

## Arab American University

## **Faculty of Graduate Studies**

## The Discrepancy in Water Sales Prices in Palestine: Social Equity for the Household Customers and Financial Performance of the Water Service Providers

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#### The Discrepancy in Water Sales Prices in Palestine: Social Equity for the Household Customers and Financial Performance of the Water Service Providers

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Imum

#### Abstract:

According to the Palestinian Central Bureau of Statistics there are some considerable discrepancies in important economic indicators among the various Palestinian areas. The prices of some goods and services are high in a given area, while in other areas the same goods and services may be lower significantly. That is, the water price is NIS 1.54 per cubic meter in Qalqiliya city, which is lower by more than three times than the water price in the Ramallah city which is at NIS 6.78 per cubic meter. discrepancy in water prices leads feelings lack of inequality in social justice among people in given city and another. In total this feeling may increase and affect the stability of communities and society. Therefore, the local and community development process would be negatively affected. Hence, it is necessary for government and policy makers to monitor these differences, their size, their drivers, their focus, to provide community sustainability and prosperity. This thesis aims to study the discrepancies in water price of the water service providers in the West Bank and the Gaza Strip, and to correlate these discrepancies with the financial and technical performance indicators such as the per capita, non-revenue water, staff productivity, operating cost. It is important also to know the direction of the relationship between the average water price and the performance indicators while positive or negative relationship. To achieve the expected results, this thesis will test by conducting Multivariate Analysis of Variance (MANOVA) the relationship and significant impact of average water price as predictor over many dependent parameters. The sample size in this thesis has included all water service providers that deliver water services to more than 80% of the Palestinian population. The study shows that there are more than 250 water tariffs in the West Bank and the Gaza Strip for about 273 Water Service Provider in Palestine. There is also a significant difference in the performance indicators for water providers based on the average water price. The low price category of water service providers is the worst category in performance. The low price category includes the highest percentage of water losses, the lowest collection rate of the accumulated debts, the highest percentage of water consumption, the lowest productivity of staff, and the highest percentage of financial losses. These indicators are particularly give the decision makers the worries about the sustainability of water sector especially that there is, 44% of water service providers falls under this category.

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## List of Abbreviation

Abbreviation	Meaning
AFD	L'Agence Française de Développement
CMWU	Coastal Municipal Water Utility
СоМ	Council of Minister
DOI	Digital Object Identifier
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IBNET	International Benchmarking Network for Water and Sanitation Utilities
IWA	International Water Association
IWRM	Integrated Water Resources Management
JWU	Jerusalem Water Undertaking
KFW	Kreditanstalt für Wiederaufbau
MoLG	Ministry of Local Government
NRW	Non-Revenue Water
PWA	Palestinian Water Authority
UFW	Unaccounted for Water
UN	United Nation
UPWSP	Union of Palestinian Water Service Providers
WB	World Bank
WBWD	West Bank Water Department
WSP	Water Service Providers
WSRC	Water Sector Regulatory Council
WSSA	Water Supply and Sewerage Authority
PCBS	Palestinian Central Bureau of Statistics
MENA	Middle East and North Africa



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# **Chapter One: Introduction**

**Problem Definition** 

**Research Hypothesis** 

**Research Significance** 

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#### Introduction

In general, the results from studies and investigations that showed differences between social groups in given society, or differences among various areas are the key to political intervention from government to update its policies, investments from donors to decrease the gap, and interest from civil society institutions to advocate the marginalized groups and areas.

In Palestine, according to the Palestinian Central Bureau of Statistics (PCBS) there are some discrepancies in important economic indicators between the various Palestinian areas. By looking to one of the most important economic indicators which is the percentage of unemployment, there is a considerable difference between the town of Qatneh, northwest of Jerusalem, for example, and the town of Mazraa Sharqeya, northeast of Ramallah. The unemployment percentage in Qatneh is 30.7%, while in Mazraa Sharqeya is 5.3%. i.e. a difference of about six times between the two towns. (Palestinian Central Bureau of Statistics, 2018).

As in depth comparison, the number of population in Qatneh is 6,981 persons, while in Mazraa Sharqeya is 4,063; but the total space area in Qatneh is only 3,936 Acres, while the Mazraa Sharqeya total speace is 16,437 Acres in. In other words, the population of Mazraa Sharqeya town is twice as small as the population in Qatneh, while the land area of Qatneh does not exceed one quarter of Mazraa Sharqeya area. Most of the Mazraa Sharqeya is located in Area A and B, while there is no land in Qatana, two thirds of which is located within Area C. (Applied Research Institute, ARIJ, 2012).

In addition to the previous example, about half of the workforce in Qatneh depends entirely on the work inside Israeli areas, while only 1% of the workers in the Mazraa Sharqeya work within the Israeli areas. These differences also apply to livestock from cattle, goats, poultry, hives and others. (Palestinian Ministry of Agriculture, 2010).

As a result of these differences in economic capabilities, the prices of goods and services vary in the different Palestinian areas. The prices of some goods and services are high in a given area, while in others they may be low. For example, the water price is NIS 1.54 per cubic meter in Qalqiliya city, which is higher by more than three times than the water price in the Ramallah city which is at NIS 6.78 per cubic meter. The reason for this is that there is water in Qalqiliya area within the Western Basin in Palestine, while not available in Ramallah and relying on the purchase

from Israeli company Microt (Through West bank Water Department" WBWD") at high prices. (Water Sector Regulatory Council, 2016).

It is clear that there are differences between the Palestinian areas in many economic levels. In general, differences in economic capabilities, price discrepancies may lead feelings lack of inequality in social justice between one city and another; or in the same city but in different areas and neighborhoods. In total this feeling may increase and affect the stability of communities and society such as social and political problems. Therefore, the local and community development process would be negatively affected. Hence, it is necessary for government and policy makers to monitor these differences, their size, their drivers, their focus, to provide community sustainability and prosperity.

Water is at the heart of sustainable development and is essential for socio-economic development, energy, food production, ecosystem integrity and human survival. Water is also at the heart of adaptation to climate change, acting as a link between society and the environment. Water is also a matter of rights (United Nations, 2018). As the world's population increases, the need for a balance between all the requirements of water resources is increasing, allowing communities to get enough water.

Water prices in countries that face limited water resources are a reflection of those countries polices. The water policy is important in those countries because it touches an important part of social and economic policies on the one hand, and it works as a mechanism and regulatory tool for managing water consumption on the other hand. Despite of the limited water resources in Palestine due to the Israeli occupation of 80% of the sources. Water tariffs in Palestine are not built based on economic or social criteria, and are in many cases considered as violation of one of the fundamental rights (Tamimi, 2015).

According to (Tamimi, 2015) in this issue, there is a difference in water pricing between the governorates and water serve providers. None of the water prices are based on a specific tariff policy that takes into account the economic and social dimensions such as poverty, marginalization, number of family members, amount of family income, etc. The current policy concentrates on the consumption and on the Principle Polluter Pays. i.e. no linkage with the family income and marginalized groups (State of Palestine, 2013).

However, others may argue that tariff for water and wastewater services, is the appropriate price a user of these services is expected to pay. The consumer of water services and the user of wastewater may be low or high level of income; therefore, a different price blocks are set to achieve the user appropriate price (David Laredo, 1991). The tariff blocks in Palestine hence are four according to the 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 meter for high consumption issue, and the last block is more than 30 cubic meters. By this structure, the policy adapts the social equity and considers the low level income of household customers.

A field study prepared by the Palestinian Hydrological Group showed that some low income families in southern area in Hebron governorate for instance pay from 12-15% of their income to buy water while middle and high income families pay less than 2% of their monthly income. This requires actions from policy makers based on social justice that is the foundation of sustainable development (Tamimi, 2015).

Equity is a word that is used with a range of meanings. In the case of water, equity has to do with fair distribution – both of resources and of and responsibilities. The distribution of resources assures of water via fair pricing system; it also relevant to the responsibility associated with urban water such as the need, at times, to conserve water. (CUAC, 2011). Consumers always react negatively when they feel that water distributions are unbalanced, especially in the intermittent supply, water shortages, and when basic needs are not being met, or if there are big unfair discrepancies between customers or groups of customers especially in the prices.

So far, there are differences in water sales prices between the Palestinian areas, which in turn causes the citizen who suffers from water shortage and high prices to feel uncomfortable when comparing himself or herself with the citizen who lives in areas where water prices are low and are available in continuous supply. Different water prices also have an impact on the financial performance of water service providers. In general, finding a way to measure the current performance, services expanding, and sustainability of water service providers has been one of main concerns of regulatory bodies, Non-profit organizations and government entities around the world, especially when the performance linked with variation in water sales prices. Like 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 operation, management, and structure as a natural monopoly.

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

In essence, the number and the choice of the indicators are important to whether it gives full image about different performance areas of water service providers. For financial management, profitability, and bills collection efficiency have received considerable interest since they are core indicators. The profitability can be measured by the working ratio. This ratio simply equals the total amount of operating and maintenance expenses incurred by service provider over the total operating revenue generated during the year. The result of this ratio can be explained as the ability of the service provider to cover operating and maintenance cost from the recognized revenue; and whether will be remaining amount to cover capital expenditures for investment and expansion the water services into new areas. Since the overall objective of the water provider is to deliver the service rather than achieve profit; the default amount of this ratio may be one. Wherein total revenue equals total operating expenses. Less than one however, means revenue covers operating expenses with considerable profit margin.

Showing 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 is important because it later becomes payment for things that make providing water services run; such as admin expenses, employees, rent, and other operating expenses. Therefore, ability of service provider to collect water bills from its customer is an indicator for management efficiency. The more the invoice payment promptly by the customers, the more the financial sustainability for the 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.

In some countries, the efficiency of water bills collection may be compared with other performance indicators of the service provider to make sure whether there is effect on overall performance. Some researchers find correlation between the customer's payment and non-revenue water. Low level of customers' 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' good financial performance; the water providers can achieve profitability by increasing the price or water tariff, decrease the cost and administrative expenses or both at the same time. The more the price and the less the cost, the more the achievement of financial performance. Therefore, the strong financial position is a matter of collection the receivables, profitability, covering the operating expense, ability to allocate for capital investment, minimal level of non- revenue water, and payment to the water bulk supplier. All those financial performance areas have direct effect on the water price and vice versa.

In Palestine, the average financial loss in water service is near to 30%. This means that the water service providers shall increase their price to generate revenue that sufficiently covers the operating and maintenance cost. The average price in all Palestinian water service providers is near to 3.5 NIS; where in West Bank equals to 4.7 NIS per cubic meter, and in Gaza is about 1.7 NIS. A study shows that increase in water price by one NIS leads to decrease the non-revenue water by 0.21 unit, and increase the financial viability and profitability by 0.81 unit. From financial point of view, high price of cubic meter means covering cost and possibly allocating part of surplus for non-revenue water reduction projects. In this setting, high in water price and more in quantity sold, results more in revenue generated by water provider.

As a general rule, high water price leads to decrease the quantity consumed. In Economic the demand is how many goods and services are bought at various prices during a given period of

time. Demand is the consumer's need and wants to own the product or the service. It's constrained by the willingness and ability of the consumer to pay for the good or service at the price offered. The law of demand governs the relationship between the quantity demanded and the price. Again, increasing in water price leads to decrease the quantity demanded of water, other things being constant.

To pave the way for the financial sustainability and good performance, the Palestinian water tariff bylaw has been set to consider three main objectives. The first objective is cost recovery, wherein, the water providers shall cover the full cost including the operating, maintenance, deprecation, and loans. The second objective is the Economic efficiency, means that, price shall be as incremental blocks, therefore, the high level of consumption supposed to pay more. The last objective is the social equity, which considers the low income household. According to the current bylaw and policy, there is no specific guideline, article, or internal procedure for the tariff to fair distribution of the non-revenue water. The current water pricing policies charge the whole non-revenue water cost to the consumers, which is not a socially fair practice, the low level income shall pay against things that they are not responsible for all this cost. Expressed in other term, if a water service provider has water loss level of 50% of the system supply. The water utility will charge twice the price of water to recover the cost of this losses.

So, there are differences in water sales prices and costs among water service providers in Palestine. It is natural that rising water prices will lead to increased revenues and therefore increased profits. But it may also lead to decrease the water consumption and thus decrease the expected revenue that supposed to be generated. Some argue that increasing prices will lead to increased water thefts and illegal connections. High price may also result in lower receivables and cash collections. Thus weakening the financial position of the water service provider. It is worth to investigate this debate from different point of views, and to know how the variation in water price of service provides in Palestine is correlated with social equity of household's customers, and how these discrepancies in water provides affect the financial performance of water service providers.

#### **Problem Definition**

In Palestine, it becomes clear that there are differences in the water sales prices in various Palestinian areas. Some water service providers sell the cubic meter on average price by more than

five shekels, while other water service providers sell it less than two shekels. It is important to know whether the differences in sales price reflect social justice for the Palestinian citizens. Expressed in other term, and whether there is relationship between social justice and the difference in water prices. On the other hand, it is worth to assess the impact of water price variations on the financial performance of water service providers in Palestine. For example, test if increasing water prices will lead to increased revenues, reduce water losses and increase efficiency, or these deliverables can be achieved through low price.

Specifically, the research tries to answer two main questions:

Firstly, how does the sales price affect the financial performance of the water providers? For instance, does high price lead to increase the non-revenue water, thefts and illegal connections? Does the low price cause more debt collections?

Secondly, is the discrepancy in water sales price matches with the social justice in water consumption for the Palestinian people? For instance, does people who consume water at high price have sufficient access to the water resources, fair government subsidy, and thus have high per capita consumption?

Certainly there are different views and debate in this area. May given point of view is valid in one country, but not valid to other countries because of the different circumstances. For example, rising prices could lead to increased thefts and illegal connections in Kenya, but could lead to increased revenues and reduced losses in Europe.

The differences in water price have several reasons such as: high purchased costs when purchasing water from the West Bank Water Department, and high cost of operation and maintenance, especially if there is water pumping. Also because of the large percentage of water losses, whether due to thefts or because of the inaccuracy of water meters. There are also other reasons such as lack of proper pricing and accounting methods, especially fixing a price similar to neighboring areas, or consider water as a source of income for the service provider to pay the staff salaries of other services, especially most of Palestinian water providers are municipalities and those provide many services to the Palestinian citizens.

Knowing whether there are significant or insignificant differences between the Palestinian water service providers in sales prices is important and has an impact on stability and sustainable development. Reducing price variations consists with social justice. The suitable water price will increase the quality of service, expand the water service to other regions, and enhance financial sustainability of water service providers.

#### **Research Objectives**

The thesis aims to study the discrepancies in water price of the water service providers in the West Bank and the Gaza Strip, and to correlate these discrepancies in water prices with the financial and technical performance indicators such as the per capita, non-revenue water, staff productivity, operating cost, and other performance indicators of the water service providers. It is important also to know the direction of the relationship between the average water price and the performance indicators while positive or negative relationship. Also to examine whether there are significant differences between the performance indicators based on the average water price. Therefore, knowing and explaining the effect of the average water price on the financial performance of water service providers in Palestine and knowing also whether the average water prices in the Palestinian areas will add value for the policy makers to setup the bylaw and update the required laws to increase the performance of water sector, and to find tools that provide fair distribution and allocation of nature resources among the Palestinian peoples.

#### **Research Hypothesis**

In evaluating what variables and performance indicators can be affected and response to water sales price while positive or negative relationship; this thesis reiterates on the common notion that the sales price can affect on the non-revenue water, collection efficiency daily consumption, purchase cost, and other variables such as water provider size, location and ownership

#### **Statistical Hypotheses**

Following the null hypotheses that will be posed and evaluated with a significance level of 0.05.

