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Water Pricing for Domestic Use in the Gaza Strip

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يقول الله تعالى في كتابه الكريم :

﴿ أو لم ير الذين كفروا أن السموات والأرض كانتا رتقاً ففتقناهما وجعلنا من الماء كل شيء حي أفلا يؤمنون ﴾

صدق الله العظيم

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Dedication

I would like to dedicate this work to my family

and to those who help

me for their strong support

Yusuf S. Al-Ghuraiz

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Abstract

Water scarcity in the Gaza Strip forms a real crisis for people in this area. The ground water is the main resource for domestic use in the Gaza Strip. This resource suffers from rapid decline in both quality and quantity. The crisis should be managed carefully to secure the water demand with an appropriate price.

The water sector can't be managed successfully without a suitable water pricing system because any improvement process for the water supply service is likely to increase the cost of this service. Water pricing must be integrated with other measures to ensure that environmental, economic and social objectives are met cost effectively.

Globally, evaluation of water pricing systems continues to be a very essential issue. Subsequently, this research aims to study the major factors on which water pricing should be built in the Gaza Strip to enhance the appropriate water pricing to play a key role in the development of a sustainable water service.

The major factors that were studied in this thesis include water consumption, water quality and quantity of the supplied service, socioeconomic situation, willingness to pay, ability and affordability, illegal connections, public awareness, community participation in decision making, institutional arrangements and the political situation.

Forty-four interviews were administered with persons, who were dealing or having contact with water supply sector. Seven hundred and sixty questionnaires were distributed among the subscripted households in the governorates of the Gaza Strip. Only 609 of them were used in data analysis.

The results of the study reveal that the average price " 3.0 NIS per m^3" for improved water supply service, that matches the WHO standard, is a suitable price for domestic use. This price could cover the costs of production, maintenance and operation according to water tariff study conducted by and for the Palestinian Water Authority. This price also is affordable by all income groups.

Furthermore, the study provides several recommendations such as, developing water pricing policies, searching for additional water resources, replacing the fragmented structure by a unified policy approach and organizing public awareness campaigns. The study contributes towards establishing a baseline for any water tariff structure and reflects the need for further research.

الخلاصـــــــــــــة

أسعار المياه للاستعمال المترلي في قطاع غزة

تشكل أزمة المياه في قطاع غزة مشكلة حقيقية للسكان ، ويعتبر الخـــزان الجـــوفي هـــو المصدر الرئيسي للمياه للأغراض المترلية في قطاع غزة ، ويعاني الخزان الجوفي للميـــاه في قطاع غزة من الهبوط الحاد في الجودة والكمية بسبب زيادة النمو السكاني وبالتالي ازدياد الطلب على المياه وعدم توفر مصادر أخرى بديلة للمياه ، لذا يجب أن تتم إدارة مـــصادر المياه بعناية فائقة كي تؤمن احتياجات السكان من الميـــاه وبالـــسعر الـــذي يتناســـب وإمكانيات السكان المادية .

إن نجاح إدارة قطاع المياه مرهن بنظام متوازن لأسعار المياه يحقق تغطية التكاليف اللازمة لتحسين الخدمة وفي نفس الوقت يحقق الأهداف البيئية والاقتصادية و الاجتماعية .

يعتبر موضوع التعرفة المائية من المواضيع التي تحظى بالاهتمام والتقيـــيم المـــستمر علـــى مستوى العالم ، لذا كان هدف هذه الدراسة هو دراسة العوامل الرئيسية التي تؤثر علـــى التعرفة المائية في قطاع غزة والتي يجب أن تؤخذ بعين الاعتبار عند رسم سياسات وأنظمة التعرفة المائية لضمان استمرارية وديمومة خدمة المياه بشكل ناجح وفعال .

من العوامل الرئيسية التي يتم تناولها في هذه الأطروحة : كمية المياه المستهلكة وعلاقتـــها بأسعار المياه ، جودة وكمية المياه ، الظروف الاقتصادية والاجتماعية ، رغبة السكان في الدفع المالي للخدمة المتطورة وقدرتهم على ذلك ، الوصلات غير القانونية ، الوعي العام ، المشاركة المجتمعية في صناعة القرارات المتعلقة بخدمة المياه ، البنية التحتية للمؤسسة القائمة على خدمة المياه والوضع السياسي في المنطقة .

