Scientific Research Publishing

The Impact of Water Price on the Financial Sustainability of the Palestinian Water Service Providers

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Abstract

The impactof water sales price on the performance of water service providers is typically something of a mystery. High prices mean more revenue and profit; but it may lead to less bills collection and encourage the illegal connections. Yet, this argument has not been fully addressed in the Palestinian water sector; this research evaluates the effect of average water prices on the financial sustainability key indicators as collection efficiency, profit or loss percentage, non-revenue water, staff productivity, daily consumption, operating, and maintenance cost. The average price of cubic meter sold is segmented into low, medium, and high categories. Multivariate analysis shows that there are significant differences in profit or working ratio, daily consumption, and operating cost based on the different price categories. Further significant differences have been found in non-revenue water, collection efficiency, and water production based on low and high price categories. On the other hand, no significant difference has been found in staff productivity. The results show high price set by Palestinian water providers, leads to an increase in the bill collection rate and profit margin. However, negative relationship has been found between the price on one hand, and non-revenue water, average daily consumption, and water production on the other hand. The implication of these findings reveal that the Palestinian water providers should increase water prices gradually to cover operating and maintenance cost for better financial performance and sustainability.

1. Introduction

In the water sector, searching for a method to measure the performance, expanding services, and sustainability of water service providers has been one of the main concerns of regulatory bodies, non-profit organizations, and government entities around the world. As is the case in the electricity and communication sectors, water sector has received very special attention and interest; not only because water is a must for every human being, but also because of its nature of operation, management, and structure as a natural monopoly.

To measure the performance of water service providers, the researchers and water experts have developed performance indicators based on international standards. The International Water Association IWA, a hub of the water sector in the World has been facilitating the work of experts and professionals for the purpose of finding creative solutions for current water problems for the past 60 years. The performance indicators that are published by IWA have always provided effective tool to reflect the current situation, trend, and tracking it over time for water service providers.

In essence, the number and choice of the indicators are important since they give full picture about different performance areas of water service providers. The financial management, profitability, and bill collection efficiency have received considerable interest since they are core indicators. The profitability can be measured by the working ratio. This ratio is simply calculated to be the total amount of operating and maintenance expenses incurred by service provider divided by the total operating revenue generated during the year.

A surplus in the income statement of the water service provider without change this surplus into cash inflow would be difficult for water service provider to continue providing water services to the customers. Cash inflow is the lifeblood of the water providers. It's important because it later is converted into payment for things that make providing water services stay in business; such as administrative expenses, employees, rent, and other operating expenses. Therefore, the ability of the service provider to collect the water bills from its customers is an indicator for the management efficiency. The more the invoices payment promptly by the customers, the more the financial sustainability for water services providers. Naturally, pure positive cash flow is preferred.

In some countries, the efficiency of water bill collection may be compared with other performance indicators of the service providers to make sure that there is an effect on the overall performance. Some researchers find correlation between the customer's payment and non-revenue water. Low level of custom-

ers' payment causes increasing non-revenue water level; since there is little or no incentive to save the water when no intention to pay for it.

Given the fact that generating profits, collection efficiency, and non-revenue water reduction are key aspects of maintaining water service providers' financial sustainability; the water providers may achieve profitability by increasing price or water tariff, decrease cost and administrative expenses, or do both at the same time. The higher the prices and the lower the cost, the better chance to achieve financial sustainability. Therefore, financial sustainability is a matter of collection receivables, profitability, covering operating expense, ability to allocate for capital investment, minimal level of non-revenue water, and payment to water bulk supplier. All those financial performance areas have direct effect on water prices and vice versa. The purpose of this study hence is to measure whether significant differences in the financial performance based on the different price categories of water services; and which areas that always will be affected. The implication of the findings will support the decision makers for better financial performance and sustainability.

2. Palestinian Water Providers

According to the data bank of Palestinian Water Authority and Water Sector Regulatory Council [1], there are more than 280 water and wastewater service providers in the form of water and wastewater utilities, undertakings, authorities, water departments within municipalities, village, joint service council's, cooperative associations, or private sector. Since there is only one cooperative association in AbuDis, and one private sector provider in the newly established city of Rawabi; this study will focus on the three types in terms of institutional structure and ownership. Firstly: Regional Utilities, those are semi-independent and report to their board of directors. Joint Service Councils are reporting to ministry of local government directly; and Water Department within the Municipalities report to mayor of municipality, which at the end reports to ministry of local government. The Palestinian Water Law 2014, [2] calls for merging current water providers into regional utilities; changing structure and ownership from municipalities to be fully legal and financial independent utilities. The purpose of this merging is based on expectation that amalgamation will achieve more efficiency, high quality of water services, direct monitoring, expanding the services into new areas.

