the normal).

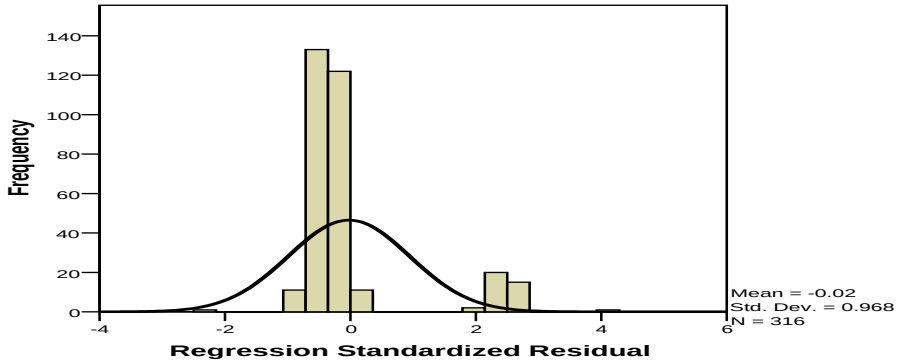


Figure 5-10 Residual Analysis WTP for Water

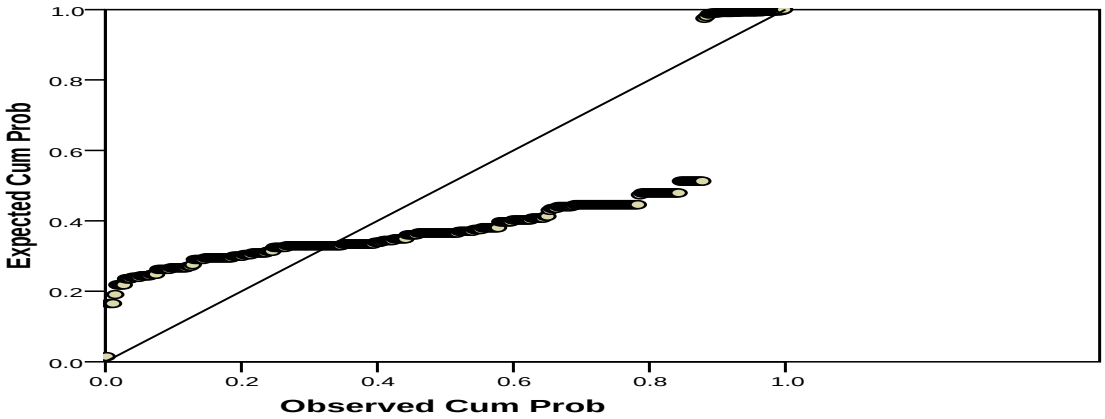


Figure 5-11The normal probability plot of the standardized residuals

The graph above shows the normal probability plot of the standardized residuals. It compares the observed values with those predicted by the model. If the variable is normally distributed, the points should appear on or close to the diagonal line. This is certainly acceptably close.

5.2.2Categorical Data Analysis for Water Services

Highest price you are willing to pay for $1m^3$ of water (NIS) -Income per month (NIS)

- No significant : Linear by linear association
- No significant relation: Likelihood ratio test
- The Ho assumed that the relation is independent
- Result there is no significant relation
- Ordinal independent and ordinal dependent

Table 23 Cross Tab Results for Income per month (NIS)

Crosstab

Count

		Income per month(NIS)							
		< 800	[800-1200]	[1200-1600]	[1600-2000]	[2000-2400]	[2400-2600]	> 2600	Total
Highest Price Y	<=5	18	32	49	50	31	26	78	284
Are Willing To F	[6-8]	3	7	8	7	10	4	10	49
For 1m3 of water(NIS)	[9-11]	1	2	2	3	1	1	1	11
	[12-14]	3	3	3	0	1	1	2	13
	[13-15]	0	0	0	1	0	0	0	1
	>15	0	0	0	0	0	2	2	4
Total		25	44	62	61	43	34	93	362

Table 24 Chi-Square Tests for Income per month (NIS)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.325[a]	30	.353
Likelihood Ratio	29.647	30	.484
Linear-by-Linear Association	.682	1	.409
N of Valid Cases	362		

a. 30 cells (71.4%) have expected count less than 5. The minimum expected count is .07.

Table 25 Symmetric Measures for Income per month (NIS)

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Nominal by Nominal	Phi	.299			.353
	Cramer's V	.134			.353
Ordinal by Ordinal	Kendall's tau-b	-.063	.046	-1.379	.168
	Gamma	-.113	.081	-1.379	.168
N of Valid Cases		362			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Highest Price You Are Willing to Pay For $1m^3$ of water (NIS) * Water Supply Source

- No significant Relation: Kruskal-Wallis test
- The Ho assumed that the relation are independent
- Result there is no significant relation
- Nominal independent and ordinal dependent.

Table26 NPar Tests for Water Supply Source

	N	Mean	Std. Deviation	Minimum	Maximum
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	368	3.8845	2.96222	2.50	16.00
Water Supply Source	400	1.0425	.27547	1.00	4.00

Table 27 Kruskal-Wallis Tests for Water Supply Source

	Water Supply Source	N	Mean Rank
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	piped water	356	182.87
	Wells	9	213.00
	Vendors	1	144.00
	Total	366	

Table 28 Test Statistics for Water Supply Source

	Highest Price You Are Willing To Pay For 1m3 of water(NIS)
Chi-Square	1.654
df	2
Asymp. Sig.	.437

Highest Price You Are Willing To Pay For $1m^3$ of Water (NIS) - Monthly Water Bill (NIS)

- Significant relation: Linear by linear association test
- The Ho assumed that the relation are independent
- Result there is significant relation

- Ordinal independent. and ordinal dependent.

Table 29 Cross tab Results for Monthly Water Bill (NIS)

Crosstab

Count

		Monthly Water Bill(NIS)							
		.00	<=50	[51 - 100]	[101 - 200]	[201 - 250]	[251- 300]	> 300	Total
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	<=5	1	37	99	77	20	26	20	280
	[6-8]	0	3	20	11	4	4	7	49
	[9-11]	0	2	0	5	0	2	0	9
	[12-14]	0	0	1	4	3	2	2	12
	[13-15]	0	0	1	0	0	0	0	1
	>15	0	0	0	0	1	2	0	3
Total		1	42	121	97	28	36	29	354

Table 30 Chi-Square Tests Suitable for Monthly Water Bill (NIS)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.831[a]	30	.074
Likelihood Ratio	42.147	30	.070
Linear-by-Linear Association	10.146	1	.001
N of Valid Cases	354		

a. 33 cells (78.6%) have expected count less than 5. The minimum expected count is .00.

Table 31 Symmetric Measures for Monthly Water Bill (NIS)

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Nominal by Nominal	Phi	.344			.074
	Cramer's V	.154			.074
Ordinal by Ordinal	Kendall's tau-b	.125	.045	2.692	.007
	Gamma	.235	.082	2.692	.007
N of Valid Cases		354			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Highest Price You Are Willing to pay for 1 m^3 of water (NIS) - Knowledge of price paid per m^3

- Significant Relation: Kruskal Wallis Test

- The Ho Assumes that the relation are independent

- Result there is significant relation
- Nominal Indep. And Ordinal Dep.

Table 32 NPar Tests for Knowledge of price paid per m^3

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	368	3.8845	2.96222	2.50	16.00
Knowledge of price paid per m3	398	1.7990	.86044	1.00	3.00

Table 33 Kruskal-Wallis Test Knowledge of price paid per

Ranks

	Knowledge of	N	Mean Rank
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	yes	187	172.65
	No	82	189.14
	Does Not Matter	98	201.36
	Total	367	

Table 34 Test Statistics for Knowledge of price paid per

Test Statistics [a,b]

	Highest Price You Are Willing To Pay For 1m3 of water(NIS)
Chi-Square	9.645
df	2
Asymp. Sig.	.008

a. Kruskal Wallis Test

b. Grouping Variable: Knowledge of price paid per m3

Highest Price You Are Willing To Pay For $1m^3$ of water (NIS) - Means of Payment of Bill

- Significant Relation: Kruskal Wallis Test 0.5 of the asymptotic.
- The Ho Assumes that the relation is independent
- Result there is significant relation

- Nominal Indep. And Ordinal Dep.