*H*<sub>0</sub>-1: There is no significant relationship between Average Water Price and Working Ratio.

- *H*<sub>0</sub>-2: There is no significant relationship between Average Water Price and Collection Efficiency.
- $H_0$ -3: There is no significant relationship between Average Water Price and Non-Revenue Water.
- $H_0$ -4: There is no significant relationship between Average Water Price and Staff Productivity.

 $H_0$ -5: There is no significant relationship between Average Water Price and Account Payable.

 $H_0$ -6: There is no significant relationship between Average Water Price and Consumption.

 $H_0$ -7: There is no significant relationship between Average Water Price and Provider Ownership.

 $H_0$ -8: There is no significant relationship between Average Water Price and Provider Location.

 $H_0$ -9: There is no significant relationship between Average Water Price and Supply Hours.

H<sub>0</sub>-10: There is no significant relationship between Average Water Price and Operating Cost.

#### Non statistical Hypotheses

In analyzing the relationship between different financial performance indicators for water service providers and average prices, whether low, medium, or high prices, we assume that there is a relationship between water prices and working ratio. i.e. the higher the prices rise, the higher the revenue and therefore the higher the percentage of the total profit and this leads to the improvement in the financial performance of water service providers.

We also assume that the low prices will result in small amount of water bills. This will mean that the value of the water bill is a small proportion compared to the monthly income of the water consumer. When the water invoice has small amount, it gives the Palestinian customer incentive to pay the bill and thus increase collections with the water service provider and therefore increase cash revenues and improve financial performance.

We also assume that increasing water prices will lead to increased non-revenue water, because a citizen who does not have the ability to pay water will steal water and illegal connections. Therefore, we expect to see a strong correlation between the increase in the price of water and the non-revenue water.

This research assumes that increasing water prices will increase revenues. Therefore, the water service provider will be able to increase the salaries of staff and thus increase the productivity of workers. We also assume that increasing the price of water will lead to the payment of the water service provider to the West Bank Water Department. The assumption in this thesis is also that there is a relationship between the water service provider's location and the price of water. The

expect prices to be lower in the north due to the water availability, while high price in the south because of the lack of water in that areas.

#### **Research Significance**

Water is a basic need for human beings. The comprehensive study that covers the change in water prices between the Palestinian governorates and the various water service providers in Palestine is useful and draws the attention of decision makers, international donor institutions, and civil society organizations that take care of human rights and social justice. The results of this thesis benefit the Palestinian citizen in the importance of obtaining his or her rights through equality and justice among members of society in general. Indeed, living in given society with social equality and sharing wealth is better than living in other society that does not adopt or implement this theory. The harmonization of water prices with the water consumption, and the ability of citizens to pay the cost of water give more social justice and allow each citizen to contributes by his or her financial capacity. When citizen feels in social justice, overall public satisfaction will be achieved in the society from the political and social situation, as well as lead to sustainable development and a strong incentive to continue looking forward future.

The importance of this research also appears in improving the financial performance of water service providers in Palestine. The expectation is to receive answers to some questions and assumptions about the strength of the relationship between water selling price and other performance indicators. These indicators necessarily reflect the assessment of the financial position of the water service provider. Strengthening the financial position of the service provider will lead expansion in water service to new areas, and will increase the quality of service such as ability to continue water pumping in stable and regular basis. As well as will lead to payment the accumulated receivables to the bulk water provider, and therefore the entire water system is all linked with each other.

This research will add to the literature related to this field new results and there is possibility of benefiting from it at the regional level, especially the Middle East and North Africa countries MENA suffer from water shortage phenomenon. MENA region areas represent about 6% from total World population i.e. about 336 million, and contains only 1% of the fresh water available in the earth; the region is the most water scarce region in the world (World Bank, 2018).

Locally, the results of this thesis will benefit the WSRC by simplifying its monitoring programs on water service providers, and amalgamate the efforts of government, international donation agencies and water service provider's management to direct their effort and financial fund support to specific weakness and shortage in given area of water providers. Such as PWA water tariff policy to increase or decrease the water price, link the water price with annual income, provide regulatory tool for water tankers, and so forth. This can be performed by updating and quantifying strategies and policies to set proper milestones for the deliverables and achievement.

#### **Research Limitations**

The study is limited by place to include the water service providers in the West Bank's towns, camps including Area C, some areas in East Jerusalem, and the Gaza Strip. There are time limitations to this search. The data examined for this research covers up to financial data of year 2016 for all water providers, and data of performance indicators of years 2015, 2016 and 2017.

#### **Topics Arrangement**

This thesis is organized as: Chapter one provides for the introduction. During this, the preface about the water tariff and its relationship with the social equality and financial performance of water providers in Palestine and the MENA region, research hypothesis based on the selected variables and the limitations of this study also are included in this chapter. The limitations are mainly place, and time as well as the difficulties and obstacles the researcher faced during preparing this thesis. Difficulties of data collection process also included in this thesis because the researcher followed the data collection as project manager of this task. For the theoretical framework on this subject, chapter 2 is fully dedicated. Within chapter two the definition of water tariff, its types will be investigated in Palestine. The previous studies about this topic from Palestine, regional, and international published material will also be reviewed and documented for better understanding the concept. The relationship between the independent parameter and other response financial and technical indictors, background about water service providers in Palestine will also be studied. At the end of this chapter, the researcher will propose what the current study expect to add new value to the policy makers and international donors as well as to the Palestinian citizen; and how the current study differs from the previous studies that conducted in the same fields.

The third chapter will contain on the research methodology and design. Sub sections will be developed such as sample size and the justification because the data belong and represents all water providers in Palestine, data collection tools, and the interviews. Other section about the description of the model test, stated indicators to measure the validity, and how they will be verified. It noteworthy to mention here the variables of the study: independent variable, and dependent variables, as well as the design of the study such as descriptive and numerical tests, to test hypotheses as required by the research will be developed in this chapter.

The fourth chapter will present the results of the study by describing those findings through a narrative, tables and forms. This chapter also includes answer to the study questions directly and research hypothesis.

The last chapter will summarize the results from the previous chapter, and will propose scientific explanations of the findings. Therefore, the conclusion and recommendation. Of course, the chapter will refer to the previous studies that agreed with the current study and the studies that did not agree with the justification of this agreement or not in the Palestinian context. This chapter will end with direct recommendations to the decision makers and civil society that work in the fields of human rights, social equality and marginalized groups. As well as recommendations to the international donors based on the results of the study and its conclusions.

# **Chapter Two: Theoretical Framework**

**Tariff Definition** 

**Previous Studies** 

**Palestinian WSP** 

**Social Equality** 

**WSP Performance** 

**Tariff Bylaw** 

#### **Tariff Definition**

Water tariff is simply applying an economic monitoring tool to influence consumer behavior in terms of water conservation, efficient water use, and environmental protection (State of Palestine, 2013). Therefore, the tool works as an important incentive for demand management, cost recovery of water service, the scarce value of water, and the willingness of consumers to pay for additional investment in water services. High-income countries tend to apply a tariff for water systems based on full cost recovery and provided services, while low-income countries struggle to cover basic operating and maintenance costs and apply various governmental subsidy schemes to those consumers who are unable to pay for water services.

Setting tariff that covers the cost is one of drivers for financial sustainability. The sustainability requires sufficient income to cover not only current operating and maintenance of water service, but also the future financial liabilities, such as operating costs as well as the total cost of investments and construction. The value to be paid by the end consumer against his or her consumed quantity of water should be simple, and can be understood by the customer so that the consumers can see and understand how patterns of consumption affect the monthly invoices.

Recently there is understanding that water has not only economic value, but also social, religious, cultural, and environmental values, all those values are correlation in a cycle. There is economic cost of water, and the water should target all groups in social equity. The concept of equity in water use and management also can be noted in maximizing the value of water, in many uses, while promoting equal access and adequate supply to match the needs of society groups, especially low level income household. They have the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life (Hall, Koppen, & Houweling, 2014). Therefore, water tariff and water supply should consider all the marginalized groups, children, communities, environment, and the right accessing water to those groups.

Understanding the relationship between water price, value, and cost is very important in water tariff concept. Water is a scarce resource that is critical for municipal, industrial, and agricultural development and production. Generally, the producers decide to supply a good because they expect to be able to sell it for at least what it costs to produce (Michael Brady & Jonathan Yoder,2013). This is also applicable to water service; the water producers expect to cover the cost of water produced with some surplus. When considering water is an economic commodity with commercial

price, this means that price is determined by market factors from supply and demand. The principle of considering water like any other import and export commodity, may lead to the global and regional markets for water, as well as the water price may change from month to month and from season to season depending on the market demand and supply. In this case, water price may have direct impact on the development activities. For example, in agriculture, water pricing may lead the farmers to rationalize their water use to maximize their economic return, the price of water may increase to such an extent that agriculture becomes economically not feasible, but for instance the business may become feasible in manufacturing industry, and is therefore a clear political, social and economic impacts on the society.

The alternative of water pricing as any economic commodity is the development of water tariff for water uses commensurate with the cost of providing these services with some surplus or a profit margin that cover future investment and capital expenditures. Water tariffs should take into account the social and environmental priorities and match with the whole ecosystem (Ibrahim Jaber, 2006).

So far, water tariff is the amount that the consumer pays to water service provider against the water service. The water service cost includes total cost of maintenance, operations, chlorination and pumping of water from production up to the end consumer. Water tariff can be used by the government as a tool for justice between the groups of society, such as influence the behavior of individual consumers in water consumption to match with the available water resources in the state, and to push the development process with considering the environment and overall eco system.

#### **Previous Studies**

Many literatures have tackled the water tariff structure and system. However, limited researches have concentrated average price and its effect on the financial performance of the water service providers, and social equity. 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. However, other may argue that low water price encourages the customers to pay their due water bills since the amount is small compare with the income. It decreases the illegal connection, and it prevents social unfair use of water, since it

becomes available at reasonable and affordable price. It is imperative, therefore, to review related studies which to that end lead to exert the effect of water price on different performance areas; and to evaluate the current tariff in the water service providers from the aspect of social fairness especially the non-revenue water.

(Ayman Rabi and Ziad Mimi, 2013) studied the water tariff system in Palestine from economic efficiency and social justice aspects. The authors concluded that the results of the study showed water tariffs vary significantly between the various Palestinian water service providers. This discrepancy is due to the adoption non-objective bases for the determination of prices. The researchers found that there is a conflict in achieving the tariff objectives, where the goal of achieving social and economic justice sometimes contradict with the goal of cost recovery. Therefore, many aspects shall be considered when final setting the price, so balancing between the objectives is the core strategy in this direction. However, our study tackles the effect of water price on water service providers from the financial performance including the non-revenue water, debt collection and payment water invoices to WBWD.

(Murrar, Tamimi & Samhan, 2017) studied the determinants of non-revenue water and financial viability for the Palestinian water service providers. The researchers collected many parameters that affect on non-revenue water and financial viability of the Palestinian water providers. Cross sectional data has been collected from Palestinian water provider's performance reports, that were issued by Palestinian Water Authority and recently have been issuing by Water Sector Regulatory Council. 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 the 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 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 the non-revenue water by 346 units, other things begin equal.

However, in the same study, the price as predictor have been included again into another regression to explain the financial viability of the Palestinian water providers. The results indicate that

average price has the highest effect on the financial viability of the Palestinian water providers. The increasing price by one unit, results in more of financial viability by.821 units, other things begin constant. This explains high price, leading to generate more revenue, and then more in good financial performance and profitability. The researchers recommend Palestinian Water Authority (PWA) as policy maker to put some targets for Palestinian service providers at national level. One of those targets is increasing the average price of cubic meter to cover the basic cost. Therefore, those targets may lead to increase service provider's performance in non-revenue water and overall enhance their financial viability.

(Murrar, 2017) studied the relationship between size and performance of the Palestinian water service providers. the researcher evaluates the size of Palestinian water providers i.e. small, medium and large on different performance areas as non-revenue water, staff productivity, collection efficiency, average consumption, average price, and profitability. Panel data has been collected from Palestinian water provider's performance reports, covering period from year 2010 up to 2015. The published data in the reports cover service providers that serve more than 70% of total Palestinian population (WSRC, 2015). Since only one predicator i.e. providers' size, and many dependent variables, multivariate analysis of MANOVA has been used. The researcher has adapted this methodology to maximally discriminate between distinct groups of performance of Palestinian water providers.

The researcher finds that there are significant differences in some performance areas such as working ratio, non-revenue water, staff productivity and average price based on the size. Since there is significant difference in price based on the size of water provider; the author has sketched average price and average cost per unit sold, side by side with gross profit and working ratio. The results indicate that average cost and average price per cubic meter sold go together. The larger the size of service providers, the closer the lines of average price and average cost. The researcher concludes generally that, Palestinian water service providers, especially large providers always set water tariff based on calculated cost.

The author comes with the fact that whether small or large service providers, there is also difference in cost and price values within the same size category i.e. small, medium and large. Some large service providers incurred high cost and charge high price, however, other may charge less price even they incurred high cost. Generally, the study agreed with the previous researches

and studies where, the more the price, the more the revenue generated, and therefore, the more in profit margin for the water providers.

(Murrar, 2017) studied another performance area of Palestinian water service providers which is the collection efficiency of the water bills, and the motivational strategies that affect and encourage the Palestinian water customers to pay against the 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 the strategies of late payment penalties, early payment discount, and incremental tariff blocks are not significantly associated with this motivation. This means that the if water service provider decides to decrease the water price, then the collection efficiency will not be increased. The Palestinian water customers will not pay their due invoices as a result of low price.

This matched 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 the current price of irrigation water is too low and therefore it can't achieve the sustainable of using the water. The main reason for that is not farmer inability to pay, but unwillingness to pay due to poor services founded in the management of the water. (Tang, Nan & Liu 2013).

On the opposite direction, some water service providers add penalties on the late payment of water customers. Or even increase significantly the water tariff to subsidize the uncollected invoices. The clue to this increase is the revenue generating from issuing invoices will be increased. The invoice amount will become more than before and this may not encourage the customers to pay their invoice. On the other hand, the government entities that supposed to approve high tariff rate may not agree with high tariff blocks due to reserve the low income households. In Kenya, a study over the 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 the poor household. (Fuente, Gatua, Ikiara, & Whittington 2015).

The structure and ownership of water service providers may have relationship with average price. (Maria Valiñas, Francisco Gómez and Andrés Tadeo, 2013) studied the relationship between the ownership of water service providers in Spain and the price of water for residential use. Secondary data from different resources has been collected. The official statistic in Andalusia and official web site of water utilities for about 386 water service providers were main data input. The data

covered about 60% of the Southern Spain region and about half of municipalities in that region. The researchers employed two tests; the ordinary least square regression and Heckman sample selection model.

The authors find that prices are lower when the water service is directly provided by town councils. However, when water services are contracted out to external companies, the prices set by public utilities are higher than the prices of private utilities. Another finding of this paper indicates that the water average price is higher when the water services are privatised to an institutionalised public-private partnership compared to contractual public-private partnerships. The reader can conclude that different types of structures of water providers may have direct effect on the water price.

(Murrar et al, 2017) studied the efficiency and institutional performance of the Palestinian water service providers. The collected cross sectional data covers from year 2010 up to year 2015. The researcher collect data from stated sample contains all Palestinian water utilities, which are three utilities i.e. one in Gaza and two in West Bank; and from joint service councils, the selected almost all which are five councils. The rest of this sample is collection of data for water departments in the municipalities which are 55 municipalities; this is sum up to 63 Palestinian water service providers.