ضمن الإجراءات التي اتبعت في هذه الدراسة فقد تم إجراء مقابلات مع أربعة وأربعـــين شخصا ممن يعملون في قطاع المياه أو ممن تتوفر لهم خبرة عالية في هذا المجال في قطـــاع غزة سواء في سلطة المياه أو البلديات أو الجامعات أو مؤســـسات دوليـــة أو خاصـــة، وكذلك تم توزيع سبعمائة وستون استبياناً على المواطنين من مختلف محافظات قطاع غزة حيث كانت نسبة الاستجابة 96% وبعد تنقيح الاستبيانات التي تم استقبالها أجريـــت

عملية تحليل البيانات على 609 فقط من هذه الاستبيانات باستخدام برنـــامج SPSS وقد اختبرت النتائج باستخدام الاختبارات التالية " Chi square , ANOVA and t-test" وقبلت النتائج عندما كانت الفروقات الإحصائية بنسبة أقل من 5%.

وقد كان من أهم النتائج التي تم التوصل إليها أن السكان لديهم الرغبة والمقدرة الماليـــة لدفع ثلاثة شواقل لكل متر مكعب من المياه المطورة والتي تنطبق عليها مواصفات منظمة الصحة العالمية وهذا السعر يغطي التكاليف اللازمة لتقديم هذه الخدمة حسب الدراســـة التي أعدتها شركة ليكا لصالح سلطة المياه الفلسطينية.

وقد أوصت هذه الدراسة بالعديد من التوصيات مثل:

- السعي الحثيث لتطوير خدمة المياه بما يتناسب مع ظـــروف الـــسكان الاقتـــصادية والاجتماعية .
- اعتبار متوسط سعر المياه المطورة للشرائح المختلفة ثلاثة شواقل لكل متر مكعب هـــو سعر مناسب لبناء تعرفة مائية متوازنة .
- يجب الأخذ بعين الاعتبار عند تصميم التعريفة المائية لقطاع غزة الشرائح الاقتصادية المختلفة وضمان التكافل بين الأسر الفقيرة والأسر الغنية .
- ضرورة السعي لإيجاد مصادر مياه بديلة لتقليل التكلفة وتوفير كمية الميـــاه اللازمـــة للأغراض المترلية مثل البحث في إمكانية جلب مياه إضافية من دول مجاورة ، الاســـتفادة من مياه الأمطار والاستفادة من مياه الصرف الصحي المعالجة للري والزراعة.
- يجب أن تضاعف المؤسسات القائمة على خدمة المياه جهودها من اجل تقليل الفاقد حتى تقل تكلفة المتر المكعب وذلك بالصيانة الدائمة والمتابعة المستمرة لشبكات وعدادات المياه وكذلك ملاحقة الوصلات غير القانونية ووضع حد لها .
- برامج توعية وإرشاد للسكان حول ترشيد استهلاك المياه .
- تعزيز المشاركة المجتمعية في صناعة القرارات المتعلقة بخدمة المياه .

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List of Acronyms and abbreviations

ANOVA	Analysis of Variance
CIP	Capital Investment Program
CMWU	Coastal Municipalities Water Utility
CVM	Contingent Valuation Method
ESCAP	Economic and Social Commission for Asia and the Pacific
GDP	Gross Domestic Product
GNP	Gross National Product
IBRD	International Bank for Reconstruction and Development
L/c/d	Liter per capita per day
LEKA	Lyonnaise des Eaux Khatib and Alami
MENA	Ministry of Environmental Affairs
MoLG	Ministry of Local Government
NGO	Non-Governmental Organization
NIS	New Israeli Shequl (~ USD 0.21)
NRWA	National Rural Water Supply Association
NWC	The National Water Council
OECD	Organization for Economic Co-operation and Development
PCBS	Palestinian Central Bureau of Statistics
PECDAR	Palestinian Economic Council for Development and Reconstruction
PLO	Palestinian Liberation Organization.
PNA	Palestinian National Authority
PWA	Palestinian Water Authority
SCF	Save the Children Federation
SPSS	The Statistical Package for the Social Sciences
UFW	Unaccounted For Water
UK	United Kingdom
UN	United Nations.
UNDP	United Nations Development Program

UNICEF	United Nations International Children's Emergency Fund
UNRWA	United Nations Relief and Works Agency
USA	The United States of America
USAID	United States Agency for International Development
WHO	World Health Organization
WTP	Willingness to Pay

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Chapter (1)

Introduction

This chapter includes historical, geographical and demographical data about Gaza Strip due to the importance of this information for recognizing the area of the study with most of its details; furthermore it contains explanation of water scarcity in Gaza Strip, problem definition, objectives and the importance of the study.