Table 35NPar Tests for Means of Payment of Bill

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	368	3.8845	2.96222	2.50	16.00
Means of Payment of Bill	392	2.0918	.93892	1.00	4.00

Table 36 Kruskal-Wallis Test for Means of Payment of Bill

Ranks

	Means of Payment of Bill	N	Mean Rank
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	Municipality	95	158.37
	Collector	173	155.08
	Bank	50	176.95
	Total	318	

Table 37 Test Statistics for Means of Payment of Bill

Test Statistics[a,b]

	Highest Price You Are Willing To Pay For 1m3 of water(NIS)
Chi-Square	4.378
df	2
Asymp. Sig.	.112

a. Kruskal Wallis Test

b. Grouping Variable: Means of Payment of Bill

Highest Price You Are Willing to Pay For $1m^3$ of water (NIS) - What do you think about illicit conditions

- Significant relation: Kruskal Wallis test
- The Ho assumed that the relation are independent
- Result there is no significant relation
- Nominal independent and ordinal dependent.

Table 38 NPar Tests for what do you think about illicit conditions

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	368	3.8845	2.96222	2.50	16.00
What do you think about illicit conditions	399	1.2882	.51572	1.00	3.00

Table 39 Kruskal-Wallis Test for What do you think about illicit conditions

Ranks

	What do you think	N	Mean Rank
Highest Price You Are Willing To Pay For 1m3 of water(NIS)	Forbidden	271	183.59
	Must Be Stopped	85	176.90
	Others	11	248.86
	Total	367	

Table 40 Test Statistics for What do you think about illicit conditions

Test Statistics[a,b]

	Highest Price You Are Willing To Pay For 1m3 of water(NIS)
Chi-Square	8.746
df	2
Asymp. Sig.	.013

a. Kruskal Wallis Test

b. Grouping Variable: What do you think about illicit conditions

5.3 Percentage of Payment for Water Bills Total Income.

All related variables in the ratio were recoded from dummy variables to real estimated values. The ratio was computed for each sample of the 400 samples. A 95% confidence interval was constructed for the ratio values to compare with the proposed sample.

From the SPSS program, the confidence interval for the ratio was as following:

The 95% confidence interval is 0.0499-0.0589 meaning that the data shows that we are 95% confident that the percentage of amount paid to water to the total income will range from 4.99% to 5.89%.

Chapter Six: Discussion

6. Introduction

Many variables affected the population willingness to pay for water and wastewater services, still total income (though assumed to be a variable) was not variable of influence.

6.1 Costs and Tariffs of Water and Wastewater Services

The current tariffs in Ramallah and Al-Bireh were presented in chapter two; results of comparing chart in study period show that:

A. From comparing the revenue efficiency for the period 2001-2004, it was obvious that the only institution that maintained its efficiency level constant was JWU. For three years period it occupied the second highest efficiency, whereas the positions of other institutions varied along the period.

B. For the plots of average selling prices for the period of (2001-2004) it revealed that there was no specific trend.

C. Revising the plots of average operation and maintenance unit cost versus selling prices & unit revenues, it could be seen that Betoniya and Birzeit Municipalities exchanged occupying the first position, but the other institutions had varied order along the period.

D. Billed Revenue versus total Sold plots showed that Betoniya Municipality had the first rank for three years 2002-2004, the second rank was occupied by Birzeit for the same period, and JWU and West Bani Zeid came without fixed order.

E. For the expenses comparisons plots JWU came always first, there were no specific trends for the rest of institutions.

Each of the four utilities is providing the service, under its own tariff system.

Revising the excel sheets in Appendix A for the utilities in the period 2001-2004 would show:

For the 2001 Year

The data below shows that the water price of supplied unit cost for the year 2001 does not cover the operation and maintenance unit cost. Still the supplied unit cost is twice as much the purchased unit cost**.**

		Betoniya	Birzeit	JWU
Purchased Unit Cost	NIS/m^3	3.50	2.60	2.42
Supplied Unit Cost	NIS/m^3	4.17	2.97	4.46
O&M Unit Cost	NIS/m^3	6.43	3.42	5.69
Total Produced Cost	NIS/m^3	0.00	0.00	0.97
Total Purchased Cost	NIS/m^3	6.43	3.42	4.72
Production Unit Cost	NIS/m^3	---	---	2.68
Losses Cost	NIS/m^3	2.25	0.45	1.23
Average Selling Prices	NIS/m^3	5.36	4.56	4.77
Average Unit Revenues	NIS/m^3	6.54	4.69	5.59

It is obvious from this table that the average selling prices estimated as (Billed sold /total sold) would cover the operation and maintenance unit cost only for Birzeit, and a 25% of the rest of expenditures. Still the other two utilities average selling prices is not sufficient to cover the operation and maintenance unit cost, not to mention other expenditures. The justification for having high average unit revenues is that the utilities could have collected debts that accumulated from previous years.

For the 2002 Year

The data below shows that the water price of supplied unit cost for the year 2002 does not cover the operation and maintenance unit cost.

		W. Bani Zeid	Betoniya	Birzeit	JWU
Purchased Unit Cost	**NIS/m^3**	2.38	3.52	3.50	2.43
Produced Unit Cost	**NIS/m^3**	--	--	--	3.24
Supplied Unit Cost	**NIS/m^3**	3.54	4.21	3.95	4.78
O & M Unit Cost	**NIS/m^3**	4.17	6.36	4.59	6.09
Total Produced Cost	**NIS/m^3**	0.00	0.00	0.00	1.01
Total Purchased Cost	**NIS/m^3**	4.17	6.36	4.59	5.08
Losses Cost	**NIS/m^3**	0.63	2.15	0.64	1.30
Average Selling Prices	**NIS/m^3**	6.32	5.64	6.35	4.57
Average Unit Revenues	**NIS/m^3**	6.47	6.46	6.52	5.07

It is obvious from this table that the average selling prices estimated as (Billed sold / total sold) would cover the operation and maintenance unit cost for Birzeit, and West Bani Zeid, and a slight percent is left for the rest of expenditures . Still the other two utilities average selling prices is not sufficient to cover the operation and maintenance unit cost, not to mention other expenditures. The justification for having high average unit revenues is that the utilities could have collected debts that accumulated from previous years.

For the 2003 Year

The data below shows that the water price of supplied unit cost for the year 2003 does not cover the operation and maintenance unit cost.

		W.Bani Zeid	Betoniya	Birzeit	JWU
Purchased Unit Cost	**NIS/m^3**	2.38	3.77	3.76	2.46
Supplied Unit Cost	**NIS/m^3**	3.13	4.35	4.07	4.51
O & M Unit Cost	**NIS/m^3**	4.42	7.27	6.13	6.60
Total Produced Cost	**NIS/m^3**	0.00	0.00	0.00	1.15
Total Purchased Cost	**NIS/m^3**	4.42	7.27	6.13	5.44
Production Unit Cost	**NIS/m^3**	0.00	0.00	0.00	3.09
Losses Cost	**NIS/m^3**	1.29	2.92	2.06	2.08
Average Selling Prices	**NIS/m^3**	6.09	6.07	5.35	5.69
Average Unit Revenues	**NIS/m^3**	6.28	7.37	5.45	6.93

It is obvious from this table that the average selling prices estimated as (Billed sold / total sold) would cover the operation and maintenance unit cost for West Bani Zeid, and a slight percent is left for the rest of expenditures. Still the other three utilities average selling prices is not sufficient to cover the operation and maintenance unit cost, not to mention other expenditures. The justification for having high average unit revenues is that the utilities could have collected debts that accumulated from previous years**.**

For the 2004Year

The data below shows that the water price of supplied unit cost for the year 2004 does not cover the operation and maintenance unit cost.

		West Bani Zeid	Betoniya	Birzeit	JWU
Purchased Unit Cost	**NIS/m^3**	2.50	4.05	4.00	2.57
Supplied Unit Cost	**NIS/m^3**	3.19	4.70	4.43	4.57
O & M Unit Cost	**NIS/m^3**	5.08	7.25	6.29	6.45
Total Produced Cost	**NIS/m^3**	0.00	0.00	0.00	1.16
Total Purchased Cost	**NIS/m^3**	5.08	7.25	6.29	5.28
Production Unit Cost	**NIS/m^3**	0.00	0.00	0.00	3.34
Losses Cost	**NIS/m^3**	1.89	2.54	1.87	1.87
Average Selling Prices	**NIS/m^3**	4.14	6.37	9.03	6.15
Average Unit Revenues	**NIS/m^3**	4.45	7.43	9.13	7.25

It is obvious from this table that the average selling prices estimated as (Billed sold / total sold) would cover the operation and maintenance unit cost for Birzeit and a slight percent is left for the rest of expenditures. Still the other three utilities average selling prices is not sufficient to cover the operation and maintenance unit cost, not to mention other expenditures. The justification for having high average unit revenues is that the utilities could have collected debts that accumulated from previous years**.** From this it could be concluded that the tariff used by the utilities are not sufficient to cover operation and maintenance costs in most cases not to mention other costs (investment , depreciation …). Though the PWA excel sheet has calculated many indicators still these were not taken into consideration by the utilities. Water and wastewater were treated as a commercial good, so a price for the service was charged, thus implication of a pricing policy arises.