The researchers find that the sales price of cubic meter plays major factor in revenue calculation. The data shows that on average the Joint Services Councils "JSCs" deliver water services at price 5.5 NIS, where the water department in the 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. By the way, the (Palestinian water law 2014) calls for amalgamation of the current water service providers into large regional utilities that are financially independent and have separate legal entities. therefore, the expecting increase in the price as a result of this aggregation.

(Charles Howe and Linaweaver, 1967) studied the impact of price on residential water demand and its relation to system design and price structure. The authors concluded that the domestic demands are relatively inelastic with respect to price; and the elasticity of demand may not only be different from category to another, but also within the same category but different locations i.e. could be elastic with respect to price, but less so in the west than in the east.

The different in elasticity in water demand is also linked with different in tariff blocks based on the consumption. A popular water pricing is based on incremental tariff blocks. According to (Henrique Monteiro, 2010) the incremental tariff blocks are always considered as effective tool and instrument to achieve many objectives. It supports the goal of water equity, water conservation, and revenue neutrality based on the efficiency.

In Palestine, the water tariff bylaw has determined that the water price shall be based on incremental tariff blocks (State of Palestine, 2013). According to Article 4, the price shall be increased as per the increased in the water consumption. Further, the wastewater tariff shall also be incrementally based on the 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.

In Palestine, there is shortage in water resources, and the Palestinian Water Authority has no full control over all water resources, therefore, the increments tariff system is implemented. Under this system, the customers pay different amounts for different consumption levels. The rate per unit of water increases as the volume of consumption increases. Customers pay a low rate up to the first block of water consumption for the basic need, and pay a higher rate up to the limit of the second tariff block, and so on until the highest block of consumption. However, at the last tariff block the customers can use as much water they need, but for each additional water unit consumed they pay the highest price in the rate structures.

The purpose of incremental tariff is to achieve tariff policy objectives. The first one is achieving the economic efficiency; which considers water is natural and scare resources. Therefore, the price of cubic meter i.e. marginal revenue equals the maximum utility. This leads to consume water based on the maximum need. The second objective is the social equality, under this, the low income households have the right to access the water. It may appear that the social benefits of providing water free of charge significantly exceeds the social costs. However, in Palestine, the

low initial price tariffs for water services to support the low income consumers. The third objective is the cost recovery for the purpose of financial sustainability and services continuity. The cost includes the operating and maintenance cost i.e. production and distribution, deprecation, and admin cost. This will enable the water service provider to continue delivering the services in acceptable quality.

#### Water Sector

In 2009, the Palestinian Council of Ministers endorsed the Action Plan for Reform towards the definition and implementation of a comprehensive program of institutional and legislative restructuring in the Palestinian water sector. The overall architecture of this reform process envisions a new distribution of responsibilities, authorities, and split policy from the regulatory functions.



In 2014, a new Water Law was approved. As a result, the institutional framework of the water

sector in Palestine has been defined by this Water Law 2014. The major player in the sector is Palestinian Water Authority PWA i.e. ministerial role to ensure better handling of the planning and developing policies of the water sector. It is responsible for setting water sector policy, strategy, master planning, sector development, restructuring, water resources licensing, management, and monitoring.

However, new entity has been created which is Water Sector Regulatory Council WSRC, it has the function of monitoring the performance of water services providers, approving water prices, water tariff to ensure that service is provided according to the standards; and with the aim of ensuring water and wastewater services quality and efficiency to customers in Palestine at affordable prices. The third party of water sector, is water service providers that include municipalities, regional utilities, joint water councils, and the national water company (i.e. the bulk provider); those are in charge of water and wastewater services delivery to the customers (Palestinian water law 2014).

#### Water Providers

According to the data bank of Palestinian Water Authority and Water Sector Regulatory Council (WSRC, 2014), there are more than 280 water and wastewater service providers in the forms of water and wastewater utilities, undertakings, authorities, water departments within municipalities, village, joint service council's, cooperative associations, and private sector. Since there is only one cooperative association in AbuDis, and one private sector which is Rawabi, in this study the interest is in three types in terms of institutional structure and ownership.

Firstly: Regional Utilities, according to the performance monitoring report of Water Sector Regulatory Council; the Coastal Municipal Water Utility CMWU is providing water services to Rafah Municipality (WSRC, 2014). However, in the West Bank, there are two water utilities, the first one is Jerusalem Water Undertaking. JWU is the largest service provider in the Palestinian areas based on the number of connections and network length. The other utility is Water Supply and Sewerage Authority in Bethlehem. WSSA is providing its services to Beit Sahour, Beit Jala, and Bethlehem in addition to other small localities.

Secondly: Joint Services Councils. The Ministry of Local Government (MoLG) has established one legal entity to deliver different services to the small villages in the hope of achieving improved

quality of services, economies of scale, and efficiency in cost during delivering those services. (MoLG, 2017). In this analysis, the interest will concentrate only on five councils that are providing the water services: Northwest Jenin Joint Service Council, Maythaloun Joint Service Council, Tubas Joint water service council, Joint Services Council for Planning and Development Southeast of Nablus, and Joint Service Council Northwest Jerusalem.

Thirdly: Water departments within the municipalities. A quick scan of the services providers reveals that most of them are in this structure and ownership. In Gaza Strip, there are 25 water service providers; 24 of them are departments within the municipalities. However, in the West Bank, large Palestinian municipalities such as Jenin, Tulkarem, Qalqilia, Nablus, Jericho, Hebron, and others (WSRC, 2015).

The regional utilities are semi-independent and report to their board of directors. The joint service councils are reporting to the ministry of local government directly; and the water department within the municipalities report to the mayor of the municipality, which at the end report to ministry of local government. The three Palestinian water utilities deliver water services to more than half millions of people i.e. about 18% of the sample population. However, the municipalities deliver their services to more than 75% of total population; and the rest is served by the joint service councils. The data shows that there is discrepancy in average price, cost, and profit between those intuitional providers (WSRC, 2015).

#### **Social Equity**

Equity is a word that is used with a range of meanings. In the case of water, equity has to do with fair distribution – both of resources and of and responsibilities. The distribution of resources assures of water via fair pricing system; it also relevant to the responsibility associated with urban water such as the need, at times, to conserve water. (CUAC, 2011). Consumers always react negatively when they feel that water distributions are unbalanced, especially in the intermittent supply, water shortages, and when basic needs are not being met, or if there are big unfair discrepancies between customers or groups of customers.

Simply, water is fundamental to human being's life and health. It is the most essential of all services. Because of water's fundamental importance, there has been a push for recognition of a human right to water i.e. access to safe water and sanitation and sound management of freshwater

are essential to human health and to environmental sustainability and economic prosperity. According to the UN Sustainable Development Goal 6.4, "by 2030 substantially increase wateruse efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity". (UN Water, 2018).

According to the Consumer Utilities Advocacy Center (CUAC, 2011) achieving social equity, sustainable, and fair withdrawal and supply, four principles shall be adapted: Firstly, proportionality, meaning that the allocation made to the customer is in proportion to their contribution. Each consumer pays the costs that they, individually, impose on the water system and everyone is subject to the same processes and rules.

Secondly, the principle of equality suggests equal distribution among all customers. Each customer has the right to receive an equal amount of water. In the context of pricing, it can be explained as equalization of charges across regions and different areas of water providers. in Palestine the water law in Article 34 and 35 calls for unified tariff regulation for water and wastewater in all areas of Palestine (State of Palestine, 2014).

Thirdly, the need principle, whereby those who require more of a good receive more of it. For the water, all human beings have need whether they can pay or not. Finally, social utility principle, this principle considers the allocation of water to be in the best interests of society as a whole.

#### **WSP Performance**

(Baietti, Kingdom and Ginneken, 2006) 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 shall 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 the per capita income, so measuring the ability of low level income to pay the water bills.

Another performance area is the non- revenue water. According to the International Water Association, the non-revenue water is a core indicator to measure overall performance of water service providers. High volume percentage indicates poor management and not utilization of resources. Non-revenue water has major impact on water service providers' profit (Murrar, 2017). It mainly decreases the expected revenue from first side; as a result of illegal connections, metering inaccuracies, unmetered, and unbilled consumption. On other side, it increases the cost and expenses especially leakage in main pipes and distribution network.


The working ratio is a measure of performance of water providers. It equals the total amount of operating and maintenance cost incurred by service provider over operating revenue generated during the year. The purpose of this ratio hence is to measure the ability of the water provider to cover operating and maintenance cost from recognized revenue i.e. issued invoices, and whether will be remaining amount to cover capital investment for expanding water services into new areas. The default amount of this ratio may be 1, wherein total revenue equals total operating expenses. Less than 1 means revenue covers operating expenses. The working ratio is 0.8850, 1.0700 and 1.2940 for JSC, utilities, and municipalities respectively. On the other hand, the gross profit ratio shows that the JSCs generate profit by 4%, where, the utilities incurred losses by 17%, however, the municipalities incurred more losses by 39% on average. This means that 92% of the Palestinian water service providers have losses in their financial statement at the end of the year (Murrar et al, 2017).

The water service provider can increase the financial performance by decrease the cost and nonrevenue water percentage, therefore increase the profit and decrease the working ratio as the result. (Murrar, 2017) studied the determinant of non-revenue water in Balkan countries. The researcher collected the data of water for 180 service providers in Albania, Bulgaria, Bosnia, Kosovo, Macedonia, Moldova, and Montenegro. The highest cost per cubic meter sold in this data was in Moldova during year 2009. It was 2.82 Euros specifically in Straşeni service provider. This service provider worked successfully on decreasing the cost. The data of this provider shows cost per cubic meter decreased gradually from 2.82 in year 2009 to 0.87 Euros in year 2015. For non-revenue performance, the lowest production quantities are found in Moldova i.e. Şoldăneşti service provider. It is a small water provider delivers water service to 1,200 connections, near to 4,000 people served. The historical data of this provider shows in year 2003 the non-revenue water was 50%. The provider increased gradually the performance in non-revenue water. Year 2015 data shows non-revenue water was decreased from 50% in year 2003 to 23% as a result of increased in production quantity from 12 in year 2003 to 91 liters per person per day in year 2015.

Another characteristic of well managed utility is its ability to attract and retain qualified staff. This means that it offers both high salary levels and development opportunities for staff. This may lead to high employee's productivity. The staff productivity ratio generally indicates the number of employees serving 1,000 water connections. If the number of staff increases relative to the 1,000

connections, then, it will be less productivity. In Palestine, the municipalities water providers require an average of 4.9 employees to serve 1,000 connections, where, the utilities require 5.3 employees to do the same job. However, the Joint Services Council structure can serve the 1,000 connections with only 4 employees (Murrar et al, 2017). According to International Benchmarking Network for Water and Sanitation Utilities Database "IBNET" the staff productivity varies from 20 employees per 1000 connection in low income countries to 3 in middle income countries and about 0.8 in high income countries (Danilenko, van den Berg, Macheve, and Moffitt 2014).

# **Tariff Bylaw**

The implemented at water service providers are always different; few of them are adapt this structure. On the other hand, there is also fixed charges that shall be paid for each connection without consideration to the consumption. The fees always are set to cover the cost of connections maintenance and operation.

The tariff structure has many objectives as cost recovery, financial sustainability, efficient allocation of scarce resources, and income distribution (Singh, Upadhyay and Mittal, 2005). The most carefully designed tariff cannot accomplish all these objectives together; the low level income may affect the financial sustainability and cost recovery. The trade off and balancing between those objectives is the optimal method in the tariff set.

The general rule and principle is that the beneficiaries of a public service should pay the costs of delivering those services, but controversy surrounds the question of which costs a tariff should cover. The water service provider must meet the costs of operations and maintenance, capital, and short-term loans (Tariff bylaw, 2013). The operating and maintenance cost include payroll, power, electricity, fuels, chemical material, and other supplies. For long term investment, the capital assets shall be included in budget planning. Such items as pumps, water networks, pumping stations, and sewage treatment plant, those have a useful life of many years. The other item of tariff is the operating interest; it is the cost of short-term borrowing that water service provider may apply to cover deficit cash flows. Bank or donor's loans to finance all or large portions of operating costs is a bad practice and should be avoided. A well financial management may adapt borrowing in capital investment and water service expansion only.

In tariff, the term user classes are the categories where the water provider can classify the customers according to their consumption. These categories have been determined for the purpose of monitoring the services. According to the water tariff bylaw, there are mainly four classes which are, residential or household, commercial, industrial and touristic. Variations in fees between those different classes are limited and called tariff multipliers.

Generally, the household or demotic consumption incurred less price than commercial or industrial. From consumption wise, commercial and industrial enterprises are usually the largest users of service and are separately designated as a user class for each. The Palestinian tariff bylaw has no clear definition for those terms. The water service providers always set in those categories as commercial companies, banks, manufactories, and other private sector associations.

An important consideration often overlooked during the developing tariff bylaws is the efficiency of the operation. Customers will react favorably to good service and will be willing to pay for it. An empirical study in Uganda showed that the customer satisfaction and serveries quality contribute significantly in the behavior of the customer to pay the water invoice (Kayaga, 2004).

Conversely, poor service will evoke the public opposition to new or revised tariffs and payment the water bills. A study shows there is no relationship founded between the customers' income and nonpayment of water invoices (Vasquez, 2015). A measure of efficiency often used nonrevenue 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.

(Alegre, et al 2000). Identifying the causes of non-revenue water is important for tariff calculation. Lowering the level will decrease per-unit costs and postpone the need for investment in capital assets. From socially argument, it is not fair that the customer pays high cost of cubic meter as a result of inefficiency by the water provider. A level of 15 percent or less is acceptable as in the literatures, and indicates that a utility has this component of its operation well under control. But levels between 30 and 50 percent are not usual. Some Palestinian water providers have high non-revenue water, where, others have minimum level i.e. Tulkarem 50% and Ellar municipality is less than 8% (WSRC, 2015). Its worthy mentioned here that there is no clear directions or articles related to the non-revenue water issue in the Palestinian tariff bylaw 2013.

# **Chapter Three: Methodological Approach**

**Method Overview** 

**Technical Method** 

**Data Collection** 

Sample Size

**Model Design** 

# **Method Overview**

A review of related studies clearly elucidated that there are many procedures and strategies can

# **Technical Method**

A review of related studies clearly elucidated that there are many procedures and strategies can be adapted by water service providers to enhance the financial performance. This thesis 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, average, energy cost, service provider size, service provider structure, non-revenue water, collection efficiency, supply payment, and profit or loss percentage of Palestinian water service providers. (Grice Iwasaki, 2007).

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.

# **Data Collection**

Site visit to different Palestinian water service providers to perform limited interviews with the decision makers and financial managers will be the first process in this method. The overall purpose of the interview hence, is to have full understanding of the water providers' procedures, and programs in different areas of those parameters and other that will be exerted from literatures so they can enhance the financial performance. The exerted variables as per literature reviews also will be verified with those managers.

In addition to interviews, this thesis will mainly depend on the secondary data that have been collected from published performance indicator reports of Palestinian water service providers. The Performance Reports were published by Palestinian Water Authority (PWA); and currently are published by Water Sector Regulatory Council (WSRC); with full support as financial and technical advisors team by Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) Water Program.

Data quality is the main strength in this thesis and assessed in terms of the reliability of the source and accuracy of the data. Data accuracy however, accounts for measurement errors in the acquired data, i.e. the closeness of observations, computations or estimates to the true value. Accuracy relates to the exactness of the result, and is distinguished from precision which relates to the exactness of the operation by which the result was obtained. WSRC collects the financial, technical, and all parameters data from the water service providers and verified it before publishing. A professional team and consultants always hired to collect the data and verify it, so this will give the reliability and more fitted for the expected results of the thesis.