3. Palestinian Water Tariff

A tariff for water and wastewater services, is the tool to set the appropriate water price a user of these services is expected to pay. The consumer of water and wastewater services may be of either a low or high level of income; therefore, a different price blocks are set to achieve the user appropriate price [3]. In Palestine, the water tariff bylaw has determined that water price shall be based on incremental tariff blocks [4]. According to Article 4, the price shall be increased as

there is an increase in the water consumption. Further, the wastewater tariff shall also be incrementally based on water consumption. This means that the more the water consumption, the higher the price of each cubic meter for water and also for disposal of the wastewater.

The tariff blocks in Palestine are four according to tariff bylaw 2013. The first block is up to 10 cubic meters; the second block is from 10 to 20 cubic meters. The third one is from 20 to 30 cubic meters for high consumption issue, and the last block is more than 30 cubic meters. The current implemented tariff in water service providers are always different; few of them have adapted to this structure. On the other hand, there is a fixed charge that shall be paid for each connection without consideration to consumption. Fees always are set to cover cost of connections, maintenance, and operations [4].

The tariff structure has many objectives as cost recovery, financial sustainability, efficient allocation of scarce resources, and income distribution [5]. The most carefully designed tariff cannot accomplish all of these objectives together; low level income may affect financial sustainability and cost recovery. Trading off and balancing between those objectives are optimal method in tariff set.

An important consideration often overlooked during developing pricing system is the efficiency of the operations. Customers will react favorably to good service and will be willing to pay for it with less interest in the price. An empirical study in Uganda showed that customer satisfaction and serveries quality *i.e.* not water price contribute significantly in the behavior of the customer to pay water invoice [6]. Conversely, poor service will evoke the public opposition to new or revised tariffs and payment water bills. A study shows there is no relationship found between customers' income, water price, and nonpayment of water invoices [7]. A measure of efficiency often used non-revenue water, which is the difference between the quantity of water supplied into the network and the quantity of water consumed whether metered or not. It is primarily the result and aggregate of leakages, illegal connections, metering inaccuracies, and unbilled consumption. Therefore, some water regulatory bodies, government entities accept specific level of non-revenue water during water prices approval.

4. Integrative Review

Many literatures have tackled water tariff structure and system. However, limited researches have concentrated average price and its effect on financial performance of water service providers. Some researchers find that high water price causes more revenue for water service providers, expanding water services into new areas, capital investment as pumping and networks, therefore, more in financial sustainability. Others may argue that low water prices encourage customers to pay their water bills since the amount is small compared to their income. It reduces the illegal connections and prevents social unfair use of water, because it becomes available at reasonable and affordable prices. It is imperative, therefore, to review related studies which to that end lead to exert the effect of

water price on different performance areas.

Baietti, Kingdom and Ginneken, [8] studied the characteristics of well-performing public water utilities. The researchers conclude that many performance areas water provider can enhance to be rated as good performance such as tariff efficiency. The water utilities have not only cover operating and maintenance costs; but also a majority to generate a profit or surplus large enough to service their account payable and allocate given amount toward new investments for expansion of services. The tariff shall also be fair when compared with per capita income, so measuring ability of low level income to pay water bills.

Murrar, Tamimi & Samhan, [9] investigated the determinants of non-revenue water and financial viability for the Palestinian water service providers. The authors collected many parameters that affect non-revenue water and financial viability of the Palestinian water providers. Two multiple regressions have been conducted. One of the predictors for those regressions was the average price. The findings of this measurement show that, average price has significant impact on non-revenue water. Positive relationship between price and consumption from one side, and the financial viability from the other side. The low in price and less in quantity sold, results less in revenue generated by water service providers, which to that end leads to less in financial viability. In high non-revenue, low water prices, those conditions lead to insufficient amount of generated revenue, and therefore bad financial performance. The results of this research show high effect of price on non-revenue water and financial viability. The increasing price by one unit, results in decreasing non-revenue water by 0.346 units, other things being equal. On the other side, increasing price by one unit, results in more of financial viability by 0.821 units, other things being constant. This explains high price leads to generate more revenue, and then more in good financial performance and profitability.

Abdullah Murrar, [10] studied another performance area of Palestinian water service providers which is the collection efficiency of water bills, and motivational strategies that affect and encourage the Palestinian water customers to pay water invoices. Primary data has been collected from water experts and staff in the water service providers. The descriptive and inferential analysis have been conducted on the collected data. The findings of multiple regression showed that strategies of late payment penalties, early payment discount, and incremental tariff blocks are not significantly associated with this motivation. This means that if water service provider decides to decrease the water price, then the collection efficiency may not be increased. The Palestinian water customers will not pay their due invoices as a result of low price. This was in conformity with another study in China, where the price was not determinant in the customer's payment due invoices rather than the quality of services. The study showed that current price of irrigation water is too low and therefore it can't achieve sustainable use of water. The main reason is not farmer inability to pay, but unwill-

ingness to pay due to poor services founded in the management of the water [11].