1.1 Background

As a result of Arab-Israeli conflict in Palestine, in 1948, many Palestinians were forced to leave their homes and moved to several different areas within the Middle East region, thus creating a large and dispersed community of refugees. In that time the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) was formed. The purpose of the agency was to provide basic education, health, relief and social services to registered refugees in the five different areas of the region, namely, Jordan, Syria, Lebanon and occupied Territories of the West Bank and Gaza Strip.

From 1917 to 1948, Gaza was a part of Palestine under the British mandate. The current boundaries of the Gaza Strip are a product of the Arab- Israeli War of 1948, which incorporated two–thirds of mandate Gaza into Israel. An armistice between Israel and Egypt brought the remaining one – third of Gaza's most marginal land – the 365 square kilometers now referred to as the Gaza Strip – under Egyptian administration. The 1948 war displaced approximately 900,000 Palestinians; 250,000 of these refugees fled to the Gaza Strip, increasing the population of the area by more than 300 percent. The huge influx, combined with the loss of resources and disruption of domestic trade, created an unstable economic situation. The Egyptian administration did little to promote economic self-sufficiency in Gaza or to increase ties with its own economy, assuming instead that Gaza's future would rest on an economic relationship with Israel. By the time of the Israeli occupation of 1967, Gaza's economy remained "fragile and underdeveloped", dominated by its service sector, and heavily dependent on citrus agriculture (Sara Roy, 1995).

The six –Day War in June 1967 both the West Bank and Gaza Strip under Israeli occupation. Israeli fostered economic dependence in order to keep a hostile Palestinian state from being established on its vulnerable borders. Israeli policy exhibited two overriding priorities: absolute control over land and water resources in the occupied Territories and suppression of any form of independent political or economic organization (Sara Roy, 1995). In Gaza, these aims were embodied in a range of discriminatory policies, including the expropriation of land and water resources, restrictions on research and training, low levels of investment in infrastructure, the absence of financial support or credit facilities for Palestinians, the prohibition of land –and water-use planning, severe restrictions on travel, and restrictions on exports (Kelly, K. and Homer-Dixon, 1995). A large percentage of the Gaza workforce became incorporated into the lower echelons of Israeli's economy, especially in construction and as unskilled labor. The net effects of these policies have been the economic and political isolation of the Palestinian population in Gaza and the future weakening of already fragile local economic structures (Sara Roy, 1995).

From the outset, the occupation was resisted within both the Occupied Territories and throughout Palestinian diaspora. Internationally, it brought the Palestinian Liberation Organization (PLO) to prominence. In 1974, the United Nations (UN) granted the PLO observer status as " the sole legitimate representative of the Palestinian people (Kelly, K. and Homer-Dixon, 1995). In 1993 Israel government and PLO signed the Gaza –Jericho First Accord. This Accord has transferred responsibility for a resource –poor, overpopulated and politically unstable region from Israel to the newly formed Palestinian National Authority (PNA).

The Gaza Strip is bordered by the Mediterranean Sea to the northwest, An-Naqab Desert to the east and south and Egypt to the southwest. The Gaza Strip has an area of only 365 km^2. The population in 1998 was 1.1 million (Palestinian Central Bureau of Statistics (PCBS, 1998). From 1948 to 1991, the total population tripled from 260,000 to 785,000 people (DURP/MoPIC, 1997) which makes this area one of the most densely populated areas in the world (2,150 persons / km^2 in 1991).During this time the refugee population also tripled from 170,000 to 510,000 people with an estimated 280,000 (55 percent) living in the more densely populated refugee camps.

Considering 1995 population as 886,000 in the Gaza Strip (365 km^2) , the population density is then 2,427 persons/ km^2. The Gaza Strip composed of five governorates as shown in the map Figure 1.1 (El-Hawi, M. and Hamilton, 2002).

The distance from north to south is about 45km and from east to west varying from 5 to 12km. The area includes several Israeli settlements covering approximately 1/5 of the total area (Sogreah and Team engineering group, 1998).