The performance areas are selected to achieve financial sustainability of service providers. Four elements have been considered: firstly, profit/loss generated by service provider. For this factor, operating and maintenance cost, and average price are related. On the 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 issue, the average consumption may indicate as ability of Palestinian service provider whether municipality, regional utility, or council to deliver quality of service 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 the water utility is liquid. For this reason, collection efficiency has been reflected as a key performance area. 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 financial sustainability.

To have details about tariff structure, tariff blocks, connection categories, consumptions pattern, family income and other parameters; secondary tariff data for Water Sector Regulatory Council will be used. The data is for all Palestinian water service providers in West Bank and Gaza. However, primary data will be collected from different water service providers about private and public tankers. The information is important as the price of cubic meters, profit generated, cost of delivering, and volume of tankers. The information that will be collected will be again cross tabulated with the published performance data; thereafter gain rich results.

#### Sample Size

According to the Water Sector Regulatory Council, the published data in 2017 report covers more than 80% of total Palestinian population (WSRC, 2018). Expressed in other terms, the sample size in this thesis will be included all water service providers that deliver water services to more than 80% of the Palestinian population. The sample size of this research contains all Palestinian water regional utilities, which are 3; and from joint service councils, the selected almost all which are 5 councils. However, from the water departments in the municipalities the sample are 55 municipalities; this is sum up to 63 Palestinian water service providers. However, to enhance the representative sample, a cross sectional data will be considered; where, this thesis will include all data in performance reports from year 2010 and up to year 2017 for all service providers.

# **Model Design**

Generally, the thesis will adapt quantitative research methodology. The data will be collected from secondary source i.e. tariff data for all water service providers in West Bank and Gaza, and published performance reports of Palestinian Water Authority and Water Sector Regulatory Council. The framework is adapted to reflect multivariate analysis. The examination evaluates the groups of performance based on the price of Palestinian water service providers. The performance areas are collected from water providers and published on annual basis, they are non-revenue water, staff productivity, collection efficiency, average consumption, and working ratio. This relationship may be positive or negative; the following diagram sketches this relation



Where:

WKR: Working Ratio.	APP: Account Payable Payment.
NRW: Non-Revenue Water.	GTP: Gross Profit.
SFP: Staff Productivity.	AVC: Average Consumption.
CEL: Collection Efficiency.	SPO: Service Provider Ownership
OMC: Operating and Maintenance Cost.	WSH: Water Supply Hour

# **Chapter Four: Research Results**

**Descriptive Statistics** 

**Regression Analysis** 

**Correlation Analysis** 

# **Descriptive Statistics**

This section provides simple summaries about the variables and about the observations that have been made in this research. The descriptive statistic data showed 11 variables are in Appendix A table A01 used in the evaluation. The research sample included 212 water service providers over the years 2015, 2016 and 2017.

# Water providers

The descriptive statistics Appendix A table A01 shows that there are 212 service providers in this research study. However, since this sample is comprehensive for water service providers in the last three years, the number of water service providers is 84 service providers providing water service to 80% of the West Bank and Gaza Strip population. Those water providers serve 466,536 water connections, which about 37,265 connections are pre-paid. The sample shows the distribution of water service providers in the West Bank and Gaza Strip. The sample also included a small, medium and large water provider. It includes on a different structure of water service provider such as municipality, joint services council, water authority as well as cooperative society. Table A01 can summarize the descriptive characteristics of water service providers

Table A 01: Descriptive Characteristics of Water Service Providers									
Region	Municipalities	Joint	Cooperative	Regional	Small	Medium	Large		
Name	Department	Councils	Associations	Utilities	Size	Size	Size		
North	21	4	1	0	9	11	6		
Middle	8	1	1	1	3	5	3		
South	19	0	0	1	1	13	6		
Gaza	27	0	0	1	11	9	7		
Total	74	5	2	3	24	38	22		

Table A 01 shows the distribution of water service providers in different regions in Palestine. The central West Bank, including the city of Ramallah, Jerusalem and Jericho, has fewer water providers comparing with other regions. Where the Jerusalem Water Undertaking i.e. the largest water regional utility operates within its jurisdiction in the areas of Ramallah and Jerusalem. There is also Abu Dis Cooperative Water Association in Abu Dis area of Jerusalem, as well as the North West Jerusalem Water Council in the Bidu area. Finally, there are also many municipalities within the municipal water department in the central region. Thus, this region includes all water provider

structure. The Palestinian Water Authority seeks to merge water service providers into regional water utilities such as the Jerusalem Water Undertaking so that PWA can control and manage the performance of those water providers.

The northern West Bank is characterized by the existence of joint services councils for water services, which were established in the last period with the aim of providing water service efficiently and to separate the water service from the other services that are provided by municipalities. Those joint service councils have introduced pre-paid water meters in their areas. other character for these councils is that they have lower non-revenue water percentage than water loss percentage in municipalities.

The southern West Bank is characterized by a lack of available water especially in the summer season. in this region, the water service providers are medium to large size. This is due to the increase in population in the communities in the region. There is one water regional utility in Bethlehem that provides water and sanitation services. The Palestinian Water Authority works to merge the water service providers in the Hebron governorate in the long-term into regional utility.



Figure 1.4 Distribution of Water Providers According to the Location

Overall, there is a disparity in the volume of water service providers and discrepancies in the distribution of water service providers to the regions. There is also a disparity in the ownership of water providers. All these characteristics have an impact on water prices that sold to the end

customers and the extent of their variation from one region to another. Previous studies have shown that, for example, the Joint Services Councils have the ability to provide water service at a sale price higher than the municipal sale price. While the water loss percentage in these joint councils is less than the water loss in the municipalities as well. Therefore, the set of performance indicators varies based on prices which in turn vary from one region to another region, and from one service provider to another.

#### **Average Price**

According to this research methodology, the categorization of this variable is based on the difference between highest price of water in Palestine and the lowest price. The value is divided into three parts. The first is the low water price and has been indicated by the symbol 1. The second price is the average price has been symbol 2, and the third price is the high price and it has been symbol number 3. The descriptive statistics Appendix A table A01 shows that the average value of the dummy variable is 1.675. This means that water service providers in this sample sell water at different prices, but on average they sell water prices within the middle class. The raw data shows that there are 23 water providers sell more than 3 NIS, and 92 water providers sell the water cubic meter less than 3 NIS, and the remaining 97 water providers sell the cubic meter on average range from 3 to 6 NIS.

The distribution of water sales price is illustrated by the second variable. According to the table Appendix A table A01, the average sales price of water cubic meter that sold by water service providers in Palestine is about 3.70 shekels i.e. it is about one dollar. The lowest sales price is less than one shekel and it is priced by Wadi Gaza water provider in the Gaza Strip, there are other providers such as Khuza'a, Gaza Municipality and Umm al-Nasser. Some areas of the Gaza Strip face from salty water that is not suitable for drinking. Currently, there is general trend for the desalinated water and therefore the price of the water cubic meter is more than this stated price. While the table showed very high water prices in the municipalities of Ethna, Dhahiriya and Bitonia, these areas suffer from a severe shortage of water. Those areas in the south i.e. Hebron governorate, they sell the water during the summer season in the tanks. According to these municipalities, the water comes once time every two months and when it comes, it comes in insufficient to satisfy the resident's needs, forcing residents to dig wells of artesian water in their homes to collect rain water to compensate for their water consumption. The table shows that there

is deviation and dispersion in prices of 1.8 on average, indicating the difference in water prices in Palestine according to the conditions of each service provider.

#### **Working Ratio**

In financial analysis, there are several indicators that measure the financial performance of given institution of private sector company. One of these indicators is the ratio of expenditure to revenue. For the water providers, the working ratio 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 financial ability of water provider to cover operating and maintenance cost from accrued revenues or even collected revenue, 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, therefore, no surplus or deficit. Less than 1 means revenue covers operating expenses with considerable margin.

Table A01: Descriptive Statistics shows the average working ratio for all water providers is 1.205. This means that total revenue can't cover the operating and maintenance cost of water providers. More than 20% losses in general according to this financial indictor.

Some water service providers incur high financial losses, especially in the Gaza Strip due to the high cost of maintenance, for example the municipalities of Wadi Gaza, Khuza'a and Al-Nasr. In the West Bank there are municipalities such as the sheikh and Arabeh. At the same time, there are other municipalities that cover the total expenditure from their own revenues such as Deir al-Ghosoun, Badia, al-Dhahiriya and others. This is due to the fact that some municipalities do not purchase water from water bulk providers, but rather produce from their own wells, other water providers don't pay electricity and fuel costs to pump water i.e. the water transited by gravity. Some municipalities do not record real expenses or they record their expenses on a cash basis rather than record on an accrual basis.

The working ratio varies from one region to another and from one service provider to another. In the northern region for instance, where the water service is better than other areas, the working ratio is 0.978. The percentage of working ratio in the central region is 0.929, while in the south where there is a shortage of water, it reaches 1.08. While in the Gaza Strip it is 1.60%. This ratio generally is high and there is a heavy loss in this region. On the other side, the working ratio varies

from time to time. For example, in a given year, the ratio may be high and in another year it may be low, depending on many factors, including costs of operating and maintenance during that period, and the revenues collected by the municipality or water provider in a specific year. Overall, in this research a decline in the working ratio for the last three years was observed. It reached 1.280 in 2015, and fell by 2016 to 1.22, in 2016, while in 2017 it was 1.13. This means that there are some strategies to reduce the losses incurred by water service providers in Palestine.

#### **Non-Revenue Percentage**

There are a number of performance indicators that measure the water loss of water service provider. In general, the non-revenue water is the difference between the amount of water entering the network and the amount of water sold to consumers. Sometimes water losses are as high as 50%, such as Jenin and Tulkarem municipalities. This in turn causes the service provider to provide the service with low quality. Also it increases the cost of selling water cubic meter. In addition, the non-revenue water causes the unfair distribution of water because a substantial quantity does not reach the water consumer, who is in high need of it.

According to the descriptive statistic table, water losses reached 72% in Azmut, Anata and Wadi Gaza. One of the reasons for the loss of water in these areas is the theft of water in Anata, also because of the Israeli war on the Gaza Strip, causing the discharge of a large amount of water, while other reasons for this high percentage of water loss is the lack of proper registration in some water service providers, As well as because of the deprecation of water network, where the network becomes old and dilapidated in some areas, further, the percentage of error in meters, especially the old ones.

In the northern West Bank, the percentage of water losses was 28.5% and the highest percentage is in Jenin and Tulkarem, while in the central region the non-revenue water reaches 25%. The central area is served mainly by the Jerusalem Water Undertaking, it is the largest service provider in Palestine and serves major areas and cities in the central region such as Ramallah, Al-Bireh, Jerusalem, villages and surrounding towns within the concession area. In the south, water loss is on average 25% and these areas suffer from a severe shortage of water, especially in the summer. Gaza region is the highest percentage in water loss, the percentage of water loss for the past three years is 34%, which is high and one of the reasons is the deprecation of the network and the inaccuracy of the meters.

Generally, the performance of water service providers appears to be gradually improving through performance indicators. In 2015, the water loss rate was 30.05% and in 2016 it fell to 29.4%. The percentage of losses continued to drop to 28.4%, for the water service providers in the selected sample in this research.

#### **Staff Productivity**

The assessment of the efficiency of a worker or group of workers is referring to the staff productivity in water service providers. Productivity may be evaluated in terms of the output of an employee in a specific period of time. Typically, the productivity of a given worker or water provider will be assessed relative to an average for employees doing similar work. In terms of Palestinian water providers, the staff productive is simple how many employees the water provider needs to serve 1,000 water connections. Because much of the success of any organization relies upon the productivity of its workforce, employee productivity in water sector is an important consideration to decrease the cost of selling water service and provide quality of services.

generally, 3 to 4 staff members are required to serve the 1,000 connections. According to the descriptive statistic table, the value is varied between 1.16 up to 21.51 members for each 1,000 connections. The existence of a large number of employees in water department to serve a small number of water connections is an additional burden on the water service provider. An increase in the number of employees compare to the 1000 is administrative negligence and the recruitment process without justification i.e. it is simply over staffing. The descriptive statistics Appendix A Table A01 indicates that the municipalities of Wadi Gaza, Ummal-Nasser and Jericho Municipality are among the most water service providers, in terms of increasing in the number of employees relative to the number of connections. One of the reasons for the increase in the number of employees is the excessive recruitment and also the decline in the number of water connections relative to the population. There are also many number of household families that consume water from a single water connection such as in Hebron. Therefore, a number of municipal employees may be hired to serve other departments in the municipality. On the other hand, some water service providers have a few staff members, but with high efficiency, for example the municipality of Bitonia, Tarqumiya, Qafin and Yabad. One of the reasons for the decrease in the number of employees compare with the 1000 connections is that the municipalities or water providers always hire a fixed-term contract such as the hiring water invoice and debt collection staff member for a specified period. Some water service providers also relied on prepaid meters, in other water providers, the department of water me be served with other departments by the same staff members such as the Crafts, Sanitation and others. In total, the Appendix A table A 01 shows that there are 3.8 employees in the northern West Bank per 1,000 water subscriptions, the same percentage is in the center, while in the south region it drops to 3.55 per 1,000 subscribers despite the lack of water service. In the Gaza Strip, the average number of employees was 5.50 employees per 1,000, according to the average which is high compare with the other Palestinian regions.

Overall, the employment rate has been rising over the last three years, with the number of employees per 1,000 connections in 2015 reaching 4.2, while in 2016 it was 4.8 per 1,000 connections, and in 2017 it rose to 4.67 per 1,000 connections as well.

#### **Collection Efficiency**

Cash is the lifeblood of a water service provider. The existence of cash in sufficient quantity with the service provider allows its payment the salaries due. The water provider can pay for maintenance and daily operations cost, in addition to the possibility of expanding the water network and also in new investments and increase the quality of water service. Hence the collection efficiency indicator is very important for the service provider. The indicator concept can be calculated by the sum of the amounts of the receivable relative to the water revenues. The higher the percentage of collection efficiency, the greater the ability of the service provider to pay the water invoice and cost dues, and the lower the ratio, the difficulty the service provider in payment its due amount.

The descriptive statistics table indicates the difference in the percentage of collection among service providers. There are service providers that have collection efficiency near to zero collection rate, while other water service providers have the rate up to 150% collection efficiency. There must be a number of reasons that lead to an increase in the collection rate, water providers such as the municipalities of Anabta, Yabad, Jericho, Qafin, Arrabeh and others. These municipalities have installed prepaid water meters and the ratio of receivables has been accumulated. The prepaid meters force the subscriber to pay the current invoice amount in full and pay part of the value of the previous invoice at a certain rate and thus, gradually will pay the whole amount due.

The percentage of collection efficiency in the northern West Bank averaged 83%, while in the central region it was about 68%. The reasons for this rate compare with the north regions is that the middle the areas there are postpaid meters rather than prepaid installation like in the north region. While the average collection in the region of the south was 50%, which is very low, which means that the citizen pays only half the amount of water bill throughout the year and the second half of the bill will be accumulated as debt to the subsequent years. The reasons for the low collection in this region are due to the lack of access to water and thus the low quality of service. In Gaza, the percentage is also 50% due to low income, water quality, and water service quality concern. By tracking the percentage of collection efficiency within the past three years, the rate is fixed in total and reaches 63% in 2015, 2016 and 2017.

#### **Operating Cost**

Cost is the main driver for determining the price per cubic meter of water sold. The higher the cost, the higher the price of water to the end consumer. Water costs vary from one water service provider to another. Some Palestinian water service providers suffer from high costs of water pumping, electricity, network consumption and daily operation costs. Other water service providers do not have a significant cost problem because water is not purchased from bulk providers, rather it is produced from their own, and the water quantity is transferred by gravity from the reservoirs to the water network.