On the opposite direction, some water service providers add penalties on late payment of water customers. Or even increase significantly water tariff to subsidize uncollected invoices. The clue to this increase is revenue generating from issuing invoices will be increased. The invoice amount will become more than before and this may not encourage customers to pay their invoices. On the other hand, the government entities that supposed to approve high tariff rate may not agree with high tariff blocks due to reserve low income households. In Kenya, a study over water pricing and poor showed that high-income households and non-residential customers receive a disproportionate share of subsidies due to water tariff and that subsidy shall target poor household [12].

Abdullah Murrar *et al.*, [13] studied the efficiency and institutional performance of the Palestinian water service providers. The collected cross sectional data covers the period from year 2010 up to year 2015. The researchers found that the sales price of cubic meter plays major factor in revenue calculation. The data showed that on average Joint Services Councils "JSCs" deliver water services at price of 5.5 NIS, where water department in municipalities can charge people only by 3.2 NIS on average, however, the regional utilities set their services at 4.7 NIS. On the other hand, for the cost of water cubic meter, the same cost for both JSC and utilities *i.e.* 5.16 NIS, where, it cost less for the municipalities by 3.88 NIS. This means that when moving from dependent to autonomy structure of Palestinian water providers *i.e.* from municipalities to utilities and to JSCs; the water price raises, the gross profit margin increases and achieves more coverage of operating and maintenance cost.

Rubio, Villaverde & Gómez, [14] analyzed the ability of urban water tariffs in Spain to recover costs and to promote efficiency, sustainability, affordability and equity. The researchers found the amount of water bills forms small percentage of family income. However, many families become unable to pay the due water invoices. Mathur & Vijay, [5] found that customers give little or no attention towards conservation of water since its inexpensive and therefore this encourages people to waste. This means that the water price plays an effective tool for customer behavior. The higher the water sales price are, the more negative behavior may appear through illegal connection and/or no payment the water invoices.

5. Research Methodology

A review of related studies clearly elucidated that there are many procedures and strategies that can be adapted by water service providers to enhance their financial performance. This research will test by conducting Multivariate analysis of variance (MANOVA) the relationship and significant impact of price as predictor over many dependent parameters as staff productivity, daily consumption, energy cost, service provider size, service provider structure, non-revenue water,

collection efficiency, and profit or loss percentage of Palestinian water service providers. When one predictor and many respond variables, the MANOVA technique is used to test whether there is significant difference between groups based on the independent variable [15].

The research mainly depends on secondary data that has been collected from published performance indicator reports of Palestinian water service providers. The performance reports used to be published by Palestinian Water Authority (PWA); but currently are published by Water Sector Regulatory Council (WSRC); with full support as financial and technical advisors team by Deutsche Gesellschaftfuer Internationale Zusammenarbeit (GIZ) Water Program. According to the WSRC, the published data in 2016 report covers more than 70% of the total Palestinian population. Expressed in other terms, the sample size in this research will include all water service providers that deliver water services to more than 70% of the Palestinian population. The sample size of this research contains three Palestinian water regional utilities, 5 joint service councils, and 55 water departments in the municipalities; this comes to 63 Palestinian water service providers. However, to enhance the representative sample, a cross sectional data will be considered; where, this paper includes all data in performance reports from year 2010 and up to year 2015 for all service providers.

Those observations will be analyzed and tested using Statistical Package for Social Science (SPSS). Both descriptive and inferential analyses will be carried out. The purpose of this inferential test is to know whether significant differences appeared in those performance dimensions based on the average price of water providers.

In this paper, the water prices are classified into three broad categories based on the current water average prices. The average price of cubic meter is calculated by dividing the total net sold quantity during the year by water service provider over the number of cubic meters invoiced. The low level category includes range from lowest price up to 33% of the highest average price. However, for the high category, it starts from 66% of the highest price, therefore, the medium category is in between low and high. Table 1 summarizes the range and the number of water service providers in each category.

The performance areas that are affected by average water price are selected from those observations to achieve financial sustainability of service providers. Four elements have been considered: firstly, profit or loss generated by service provider. For this factor, operating and maintenance cost is considered. On the

Table 1. Price categories.

Price Category	Price Range NIS	Average Price NIS	No of Water Providers
Low	0.81 to 2.75	1.66	57
Medium	2.76 to 5.50	4.19	50
High	5.51 to 8.31	6.14	36

other hand, gross profit margin and working ratio have been included to support this factor. Generally, less cost and high price, produce more in gross and net profit margin. Secondly, consumption, the average consumption may be indicated as the ability of Palestinian service provider whether municipality, regional utility, or council to deliver a good quality of services and continuous supply. The consumption pattern always affected directly by the price and tariff structure.