Market prices were an important source of value information but adequate price series did not exist in this research case. Charges for water & wastewater services were determined by tariffs that bore no relationship to the quantity of services used. Households were thus unable to adjust the quantities of water and wastewater services consumed in relationship to the values they placed on the services. In addition the size of the tariffs was unrelated to the costs of providing the services. Water & wastewater in Ramallah and Al-Bireh are administered as independent bureaus of PNA.

The district had main supplying institutions, every institution had its own system, and all of them were monitored and regulated by the PWA tariffs and policies.

Among these institutions there were differences in: the supply source, the quantity and quality of supplied water. The population served by these utilities differ in their socio- economic factors, though they all were affected by the same political complicated situation, still this did not make there willingness to pay and affordability test results similar.

The financial available data for the district was obtained from PWA. It was fully studied and analyzed (chapter two), yet the institutions slightly showed a constant trend through the study period. On the contrary the variation was large in a short period , which showed inability of the institutions to apply correction measures , that could be due to lack of experience, or due to the unwillingness of the

population to pay for the service, as they did not consider water to be a commercial good .

Data concerning water services provided by JWU, Birzeit and Betoniya, West Bani Zeid Municipalities were analyzed (Annex A). Amounts of water purchased, supplied, billed revenue … etc., were obtained and analyzed in the format shown in Annex A. As well Al-Bireh Municipality had been visited, to obtain the costs of wastewater services provided below.

Al-Bireh Wastewater Treatment Plant

According to the sanitary engineer in Al-Bireh Municipality, A study had been conducted on 1997, which aimed at estimating a tariff for wastewater. Palestinian Water Authority (PWA) in cooperation with the German agency for technical assistance (GTZ), and Al-Bireh Municipality, assumed the following three scenarios:

1. Full Cost recovery Scenario:

Under this scenario the life time of the plant was assumed to be 15 years, and all the assets (hardware and software) should be distinguished according to type.

By taking into account how many cubic meters flow to the plant, the resulting number was 5 NIS/m^3; this was considered a high price for the subscriber to pay. (Investment, Operation, Maintenance, Power, Depreciation are covered under this scenario).

2. Loan from the bank Scenario:

It was assumed that the cost interest is 8.0%, half is paid by the municipality and the other half is covered by a bank loan. The previous scenario calculation were repeated, the resulting number was 3.3 NIS/m^3.

3. Grant Scenario (Investment, no cost of interest):

This was a fund from German Government, The previous calculation was repeated, and the resulting price is 2.8 NIS/m^3. None of the previous numbers were adopted, as Intifadit al Aqsa begun, so the municipality council took the decision to charge the subscribers 1.2 NIS/m^3.

Through bridging project with Jerusalem Water Undertaking (JWU), The JWU collected the wastewater fees as 1.2 NIS/m^3, and gets a 10% of total collection ratio. The collection ratio was between 55-57%, the electricity bill of the treatment plant was around 50,000 NIS, not to mention other expenses; these were covered from other municipality resources.

It should be known that the trucks used to pay 5 NIS per time of unloading before Al Intifada, but after they do unload in the manhole outside the plant, because of that their number was unknown. Ramallah municipality had rehabilitated the old treatment plant, it was located in the industrial zone to the west of Ramallah city, and though it had been rehabilitated still it was not working properly as the officials stated (PWA, Personal Communication 2005).

6.2Willingness to Pay for Wastewater Services

6.2.1 Multiple Linear Regression Analysis for Wastewater Services

The multiple linear regression model was built as shown in chapter five, to test the hypothesis for wastewater services. The regression was not strong fit (R^2adj = 25.5%), and the overall relationship was significant ($F_{1,312}$ =3.399, $p<0.10$). This type of information indicated that the overall model was good predictor but the data set were weak since they were not scale measurement. The hypothesis was proved to be correct, as all the variables entered had a significance value below 0.05, excluding the income. This could be easily justified as the general trend followed by the population in never to state their true income in such field surveys. This model had a low R^2, though it proved that the independent variables affect the willingness to pay (with excluding the total monthly income), as a result a categorical data analysis was performed in order to obtain a better representative model.

6.2.2 Categorical Data Analysis for Wastewater Services

A categorical model was constructed, the same independent variables were tested, but income (the trend followed by the population in never to state their true income in such field surveys), cost of emptying the cesspit /month were removed, as cost of emptying cesspit is a very significant variable, whereas the income showed to be an insignificant variable.

The results were justified as follows: the water supply source is a low significant factor, all water providing utilities in the district buy bulk water from Mekorot,

and this eliminates the effect of source difference as the quality of water is the same. Method of sewerage collection showed low significance, there are mainly two methods for the disposal, the first is the cesspit, and the second is the sewerage network, most of the population depended on cesspits except in urban areas. Knowledge of price paid per m^3 was a low significance variable, as most people replied that they did not know the amount they pay per m^3, as the payment for the disposal of wastewater is done either by a network, in this case the amount they pay is a percent of the water bill., or by emptying cesspit, and in this case they pay by number of times the tank needs to empty its load.

The other variables (Monthly water bill, monthly water bill, suitable monthly average bill of sewage, how many times you empty your cesspits) showed high significant values, that matched with the hypothesis still the above variables affect the wastewater willingness to pay but they were less significant.

6.3Willingness to Pay for Water Services

6.3.1 Multiple Linear Regression Analysis for Water Services

The multiple linear regression model was built as shown in chapter five, to test the hypothesis for water services. The regression was not strong fit ($\mathbf{R^2_{adj}}$ = 12.2%), and the overall relationship was significant ($F_{1,312}$ =2.901 , $p<0.10$) this type of information indicated that the overall model was a weak predictor and the data set were weak since they were not on scale measurement. The hypothesis was proved to be correct, as all the variables entered had a significance value below 0.05, excluding the water supply source. This could be easily justified as by the fact that

all the district mainly get water in bulk from Mekorot and thus the bulk price is fixed .This model had a low R^2, though it proved that the independent variables affect the willingness to pay (with excluding the total monthly income), as a result a categorical data analysis was performed in order to obtain a better representative model.

6.3.2Categorical Data Analysis for Water Services

A categorical model was constructed, the same independent variables were tested, but income, water supply, what do you think about illicit connections were removed, as they showed to be low significant variables.

The results were justified as follows: income was removes as the trend people follow in such surveys that they never state their true income. The water supply source is not a significant factor, all water providing utilities in the district buy bulk water from Mekorot, and this eliminates the effect of source difference as the quality of water is the same. The other variables (Monthly water bill, knowledge of price paid per m^3, means of payment of bill) showed high significant values, that matched with the hypothesis still the above variables affect the wastewater willingness to pay but they were less significant.

Chapter Seven: Conclusions and Recommendations

This thesis had a certain hypotheses, and main findings due to testing other possibilities; the hypotheses of this research were as follows:

a) Current water pricing policies are not sufficient, and needs adjustments

b) It is assumed that the following factors affect the willingness to pay for

- Water Services :

Income ,water supply source, monthly water bill ,times buying from other sources ,knowledge of price paid per m^3, what do you think of illicit connections ,means of paying water bill .

- Wastewater Services:

Income, water supply source, monthly water bill, times buying from other sources, knowledge of price paid per m^3, suitable monthly average bill of sewage ,method of sewerage collection , how many times you empty your cesspits ,cost of emptying the cesspit /month.

c) It is assumed that water bill is in the range adopted by the World Bank which is 3-5% to of the total household income .

7.1 Wastewater Services

- Willingness to pay was not related to income, as people were not giving their total true income for different consideration, this was proved by the multiple linear regression, and the categorical data analysis.

- The most significant variables on the willingness to pay for wastewater were: monthly water bill, times buying from other sources, knowledge of price paid per m^3, suitable monthly average bill of sewage, times of emptying cesspits, cost of emptying the cesspit /month.
- The socio economical factors were not the significant factors for determining the WTP for wastewater.
- If the population were provided with wastewater services, some were willing to pay higher than the current tariff for the service.
- The more the people were currently aware of what they have to pay for the services the more they were willing to pay for them.
- Few people refused to fill the questionnaire as they thought that it has to do with income taxes, or it might cause an increase in services tariffs which they consider to be high already.
- Many people thought the district had no problem concerning wastewater services.