The descriptive statistics Appendix A table A01 shows high cost of maintenance and operation, for example Wadi Gaza, Anata, Usna, Abu Dis and others. The water cost in that areas is about on average averaging 10 shekels. This is a high amount, one of the reason for this increase is high percentage of non-revenue water, as well as the high costs of pumping water, especially in areas that need to transfer water to the areas set on the high mountains.

The average cost of electricity to pump one cubic meter of water was about half shekel. The energy cost represents about 11% of total water costs. The cost of purchasing from bulk provider is the significant cost of cubic meter, the cost of purchasing one cubic meter from bulk provider i.e. West Bank Water Department is about 3 cubic meters of water.



The data show a difference in the ratio of energy costs to total operating and maintenance costs for water providers. Figure 1.3 shows a difference in water O&M costs ranging from NIS 1 to NIS 13. The reasons for the high water costs are due to the high non-revenue water percentage and the cost of energy and water purchases. The figure above shows a lack of harmony between total water costs and energy costs. There are water service providers with high energy costs that may represent up to 50% of total maintenance and operating costs. in general, the discrepancies in the total cost and energy cost among those water providers lead to discrepancies in water providers for each cubic sold other things being constant.

# Per Capita

The descriptive statistics Appendix A table A01 shows that the average per capita for daily water consumption in Palestine is 80 liters per day. This is less than the minimum quantity recommended by the World Health Organization, which recommends that the minimum limit of 120 liters per day should be provided. The reasons for the decline in the per capita in Palestine are the existence of the Israeli occupation, which prevents the development and digging wells, and prevents the transfer the water from one province to another. In the governorate of Qalqilya for instance, there is water availability because the city lies on the western basin of Palestine. At the same time, the Hebron governorate in the south West Bank suffers from a shortage of water because of the lack

of water resources in that area. The Israeli occupation prevents the transfer of water from Qalqiliya, for example, to Hebron. The transfer of water requires the installation of a carrier line running through the areas under the control of the Israeli occupation in the West Bank. The occupation always makes obstacles to prevent the installation of water carrier lines.

The Israeli occupation also request license for digging the wells inside the Palestinian Authority control area as well. This, in turn, prevents access to the minimum natural resources of the Palestinians. All these factors cause a difference in the daily water per capita for the Palestinian people. In Jericho and Qalqilia, the per capita there is more than 250 liters per day. While in the areas of Hebron such as Al-Dhahiriya, Dura, Halhul and others are about 30 liters per day. The descriptive statistics table also shows a significant dispersion and deviation in the per capita daily consumption in the Palestinian areas.

Per capita in the Gaza Strip is about 94 liters per day. This quantity is not suitable for human drinking since it is very salty. The households are forced to buy gallons of healthy water from private sector to drink. In the northern West Bank, the average per capita is 73 liters per day and is also below the minimum according to the World Health Organization. Some areas of the north contain wells that provide sufficient quantity of water such as Anabta town; and other areas have water shortages such as Jenin city. In the central West Bank, the per capita per person of this area is 97 liters per day. The increase in this quantity is because of Jerusalem Water Undertaking which is the largest water provider in Palestine that purchases water from the West Bank Water Department and produces about 20% of water supplies.

In the southern West Bank, Palestinians suffer from water shortage. The average water per capita per person is 56 liters per day. According to the World Health Organization the per capita in Hebron is only one third of the minimum quantity. This is a small quantity and local residents there depend on their own wells in their houses and also buy private water tankers in the summer at double prices with lower quality as well.

The daily per capita per person has stable over the last three years near to 82 liters per day such as in 2015. While 83 liters per day per day per person, and in 2017 it rose slightly to 85 liters per day.

#### **Other Analysis**

Data shows the distribution of water service providers in the various Palestinian governorates. The central region is the lowest number of water service providers because of there is large regional utility that servers many villages and cities in the center region. Which is Jerusalem water Undertaking. The results indicate that there are more than 75 of different water prices for about 84 water service providers in this sample. Almost every water service provider sells water prices different that other prices of other water provider. At the same time, the results show that the water network coverage rate is about 90% of the Palestinian areas. Palestinians are forced to pay double the price of water by purchasing water tankers from water service providers, as in the Hebron area or from private tankers. The average price of water tanks in total from the water service provider is about 10 shekels per cubic meter, whether in summer or winter. Due to the tremendous pressure on water, especially in the summer season, the Palestinian citizen seeks to compensate for this quantity and fill their needs by purchasing water from private tanks. Where the water price of cubic meters in the summer season is on average 22 shekels. This is a very high amount, however, in the winter the amount drops slightly to 20 shekels.

The results also show that the intermittent water supply in Palestine is 5 days in the winter season, while in the summer the period increases to 7 consecutive days, which is high if we take on average all the water service providers in Palestine. It is noted at some water providers such as in Hebron areas that it takes 90 days to reach the areas such as Daherya, Yata, while it takes about 40 days in Sawahara Sharqiya in East Jerusalem.

The results indicate that Gaza governorate is the highest governorate in terms of number of population. Hebron governorate which reaches about 770,638 people and is the most governorate in the West Bank in terms of the percentage of population to the proportion of water subscriptions. in Hebron there are about 11 people for each water connection. The percentage of prepaid water meters generally is about 10% for all water service providers. It is noted that there is a difference in the Palestinian areas in terms of percentage of prepaid meters to water connections. Jenin and Tuba governorates are the highest governorates that have prepaid water meters Tubas 37%, Jenin 36%, Ramallah 22%, Nablus 15%, Qalqilia 12%, Hebron 10%, Tulkarem 7%, Bethlehem 2% and the rest of the provinces 0% and are Jericho and Salfit and the Gaza Strip in general.

According to the results of this thesis, water service providers change the water tariff at very long period of time, it takes many years to change the water prices. On average, the tariff has changed last time in 2007 and this is a long time period if compared to this period with changing operating and maintenance costs. The data also indicates that half of the water service providers in Palestine do not sell water in the incremental increase according to water consumption. There are many of them selling at a fixed price and about 200 service providers out of 270 service providers do not classify subscriptions depending on households, commercial, industrial and other. But those water providers always sell all customers at the same classification. On the other side, the average connection fees are about 715 NIS. The connection fees also vary from one water provider to another. The highest fees amount is found at Beitunia. sometimes the connection fees reach about 1,500 shekels. For water providers who sell their water according to the segments, the prices of these categories also change. The average price of the first category is 4 NIS, while the second category is NIS 4, the third is NIS 6, the fourth is NIS 6, and the fifth is NIS 7. The study shows that there is no relationship between the level of household income or the unemployment rate and the prices of water sold in different Palestinian areas.

# **Regression Analysis**

The cross sectional data is analyzed and tested using Statistical Package for Social Science (SPSS). Both descriptive and inferential analyses have been carried out.

#### **Regression Test Result**

Appendix Table A03 summarizes the collected data according to the price classification from performance reports of Palestinian water service providers. The Appendix Table A03 shows 212 observations for near to 84 water service providers. The data covers the period from year 2015 and up to year 2017. However, Appendix Table A08 and A10 propose multiple and significant comparisons between those prices. The approximate multivariate for Wilk's Lambda analysis as in Appendix Table A05 and Table A09 show that overall model is significant where p = 0.000 (Haase & Ellis,1987). Therefore, there is a statistically significant difference in performance of water service providers based on the price categories, where F = 24.435, p < 0.0005 and Wilk's  $\Lambda = 0.228$ .

Essentially, multivariate analysis is a system to find patterns and relationships between several dependent variables and one or more independent variable simultaneously. Thus, the multivariate analysis can predict the effect a change in one variable will have on other variables. (CAMO, 2011). To test the significant difference between different performance indicators of water providers based on water prices i.e. small, medium and high price Wilks' lambda is used in this testing. It is a test statistic used in multivariate analysis of variance (MANOVA) to test whether there are differences between the means of identified groups of subjects on a combination of dependent variables (Everitt & Dunn, 1991). Therefore, this test considers every difference in each performance indicator based on the price category of water service providers.

Table Appendix A07 Tests of Between-Subjects Effects testing results shows that there is significant relationship between average water price and working ratio, Non-revenue water, staff productivity, consumption, ownership, operating cost energy cost and size. However, no significant difference between the collection efficiency based on the price has been found.

# **Correlation Analysis**

The correlation table in appendix A Table 02 shows that there is a strong relationship between the different variables in this research study. some variables are positively correlated in this table and others negatively correlated. on the other side, there are many variables that have significant relationship. in this section analysis, the focus on the water sales price and its relationship with other dependent variables. on the other side, the relationship between dependent variables will be also investigated in this section to better understand the big picture.

## **Average Price**

The correlation table in appendix A Table 02 data shows a significant correlation between the working ratio and the water sales price. That is, the higher the water price in the water service provider, the lower the loss with the water service provider. This confirms the extent to which this result fits in with the theory as a whole. As prices increase, revenues rise, and losses fall. This relationship does not mean that in all time have the same effect in other countries, where high prices can lead to increased losses, for example high water sales price to the customer may lead increasing the theft or illegal connections, thus increase the financial losses. But overall in Palestine and according to the performance indicators in Palestine the data shows that the high

prices lead to reduce losses incurred by the service provider. This can be explained also that the water service provider in Palestine puts the price of water within a very low profit margin or loss.

The results of the correlation test show a strong inverse relationship between the sales prices of water and the percentage of non-revenue water. In other words, the higher the sales price of water in Palestine of the water providers, the lower the water loss or non-revenue water volume. This is consistent with some previous studies that support this outcome. Increasing water prices will result in increased revenues and therefore lower costs. In the case of an increase in revenues and debt collections, it will be possible for the water providers to maintain the water network and repair the fractures in the network pipes, which will reduce the water loss rate. The availability of cash and revenue will also lead to the possibility of the water service provider to buy some computerized programs as well as collection tools and control on water records, which causes reduction of water loss, whether real loss or apparent loss.

Also the correlation table in the appendix show a significant and inverse relation between the rise in water prices and the employee productivity index. In other words, a rise in water prices will result in a reduction in the number of employees who serve the 1,000 water connections. In other words, a service provider with a small number of employees who work efficiently sells water prices higher than a service provider with a low staff productivity. This is explained by administrative performance and an unjustified increase in staff or over staffing problem. In order to understand things more clearly, the ratio of total profit should be compared with these performance indicators such as staff productivity. The correlation table shows that increasing the number of employees leads to increased financial losses for the water service provider. The correlation table also indicates that the increase in the number of employees relative to 1,000 connections is linked to positive relationship with the working ratio. In other words, the higher the financial loss of water provider, the greater the number of employees per 1,000 water connections. The correlation test results indicate that there is a positive relationship between increased debt collections percentage and high water prices. In other words, the more the water service provider increases the average water prices, the higher the water providers receive collections, but with insignificant relationship. In summary, increased water prices reduce financial losses to the water service provider. The water service provider can also purchase tools to collect more debt and control on receivable amount. The appreciation in sales prices does not necessarily mean an increase in debt collections in other countries or in all water service providers in Palestine. The result of this research is based on normal distribution in Palestine, but not identical for each water provider in Palestine or other countries.



**Figure 1.5:** Relationship between the Average Sales Price and Operating Cost of Water in Palestine The correlation table shows a significant and positive relationship between water prices and water costs. That is, the higher the cost of water, the higher the price of water. This explains why water service providers generally determine water prices based on basic costs. But the correlation table shows at the same time that there is a fundamental adverse relationship between electricity costs and water prices. That is, the higher the cost of electricity, the lower the price of water sold to the final consumer. Many water service providers rely on gravity to transport water and at the same time buy water at high costs from the West Bank water cycle. Electricity costs are for water service providers who produce water from their wells and therefore there is no cost of purchasing water at high prices. Water revenues generally depend on two drivers. The first one is the quantity of water sales and the second is the sale price of water cubic meter. Increasing the quantity of water consumption means that the water service provider can generate more sales revenue. At the same time, rising water prices means more water revenues. The correlation table shows an inverse relationship between the daily per capita of water consumption and the average water price. That is, the higher the per capita consumption, the lower the water sales price and vice versa. Some water service providers sell the water cubic meter at less than NIS 3 because the cost of producing the cubic meter is small compared with the prices of other service providers. For instance, the average price of water cubic in Qalqilya is 1.5 shekels. This is due to the low cost of water because Qalqiliya Municipality produces water from its underground wells. While the municipality of Beitunia has an average water price of about NIS 8, because the municipality does not produce water, but rather purchase the required quantity from the wholesale water supplier from the West Bank Water Department at a price of NIS 3 per cubic meter.

#### **Other Variables**

The correlation table in appendix shows that there is a strong relationship between the different variables in this research study. It was noted that there is a significant positive relationship between the working ratio and the percentage of water loss or non-revenue water. This means that the more non-revenue water the water service provider has, the higher the working ratio. In other words, there is a direct relationship between the non-revenue water and the losses incurred by the water service provider. This is in line with previous studies, which consider that the cost of water loss leads to increased costs of water service.

According to the table, there is also a positive correlation between the staff productivity index and the working ratio of water provider. In other words, the higher the number of employees per 1,000 connections, the higher the percentage of working ratio. In other words, the greater the number of staff members of water service providers, the more the financial loss incurred by water providers as result. This is also consistent with previous studies. those studies emphasize that increasing worker productivity leads either to lower costs or increase production; and thus in both cases will reduce the financial losses of the water service provider.

This does not mean that in all cases higher productivity will lead to lower costs for all service providers in other countries or some water service providers in Palestine. in some cases, may the

increasing in the number of employees lead to increase collections and revenues through debt collection and follow-up of the quality of water service, thereby increasing the price of water to cover revenues. However, according to the normal distribution in Palestine, increasing productivity and reducing non-revenue will generally reduce the financial losses of the water service provider.

The study showed an inverse relationship between the percentage of debts collected from the consumers and the percentage of working ratio. That is, the higher the percentage of debt collection from subscribers, the lower the working ratio, i.e. the losses incurred by the water service provider. This is in line with many previous studies which confirm that increased debt collection from subscribers will reduce financial losses. Because of this, many water service providers are working on debt collection campaigns, so that those water providers can pay their dues to the water supplier in the West Bank Water Department. Another justification is that water service providers in Palestine rely on a cash basis to calculate revenues. Which is related to such as subscription fees and water sales within prepaid meters. Where revenue is recorded when cash is received from the water sold.

Data in the correlation table indicates that there is a significant relationship between maintenance costs, operations and working ratio. As well as a significant relationship between energy costs and working ratio. This is complied with the previous theory and studies which confirm that increased costs lead to lower overall profit.

One of the key indicators in the water sector is the quantity of water consumption per capita of liters per day. The correlation table shows an inverse correlation between the working ratio and water consumption. That is, the greater the per capita water consumption, the lower the working ratio. This, in turn, is consistent with the theory that states increasing water consumption will result in higher revenues and thus reduce the final loss rate in the service provider's income statement.

# **Chapter Five: Discussion and Conclusion**

Discussion

**Main Results** 

Conclusion

Recommendation

# **Discussion and Explanation**

This section contains a summary of findings and discussion from the inferential test i.e. multivariate analysis. Overall, the examination aims to determine whether there is a significant difference in the financial, technical and administrative performance indicators of water service providers based on low, medium and high average water sales prices.