Thirdly, the collection efficiency dimension. This aspect is correlated with the profit generating since, this profit shall be collected and changed into cash inflow to enable service provider to pay due invoices and operating expenses. The lower the collection efficiency, the less liquidity the water utility may experience. For this reason, collection efficiency has been reflected as a key performance indicator. The last dimension in this performance is service providers' efficiency in non-revenue water reduction and employees' productivity. The less the non-revenue water percentage, the more the management efficiency, and hence the financial sustainability.

To enhance the analysis especially the degree of relationship between variables, a correlation matrix is considered in this research since it is one of the most common and useful statistics. The correlation measures the strength and direction of linear relationships between price and other performance indicators as profit, working ratio, non-revenue water, collection efficiency and so forth. By extension, the correlation evaluates whether there is statistical evidence for a linear relationship among those variables in the population [16].

6. Data Analysis and Discussion

The cross sectional data is analyzed and tested using Statistical Package for Social Science (SPSS). Both descriptive and inferential analyses have been carried out. Appendix Table A2 summarizes the collected data from performance reports of Palestinian water service providers. The table shows 143 observations for near to 65 water service providers. The data covers the period from year 2010 and up to year 2015. However, Appendix Table A3 proposes multiple and significant comparisons between those prices. The approximate multivariate for Wilk's Lambda analysis as in Appendix Table A2 shows that overall model is significant where p = 0.000 [17]. Therefore, there is a statistically significant difference in performance of water service providers based on the price categories, where F = 20.620, p < 0.0005 and Wilk's Λ = 0.151.

6.1. Profitability Analysis

The major performance area for water providers is the bottom line in their income statement. It is expressed by the working ratio; it equals total amount of operation and maintenance expenses incurred by water provider over operating revenue generated during the year. The purpose of this ratio hence is to measure the ability of water provider to cover operating and maintenance cost from

revenues, and whether the remaining amount will cover capital allocation and investment. The default amount of this ratio is 1, wherein total revenue equals total operating and maintenance expenses. Less than 1 means revenue covers operating expenses with considerable margin. Back to **Appendix Table A1**, it shows the higher the water price of cubic meter, the less the working ratio will be. This can be explained as water providers can generate more operating profit compared with water providers that set their price at low and medium categories. Again, the operating cost per cubic meter for all water providers is considered in this calculation.

Appendix Table A3 shows that there is significant difference in working ratio between low and medium price categories, low and high, and therefore between medium and high. To gofarther in the analysis, the operating and maintenance cost is considered. **Appendix Table A1** sketches positive relationship between price category and cost per cubic meter. The higher the cost of cubic meter, the higher the average price. The results reveal that there is significant difference in operating and maintenance cost based on the three categories of water prices.

As a general rule, the working ratio and gross profit are affected by revenue and cost. The more in billed revenue and less in recognized cost, the more in profit achieved by water service providers. The sales price of cubic meter plays major factor in revenue calculation, therefore, it's necessary to set average price and average cost per unit sold, side by side with net profit and average consumption per capita per day.

Table 2 shows high loss rate incurred by water providers that set their prices in low category. The high category covers operating and maintenance cost without inclusion of deprecation. The correlation table proposes negative and significant relationship between working ratio and average water price from one side; and positive relationship with operating and maintenance cost from the other side. This implies that Palestinian water providers always set their prices based on the cost, but without full knowledge on the cost calculation. Those results are in conformity with previous study that showed fitted lines of average cost and average price. The researcher concluded that Palestinian water service providers, especially large providers always set water tariff based on calculated cost [18].

6.2. Average Consumption Analysis

The core service of water providers is to deliver good quality water to the customers. If there is no water to deliver, then, the customer will not receive the

Table 2. Price cost relationship.

Price Category	Average Price NIS	Average Cost NIS	Net Profit or Loss	Consumption l/c/d	Bills Collection
Low	1.66	2.67	−70.0%	116	52%
Medium	4.19	4.76	−10.0%	68	68%
High	6.14	5.84	5.00%	72	72%

required quantity and therefore the average daily consumption per capita per person will be at the low level. In Palestine, the customers in Qalqilia and Jericho service providers have an average consumption of 170 and 271 liters per person per day respectively. Where in Dahiriya and Yatta municipalities, the average consumption quantities reaches 31 liters per person per day. Leaving other things constant, the main reason for this variation between high and low consumption is water availability. In Qalqilia and Jericho, wherein large consumption quantities, the water providers are delivering in continuous supply mode. However, high intermittent supply is appearing in low consumption areas, *i.e.* the customers in Yatta and Dahiriya may wait for more than one month to receive their share of water especially in the summer season.