Figure 1.1 The Governorates of Gaza Strip

The topography of the area is flat, rising to a maximum height of 65 m above sea level. The climate is typical of that of the eastern Mediterranean with mild wet winters and hot dry summers. Monthly average temperature reaches a maximum of 35 ^{O}C and a minimum of 4^{O}C. Sand dunes are the main feature along the coast line; sandy soil, loessial sand soil and loess prevail in the eastern part of the strip. In contrast the soil of the east of Gaza town and the northeastern part of the Gaza Strip consists of dark brown clay loams. There are no permanent surface water sources. Annual rainfall is between 150 and 350 mm. Groundwater is the only significant source of water in the Gaza Strip. This is directly replenished by rainwater infiltration and underground flow from the east (Nassar, A.Majid, 1996).

Institutional arrangements in the Gaza Strip are weak, resulting from a lack of investment, from the exigencies of the occupation and from lack of support by the local population (Camp Dresser, 1993). The water sector is managed now by municipalities and village councils individually with supporting role from Palestinian Water Authority (PWA), UN Relief Works Agency (UNRWA), and Ministry of Local Government (MoLG), where each municipality or village council has its own water policy, water tariff, operating system and maintenance system. Currently, special attention is paid to the environmental health sector (water and sanitation). This sector requires urgent attention in terms of funding, institutional and financial development, and community development.

1.2 Water Situation in the Gaza Strip

1.2.1 Introduction

As the first source of freshwater north of the Sinai Desert, the area currently known as the Gaza Strip, was once considered to have great strategic value. However, a massive influx of refugees to the area in 1948 placed tremendous stress on its fragile resources. By the time of Israeli occupation in 1967, Gaza hovered on the verge of a water supply crisis. Today, Gaza has become "the most horrifying case of all" in the notoriously water-scarce Middle East region. There was rapid decline in both the quality and quantity of water supplies, frequent outbreaks of waterborne disease, increased alkalinity and salinity of the soil, and the almost total absence of proper sewage disposal or reasonable domestic hygiene. Water scarcity in Gaza has clearly aggravated socioeconomic conditions (Kelly, K. and Homer-Dixon, 1995).

In the case of Gaza, years of occupation have interacted with severe resource scarcities to produce a dismal socioeconomic environment. It is clear that over the years water scarcity has worsened socioeconomic conditions. The situation is further complicated by the fact that resources and population in Gaza are administered by several authorities, including the UN Relief Works Agency (UNRWA), the Israeli military government and the Palestinian Authority (PA). The PA took over the administration of Gaza's water supply in May 1994 (Kelly, K. and Homer-Dixon, 1995).

1.2.2 Water Scarcity in the Gaza Strip

Sandra Postel calls the Middle East the "region of the most concentrated water scarcity in the world," with nine out of fourteen countries facing water-scarce conditions. In Gaza, the water crisis is a function of population growth , an agriculturally intensive economy, a fragile water ecosystem , and a highly inequitable distribution of resources (see figure 1.2) (Kelly, K. and Homer-Dixon, 1995).