#### **Financial Indicators**

The results of multivariate analysis show that there are significant differences in the working ratio between low-priced water providers and medium and high price categories of water service providers. At the same time, there are no significant differences in working ratio between water service providers who sale water on average at medium price and water providers who sale water at high price. The working ratio for water service providers with low prices was 1.52, while for water providers with medium average prices of 0.96, water suppliers with high prices were 0.92. This means that the higher the price of water sales to the water service provider, the greater the possibility of covering operating expenses and maintenance cost from the revenue generated. Certainly, high-priced water service providers have more capabilities than low-price service providers in terms of accumulated debt collection, cost reduction, service expansion, etc. The cost-coverage ratio is greater compared with water service providers selling at a price Low.

Another financial indicator is the collection of accumulated debt. The water sector in the West Bank and Gaza Strip suffers from the accumulation of debts to the water service providers in the different areas in West Bank and Gaza Strip, and the same thing from water providers to West bank Water Department i.e. the bulk provider. Where the value of debts of WBWD i.e. the Palestinian Water Authority amounted to about one and half Billion NIS. It is a huge amount and puts the sustainability of the water sector at high risk. The results showed that there are no significant differences in the collection efficiency between the water service providers in Palestine according to the average price of water sales. That is, regardless of the water selling price is high or low, the collection rate depends on other factors. Recently, many water service providers have purchased and installed prepaid meters. Some of these water service providers sell water at low, medium or large prices. Therefore, there are no differences based on the price of water. A lowprice water service provider can sell water at a higher price without affecting the collection rate. But in general there is a direct relationship between the price of water and the collection of debt. That is, the higher the water sales price, the higher the rate of debt collection. The debt collection efficiency at low water prices was around 59%, while it rose to 63% for water service providers with medium average sales price, while for high-priced water service providers it was 71%. The increase in the price of water leads to an increase in the revenues of the water service provider, and therefore the possibility of contracting the water provider with external collection staff to collect the accumulated debt. Also, there are many water service providers who have purchased means and tools i.e. software to increase the debt collection such as computer programs, and prepaid meters. As a result of high price and revenue, those water providers can purchase and install the prepaid meters their own budget and therefore not waiting for an external fund or relying on water authority projects.

Maintenance and operation costs vary with water service providers. Some water service providers buy water from the water bulk supplier, while others produce water from their own wells at low costs. The results of the empirical tests show that there are significant differences in water costs of sales among water service providers who sell water at different prices. This means that the water service provider sells in general based on the cost of the cubic meter that buys or produces. The average cost of the lowest segment of water providers selling at a low price is 2.86 NIS. The average medium cost per cubic meter is 4.89 NIS, while the upper segment is 6.50 NIS. In total, there are no differences in energy costs between water service providers based on the price of water sold. The percentage of energy expenses from maintenance and operating expenses is approximately 25% from the cost value of the low-price water service providers.

#### **Technical Indicators**

One of the most important indicators that measures the efficiency of water provider is the nonrevenue water volume. It is an important indicator in Palestine because Palestine suffers from a shortage of water in general. Reducing the quantity of water loss is therefore a new water resource that can be used to increase per capita water consumption. The results of the multivariate test show that there are significant differences in the water losses among water service providers who sell water prices within the low and middle categories. However, there are no significant differences between the high, low, and medium prices. Data indicates that the non-revenue water percentage was about 32% for water service providers selling water at low prices. While it was around 29% for water service providers selling at high prices. However, the non-revenue water percentage is about 26% for the water service providers, who sell at medium prices between 3 and 6 shekels per cubic meter.

The number of water service providers within the medium average price category is 97 water providers. The non-revenue water is less in this category that other water providers in other categories due to the presence of water service providers who have reduced water losses such as Ellar Municipality, Nuba Municipality and others. However, there are also water service providers with a high water loss rate such as Jenin Municipality and Tulkarem Municipality.



Figure 1.6: Relationship Between the Average Price and Per Capita Water Consumption

The results of the empirical examination showed that there are significant differences in per capita consumption according to the prices of water sold. That is, the higher the water sales price, the lower the daily per capita consumption. Many water service providers have set the selling water price per cubic meter at a low price due to the availability of water in their areas, such as the Municipality of AlOuja, the Municipality of Qalqilya, the Municipality of Jericho and others. While in areas where water shortages, the average price is higher than in areas where water is available. For example, Hebron and the south region in general, as these areas suffer from water shortage, which increases the demand of water consumption, the water service providers sell in that areas the water to their customers by water tankers at higher prices than other water service providers.

#### **Administrative Indicators**

The results of the empirical examination show that there are significant differences in the staff productivity ratio of the water suppliers based on the different sales prices categories. On average, there are 5 employees who serve 1,000 water connections in water service providers who sell water at low prices. While the number of employees is about 4 employees per 1,000 connections in the high price category of water service providers, and the lowest staff productivity is in the medium-price category, which reaches 3.7 employees per 1,000 connections. Recently, there has been an increase in prepaid meters for water service providers, especially in medium price category such as joint service councils and other providers. The installation of prepaid meters leads to a reduction in the number of employees and therefore the reduction of the number of staff relative to 1,000 connections. At the institutional level, there are no significant differences between the different sizes of water service providers relative to prices setting.

# Main Results

The study showed that there are findings based on the statistical and empirical tests, as well as the results due to the review of the previous studies and documents related to the Palestinian water sector such as water tariff bylaw, financial sustainability bylaw, as well as the Water Law of 2014 and other studies. In general, the results can be divided into two types for easy follow-up. The first is non-statistical results; which is observed during reviewing previous studies and interpreting the results from statistical tests of this research. The other results are the findings of the statistical and empirical tests to show the measurement of the significant differences in performance indicators of water service providers based on high, medium, and low water prices.

# **Non Statistical Findings**

According to previous studies in this research and the study of the water sector in Palestine, it was found that the Palestinian water sector is a fragile sector. The water sector is organized i.e. regulated and at the same time unorganized. There is a water law for 2014, a water tariff bylaw, a financial sustainability bylaw, a public-private partnership bylaw, a non-revenue water bylaw and other regulations and gridlines. At the same time, all these laws and regulations are not actually fully implemented on the ground.

One of these regulations is the water tariff system. The Water Law also calls for a unified tariff system for all water service providers in Palestine. This study shows that there is no

implementation for this article of the law and the current tariff system is not also implemented as well. The study also reveals that the government subsidizes the purchase price of water regardless of the financial situation of the service provider and regardless of other factors such as water availability, family income, marginalized areas and other economic and social indicators. It was also noticed that there are high percentage and quantity of prepaid meters that are implemented in the Jenin and Tubas areas, which those governorates are suffer from low level of family income compared with other families' income in other governorates. The differences between the Palestinian areas in the water price, water availability, and water consumption can be one of the factors that cause instability in the Palestinian society and therefore the lack of social justice.

On the other hand, the study showed that the price of water has an impact on the financial performance of water service providers. Water service providers who sell water at high prices have been found to be better performing financially than those who sell water at low prices. There are many areas of performance that are noted such as an improvement in the performance of debt collection, high profits, employee productivity, water loss and other performance indicators. It has been noticed that there is a high non-revenue percentage in water providers who sell at low and high prices. The medium prices are the lowest percentage of non-revenue water. This indicates at low prices that the water providers may find difficulties to make maintenance for the water network due to financial losses and lack of cash availability. Water providers, who sell at high prices, also have high non-revenue water percentage. this high non-revenue water percentage may be explained as illegal connections in addition to other factors. Water prices are high in areas where there is no Palestinian security control such as Abu Dis, as well as areas of southern Hebron such as Dahariya, Dora, Ithna, Tarqomya and others.

#### **Statistical Findings**

The results indicate that there are almost every water service provider sells water prices different that other prices of other water provider. The data shows discrepancies in almost everything in Palestinian water sector. The distribution of water service providers varies according to the region and Palestinian governorates. The central region is the lowest number of water service providers because of there is large regional utility that servers many villages and cities in the center region. Palestinians are forced to pay double the price of water by purchasing water tankers from water service providers, as in the Hebron area or from private tankers. The water price of cubic

meters in the summer season is on average 22 shekels. This is a very high amount, however, in the winter the amount drops slightly to 20 shekels. It is noted at some water providers such as in Hebron areas that the water service takes 90 days to reach the areas such as Daherya, Yata, while it takes about 40 days in Sawahara Sharqiya in East Jerusalem; in Qalqilya and Jericho the water is in continuous supply. It is noted also that there is a difference in the Palestinian areas in terms of percentage of prepaid meters to water connections. Jenin and Tuba governorates are the highest governorates that have prepaid water meters. The data also indicates that half of the water service providers in Palestine do not sell water in the incremental increasing segments according to water consumption. There are many of them selling at a fixed price and about 200 service providers out of 270 service providers do not classify subscriptions depending on households, commercial, industrial and other. But those water providers always sell all customers at the same classification.

all those discrepancies in water prices and other parameters have direct effect on the financial performance of water providers. The results of multivariate analysis show that there are significant differences in the working ratio between low-priced water providers and medium and high price categories of water service providers. This means that the higher the price of water sales to the water service provider, the greater the possibility of covering operating expenses and maintenance cost from the revenue generated.

The results showed that there are no significant differences in the collection efficiency between the water service providers in Palestine according to the average price of water sales. That is, regardless of the water selling price is high or low, the collection rate depends on other factors. Recently, many water service providers have purchased and installed prepaid meters. Some of these water service providers sell water at low, medium or large prices. Therefore, there are no differences based on the price of water. But in general there is a direct relationship between the price of water and the collection of debt.

The results of the empirical tests show that there are significant differences in water costs of sales among water service providers who sell water at different prices. This means that the water service provider sells in general based on the cost of the cubic meter that buys or produces.

The results of the multivariate test show that there are significant differences in the water losses among water service providers who sell water prices within the low and middle categories. However, there are no significant differences between the high, low, and medium prices. Data indicates that the non-revenue water percentage was about 32% for water service providers selling water at low prices. While it was around 29% for water service providers selling at high prices. However, the non-revenue water percentage is about 26% for the water service providers, who sell at medium prices between 3 and 6 shekels per cubic meter.

The results of the empirical examination showed that there are significant differences in per capita consumption according to the prices of water sold. That is, the higher the water sales price, the lower the daily per capita consumption. Many water service providers have set the selling water price per cubic meter at a low price due to the availability of water in their areas, such as the Municipality of AlOuja, the Municipality of Qalqilya, the Municipality of Jericho and others. While in areas where water shortages, the average price is higher than in areas where water is available.

The results show that there are also significant differences in the staff productivity ratio of the water suppliers based on the different sales prices categories. Recently, there has been an increase in prepaid meters for water service providers, especially in medium price category such as joint service councils and other providers. The installation of prepaid meters leads to a reduction in the number of employees and therefore the reduction of the number of staff relative to 1,000 connections.

# Conclusion

The study shows that there are more than 250 water tariffs in the West Bank and the Gaza Strip for about 273 Water Service Provider in Palestine. There is also a difference in per capita water consumption in these different areas. It is therefore necessary to study this phenomenon and its impact on two important issues. The first issue is the impact on the financial performance of water service providers in Palestine. Second, the extent to which these differences are consistent with the social justice of the Palestinian citizen and whether the water prices and the tariff system reflect the achievement of social justice.

The discrepancies in the water prices of the water service providers have several reasons, including high maintenance and operating costs per water cubic meter, as well as the difference in the cost of purchasing and producing water. The water production from the water service provider wells is

less than the cost of purchasing the cubic meter from West bank Water Department by about 3 NIS. The results reveal that about 80% of the Palestinian water providers depend on the West Bank Water Department and only 20% from total water supplied quantity is produced from the wells of the water service providers. Also, the profit or loss margin of water service providers is one reason for the increase or decrease in the water sales price. Therefore, knowing the importance of these discrepancies or variation in water prices from one region to another and their impact on the performance of the water service providers can improve the performance of the water service providers and their service provider in general.

The thesis aims to study the water price discrepancies of the water service providers in the West Bank and the Gaza Strip, and to link them with other performance indicators such as the per capita, non-revenue water, and other performance indicators of the water service providers. Also to examine whether there are significant differences between the performance indicators based on the average water price. Therefore, knowing and explaining the effect of the average water price on the financial performance of water service providers in Palestine and knowing also whether the average water price achieves social justice for the Palestinian people will be added value for the policy maker to setup the bylaw and updated the required laws to increase the performance of water sector.

To achieve this, this research follows the empirical method to test these hypotheses, that have been tested through multivariate analysis to show first whether there is a significant relationship between performance indicators based on the average price of water. Because there are many variations in water prices; the water price has been divided into three categories. The lowest category is the price of water provided by water service providers up to 3 NIS. The medium price is the water cubic meter that sold by the water service providers from 3 NIS to 6 NIS. The third category is the price of high cubic meter that is greater than 6 NIS.

To improve results and increase the number of water service providers in the selected sample, secondary data from the performance indicators reports for water service providers in Palestine that published by the Water Sector Regulatory Council for the past three years were adopted in 2015, 2016 and 2017. The number of records are 212 line indicators in the statistical software that belonging to 84 water service providers distributed in the West Bank and Gaza Strip. This data contains various water service providers such as small, medium and large size, different water
prices, different costs and so on. In addition, the Water Sector Regulatory Council's tariff database has also been adopted. This database contains all water service providers in Palestine, including the West Bank and the Gaza Strip, as well as East Jerusalem.

Data shows the distribution of water service providers in the various Palestinian governorates. The central region is the lowest number of water service providers because there is large regional utility - Jerusalem Water Undertaking - servers many villages and cities in the center region. The results indicate that there are more than 75 of different water prices for about 84 water service providers in this sample. Almost every water service provider sells water prices different that other prices of other water provider. At the same time, the results show that the water network coverage rate is about 90% of the Palestinian areas. Palestinians are forced to pay double the price of water by purchasing water tankers from water service providers, as in the Hebron area or from private tankers. The average price of water tanks in total from the water service provider is about 10 shekels per cubic meter, whether in summer or winter. Due to the tremendous pressure on water, especially in the summer season, the Palestinian citizen seeks to compensate for this quantity and fill their needs by purchasing water from private tanks. Where the water price of cubic meters in the summer season is on average 22 shekels. This is a very high amount, however, in the winter the amount drops slightly to 20 shekels.

The results also show that the intermittent water supply in Palestine is 5 days in the winter season, while in the summer the period increases to 7 consecutive days, which is high if we take on average all the water service providers in Palestine. It is noted at some water providers such as in Hebron areas that it takes 90 days to reach the areas such as Daherya, Yata, while it takes about 40 days in Sawahara Sharqiya in East Jerusalem.

The results indicate that Gaza governorate is the highest governorate in terms of number of population. Hebron governorate which reaches about 770,638 people and is the most governorate in the West Bank in terms of the percentage of population to the proportion of water subscriptions. in Hebron there are about 11 people for each water connection. The percentage of prepaid water meters generally is about 10% for all water service providers. It is noted that there is a difference in the Palestinian areas in terms of percentage of prepaid meters to water connections. Jenin and Tuba governorates are the highest governorates that have prepaid water meters Tubas 37%, Jenin 36%, Ramallah 22%, Nablus 15%, Qalqilia 12%, Hebron 10%, Tulkarem 7%,

Bethlehem 2% and the rest of the provinces 0% and are Jericho and Salfit and the Gaza Strip in general.

The data also indicates that half of the water service providers in Palestine do not sell water in the incremental increase according to water consumption. There are many of them selling at a fixed price and about 200 service providers out of 270 service providers do not classify subscriptions depending on households, commercial, industrial and other. But those water providers always sell all customers at the same classification. On the other side, the average connection fees are about 715 NIS. The connection fees also vary from one water provider to another. For water providers who sell their water according to the segments, the prices of these categories also change. The average price of the first category is 4 NIS, while the second category is NIS 4, the third is NIS 6, the fourth is NIS 6, and the fifth is NIS 7. The study shows that there is no relationship between the level of household income or the unemployment rate and the prices of water sold in different Palestinian areas.