Appendix Table A1 shows high daily consumption in the areas of low water prices *i.e.* Qalqilia, Jericho and Zeita. However, when the average prices move into high category, the consumption decreases by 50%. The major reason for this decreasing in addition to high price is the water shortage in that areas. The multiple comparison table displays $p < 0.05$; this implies that there is significant difference in Palestinian customer consumption based on the three price categories.

6.3. Non-Revenue Water Analysis

Appendix Table A1 shows non-revenue water percentage is low in high price-segment, which means that it is high percentage in low price category. The non-revenue water is near to 36% in low price category, 31% in medium, where, its 28% in high category. From statistic point of view, there is significant difference in non-revenue water based on low and high price category; however, no significant difference is found between the other categories. In Palestinian water sector, the water providers that deliver water in low price have less interest to decrease the non-revenue water. Mathur & Vijay, [5] found that customers give little or no attention towards conservation of water since its inexpensive and available. However, when the cost of cubic meter is relatively high, no water available, the intension is to save the quantity of water and high cost, therefore the non-revenue water percentage is less.

The correlation table displays negative relationship between price from one side and non-revenue water from the other side. The more the daily consumption, the less the non-revenue water is. In Palestine, some water providers have non-revenue water projects, especially from international donors, so changing unmetered to be metered; this decreases the non-revenue water percentage. In North West Jenin Council, this Palestinian water service provider has non-revenue water 39%, number of connections is 6000, network length is about 505 km, capital expenditures by USD 500,000, from its own tariff has been disbursed to decrease the non-revenue water. Many activities have been followed such as nigh flow, changing some network pipes, meters, and so forth. Within two years, the non-revenue water becomes less than 20%.

From financial point of view, high price of cubic meter means covering cost

and possibly allocating part of surplus for development projects including non-revenue water reduction projects. In this setting, the low in price and less in quantity sold, results less in revenue generated by water utility, which to that end leads to less in financial performance. A study shows high impact of price and consumption on non-revenue water. The increasing price by one unit, results in decreasing the non-revenue water by 0.346 [9].

6.4. Collection Efficiency Analysis

Showing surplus in the income statement of water service provider without change surplus into cash inflow; would be difficult for water service provider to continue providing water services to customers. Cash inflow is the lifeblood of the water providers. Its important because it later becomes payments for things that make providing water services run; such as administrative expenses, employees, rent, and other operating expenses. Therefore, the ability of water provider to collect water bills from its customers is an indicator for management efficiency. The more the invoice payment promptly by the customers, the more the financial sustainability for water services providers. Naturally, positive cash flow is preferred. Positive cash flow means water service provider is running smoothly. High positive cash flow is even better and will allow to make new investments; *i.e.* expand the water services into new areas, expand the water network, purchasing pumps and others. The negative cash flow refers to more money paying out than being coming from customers. That is why water bills collection is core indicator for sustainability and services continuity.

This research demonstrates that low price category of the Palestinian water providers may collect only 52% from their annual water bills; the medium category providers collect 68%, where high price category providers collect 72%. For the low price category, the water providers may collect only half of its annual revenue. The other part *i.e.* 48% of annual water sales will always be accumulated into next year as account receivables. The Table 2 shows that loss in the price category reaches up to 70%. This implies that half of this revenue always not recovered and recognized due to collection problem.

In the Palestinian water sector, some of the strategies are always implemented in high price category of service providers. Those strategies lead to an increase in the collection efficiency such as installing prepaid meters instead of postpaid meters, implementation of an advanced technology such as mobile software, quality of water services provided, quality of other services provided, and customers' satisfaction. All those predictors motivate customers to pay their water bills (Murrar, 2017). Appendix Table A4 shows positive and significant relationship between the collection efficiency and the average water sales price. The more water price for cubic meter, the more the collection efficiency.

6.5. Water Production Analysis

In Palestine, the water supply for service providers comes from generally two

sources: water production and bulk purchases. It has been noted that water providers that depend on production rather than purchases such as Qalqilia and Zeita incurred less cost, charge low price to customers, and have more water available therefore, more daily consumption by consumers. Appendix Table A4 shows highest and inverse relationship between the average price and dependency of water provider on production rather than purchasing. The more the dependency on production, the less the price of cubic meter charge. In Palestine, the bulk purchase price of cubic meter is near to 2.86 NIS; however, on average the cost of producing one cubic meter from own wells of water providers doesn't exceed 2.0 NIS. In Balkan countries, a study shows negative relationship between water production and the cost; *i.e.* the more the production and consumption, the less the cost per cubic meter [19].

The findings of this paper demonstrate that, the water providers which produce rather than purchase have incurred more non-revenue water and less operating and maintenance cost. This means that, there will be considerable quantity of water losses during the production and transmission process. Kingdom, Liemberger & Marin, [20] estimated from limited set of projects in developing countries, the unit cost of reducing physical leakage range from $215 to $550. Therefore, those experts who suggest the establishment of water utility should conduct cost benefit analysis before moving on with the decision. In Palestine, the water providers especially those produce rather than purchase such as Jericho and Qalqilia consider the cost and the effect of fixing physical leakage.