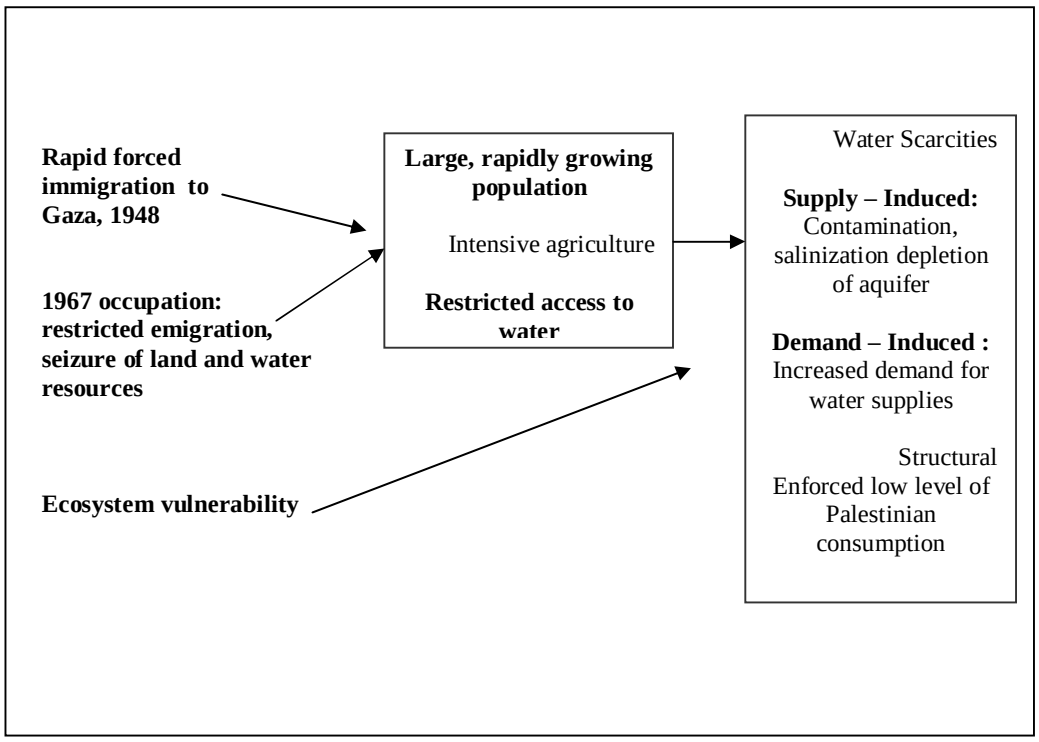


Figure 1.2 Water Scarcity in Gaza (Kimberely and Thomas Homer-Dixon, 1995)

1.2.2.1 Ecosystem Vulnerability and Overall Availability

Gaza's climate ranges from semiarid in the north to arid in the south. The warm climate causes high potential envirotranspiration (or evapo-transpiration, is the loss of water an ecosystem experiences through evaporation from plant life and soil), between 1,040 and 1,900 millimeters per years (mm/year) for Gaza as a whole. Of the average annual rainfall in Gaza (200-400 mm/year, which amounts to 117 million cubic meters (mcm) of total water from precipitation in Gaza's catchment area), only 40 percent is estimated to recharge the single freshwater aquifer underlying the territory, while the remainder is lost through surface runoff to the Mediterranean or to evaporation. Another 30 mcm of recharge comes from agricultural return flow, waste water infiltration, and groundwater flow from the east, though the last may have decreased over the years due to a number of wells drawing reservoir water beyond the Green Line (Kelly, K. and Homer-Dixon, 1995).

For its freshwater supply, Gaza relies almost entirely on groundwater drawn from its aquifer, with minimal amounts obtained from other sources, such as rooftop rainwater catchments. Gaza's aquifer is often only a few meters from the surface. It is also thin, ranging in thickness from 120 meters near the coast to 10 meters in the east. Since it is near the Mediterranean and a deeper, highly saline aquifer, it is vulnerable to declining water levels, saltwater intrusion, and contamination from agricultural and industrial activity. Estimates of the aquifer's renewable yield vary widely, ranging from 25 to 80 mcm per year, with around 65 mcm the most frequently quoted figure. Although there are serious distribution problems in Gaza, high population growth and years of heavy extraction have produced a crisis of absolute water availability (Kelly, K. and Homer-Dixon, 1995).

1.2.2.2 Supply-Induced Scarcity

Gaza's limited water supply has been overexploited (mined) since the early 1970s, and probably since the period of Egyptian control. The continuous mining of the Gaza aquifer, on average by an estimated 60 to 65 mcm per year, has caused falling water tables, salt intrusion, and chemical contamination (Kelly, K. and Homer-Dixon, 1995). In its natural state, the top of the Israeli coastal aquifer, which is analogous to the neighboring Gaza aquifer, is 3 to 5 meters above sea level. Overpumping has reduced the Gaza aquifer to well below sea level and continues to

draw it down by 15 to 20 centimeters per year. This decline reduces the aquifer's hydrostatic pressure, allowing the infiltration of saltwater from the Mediterranean and from saline aquifers below and to the east. Saltwater intrusion has already been detected as a far as 1.5 kilometers inland. While levels of salinity vary geographically, Gaza's groundwater is generally classified as saline, ranging from 650 to 3,600 parts per million (ppm). The United States (US) standard for drinking water is 500 ppm and water over 1000 ppm is considered saline. Salinity increases an average of 15 to 20 parts per million per year. This rapid increase has led some to predict the total salinization of the aquifer, if there is insufficient additional water to replace that lost to overpumping. Tables 1.1 and 1.2 show the suitability of groundwater in the Gaza Strip for domestic use.