The results reveal that there are differences in the working ratio among water service providers. It is noticed that service providers with low prices of less than 3 NIS per cubic meter have a high financial loss which is more than 50%. Although some of these water prices are low such as Qalqiliya and Jericho, but overall there are financial losses for this category. Also this category is the highest category suffering from non-revenue water, which reaches an average of 32% and is very high under the current conditions in Palestine, which suffers from severe water shortage. When examining the low prices and staff productivity, it is found that the low price category has a larger number of employees that service 1,000 water connections. That is, there is no high efficiency and productivity in the staff in this category. Also, this low category of water service providers who sell prices less than 3 NIS has the lowest debt collection rate compared to other water provider categories, but the fact that this low price category has the highest per capita water consumption. The per capita consumption in the category about 99 liters per day, compared with 59 liters per day for water services providers who have an average price of water service of 6 shekels per cubic meter.

In addition to the existence of different sizes of water providers in Palestine, the study reports that there are many water service providers structure types. There are small village councils, small, medium and large municipalities, there are also water associations, joint services councils, and also there are regional water utilities. In general, these water service providers report to the Ministry of Local Government. It is noted that low prices are found in all municipalities, and high prices are found in the regional water utilities. In other words, the municipalities do not have the ability to raise water prices compared with the joint councils and the regional utilities in general. The same concept also applies to water service providers' size, where small water service providers do not seem to have the ability or interest to raise water prices compared with the large water service providers.

## Recommendation

The main finding of this study is that there is significant difference between water prices of water service providers in the West Bank and the Gaza Strip. In addition to the core differences in the water tariff, there are substantial discrepancies in other performance indicators such as per capita water consumption. The per capita in some areas up to 250 liters per day per person, while in other areas the per capita is not reaching more than 30 liters per day. The study also shows that water providers do not implement the tariff system i.e. tariff by law by PWA. Each service provider sets its own price, consumption segments, connection categories and classification. It was also noticed the high percentage of prepaid meter recently installed in many Palestinian areas, especially in the low level income governorate such as Jenin and Tubas. Where these areas suffer from high non-revenue water, which may reach 48%. The existence of these differences in water prices will affect the stability of communities, especially in the summer. During that season, the water cube price increases up to ten times than the current price due to the water tankers. This study recommends the following:

• Government subsidies should be determined according to the low level income of the areas and not lump-sum, as is the current case with water service providers. The study shows differences in the average family monthly income in the Palestinian areas, whether between the north, center and south regions, or among the Palestinian governorates or even between villages and towns within the same governorate. For example, the average monthly family income in the village of al-Reihah in Hebron governorate is 1,100 shekels per month, while the average income in Hebron city is 3,500 shekels. These differences at a rate of three times in some areas would require reconsidering the government support for this important service and trying to link it to the classification of water service providers in terms of

poverty, unemployment, performance, and other factors that increase social justice and at the same time increase performance of water service providers.

- According to this study recommendation, the new tariff system should take into consideration family income and water availability factors. According to the Palestinian Central Bureau of Statistics, there are differences in the amount of monthly expenditures on the main commodities of the individual according to the governorate and within the town or the city itself. For example, families in Ramallah, Jerusalem and Tulkarem spend about 482 Jordanian Dinars per month on food, while the families in Jenin, Nablus, Qalqiliya and Bethlehem spend about 387 Dinars. In Khan Younis and some areas in Gaza, the family spends 294 Dinars. The existence of these differences necessitates reconsidering the new tariff system and leaving some flexibilities for the water service provider to determine the consumption categories and segments based on additional factors such as monthly income i.e. not only monthly consumption.
- The study recommends reconsidering the low water prices and controlling them to reduce the losses of water service providers with water prices less than 3 NIS. This category of water service providers is the worst category in performance. Which includes the highest percentage of water losses, the lowest collection rate of the accumulated debts, the highest percentage of water consumption, the lowest productivity of staff, and the highest percentage of financial losses. These indicators are particularly give the decision maker the worries about the sustainability of water sector especially that there is, 44% of water service providers in this category. Therefore, there is a need to intervention to mitigate this deterioration in performance.
- The study recommends the need for establishment of regional water regional utilities. The thesis shows that regional water utilities and large-scale water service providers have better capabilities than small water service providers to reduce water losses, minimize financial losses, increase collections, etc.
- The study recommends the need to conduct additional research such as study the real costs and how to reduce the operating and maintenance cost. The Palestinian water sector suffers from a limited research and studies that address the water management aspect of the water sector. Therefore, research in reducing costs and increasing water quality, water efficiency

will lead to the sustainability of the Palestinian water sector and the achievement of justice for the Palestinian citizen as well.

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# Appendix A

	Ν	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Price	212	2.0	1.0	3.0	1.675	.6623	.439
Avg Price	212	8.34	.95	9.29	3.6906	1.87615	3.520
Working Ratio	212	5.69	.30	5.99	1.2046	.75766	.574
NRW	212	70.00%	2.00%	72.00%	29.3491%	12.04851%	145.167
Staff Productivity	212	20.35	1.16	21.51	4.3869	2.69547	7.266
Collection efficiency	212	151.00%	6.00%	157.00%	62.3915%	29.40923%	864.903
Operating Cost	212	12.57	.82	13.39	4.1854	2.15724	4.654
Per Capita	212	234.32	18.10	252.42	80.7417	36.94483	1364.921
Ownership	212	3	1	4	1.20	.575	.330
Energy Cost	212	8.70	.01	8.71	.5232	.86837	.754
Size	212	2	1	3	2.01	.760	.578
Valid N (listwise)	212						

### **Table A01: Descriptive Statistics**

#### Table A02: Correlations

		Working		Staff	Collection	Operating	Per	Energy	
		Ratio	NRW	Productivity	efficiency	Cost	Capita	Cost	Price
Working Ratio	Pearson Correlation	1	.235**	.273**	075	.362**	016	.494**	340**
	Sig. (2-tailed)		.001	.000	.280	.000	.814	.000	.000
	Ν	212	212	212	212	212	212	212	212
NRW	Pearson Correlation	.235**	1	.207**	208**	.071	.090	.217**	135 <sup>*</sup>
	Sig. (2-tailed)	.001		.002	.002	.303	.193	.002	.049
	Ν	212	212	212	212	212	212	212	212
Staff Productivity	Pearson Correlation	.273**	.207**	1	129	.038	.131	.407**	226**
	Sig. (2-tailed)	.000	.002		.062	.586	.057	.000	.001
	Ν	212	212	212	212	212	212	212	212
Collection efficiency	Pearson Correlation	075	208**	129	1	.042	.009	.120	.120
	Sig. (2-tailed)	.280	.002	.062		.544	.899	.080	.080
	Ν	212	212	212	212	212	212	212	212

Operating Cost	Pearson Correlation	.362**	.071	.038	.042	1	486**	.240**	.581**
	Sig. (2-tailed)	.000	.303	.586	.544		.000	.000	.000
	Ν	212	212	212	212	212	212	212	212
Per Capita	Pearson Correlation	016	.090	.131	.009	486**	1	.003	415**
	Sig. (2-tailed)	.814	.193	.057	.899	.000		.967	.000
	Ν	212	212	212	212	212	212	212	212
Energy Cost	Pearson Correlation	.494**	.217**	.407**	.120	.240**	.003	1	191**
	Sig. (2-tailed)	.000	.002	.000	.080	.000	.967		.005
	Ν	212	212	212	212	212	212	212	212
Price	Pearson Correlation	340**	135 <sup>*</sup>	226**	.120	.581**	415**	191**	1
	Sig. (2-tailed)	.000	.049	.001	.080	.000	.000	.005	
	Ν	212	212	212	212	212	212	212	212

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

Table A03: Between-Subjects Factors

		Ν
Price	Low price	92
	Medium price	97
	High Price	23

# Table A04: Descriptive Statistics

	Price	Mean	Std. Deviation	N
Working Ratio	Low price	1.5243	1.01038	92
	Medium price	.9686	.34181	97
	High Price	.9209	.12566	23
	Total	1.2046	.75766	212
NRW	Low price	31.8478%	11.12855%	92
	Medium price	26.9588%	13.05909%	97
	3.0	29.4348%	9.19400%	23
	Total	29.3491%	12.04851%	212

Staff Productivity	Low price	5.1959	3.34820	92
	Medium price	3.7306	1.82777	97
	High Price	3.9187	1.96735	23
	Total	4.3869	2.69547	212
Collection efficiency	Low price	59.1739%	29.48183%	92
	Medium price	63.3918%	30.20643%	97
	High Price	71.0435%	24.34128%	23
	Total	62.3915%	29.40923%	212
Operating Cost	Low price	2.8601	2.01355	92
	Medium price	4.8927	1.63463	97
	High Price	6.5035	1.01720	23
	Total	4.1854	2.15724	212
Per Capita	Low price	98.5771	33.12990	92
	Medium price	68.9777	36.25067	97
	High Price	59.0135	19.55772	23
	Total	80.7417	36.94483	212
Ownership	Low price	1.07	.357	92
	Medium	1.18	.457	97
	High Price	1.83	1.114	23
	Total	1.20	.575	212
Energy Cost	Low price	.7616	1.13757	92
	Medium price	.3098	.46724	97
	High Price	.4691	.69655	23
	Total	.5232	.86837	212
Size	Low price	1.92	.802	92
	Medium price	1.97	.728	97
	High Price	2.52	.511	23
	Total	2.01	.760	212

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.974	837.470 <sup>b</sup>	9.000	201.000	.000
	Wilks' Lambda	.026	837.470 <sup>b</sup>	9.000	201.000	.000
	Hotelling's Trace	37.499	837.470 <sup>b</sup>	9.000	201.000	.000
	Roy's Largest Root	37.499	837.470 <sup>b</sup>	9.000	201.000	.000
Price	Pillai's Trace	.877	17.517	18.000	404.000	.000
	Wilks' Lambda	.228	24.435 <sup>b</sup>	18.000	402.000	.000
	Hotelling's Trace	2.926	32.512	18.000	400.000	.000
	Roy's Largest Root	2.760	61.938 <sup>c</sup>	9.000	202.000	.000

a. Design: Intercept + Price

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

	F	df1	df2	Sig.
Working Ratio	26.347	2	209	.000
NRW	1.539	2	209	.217
Staff Productivity	6.385	2	209	.002
Collection efficiency	1.534	2	209	.218
Operating Cost	2.201	2	209	.113
Per Capita	1.438	2	209	.240
Ownership	57.900	2	209	.000
Energy Cost	1.438	2	209	.240
Size	2.373	2	209	.096

# Table A06: Levene's Test of Equality of Error Variances<sup>a</sup>

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Price

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Working Ratio	16.662ª	2	8.331	16.668	.000
	NRW	1128.813 <sup>b</sup>	2	564.407	3.998	.020
	Staff Productivity	107.028 <sup>c</sup>	2	53.514	7.843	.001
	Collection efficiency	2771.217 <sup>d</sup>	2	1385.609	1.611	.202
1	Operating Cost	333.703 <sup>e</sup>	2	166.851	53.796	.000

#### Table A07: Tests of Between-Subjects Effects

	Per Capita	53547.804 <sup>f</sup>	2	26773.902	23.867	.000
	Ownership	10.746 <sup>g</sup>	2	5.373	19.054	.000
	Energy Cost	9.715 <sup>h</sup>	2	4.857	6.796	.001
	Size	6.867 <sup>i</sup>	2	3.434	6.234	.002
Intercept	Working Ratio	180.241	1	180.241	360.609	.000
	NRW	120428.215	1	120428.215	853.164	.000
	Staff Productivity	2551.904	1	2551.904	374.014	.000
	Collection efficiency	579742.952	1	579742.952	674.182	.000
	Operating Cost	3143.369	1	3143.369	1013.482	.000
	Per Capita	793929.513	1	793929.513	707.746	.000
	Ownership	255.763	1	255.763	907.030	.000
	Energy Cost	36.706	1	36.706	51.352	.000
	Size	636.414	1	636.414	1155.471	.000
Price	Working Ratio	16.662	2	8.331	16.668	.000
	NRW	1128.813	2	564.407	3.998	.020
	Staff Productivity	107.028	2	53.514	7.843	.001
	Collection efficiency	2771.217	2	1385.609	1.611	.202
	Operating Cost	333.703	2	166.851	53.796	.000
	Per Capita	53547.804	2	26773.902	23.867	.000
	Ownership	10.746	2	5.373	19.054	.000
	Energy Cost	9.715	2	4.857	6.796	.001
	Size	6.867	2	3.434	6.234	.002
Error	Working Ratio	104.463	209	.500		
	NRW	29501.357	209	141.155		
	Staff Productivity	1426.009	209	6.823		
	Collection efficiency	179723.287	209	859.920		
	Operating Cost	648.225	209	3.102		
	Per Capita	234450.468	209	1121.773		
	Ownership	58.934	209	.282		
	Energy Cost	149.393	209	.715		
	Size	115.114	209	.551		
Total	Working Ratio	428.738	212			
	NRW	213240.000	212			
	Staff Productivity	5612.930	212			
	Collection efficiency	1007747.000	212			
	Operating Cost	4695.613	212			
	Per Capita	1670073.297	212			

	Ownership	374.000	212		
	Energy Cost	217.131	212		
	Size	978.000	212		
Corrected Total	Working Ratio	121.125	211	u li	ı
	NRW	30630.170	211	u la	ı
	Staff Productivity	1533.038	211	u la	ı
	Collection efficiency	182494.505	211	U	u .
	Operating Cost	981.928	211	t	u l
	Per Capita	287998.272	211	t	u l
	Ownership	69.679	211		
	Energy Cost	159.108	211	t	u .
	Size	121.981	211		

a. R Squared = .138 (Adjusted R Squared = .129)

b. R Squared = .037 (Adjusted R Squared = .028)

c. R Squared = .070 (Adjusted R Squared = .061)

d. R Squared = .015 (Adjusted R Squared = .006)

e. R Squared = .340 (Adjusted R Squared = .334)

f. R Squared = .186 (Adjusted R Squared = .178) g. R Squared = .154 (Adjusted R Squared = .146)

h. R Squared = .061 (Adjusted R Squared = .052)

i. R Squared = .056 (Adjusted R Squared = .047)

# Table A08: Pairwise Comparisons

			Mean Difference (I-			95% Confidence Interval for Difference <sup>b</sup>	
Dependent Variable	(I) Price	(J) Price	J) J)	Std. Error	Sig.⁵	Lower Bound	Upper Bound
Working Ratio	1.0	2.0	.556*	.103	.000	.353	.759
		3.0	.603*	.165	.000	.279	.928
	2.0	1.0	556 <sup>*</sup>	.103	.000	759	353
		3.0	.048	.164	.771	276	.371
	3.0	1.0	603*	.165	.000	928	279
		2.0	048	.164	.771	371	.276
NRW	1.0	2.0	4.889 <sup>*</sup>	1.729	.005	1.481	8.298
		3.0	2.413	2.770	.385	-3.047	7.873
	2.0	1.0	-4.889*	1.729	.005	-8.298	-1.481
		3.0	-2.476	2.755	.370	-7.908	2.956