Low cost of water producers not necessary means more profit. The results presented in Appendix Table A4 prove insignificant relationship between water providers that have private wells and the working ratio. The reason for that is simply that the water providers set their sales price of cubic meter at a low level without covering operation and maintenance cost. Another weak performance for this water provider's category is the deficiency of bill collection. The results show that water providers who have private wells are inefficient in bills collection from the customers comparing with the water providers that don't have own wells, and purchase from other resources. One reason for this variation is that the water providers shall pay water invoices to the bulk supplier "West Bank Water Department". The more the pressuring from the bulk supplier on water provider to pay or schedule the due invoices, the high the collections rate of water provider from the end customers.

7. Conclusions & Policy Implications

Studies investigated water tariff and its relation to different financial performance and social equality are abundant. Their importance lies in the fact that water prices play a major role in the financial sustainability and achievement in technical areas. Some authors find that high water prices cause more revenue for water service providers. This condition paves the way toward expanding water services into new areas, capital investment as renewal capital assets, therefore,

higher efficiency and improved financial sustainability. However, others may argue that low water prices encourage the customers to pay their due water bills, decrease non-revenue water, illegal connections, and allowing people to consume the required quantity of water; since it becomes available at reasonable and affordable prices. The main purpose of this study hence is to evaluate the effect of independent parameter *i.e.* water sales price on different financial performance aspects. In addition, this study aims to come up with practical implication for decision makers whether encouraging increasing water price or keeping it at low level.

The result of this study indicates higher working ratio or profit can be generated for the water providers that set high price for each cubic meter sold. This means that there will be significant difference in profit achieved based on the low, medium, and high price categories. On the other hand, positive relationship between price categories and cost per cubic meter is found. The higher the cost of cubic meter, the higher the water average price. The implication for this argument is that the Palestinian water providers consider the cost in pricing strategy, but with no full coverage methodology. The descriptive statistic table shows high daily consumption in the areas of low water prices such as Qalqilia, Jericho, and Zeita. However, when the average prices move into the high category, the consumption is decreased by 50%. The major reason for this decreasing in addition to high price is the water shortage in those areas.

In Palestinian water sector, non-revenue water is an indicator for the efficiency of water provider. The providers that deliver water in low price have less interest to decrease the non-revenue water. However, when the cost of cubic meter is relatively high with water shortages, the intension becomes focused on saving the quantity of water and to decrease the high cost, therefore non-revenue water percentage is lowered. The non-revenue water is near to 36% in low price category, 31% in medium, where, its 28% in high category.

Other focus area on this paper hence, is the collection of water bills from customers. The more the invoice payment promptly by the customers, the more the efficiency and financial sustainability for water services providers. The results of those investigations show that low price category of the Palestinian water providers can collect only 52% from their annual water bills; the medium providers collect 68%, where, large providers collect 72%. This means the more the price per cubic meter, the more the collection percentage.

Appropriate costing and pricing mechanisms are important to enable of all water providers toward better financial performance and financial sustainability. Increasing water price gradually will enhance revenue stream for Palestinian water service providers, achieve surplus, decrease non-revenue water, and increase collection rate or percentage of water bills from customers.

Acknowledgements

Water Research at the Sultanate of Oman. We would like to express our deepest appreciation to MEDRC for publishing this paper. The deepest gratitude also to Palestinian Water Authority (PWA) for valuable, effective supervision, coordination of the scientific researches, and directing them toward finding creative solutions for current water problems.

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Appendix

Table A1. Descriptive statistics.

	Price Category	Mean	Std. Deviation	N
Working Ratio	Low	1.5953	1.39800	57
	Medium	1.0226	0.21983	50
	High	0.8775	0.14948	36
	Total	1.2143	0.94493	143
Non-Revenue Water	Low	35.4163	10.20977	57
	Medium	30.9704	12.12426	50
	High	28.6394	11.19763	36
	Total	32.1557	11.42957	143
Staff Productivity	Low	4.9379	2.58508	57
	Medium	4.6030	2.57085	50
	High	4.9386	2.75610	36
	Total	4.8210	2.61038	143
Collection Efficiency	Low	52.0995	23.85310	57
	Medium	68.5330	28.71634	50
	High	72.1822	18.24631	36
	Total	62.9013	25.90054	143
O&M Cost	Low	2.6767	2.55240	57
	Medium	4.7590	1.63699	50
	High	5.8425	1.18458	36
	Total	4.2017	2.35907	143
Consumption	Low	116.2007	58.40227	57
	Medium	83.7160	42.97105	50
	High	64.8086	22.64441	36
	Total	91.9045	50.55069	143
Production Percent	Low	84.7728	33.11925	57
	Medium	30.4644	40.54653	50
	High	26.2272	37.20015	36
	Total	51.0451	45.85724	143
Location	Low	94.9924	49.36105	33
	Medium	87.0861	62.07258	59
	High	95.4808	34.37540	51
	Total	91.9045	50.55069	143

Table A2. Multivariate Tests[a].