7.2 Water Services

- Willingness to pay was not related to income, as people were not giving their total true income for different consideration, this was proved by the multiple linear regressions, and the categorical data analysis.
- The most significant variables on the willingness to pay for wastewater were :

monthly water bill ,times buying from other sources ,knowledge of price paid per m^3, means of paying water bill .

- The socio-economical factors were non significant concerning WTP for water services.
- Water bill percent to total income ranged from 4.99% to 5.89%.
- The willingness to pay a higher tariff for water service is low, as most of the respondents refused to pay more than 5 NIS/m^3 of water.
- Concerning the issue of full cost recovery none of the Municipalities discussed applying the principle of full cost recovery for different reasons: Social, Financial, and Political, technical …etc.
- Water tariffs applied are not sufficient according to the comparison presented

To finalize, it could be said there was no consciousness and awareness from people to the unforeseen impacts and dangers for neglecting wastewater collection and treatment issues, people were only willing to pay whenever they were feeling harm and suffering from it.

7.3 RECOMMENDATIONS

A. Public Targeted Awareness program should be performed for both water and wastewater sectors, aiming at increasing the knowledge about the real costs of the services provided.

B. The Authorized party (Mainly the National Water Council) should consider reducing prices as tariffs were high which was found via field survey that

might be done by applying the policy of integrated water resources management, and applying the appropriate means of resources conservation.

C. Reducing consumption by using the appropriate affordable instruments and encouraging the population of the district to use them.

D. Increasing the quality of services might convince people to pay higher tariffs.

E. Review the pricing policy in relation to social blocks, lifelines and to support alternative service providers.

F. Clarify ownership and agree on responsibilities for operation and maintenance, especially the cost implications for infrastructure to be managed by communities.

G. Determine how cost recovery and cross subsidy will be handled within the utility and between internal sources and external sources of income.

H. Prioritize; allocate resources from revenue generation to low income communities.

Appendix A

Table (A1) Distribution Population in WB by Type of Locality, 1997 (%)

GOVERNORATE	TYPE OF LOCALITY			
	TOTAL	CAMPS	RURAL	URBAN
	NO.	(%)	(%)	(%)
RAMALLAH & ALBIREH	205,448	6.4	59.5	34.1
TOTAL WEST BANK	1,600,100	6.4	47.0	46.6

Table (A2) Water tariffs applied by JWU.

CATEGORIES	TARIFF (NIS)	NOTES
≤ 10 M^3	4.10	
11-20 M^3	4.60	
21-40 M^3	4.85	
41-100 M^3	6.30	
≥100 M^3	6.85	
TANKS	4.20	
LUMP SUM SALES	4.00	
FIXED FEES	8.00	MAINTENANCE & METER FEES

Table (A3) Water tariffs applied by Betoniya Municipality

CATEGORIES	TARIFF (NIS)	NOTES
≤ 5 M^3	32.00	
≥5 M^3	5.20	
≥5 M^3	7.20	COMMERCIAL

Table (A4) Water tariffs applied by Bir Zeit Municipality

CATEGORIES	TARIFF (NIS)	NOTES
≤ 20 M^3	5.00	
21-30 M^3	5.50	
31-60M^3	6.00	
60>	7.00	
TANKS	10	MAINTENANCE & METER FEES

Table (A5)ial Information In RamallahTariff Financ & Al-Bireh in 2001

Item	Unit	Betoniya	Beir Zeit	JWU
Population Served	#	17000		235600
Connections	#	2680		36257
Employees	#	11	3	223
Water Produced	m^3	0	0	1965275
Water Purchased	m^3	574460	203508	9608847
Water Supplied	m^3	574460	203508	11574122
Water Sold	m^3	373000	176754	8474095
Water Sold To Other Utilities	m^3	0	0	0
Water Sold by Tanks	m^3	0	0	0
Total Water Sold	m^3	373000	176754	8474095
Billed Revenue	NIS	1807920	938266	35205854
ptsYearly De	NIS	246482	150000	17495149
Billed Water Sold	NIS	2000251	806381	40393862
Meter Replacement Fees	NIS	0	0	123656
New Connection fees	NIS	440230	12588	3801897
Customers Contribution Revenue	NIS	0	0	0
Tanked Water Selling Revenue	NIS	0	10000	168018
d RevenueLump Sum Water Sol	NIS	0	0	0
Other Revenues	NIS	0	0	2899410
Sum of Revenues	NIS	2440481	828969	47386843
Price of Water Purchased	NIS	2010658	529113	23239995
Energy Expenses	NIS	7200	0	5273144
Maintenance Expenses	NIS	91023	14032	729485
s and feesSalarie	NIS	284900	57963	14229940
Other Expenses	NIS	3946	2800	4756669
Fixed Assets Depreciation	NIS	0	0	3377004
Total Expenses	NIS	2397727	603908	51606237

Table (A6)Tariff Financial Information In Ramallah & Al-Bireh in 2002

Item	Unit	West Bani Zeid	Betouniya	Beir Zeit	JWU
Population Served	#	12000	17000	12000	247983
Connections	#	1397	2730	1021	39361
Employees	#	5	11	3	218
Water Produced	m^3	0	0	0	1885323
Water Purchased	m^3	141392	549700	204000	9528346
Water Supplied	m^3	141392	549700	204000	11413669
Water Sold	m^3	119970	363785	175663	8216444
Water Sold To Other Utilities	m^3				
Water Sold by Tanks	m^3				
Total Water Sold	m^3	119970	363785	175663	8216444
Billed Revenue	NIS	541905	1792877	857233	32487774
sYearly Debt	NIS	216000	439543	460676	22585264
Billed Water Sold	NIS	757905	2050854	1114992	37577889
Meter Replacement Fees	NIS	1874	0	0	110738
New Connection fees	NIS	16780	298570	31141	2216175
Customers Contribution Revenue	NIS	0	0	0	0
Tanked Water Selling Revenue	NIS	0	0	0	120179
Lump Sum Water Sold Revenue	NIS	0	0	0	0
Other Revenues	NIS	0	0	0	1666419
Sum of Revenues	NIS	776559	2349424	1146133	41691400
Price of Water Purchased	NIS	336744	1933220	714000	23130092
Energy Expenses	NIS	0	15800	0	6101044
ce ExpensesMaintenan	NIS	33571	55160	19297	1285767
Salaries and fees	NIS	90691	290892	72248	16359757
Other Expenses	NIS	38861	18094	0	3136077
Fixed Assets Depreciation	NIS	0	0	0	4594449
Total Expenses	NIS	499867	2313166	805545	54607186

Table (A7)Ramallah Tariff Financial Information In & Al-Bireh in 2003

Item	Unit	West Bani Zeid	Betouniya	Beir Zeit	JWU
Population Served	#	12000	18000	10000	251162
Connections	#	1485	3000	1184	37340
Employees	#	5	11	3	207
Water Produced	m^3	0	0	0	2108355
Water Purchased	m^3	157587	659730	273967	9945442
uppliedWater S	m^3	157587	659730	273967	12053797
Water Sold	m^3	111568	394663	181934	7648697
Water Sold To Other Utilities	m^3	0	0	0	933697
Water Sold by Tanks	m^3	0	0	0	0
Total Water Sold	m^3	111568	394663	181934	8582394
Billed Revenue	NIS	458884	2261366	960022	40906512
Yearly Debts	NIS	337000	362720	514122	25222328
Billed Water Sold	NIS	679884	2395854	973410	43543576
Meter Replacement Fees	NIS	1500	0	0	163796
New Connection fees	NIS	18126	512330	19033	3755350
Customers Contribution Revenue	NIS	0	0	0	0
g RevenueTanked Water Sellin	NIS	900	0	0	67238
Lump Sum Water Sold Revenue	NIS	0	0	0	0
Other Revenues	NIS	0	0	0	5443856
Sum of Revenues	NIS	700410	2908184	992443	52973816
Price of Water Purchased	NIS	375057	2484872	1028830	24444132
Energy Expenses	NIS	2263	23000	0	6509024
Maintenance Expenses	NIS	19449	84762	15592	2364735
Salaries and fees	NIS	96074	258044	71236	13675553
Other epenses	NIS	0	18094	0	3454487
Fixed Assets Depriciation	NIS	0	0	0	3924543
Total Expenses	NIS	492843	2868772	1115658	54372474