	3.0	1.0	-2.413	2.770	.385	-7.873	3.047
		2.0	2.476	2.755	.370	-2.956	7.908
Staff Productivity	1.0	2.0	1.465 <sup>*</sup>	.380	.000	.716	2.215
		3.0	1.277*	.609	.037	.077	2.478
	2.0	1.0	-1.465*	.380	.000	-2.215	716
		3.0	188	.606	.757	-1.382	1.006
	3.0	1.0	-1.277 <sup>*</sup>	.609	.037	-2.478	077
		2.0	.188	.606	.757	-1.006	1.382
Collection efficiency	1.0	2.0	-4.218	4.268	.324	-12.631	4.195
		3.0	-11.870	6.836	.084	-25.346	1.607
	2.0	1.0	4.218	4.268	.324	-4.195	12.631
		3.0	-7.652	6.801	.262	-21.059	5.756
	3.0	1.0	11.870	6.836	.084	-1.607	25.346
		2.0	7.652	6.801	.262	-5.756	21.059
Operating Cost	1.0	2.0	-2.033*	.256	.000	-2.538	-1.527
		3.0	-3.643 <sup>*</sup>	.411	.000	-4.453	-2.834
	2.0	1.0	2.033 <sup>*</sup>	.256	.000	1.527	2.538
		3.0	-1.611 <sup>*</sup>	.408	.000	-2.416	806
	3.0	1.0	3.643*	.411	.000	2.834	4.453
		2.0	1.611 <sup>*</sup>	.408	.000	.806	2.416
Per Capita	1.0	2.0	29.599 <sup>*</sup>	4.874	.000	19.990	39.208
		3.0	39.564 <sup>*</sup>	7.808	.000	24.171	54.956
	2.0	1.0	-29.599*	4.874	.000	-39.208	-19.990
		3.0	9.964	7.768	.201	-5.349	25.277
	3.0	1.0	-39.564*	7.808	.000	-54.956	-24.171
		2.0	-9.964	7.768	.201	-25.277	5.349
Ownership	1.0	2.0	110	.077	.156	262	.042
		3.0	761 <sup>*</sup>	.124	.000	-1.005	517
	2.0	1.0	.110	.077	.156	042	.262
		3.0	651 <sup>*</sup>	.123	.000	894	408
	3.0	1.0	.761*	.124	.000	.517	1.005
		2.0	.651*	.123	.000	.408	.894
Energy Cost	1.0	2.0	.452*	.123	.000	.209	.694
		3.0	.292	.197	.139	096	.681
	2.0	1.0	452*	.123	.000	694	209
		3.0	159	.196	.417	546	.227
	3.0	1.0	292	.197	.139	681	.096
		2.0	.159	.196	.417	227	.546

Size	1.0	2.0	045	.108	.676	258	.168
		3.0	598*	.173	.001	939	257
	2.0	1.0	.045	.108	.676	168	.258
		3.0	553 <sup>*</sup>	.172	.002	892	213
	3.0	1.0	.598 <sup>*</sup>	.173	.001	.257	.939
		2.0	.553 <sup>*</sup>	.172	.002	.213	.892

Based on estimated marginal means

\*. The mean difference is significant at the .05 level.

1.0 = Low Sales Price, 2.0 = Medium Sales Price, 3.0 = High Sales Price.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table A09: Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.877	17.517	18.000	404.000	.000
Wilks' lambda	.228	24.435 <sup>a</sup>	18.000	402.000	.000
Hotelling's trace	2.926	32.512	18.000	400.000	.000
Roy's largest root	2.760	61.938 <sup>b</sup>	9.000	202.000	.000

Each F tests the multivariate effect of Price. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

b. The statistic is an upper bound on F that yields a lower bound on the significance level.

#### Table A10: Multiple Comparisons

		-	-	Mean			95% Confidence Interv	
			(J)	Difference			Lower	Upper
Dependent Variab	le	(I) Price	Price	(I-J)	Std. Error	Sig.	Bound	Bound
Working Ratio	Tukey	1.0	2.0	.5558*	.10289	.000	.3129	.7987
	HSD	_	3.0	.6035*	.16482	.001	.2144	.9925
		2.0	1.0	5558 <sup>*</sup>	.10289	.000	7987	3129
			3.0	.0477	.16396	.954	3394	.4347
		3.0	1.0	6035*	.16482	.001	9925	2144
			2.0	0477	.16396	.954	4347	.3394
NRW	Tukey	1.0	2.0	4.8891%*	1.72902%	.014	0.8077%	8.9705%
	HSD		3.0	2.4130%	2.76974%	.659	-4.1250%	8.9511%
		2.0	1.0	-4.8891%*	1.72902%	.014	-8.9705%	-0.8077%

			3.0	-2.4760%	2.75543%	.642	-8.9803%	4.0283%
		3.0	1.0	-2.4130%	2.76974%	.659	-8.9511%	4.1250%
			2.0	2.4760%	2.75543%	.642	-4.0283%	8.9803%
Staff Productivity	Tukey	1.0	2.0	1.4653 <sup>*</sup>	.38014	.000	.5679	2.3626
	HSD		3.0	1.2772	.60895	.093	1603	2.7146
		2.0	1.0	-1.4653 <sup>*</sup>	.38014	.000	-2.3626	5679
			3.0	1881	.60580	.948	-1.6181	1.2419
		3.0	1.0	-1.2772	.60895	.093	-2.7146	.1603
			2.0	.1881	.60580	.948	-1.2419	1.6181
Collection	Tukey	1.0	2.0	-4.2178%	4.26757%	.585	-14.2916%	5.8559%
efficiency	HSD		3.0	-11.8696%	6.83628%	.194	-28.0068%	4.2677%
		2.0	1.0	4.2178%	4.26757%	.585	-5.8559%	14.2916%
			3.0	-7.6517%	6.80095%	.500	-23.7056%	8.4022%
		3.0	1.0	11.8696%	6.83628%	.194	-4.2677%	28.0068%
			2.0	7.6517%	6.80095%	.500	-8.4022%	23.7056%
Operating Cost	Tukey	1.0	2.0	-2.0326*	.25630	.000	-2.6376	-1.4276
	HSD		3.0	-3.6434*	.41056	.000	-4.6125	-2.6742
		2.0	1.0	2.0326*	.25630	.000	1.4276	2.6376
			3.0	-1.6108*	.40844	.000	-2.5749	6467
		3.0	1.0	3.6434*	.41056	.000	2.6742	4.6125
			2.0	1.6108*	.40844	.000	.6467	2.5749
Per Capita	Tukey	1.0	2.0	29.5993*	4.87420	.000	18.0936	41.1050
	HSD		3.0	39.5636 <sup>*</sup>	7.80807	.000	21.1324	57.9948
		2.0	1.0	-29.5993 <sup>*</sup>	4.87420	.000	-41.1050	-18.0936
			3.0	9.9643	7.76771	.406	-8.3717	28.3002
		3.0	1.0	-39.5636*	7.80807	.000	-57.9948	-21.1324
			2.0	-9.9643	7.76771	.406	-28.3002	8.3717
Ownership	Tukey	1.0	2.0	11	.077	.330	29	.07
	HSD		3.0	76*	.124	.000	-1.05	47
		2.0	1.0	.11	.077	.330	07	.29
			3.0	65*	.123	.000	94	36
		3.0	1.0	.76*	.124	.000	.47	1.05
			2.0	.65*	.123	.000	.36	.94
Energy Cost	Tukey	1.0	2.0	.4518*	.12304	.001	.1614	.7423
	HSD		3.0	.2925	.19710	.301	1728	.7578
		2.0	1.0	4518 <sup>*</sup>	.12304	.001	7423	1614
			3.0	1593	.19608	.696	6222	.3035
		3.0	1.0	2925	.19710	.301	7578	.1728

			2.0	.1593	.19608	.696	3035	.6222
Size	Tukey	1.0	2.0	05	.108	.908	30	.21
	HSD		3.0	60 <sup>*</sup>	.173	.002	-1.01	19
		2.0	1.0	.05	.108	.908	21	.30
			3.0	55*	.172	.004	96	15
		3.0	1.0	.60*	.173	.002	.19	1.01
			2.0	.55*	.172	.004	.15	.96

Based on observed means.

The error term is Mean Square(Error) = .551.

 $^{\ast}\!.$  The mean difference is significant at the .05 level.

# Appendix B

No	Water Service Provider in the Study	Region
1	Abasan al Jadida Municipality	Gaza
2	Abasan al Kabira Municipality	Gaza
3	Abu Dis Cooperative Society for Water	Middle
4	Al 'Auja Municipality	Middle
5	Al Bureij Municipality	Gaza
6	Al Dhahiriya Municipality	South
7	Al 'Eizariya Municipality	Middle
8	Al Fukhkhari Municipality	Gaza
9	Al Karmel Municipality	Gaza
10	Al Maghazi Municipality	Gaza
11	Al Mughraqa Municipality	Gaza
12	Al Musaddar Municipality	Gaza
13	AL Naser Municipality	Gaza
14	Al Nuseirat Municipality	Gaza
15	Al Qarara Municipality	Gaza
16	Al Shuka Municipality	South
17	Al Shyoukh Municipality	South
18	Al Ubeidiya	South
19	Al Zahraa Municipality	Gaza
20	Al Zawaida Municipality	Gaza
21	Anabta Municipality	North
22	Anata Municipality	North
23	Arraba Municipality	North
24	As Sawahira Ash Sharqiya Municipality	Middle
25	Attil Municipality	North
26	Azmut Village Council	North

27	Azzun Municipality	North
28	Bani Na'im Municipality	South
29	Bani Suheila Municipality	Gaza
30	Bani Zaid Al Gharbia	Gaza
31	Barta'a Al-sharqia	North
32	Beit Hanun Municipality	Gaza
33	Beit Lahiya Municipality	Gaza
34	Beit Lid	North
35	Beit Ula Municipality	South
36	Beit Ummar Municipality	South
37	Beituniya Municipality	Middle
38	Biddya Municipality	Middle
39	Burqeen	North
40	Coastal Municipalities Water Utility - Rafah	Gaza
41	Dair al Balah Municipality	Gaza
42	Deir al Ghosoon Municipality	North
43	Dura Municipality	South
44	Gaza Municipality	Gaza
45	Halhul Municipality	South
46	Hebron Municipality	South
47	Idna Municipality	South
48	Illar Municipality	North
49	Jabalya Municipality	Gaza
50	Jenin Municipality	North
51	Jericho Municipality	Middle
52	Jerusalem Water Undertaking	Middle
53	Joint Service Council for Planning & Development - South East Nablus District	North
54	Kafr Ra'l Municipality	North
55	Khan Yunis Municipality	Gaza
56	Kharas Municipality	South
57	Khuza'a Municipality	Gaza
58	Kufr al-labad	North
59	Mythaloun Joint Service Council	North
60	Nablus Municipality	North
61	Northwest Jenin Joint Service Council	North
62	Northwest Jerusalem Joint Service Council	Middle
63	Nuba Municipality	South
64	Qabalan Municipality	North
65	Qabatiya Municipality	North
66	Qaffen Municipality	North
67	Qalqiliya Municipality	North

68	Ras karkar village council	Middle
69	Sa'ir Municipality	South
70	Salfit Municipality	Middle
71	Taffouh Municipality	South
72	Tarqumiya Municipality	South
73	Tubas Joint Service Council	North
74	Tulkarm Municipality	North
75	Tuqu' Municipality	South
76	Umm Al Naser Municipality	Gaza
77	Wadi Al Far'a Village Council	Gaza
78	Wadi as Salqa Municipality	Gaza
79	Wadi Gaza Municipality	Gaza
80	WSSA of Bethlehem Beit Jala and Beit Sahour	South
81	Ya'bad Municipality	North
82	Yatta Municipality	South
83	Zababdeh Municipality	North
84	Za'tara Municipality	South

ملخص الدراسة

أظهرت بيانات الجهاز المركزي للإحصاء الفلسطيني ان هناك بعض الفروقات الجوهرية في المؤشرات الاقتصادية الهامة بين مختلف المناطق الفلسطينية. نجد ان بعض أسعار السلع والخدمات مرتفعة في منطقة معينة، بينما في مناطق أخرى قد تكون السلع والخدمات نفسها أقل بشكل ملحوظ. ينطبق هذا المفهوم كذلك على خدمة المياه، فقد بلغ سعر متر المياه المكعب حوالي 1.54 شيكل في مدينة قلقيلية، هذا المبلغ أقل بثلاث مرات من سعر المياه في مدينة رام الله الذي يبلغ على خدمة المياه، فقد بلغ سعر متر المياه المكعب حوالي 1.54 شيكل في مدينة قلقيلية، هذا المبلغ أقل بثلاث مرات من سعر المياه في مدينة رام الله الذي يبلغ 6.78 شيكل للمتر المكعب. يؤدي التباين في أسعار المياه وعدم توفرها إلى الشعور بعدم المساواة في العدالة الاجتماعية بين المجتمع الفلسطيني في منطقة معينة وأخرى. بالمجمل، قد يزيد هذا الشعور ويؤثر على استقرار المجتمعات خاصة في الظروف الاقتصادية السيئة او الحاجة الماسة للمياه في فصل الصيف. وبالتالي، وأخرى. بالمجمل، قد يزيد هذا الشعور ويؤثر على استقرار المجتمعات خاصة في الظروف الاقتصادية السيئة او الحاجة الماسة فإن عملية التنمية المحلية والمجتمعية ستتمار سلبا. ومن هنا، من الضروري أن تعمل الحكومة وصانعي السياسات بتتبع هذه الاختلافات، وحجمها، واسبابها، وتركزها، وسبل الغاء او التخفيف من حدة هذه الفروقات حتى يتم توفير الاستدامة والتطور المجتمعي.

تهدف هذه الرسالة إلى دراسة الفروقات في أسعار المياه لمقدمي خدمات المياه في الضفة الغربية وقطاع غزة، وربط هذه الفروقات بمؤشرات الأداء المالية والتقنية لمزودي خدمات المياه منها على سبيل المثال، حصة الفرد من المياه في اليوم، نسبة فاقد المياه، وإنتاجية العاملين لدى مزودي خدمات المياه، تكاليف الصيانة والتشغيل، وغيرها من مؤشرات الاداء. من الضرورة بمكان أيضا معرفة اتجاه العلاقة بين متوسط سعر المياه ومؤشرات الأداء، أي فيا إذاكان هناك علاقة إيجابية او سلبية.

لتحقيق النتائج المرجوة، سوف يعمل هذا البحث على إجراء تحليل التباين متعدد المتغيرات (MANOVA) للعلاقة والأثر الاحصائي لمتوسط سعر المياه كمتغير مستقل على العديد من المتغيرات التابعة. شملت حجم العينة في هذه الرسالة جميع مقدمي خدمات المياه الذين يقدمون خدمات المياه لأكثر من 80٪ من المواطنين الفلسطينيين.

تظهر الدراسة أن هناك أكثر من 250 تعرفة مياه في الضفة الغربية وقطاع غزة لحوالي 273 مزود خدمة مياه في فلسطين.

أظهرت نتائج الدراسة وجود اختلاف كبير في مؤشرات الأداء لمقدمي المياه على أساس متوسط سعر المياه. فقد تبين ان فئة السعر المنخفض لمزودي خدمات المياه هي أسوأ فئة في الأداء (أي مزودي خدمات المياه الذين يبيعون بالمتوسط كوب المياه اقل من 3 شيقل). وتشمل فئة السعر المنخفض أعلى نسبة من خسائر او فاقد المياه، وأقل معدل تحصيل للديون المتراكمة، وأعلى نسبة من استهلاك المياه، وأدنى إنتاجية للموظفين، وأعلى نسبة من الخسائر المالية. تعطي هذه المؤشرات بشكل خاص صناع القرار المخاوف بشأن استدامة قطاع المياه خاصة وأن هناك 44٪ من مقدمي خدمات المياه يندرجون تحت هذه الفئة.