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	0.987	1027.019[b]	10.000	131.000	0.000
	Wilks' Lambda	0.013	1027.019[b]	10.000	131.000	0.000
	Hotelling's Trace	78.398	1027.019[b]	10.000	131.000	0.000
	Roy's Largest Root	78.398	1027.019[b]	10.000	131.000	0.000
Price Category	Pillai's Trace	1.009	13.447	20.000	264.000	0.000
	Wilks' Lambda	0.151	20.620[b]	20.000	262.000	0.000
	Hotelling's Trace	4.564	29.669	20.000	260.000	0.000
	Roy's Largest Root	4.319	57.007[c]	10.000	132.000	0.000

[a]Design: Intercept + Price Category. [b]Exact statistic. [c]The statistic is an upper bound on F that yields a lower bound on the significance level.

Table A3. Multiple comparison.

Dependent Variable	(I) Price	(J) Price	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Working Ratio	L	M	0.5727	0.18776	0.010	0.1113	1.0340
		H	0.7178	0.18684	0.001	0.2584	1.1771
	M	L	−0.5727	0.18776	0.010	−L340	−0.1113
		H	0.1451	0.03984	0.001	0.0480	0.2422
	H	L	−0.7178	0.18684	0.001	−1.1771	−0.2584
		M	−0.1451	0.03984	0.001	−0.2422	−0.0480
Non Revenue Water	L	M	4.4459	2.18374	0.128	−0.8605	9.7523
		H	6.7769	2.30472	0.013	1.1379	12.4158
	M	L	−4.4459	2.18374	0.128	−9.7523	0.8605
		H	2.3310	2.53435	0.738	−3.8516	8.5135
	H	L	−6.7769	2.30472	0.013	−12.4158	−1.1379
		M	−2.3310	2.53435	0.738	−8.5135	3.8516
Staff Productivity	L	M	0.3349	0.49942	0.878	−0.8772	1.5470
		H	−0.0007	0.57292	100	−1.4017	1.4003
	M	L	−0.3349	0.49942	0.878	−1.5470	0.8772
		H	−0.3356	0.58582	0.920	−1.7675	L963
	H	L	0.0007	0.57292	1.00	−1.4003	1.4017
		M	0.3356	0.58582	0.920	−L963	1.7675
Collection Efficiency	L	M	−16.4335	5.14534	0.006	−28.9381	−3.9289
		H	−20.0827	4.38519	0.000	−30.7575	−9.4080
	M	L	16.4335	5.14534	0.006	3.9289	28.9381
		H	−3.6492	5.07352	0.854	−16.0131	8.7147
	H	L	20.0827	4.38519	0.000	9.4080	30.7575
		M	3.6492	5.07352	0.854	−8.7147	16.0131
Operating & Maintenance	L	M	−2.0823	0.40974	0.000	−3.0779	−L867
		H	−3.1658	0.39150	0.000	−4.1194	−2.2122
	M	L	2.0823	0.40974	0.000	L867	3.0779
		H	−L835	0.30426	0.002	−1.8248	−0.3422
	H	L	3.1658	0.39150	0.000	2.2122	4.1194
		M	L835	0.30426	0.002	0.3422	1.8248
Consumption	L	M	32.4847	9.83714	0.004	8.6044	56.3650
		H	51.3921	8.60713	0.000	30.3940	72.3902
	M	L	−32.4847	9.83714	0.004	−56.3650	−8.6044
		H	18.9074	7.15359	0.029	1.4514	36.3634
	H	L	−51.3921	8.60713	0.000	−72.3902	−30.3940
		M	−18.9074	7.15359	0.029	−36.3634	−1.4514