Table (A8) Tariff Financial information in Ramallah & Al-Bireh in 2004

Item	Unit	West Bani Zeid	Betouniya	Beir Zeit	JWU
Population Served	#	12000	20000	10000	250000
Connections	#	1475	3202	1219	44062
Employees	#	5	11	3	201
Water Produced	m^3	0	0	0	2294638
Water Purchased	m^3	262997	664030	224460	10425289
Water Supplied	m^3	262997	664030	224460	12719927
Water Sold	m^3	165084	431041	157926	8407394
Water Sold by Tanks	m^3	1260	0	0	0
Total Water Sold	m^3	166344	431041	157926	8407394
Water Sold to Other Utilities	m^3	0	0	0	959883
Total Water Sold	m^3	166344	431041	157926	9367277
Billed Revenue	NIS	657135	2505492	873785	43916345
Yearly Depts	NIS	25876	241741	551545	7778896
Billed Water Sold	NIS	683011	2747233	1425330	51695241
Meter Replacement Fees	NIS	0	0	0	194700
New Connection fees	NIS	16583	456081	17110	4392307
Lump Sum Water Sold Revenue	NIS	0	0	0	3639344
Customers Contribution Revenue	NIS	0	0	0	3800007
Tanked Water Selling Revenue	NIS	15924	0	0	105013
Other Revenues	NIS	19182	0	0	779898
Sum of Revenues	NIS	734700	3203314	1442440	60967166
Price of Water Purchased	NIS	658460	2689901	897840	26758985
Energy Epenses	NIS	21677	13000	0	7662831
Maintenance Expenses	NIS	20639	117422	61430	1581013
Salaries and fees	NIS	120835	303156	18861	15141185
Other epenses	NIS	17425	0	15560	3049054
Fixed Assets Depriciation	NIS	0	0	0	3954113
Total Expenses	NIS	839036	3123479	993691	58147181

Table(A 9) Occupied Housing Units by Locality and Connection to Water Network in Housing Unit

Locality	Connection to Water Network								Total
	Public Network		Private System		No Piped Water		Not Stated		
	Number	%	Number	%	Number	%	Number	%	
Abu Shukheidim	204	93.6	7	3.2	7	3.2	-	0.0	218
Abu Qash	189	98.4	2	1.0	1	0.5	-	0.0	192
Al Bira	5159	98.4	61	1.2	13	0.2	12	0.2	5245
Al Janiya	110	100.0	-	0.0	-	0.0	-	0.0	110
At Tayba	310	97.5	5	1.6	3	0.9	-	0.0	318
At Tira	184	95.3	-	0.0	9	4.7	-	0.0	193
Al Lubban al Gharbi	162	97.0	-	0.0	4	2.4	1	0.6	167
Al Midya	126	98.4	-	0.0	2	1.6	-	0.0	128
Al Mazra'a ash Sharqiya	524	96.7	9	1.7	8	1.5	1	0.2	542
Al Mazra'a al Qibliya	399	89.5	19	4.3	28	6.3	-	0.0	446
Al Mughayyir	-	0.0	107	45.9	125	53.6	1	0.4	233
An Nabi Salih	50	90.9	-	0.0	5	9.1	-	0.0	55
Umm Safa	76	96.2	1	1.3	2	2.5	-	0.0	79
Budrus	160	100.0	-	0.0	-	0.0	-	0.0	160
Badiw al Mu'arrajat	-	0.0	-	0.0	82	100.0	-	0.0	82
Burqa	200	92.2	5	2.3	12	5.5	-	0.0	217

Table (9 Cont.) Occupied Housing Units by Locality and Connection to Water Network in Housing Unit

Locality	Connection to Water Network								Total
	Public Network		Private System		No Piped Water		Not Stated		
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	
Burham	63	94.0	1	1.5	3	4.5	-	0.0	67
Bil'in	176	91.7	3	1.6	13	6.8	-	0.0	192
Bani Zeid	761	96.5	9	1.1	19	2.4	-	0.0	789
Beit Sira	316	98.8	2	0.6	2	0.6	-	0.0	320
Beit 'Ur at Tahta	472	95.2	7	1.4	16	3.2	1	0.2	496
Beit 'Ur al Fauqa	120	98.4	-	0.0	2	1.6	-	0.0	122
Beit Liqya	744	96.4	14	1.8	13	1.7	1	0.1	772
Beit Nuba	23	100.0	-	0.0	-	0.0	-	0.0	23
Beitillu	280	94.0	11	3.7	7	2.3	-	0.0	298
Beituniya	1587	98.4	6	0.4	17	1.1	2	0.1	1612
Beitin	365	98.1	3	0.8	4	1.1	-	0.0	372
Bir Zeit	952	97.8	13	1.3	5	0.5	3	0.3	973
Turmus'ayya	462	95.5	10	2.1	12	2.5	-	0.0	484
Jifna	194	97.5	3	1.5	1	0.5	1	0.5	199
Jilijliya	129	97.0	1	0.8	3	2.3	-	0.0	133
Jammala	142	100.0	-	0.0	-	0.0	-	0.0	142
Jibiya	19	100.0	-	0.0	-	0.0	-	0.0	19
Khirbet Abu Falah	351	85.2	36	8.7	25	6.1	-	0.0	412
Khirbet Kafr Sheiyan	4	100.0	-	0.0	-	0.0	-	0.0	4
Kharbatha al Misbah	488	94.8	3	0.6	23	4.5	1	0.2	515
Kharbatha Bani Harith	289	96.7	2	0.7	8	2.7	-	0.0	299
Dura al Qar'	311	96.3	4	1.2	7	2.2	1	0.3	323
Deir Ibzi'	-	0.0	157	76.2	49	23.8	-	0.0	206

Locality	Connection to Water Network								Total
	Public Network		Private System		No Piped Water		Not Stated		
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	
Deir Abu Mash'al	417	98.6	-	0.0	6	1.4	-	0.0	423
Deir as Sudan	-	0.0	171	78.8	46	21.2	-	0.0	217
Deir Jarir	428	91.1	12	2.6	30	6.4	-	0.0	470
Deir Dibwan	824	94.3	11	1.3	39	4.5	-	0.0	874
Deir 'Ammar	224	97.0	-	0.0	6	2.6	1	0.4	231
Deir Qaddis	201	99.5	-	0.0	-	0.0	1	0.5	202
Deir Nidham	90	98.9	-	0.0	1	1.1	-	0.0	91
Ras Karkar	185	97.9	1	0.5	3	1.6	-	0.0	189
Ramallah	3394	98.3	41	1.2	13	0.4	4	0.1	3452
Rammun	332	96.0	11	3.2	3	0.9	-	0.0	346
Rantis	266	90.5	19	6.5	8	2.7	1	0.3	294
Silwad	774	83.8	87	9.4	60	6.5	3	0.3	924
Sinjil	659	95.2	16	2.3	17	2.5	-	0.0	692
Shabtin	75	100.0	-	0.0	-	0.0	-	0.0	75
Shuqba	426	99.3	-	0.0	3	0.7	-	0.0	429
Surda	186	96.9	6	3.1	-	0.0	-	0.0	192
Saffa	402	93.5	11	2.6	17	4.0	-	0.0	430
'Abud	275	98.2	-	0.0	5	1.8	-	0.0	280
'Arura	278	87.1	34	10.7	7	2.2	-	0.0	319
'Abwein	385	88.3	34	7.8	16	3.7	1	0.2	436
'Ajjul	-	0.0	157	94.6	9	5.4	-	0.0	166
'Atara	272	91.9	15	5.1	7	2.4	2	0.7	296
'Ein Samiya	-	0.0	-	0.0	22	100.0	-	0.0	22
'Ein Siniya	85	97.7	-	0.0	2	2.3	-	0.0	87

Locality	Connection to Water Network								Total
	Public Network		Private System		No Piped Water		Not Stated		
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	
'Ein 'Arik	-	0.0	148	77.5	43	22.5	-	0.0	191
'Ein Qiniya	-	0.0	34	42.5	46	57.5	-	0.0	80
'Ein Yabrud	437	96.7	9	2.0	5	1.1	1	0.2	452
Qibya	491	99.4	-	0.0	3	0.6	-	0.0	494
Qarawat Bani Zeid	284	95.3	5	1.7	9	3.0	-	0.0	298
Kafr 'Ein	207	94.5	1	0.5	11	5.0	-	0.0	219
Kafr Malik	355	95.4	5	1.3	12	3.2	-	0.0	372
Kafr Ni'ma	-	0.0	310	72.8	116	27.2	-	0.0	426
Kobar	379	92.7	21	5.1	9	2.2	-	0.0	409
Al Am'ari Camp	637	99.1	4	0.6	2	0.3	-	0.0	643
Al Jalazun Camp	942	95.5	36	3.7	4	0.4	4	0.4	986
Deir 'Ammar Camp	248	98.4	-	0.0	4	1.6	-	0.0	252
Silwad Camp	44	100.0	-	0.0	-	0.0	-	0.0	44
Qaddura Camp	189	100.0	-	0.0	-	0.0	-	0.0	189
Mazari' an Nubani	247	86.7	26	9.1	12	4.2	-	0.0	285
Ni'lin	528	97.4	2	0.4	10	1.8	2	0.4	542
Yabrud	75	91.5	-	0.0	6	7.3	1	1.2	82
Total	**31342**	**91.5**	**1728**	**5.0**	**1142**	**3.3**	**46**	**0.1**	**34258**

Appendix B

B.1 Sample of the Testing Questionnaire

Name: ……. **Location: ……..**
No.: …….. **Date: ……**

#	Question	Answer
1.	How old are you?	a. Less than20 b .20- 30 c. 30- 40 d. above 40
2.	What is your marital status?	a. Single b. Married c. Divorced d. Other
3.	How many persons live in the house?	a. less than 3 b. 3 - 6 persons c.(6 – 9) persons d. More than 9 persons
4.	What is the Highest degree you completed?	a. Less than High school b. High school c. College d. Bachelor Degree e. Others
5.	Dose your household have?	1. Electricity 2. Piped water 3. Flush Toilet 4. TV 5.VCR 6. Refrigerator 7.DVD player 8. Telephone 9. Computer 10. Car 11.Central Heat 12. Solar Heat
6.	Do you work outside the house?	a. Yes b. No
7.	What type of job you have?	----------
8.	How much do you make per month?	a. Less than 800 NIS b.800-1200NIS c. 12000-1600 NIS d. 1600 - 2000 NIS e. 2000-2400 NIS f. 2400-2600 NIS g. More than 2600 NIS
9.	Does your spouse work outside the house?	a. Yes b. No
10.	What type of work does the spouse have ?	----------
11.	How much does the spouse make per month?	a. Less than 800 NIS b.800-1200NIS c. 12000-1600 NIS d. 1600 - 2000 NIS e. 2000-2400 NIS f. 2400-2600 NIS g. More than 2600 NIS
12.	Do you get other financial support?	a. Yes b. No
13.	If the answer is yes , how many /year?	----------
14.	From where?	----------
15.	How much per month?	a. Less than 150 NIS b. 150- 500 NIS c. 500-850 NIS d. 850-1200 NIS e. More than 1200 NIS
16.	What are your family total income / month?	a. Less than 1700 NIS b. 1700 – 2500 NIS c. 2500 NIS -3300 NIS d. 3300-4100

#	Question	Answer
		NIS e. 4100-4900NIS f. More than 4900 NIS
17.	Water Supply Source	a. Piped water b. Wells c. Vendors d. others
18.	Your Water consumption range	a. <=10 m^3 b. 11- 20 m^3 c. 21-30 m3 d. 31-40 m^3 e. 41-100 m^3 f. More than 100 m^3
19.	Price of(1m^3)of water Paid :	----------
20.	Your Water Bill Range Per Month is	a. ≤ 50 NIS b. 51 - 100 NIS c. 101 -200 NIS d. 201- 250 NIS e. 251 - 300 NIS f. more than 300 NIS
21.	Price range paid for water from other sources/ month	----------
22.	Number of times you buy water from other sources	----------
23.	Number of premises connected to the same meter:	a. Only one b. Two premises c. Three premises d. More than three premises.
24.	Is the Premises using the meter for	1. Residential 2. Governmental 3. Commercial 4. Industrial 5. Others
25.	Number of floors in the building using the same meter	a. One floor b. two floors c. three floors d. four floors e. more than four floors
26.	Total Area of premises connected to same meter	a. Less than 100m^2 b. 100-200m^2 c.201-300 m^2 d. 301- 400 f. More than 400m^2
27.	Water usage within the premises	a. Domestic b. Agricultural c. Industrial d. Commercial e. others
28.	Water Quantity Satisfaction	a. Satisfied b. Moderate c. Unsatisfied
29.	Water Supply is described as	a. Continuous b. Intermittent c. other
30.	Households obstacles regarding water supply	a. Exist b. Not Exist
30.	Pumping Process Satisfaction	a. Satisfied b. Moderate c. Unsatisfied
31.	Pumping Duration Satisfaction	a. Satisfied b. Moderate c. Unsatisfied
32.	Water taste satisfaction	a. Satisfied b. Moderate c. Unsatisfied
33.	Water color satisfaction	a. Satisfied b. Moderate c. Unsatisfied
34.	Water purity satisfaction.	a. Satisfied b. Moderate c. Unsatisfied
35.	Water roof tank	a. Exist b. Not Exist
36.	Volume and type of roof tank	----------
37.	How many roof tanks are used	----------
38.	Ground Water Tank for pumping water	a. Exist b. Not Exist
39.	Pre usage boiling of water	a. Boiled b. Not boiled

#	Question	Answer
40.	Household collection water wells	a. Exist b. Not Exist
41.	Volume of water abstracted from these wells per year	---------- m^3
42.	Family illness caused by water :	---------- %
43.	Knowledge of price paid per cubic meter of water.	a. Yes b. No c. Does not matter
44.	Classification of price paid for water.	a. Low b. Moderate c. high d. Do not Know
45.	The lowest Price you are willing to pay per one cubic meter of water	a. ≤ 5 NIS /m^3 b. (6-8) NIS / m^3 3. (9-11) NIS/m^3 4. (12-14) NIS/m^3 5. (13-15) NIS / m^3 6.More than 15 NIS / m^3
46.	Means of payment of water bill.	a. Municipality b. Collector c. Bank d. Others
47.	In your opinion who should supply you with water	a. Municipality b. Government c. Private Sector d. None Profit non Governmental Organization e. Others
48.	What do you think of illicit connections	a. Forbidden & considered Theft b. Must be stopped c. Others
49.	Method of sewerage collection	a. Sewerage Networks b. Cesspits c. Other
50.	The suitable monthly average payment of the sewage bill?	a. Less than 15 NIS b. 16-25 NIS c. 26 – 35 NIS d. 36-45 NIS e. 46- 55 NIS f. 56-65 NIS g. More than 65 NIS
51.	The lowest Price you are willing to pay for disposal of one cubic meter wastewater	a. Less than 2 NIS/ m^3 b. 3-5 NIS / m^3 c. 6-8 NIS / m^3 d. 9 -11 NIS/ m^3 f. 12-14 NIS/m^3 g. More than 14 NIS/ m^3
52.	How many times do you empty your cesspit per month?	Often 2-4 times? ----------
53	What is the cost of emptying the cesspit per month?	----------
54.	Do you think Palestine suffers from a problem concerning water	a. Complicated Problem b. Moderate Problem c. Uncomplicated Problem d. No Problem
55.	Do you think Palestine suffers from a problem concerning Sewerage	a. Complicated Problem b. Moderate Problem c. Uncomplicated Problem d. No Problem

Thank you

B.2 Sample of the Modified Questionnaire

Name: …… **Location: ……**
No.: …… **Date: ……..**

#	Question	Answer
General		
1.	Family illness caused by water :	---------- %
2.	Knowledge of price paid per cubic meter of water.	a. Yes b. No c. Does not matter
3.	Means of payment of water bill.	a. Municipality b.Collecter c. Bank d. Others
4.	In your opinion who should supply you with water	a. Municipality b. Government c. Private Sector d. None Profit non Governmental Organization e. Others
5.	What do you think of illicit connections	a. Forbidden & considered Theft b. Must be stopped c. Others
6.	Do you think Palestine suffers from a problem concerning water	a. Complicated Problem b. Moderate Problem c. Uncomplicated Problem d. No Problem
7.	Do you think Palestine suffers from a problem concerning Sewerage	a. Complicated Problem b. Moderate Problem c. Uncomplicated Problem d. No Problem
Social		
8.	How old are you?	a. Less than20 b .20- 30 c. 30- 40 d. above 40
9.	What is your marital status?	a. Single b. Married c. Divorced d. Other
10	How many persons live in the house?	a. less than 3 b. 3 - 6 persons c.(6 – 9) persons d. More than 9 persons
11.	What is the Highest degree you completed?	a. Less than High school b. High school c. College d. Bachelor Degree e. Others
12.	Does your household have?	1. Electricity 2. Piped water 3. Flush Toilet 4. TV 5.VCR 6. Refrigerator 7.DVD player 8. Telephone 9. Computer 10. Car 11.Central Heat 12. Solar Heat
Income		
13..	Do you work outside the house?	a. Yes b. No
14.	What type of job you have ?	----------
15.	How much do you make per month?	a. Less than 800 NIS b.800-1200NIS c. 12000-1600 NIS d. 1600 - 2000 NIS e. 2000-2400 NIS f. 2400-2600 NIS