Continued

	L	M	54.3084	7.21970	0.000	36.7596	71.8572
		H	58.5456	7.59499	0.000	39.9542	77.1369
Production Percent	M	L	−54.3084	7.21970	0.000	−71.8572	−36.7596
		H	4.2372	8.44516	0.944	−16.3633	24.8377
	H	L	−58.5456	7.59499	0.000	−77.1369	−39.9542
		M	−4.2372	8.44516	0.944	−24.8377	16.3633
	L	M	0.013	0.1466	000	−0.343	0.368
		H	−0.308	0.1595	0.161	−0.698	0.081
Water Provider Size	M	L	−16.4335	5.14534	0.006	−28.9381	0.343
		H	−20.0827	4.38519	0.000	−30.7575	0.066
	H	L	16.4335	5.14534	0.006	3.9289	0.698
		M	−3.6492	5.07352	0.854	−16.0131	0.708
	L	M	−0.175	0.1034	0.261	−0.428	0.079
		H	−0.839	0.1491	0.000	−1.210	−0.468
Water Provider Structure	M	L	0.175	0.1034	0.261	−0.079	0.428
		H	−0.664	0.1719	0.001	−L86	−0.243
	H	L	0.839	0.1491	0.000	0.468	1.210
		M	0.664	0.1719	0.001	0.243	L86
	L	M	0.907	0.1506	0.000	0.541	1.273
		H	0.917	0.1625	0.000	0.519	1.315
Water Provider Location	M	L	−0.907	0.1506	0.000	−1.273	−0.541
		H	0.010	0.1800	000	−0.429	0.449
	H	L	−0.917	0.1625	0.000	−1.315	−0.519
		M	−0.010	0.1800	0.000	−0.449	0.429

Based on observed means. The error term is Mean Square (Error) = 0.604.

Table A4. Correlation matrix.

		WRO	NRW	STP	CLE	OMC	CPA	WPP	SZE	STR	LOC	PCT
Working Ratio	r	1	0.217	0.111	0.024	0.440	−0.129	0.015	−0.291	−0.154	0.293	−0.317
	Sig.		0.009	0.187	0.778	0.000	0.125	0.855	0.000	0.067	0.000	0.000
	N	143	143	143	143	143	143	143	143	143	143	143
Non Revenue Water	r	0.217	1	0.380	−0.152	0.025	−0.085	0.433	0.278	−0.291	0.127	−0.242
	Sig.	0.009		0.000	0.069	0.768	0.312	0.000	0.001	0.000	0.131	0.004
	N	143	143	143	143	143	143	143	143	143	143	143
Staff Productivity	r	0.111	0.380	1	−0.027	0.073	0.127	0.387	0.236	−0.079	−0.104	−0.008
	Sig.	0.187	0.000		0.749	0.384	0.132	0.000	0.005	0.347	0.218	0.922
	N	143	143	143	143	143	143	143	143	143	143	143
Collection Efficiency	r	0.024	−0.152	−0.027	1	0.320	−0.047	−0.146	−0.017	0.159	−0.460	0.325
	Sig.	0.778	0.069	0.749		0.000	0.581	0.083	0.842	0.058	0.000	0.000
	N	143	143	143	143	143	143	143	143	143	143	143

Continued

Operating & Maintenance Cost	r	0.440	0.025	0.073	0.320	1	−0.494	−0.564	−0.005	0.222	−0.111	0.548
	Sig.	0.000	0.768	0.384	0.000		0.000	0.000	0.956	0.008	0.185	0.000
	N	143	143	143	143	143	143	143	143	143	143	143
Per Capita	r	−0.129	−0.085	0.127	−0.047	−0.494	1	0.394	0.015	−0.337	−0.083	−0.413
	Sig.	0.125	0.312	0.132	0.581	0.000		0.000	0.861	0.000	0.323	0.000
	N	143	143	143	143	143	143	143	143	143	143	143
Production Percent	r	0.015	0.433	0.387	−0.146	−0.564	0.394	1	0.148	−0.292	0.044	−0.543
	Sig.	0.855	0.000	0.000	0.083	0.000	0.000		0.078	0.000	0.605	0.000
	N	143	143	143	143	143	143	143	143	143	143	143
Provider Size	r	−0.291	0.278	0.236	−0.017	−0.005	0.015	0.148	1	0.069	−0.116	0.147
	Sig.	0.000	0.001	0.005	0.842	0.956	0.861	0.078		0.413	0.168	0.079
	N	143	143	143	143	143	143	143	143	143	143	143
Provider Structure	r	−0.154	−0.291	−0.079	0.159	0.222	−0.337	−0.292	0.069	1	−0.253	0.454
	Sig.	0.067	0.000	0.347	0.058	0.008	0.000	0.000	0.413		0.002	0.000
	N	143	143	143	143	143	143	143	143	143	143	143
Provider Location	r	0.293	0.127	−0.104	−0.460	−0.111	−0.083	0.044	−0.116	−0.253	1	−0.442
	Sig.	0.000	0.131	0.218	0.000	0.185	0.323	0.605	0.168	0.002		0.000
	N	143	143	143	143	143	143	143	143	143	143	143
Price Category	r	−0.317	−0.242	−0.008	0.325	0.548	−0.413	−0.543	0.147	0.454	−0.442	1
	Sig.	0.000	0.004	0.922	0.000	0.000	0.000	0.000	0.079	0.000	0.000	
	N	143	143	143	143	143	143	143	143	143	143	143