#	Question	Answer
		g. More than 2600 NIS
16.	Does your spouse work outside the house?	a. Yes b. No
17.	What type of work does the spouse have ?	----------
18.	How much does the spouse make per month?	a. Less than 800 NIS b.800-1200NIS c. 12000-1600 NIS d. 1600 - 2000 NIS e. 2000-2400 NIS f. 2400-2600 NIS g. More than 2600 NIS
19.	Do you get other financial support?	a. Yes b. No
20.a	If the answer is yes , how many /year?	----------
20.b	From where?	----------
21.	How much per month?	a. Less than 150 NIS b. 150- 500 NIS c. 500-850 NIS d. 850-1200 NIS e. More than 1200 NIS
22.	What are your family total income / month?	a. Less than 1700 NIS b. 1700 – 2500 NIS c. 2500 NIS -3300 NIS d. 3300-4100 NIS e. 4100-4900NIS f. More than 4900 NIS
Water Service		
23.	Water Supply Source	a. Piped water b. Wells c. Vendors d. others
24.	Your Water consumption range	a. <=10 m^3 b. 11- 20 m^3 c. 21-30 m3 d. 31-40 m^3 e. 41-100 m^3 f.More than 100 m^3
25.	Price of(1m^3)of water Paid :	----------
26.	Your Water Bill Range Per Month is	a. ≤ 50 NIS b. 51 - 100 NIS c. 101 -200 NIS d. 201- 250 NIS e. 251 - 300 NIS f. more than 300 NIS
27.	Price range paid for water from other sources/ month	----------
28.	Number of times you buy water from other sources	----------
29.	Number of premises connected to the same meter:	a. Only one b. Two premises c. Three premises d. More than three premises.
30.	Is the Premises using the meter for	1. Residential 2. Governmental 3. Commercial 4. Industrial 5. Others
31.	Total Area of premises connected	a. Less than 100m^2 b. 100-200m^2 c.201-

#	Question	Answer
	to same meter	300 m^2 d. 301- 400 f.More than 400m^2
32.	Water usage within the premises	a. Domestic b. Agricultural c. Industrial d. Commercial e. others
33.	Water Quantity Satisfaction	a. Satisfied b. Moderate c. Unsatisfied
34.	Water Supply is described as	a. Continuous b. Intermittent c. other
35.	Households obstacles regarding water supply	a. Exist b. Not Exist
36.	Pumping Duration Satisfaction	a. Satisfied b. Moderate c. Unsatisfied
37.	Water Quality satisfaction.	a. Satisfied b. Moderate c. Unsatisfied
38.	Water roof tank	a. Exist b. Not Exist
39.	Volume and type of roof tank	----------
40.	How many roof tanks are used	----------
41.	Ground Water Tank for pumping water	a. Exist b. Not Exist
42.	Pre usage boiling of water	a. Boiled b. Not -boiled
43.	Household collection water wells	a. Exist b. Not Exist
44.	Volume of water abstracted from these wells per year	---------- m^3
Wastewater Services		
45.	Method of sewerage collection	a. Sewerage Networks b. Cesspits c. Other
46.	The suitable monthly average payment of the sewage bill?	a. Less than 15 NIS b. 16-25 NIS c. 26 – 35 NIS d. 36-45 NIS e. 46- 55 NIS f. 56-65 NIS g. More than 65 NIS
47.	How many times do you empty your cesspit per month?	Often 2-4 times? ----------
48.	What is the cost of emptying the cesspit per month?	----------
Affordability		
49.	Classification of price paid for water.	a. Low b. Moderate c. high d. Do not Know
Willingness to Pay		
50.	The highest Price you are willing to pay per one cubic meter of water	a. ≤ 5 NIS /m^3 b. (6-8) NIS / m^3 3. (9-11) NIS/m^3 4. (12-14) NIS/m^3 5. (13-15) NIS / m^3 6.More than 15 NIS / m^3
51.	The highest Price you are willing to pay for disposal of one cubic meter wastewater	a. Less than 2 NIS/ m^3 b. 3-5 NIS / m^3 c. 6-8 NIS / m^3 d. 9 -11 NIS/ m^3 f. 12-14 NIS/m^3 g. More than 14 NIS/ m^3

REFERENCES

References

Abu-Madi, M., Al-Sa`ed, R., Braadbart, O. and Alaerts, G. (2003). "Willingness Of Farmers To Pay For Reclaimed Wastewater In Jordan And Tunisia ". Water Science and Technology: Water Supply, Vol. 3, no. 4, pp.115-122.

Abu-Safieh,Y., White ,Gilbert F., Al-Hassan, Ayman A. Etal (1999), "The West Bank and Gaza Strip, Israel, and Jordan Committee on Sustainable Water Supplies for the Middle East ": Water for the Future
http://books.nap.edu/html/waterfuture/

Barghothi, Ihab (2004). "House Committee on International Relations ", Palestinian Water Authority.

Brooks, David B., Lonergan Stephen C. (1994) Ch. (8) "Water and security in Israel".
http://web.idrc.ca/es/ev-29781-201-1-DO_TOPIC.html

Cardone, Rachel and Fonseca, Catarina. (2003) "Financing and Cost Recovery ", Thematic overview paper, IRC International Water and Sanitation Centre.

Central Intelligence Agency, the World Fact Book, West Bank, Feb (2005). http://www.cia.gov/cia/publications/factbook/geos/we.html

Dinar, Ariel .Easter, K .William. Rose grant, Mark W (1999). "Markets for Water Potential and Performance ", Kluwer Academic Publishers.

Duncanson, Catriona Mhaire. Jones, Sharon A. (2004)." Implications of the World Bank's privatization policy for South Africa: Water Policy", Vol. 6 ,no. 6, P. 473-486.

"Establishing Pricing Policy", Water Utility Partnership for Capacity Building in Africa
http://www.wupafrica.org/toolkit/funding/estab-price-policy.html.

Foster,V.,Lobo,A.Halpern,J. (June, 2000). "Designing Direct Subsidies for the Poor—A Water and Sanitation Case Study", Public Policy For The Private Sector.

Franceys, Richard (1997); "Institutional Models for Customers Oriented Water Supply', Lecture Notes, IHE, Delft.

Global Security, Ramallah, Nov. (2004).
/military/world/palestine/ramallah.htm

Helsel, D.R., Hirsch, R.M.(Sep.2002)." Statistical Methods in Water Resources" Book 4, Hydrologic Analysis and Interpretation, Chapter A3.
Publication available at: http://water.usgs.gov/pubs/twri/twri4a3/

Hind, Monther. Personal Communication, (July, 2003), Al Bierh Municipality.

Hoehn, John P. (2000), "An Economic Analysis of Water and Wastewater Investments in Cairo", Egypt, Evaluation Review Vol. 24 Issue 6, p579, 30p

Hope, R.A., Garod b., G.D. (2004) "Household preferences to water policy interventions in rural South Africa ": Water policy, Vol. 6, no. 6, p.485-499.

Horan, Deborah. (END/ IPS / DHO / RJ/ 98), "Palestinians and Israeli Lock Horns Over Water ", Internet Article.

http://www.globalsecurity.org/military/world/palestine/ramallah.htm

INFOPLEASE, History, West Bank –Encyclopedia, (Jan, 2005)
http://www.infoplease.com/ce6/world/A0861915.html

Issa, K.(2004)."Economic Value of Water Used for Domestic in West Bank Palestine", Palestinian Water Authority.

Johansson, Maria Verdin. "Determinants of Charitable Giving. Evidence from Hypothetical Data on Willingness to Pay", Department of Economics, Umea University, SE-90187Umea.

(January, 2004)."Prospects of Efficient Wastewater Management and Water Reuse", Country study
http://www.emwater.org/activities/final_cs_palestine.pdf

Kushner, J., Renzetti ,S., (2004) ." Full Cost Accounting for Water Supply and Sewage Treatment: Concepts and Case Application Full Costs of Water Supply and Sewage: Concepts and Definitions", Canadian Water Resources Journal Vol. 29(1): 13–22 (2004)

Makino ,M. (Dec.2002), "Understanding The Basics" , World Bank Institute, Water and Sanitation Program.
http://wupafrica.org/toolkit/resources/pdf-files/WaterTariff-1.pdf

Merrett, Stephen. 1997," Introduction to the Economics of Water Resources- (An International Perspective)", UCl Press Limited.

Merrett, Stephen. December, 2001. "Willingness to pay – review (Deconstructing households' willingness –to –pay for water in low – income – countries), Water Policy.

Palestinian Central Bureau of Statistics Web site, (PCBS),"Water Resources Selected Statistics" 1997- 1998.
http:// www.PCBS.org/

Palestinian Academic Society for the Study of International Affairs(PASSIA), Geography, Directory of /palestine_facts/pdf/pd f2004.
http://www.passia.org/palestine_facts/pdf/pdf2004/3-Geography.doc

"Personal Communication ", Palestinian Water Authority (PWA, 2005).

"Personal Communication ", Jerusalem Water Undertaking (JWU, 2004).

"Places of Refuge ", 1999. Internet Article, Palestinian Information Center
http://www.pnic.gov.ps/english/palestine/refugees/refugees-places.html

Plaut ,S.(2000), "Water Policy in Isreal" , Policy Studies , No.47 July 2000.
www.iasps.org/policystudies/ps47eng.pdf

"Ramallah", November 14, 2004.Internet Article, Global Security.
http://www.globalsecurity.org

"Ramallah, Profile ".
http://www.ramallah-city.org/

Ramallah and Al Bierh District (Water Distribution System In The West Bank Water Department, PWA 2002)

Special Report Series (20) (March 2003). "Concerning Price Discrepancy for Water in the Palestinian National Authority Areas ": The Palestinian Independent Commission for Citizens Rights (PICCR).

SYKE. (March 29, 2004) "West Bank and Gaza Water and Sanitation Project/ Palestine/Project Document Final.

'Tariff Regulation & Guidelines', May 2003 .Palestinian Water Authority.
Internal records (not published), Palestinian Water Authority (PWA, 2004).

The West Bank and Gaza Strip, Israel, and Jordan (1999), "Water for the Future ": http://books.nap.edu/openbook/030906421X/html/114.html

Urooj Q. Amjad . (Nov., 1999) "Water, Conflict, and Cooperation"
Ramallah, West Bank.

West Bank Geography – (2003)
http://www.theodora.com/wfb2003/west_bank/west_bank_geography.html

West Bank Wikipedia, the free Encyclopedia, March (2005).
http://en.wikipedia.org/wiki/West_Bank.

Whittington, D., Davis, J. , Miarsono, H., Pollard, R.,(2000), "Designing a neighborhood deal for urban sewers: A case study of Semarang, Indonesia," Journal of Planning Education and Research 19(3): 297-308,

(1996- 2000). "Performance and Prospects", Jerusalem Water Undertaking (JWU) Ramallah/ Al-Bireh District.

(Oct. 1997), "Presentation of Program Plans:Key Development Strategies in the West Bank and Gaza Strip"
http://www.arts.mcgill.ca/programs/polisci/faculty/rexb/poc/key.html

(Oct. 1997). "The Status of Environment in Palestine, Applied Research Institute" Jerusalem (ARIJ).

(2001)" Cost Recovery: World Bank".
http://lnweb18.worldbank.org/mna/mena.nsf/Sectors/MNSID/91A092F831DBC6CF85256D8A0075CBB7?OpenDocument

March 2002. "JWU Costumer Satisfaction Study ", Jerusalem Water Undertaking (JWU) Ramallah/ Al-Bireh District.

(Sep. 2003) "Water Pricing In the Municipal Sector ": World Bank

http://lnweb18.worldbank.org/mna/mena.nsf/All/3A6237E81F44D9F0852569490070AF6B?OpenDocument.

(Sep.2003)" MENA Water Tariffs and Tariff Database ": World Bank. http://lnweb18.worldbank.org/mna/mena.nsf/Sectors/MNSID/51A91D896620CD0985256D880044EAA4?OpenDocument

(February,2004) "The Israeli imposed closure :The Effect of Closure on Health Care in the West Bank and Gaza Strip" www.palestinemonitor.org/factsheet/ effect_of_closure_on_health_care.htm - 47k

(March, 2004) "Water: Use and distribution in the West Bank and Gaza Strip", A fact sheet by the Palestine Hydrology Group. http://www.arabmediawatch.com/modules.php?name=News&file=article&sid=186

(January, 2005) "Notes from the First Group Meeting West Bank ", Applied Research Institute- Jerusalem (ARIJ) http://www.deadseaproject.org/deadseaproject/Publications/FGM1Palestine.pdf

الملخـص

إن سياسات تسعير استهلاك المياه المعمول بها في الضفة الغربية لا تلبي مبدأ استرداد التكلفة كاملة، لذلك يجب تقدير القيمة الحقيقية لتكلفة الاستثمار والتشغيل والصيانة والمياه المفقودة غير المحسوبة وانخفاض القيمة الشرائية لتقييم فاعلية المفروضة حالياً على فواتير المياه. بالإضافة لتحديد نجاعة هذه السياسات فلا بد من تقييم مدى قدرة واستعداد المستهلك على تسديد الفواتير. الدراسة تشـمل منطقـة وسـط الضـفة الغربية، بالأخص محافظة رام الله و البيرة، في ظل الوضع السياسي الحالي فإن الحركة فـي المنطقـة الوسطي للضفة الغربية صعبة جداً. أن نظام التعرفة المتزايد والمطبق من قبل مصلحة المياه و المزودين الآخرين في المحافظة يتراوح بين (4-7) شيكل /م^3، أن معظم العينة التي تم مسحها رفضت أن تـدفع أكثر من هذا المبلغ للمتر المكعب من المياه بمقابل استعداد نفس العينة لدفع مبالغ أعلى للتخلص من المياه العادمة. بالتالي فإن إنجاز الدراسة كان شاق حيث اعتمدت الدراسة على مسح تضمن توزيـع اسـتبيان وتحليل نتائج من أجل بناء نموذج يظهر الصورة الحقيقية لقدرة المستهلك وقابليته على دفـع أو تسـديد فواتير المياه. مجال هذه الدراسة يتضمن تقييم الضريبة المفروضة حالياً على خـدمات الميـاه والميـاه العادمة، ثم اقتراح تعديلات إذا لزم الأمر، بالإضافة إلى تحديد العوامل المؤثرة على ضريبة المياه.

اعتمدت الدراسة على مسح استبياني أشتمل(400) عائلـة، تـم تحليـل النتـائج باسـتخدام برنـامج (SPSS) للتحليل الإحصائي، ومن ثم بناء نموذج لفحص الفرضـية باسـتخدام (Categorial Data Analysis) وأيضا (Multiple Linear Regression).

تظهر نتائج التحليل أن أسعار المياه الحالية بحاجة لتعديل. أما في ما يتعلق باستعداد المشـتركين لـدفع رسوم المياه والمياه العادمة، إن المتغيرات المقترحة في الدراسة مـؤثرة. فـإن المسـتوى الاجتمـاعي الاقتصادي للمشتركين لا يؤثر في استعدادهم لتسديد رسوم المياه والمياه العادمة. فهناك مؤثرات أخرى، على سبيل المثال: مدى المعرفة بثمن المتر المكعب من المياه، تكلفة تفريغ الحفرة الامتصاصية ،الاستفادة من موارد أخرى للمياه، وكيفية تسديد الفاتورة.عند حساب المبلغ المدفوع لفاتورة المياه نسبة إلى الـدخل الكلي للعائلة فأن النتيجة كانت كما يلي: تظهر البيانات أن الدراسة تؤكد بنسبة 95% أن المبلغ المـدفوع للمياه مقابل الدخل الكلي يتراوح ما بين (4.99% -5.98 %) لا يتناقض مع الفرضية (التي نصت عل أن 3.0 % - 5.0% من الدخل الكلي للأسرة يصرف على فواتير المياه). بالإضافة، فإن التحليل يشير إلى أن داخل الأسرة ليس عاملاً مؤثراً، حيث أن نسبة الثقة له هي أقـل مـن (0.05) وهـذا يتـاقض الفرضية.

بسم الله الرحمن الرحيم

جامعة بير زيت

دراسة مقدرة السكان على دفع تكاليف خدمات المياه والمجاري في محافظة رام الله والبيرة

رسالة ماجستير مقدمة من

بيسان أسامة الشنار

الرقم الجامعي: 1005162

بإشراف

الدكتور ماهر عمر أبو ماضي

قدمت هذه الرسالة استكمالاً لمتطلبات درجة الماجستير في علوم وتكنولوجيا المياه في كلية الدراسات العليا في جامعة بير زيت- فلسطين

بير زيت 2007