Table 1.1 Potability of Groundwater in the Gaza Strip

Dissolved Substances	**Acceptable Concentration (ppm) (WHO Guidelines)**	**Gaza Concentration (ppm)**
Total Dissolved Solids	500	1,200 – 3,200
Sodium (Na^{+})	20	300 – 1,100
Chloride (Cl^{-})	250	400 – 1,500
Calcium (Ca^{+2})	36	40 – 120
Sulfate (So_4^{-2})	250	50 – 400
Magnesium (Mg^{+2})	30	40 – 120
Bicarbonate (HCO_3^{-})	225	300 – 700
Potassium (K^{+})	4	6 – 10
Nitrate (NO_3^{-})	45	40 – 140
Flouride (F)**	1.5	0.4 – 2.9

Source: (Hisham Zarour et al, 1994).

** Flouride figures drawn from (Zaher Kuhail and Zaki Zoarob, 1994).

1.2.2.3 Demand – Induced Scarcity

Population size is possibly the most contested statistic for Gaza. The size of Gaza's current population is largely the result of the original refugee influx from the 1948 war. Approximately 70 percent of Gaza's population are made up of these refugees and their descendants (Sara Roy, 1995).

Table 1.2 Suitability of Domestic Water Wells in the Gaza Strip

Material	Suitable Wells *	% of Suitable Wells
Total Dissolved		
Solids	23	39.7
Sodium	27	46.6
Chloride	24	41.3
Calcium	46	79.3
Sulfate	52	90.0
Magnesium	57	98.3
Potassium	32	55.2
Nitrate	0	0
Flouride	47	80.0
Hardness	6	10.3
Alkalinity	0	0

Source: (Zaher Kuhail and Zaki Zoarob, 1994).

* Out of a total of 60 domestic water wells in Gaza.

Estimates of average population density range from 1,936 people per square kilometers (/km2) to 2,055 people/km2. Densities are much higher in the refugee camps; Jabalya camp has one of the highest population densities in the world,

100,000 people/km2 in extremely poor living conditions (Kelly, K. and Homer-Dixon, 1995). Gaza's growing population and limited water resources are driving down per capita water availability. The Swedish hydrologist Malin Falkenmark has identified one thousand cubic metes per person per year as "water barrier" for agricultural and industrial development. She defines this barrier as "the level of water availability below which serious constrains to development will arise." The ratio in Gaza – even using low population estimates and optimistic estimates of sustainable water supply – is considerably less than one hundred cubic meters per person per year (Kelly, K. and Homer-Dixon, 1995).

1.2.2.4 Structural Scarcity

Discriminatory water allocation and pricing structures have significantly contributed to the present crisis in Gaza. Throughout the occupation, Israel practiced blatant and formalized discrimination regarding Palestinian water consumption in both Gaza and the West Bank. In 1967, Israel declared all water resources in the Territories to be state owned and under the jurisdiction of the military. Strict quotas were placed on Palestinian consumption. To preserve Gaza's aquifer under the occupation, Military Order 158 (which applied only to the Arab population of Gaza, and not to Israeli settlers) prohibited the drilling of new wells or the rehabilitation of existing wells for any purpose without a permit (Kelly, K. and Homer-Dixon, 1995).

1.3 Problem Definition

Uneven pricing schemes are another cause of structural scarcity. Although weak institutions and deteriorating infrastructure provide barely adequate quantity and quality of water, Gaza Palestinians pay much higher prices than do residents in Israel and Israeli settlers in the Territories. Settlers receive significant subsidies, paying \$0.10 per cubic meter (/m^3) for water that costs \$0.34 /m^3; Palestinians, who receive no subsides, may pay up to \$1.20/m^3 for water from local Arab Authorities. Relative to per capita income, Palestinians pay as much as twenty times what Israeli settlers pay for water (Kelly, K. and Homer-Dixon, 1995).

This pricing system does not reflect the vulnerability of the region's water resources: the heavy subsidization of Israeli farmers, especially in the Territories, promotes waste and overconsumption. Surprisingly, a large price differential also exists between the West Bank and Gaza for both Israelis and Palestinians; water is much

cheaper in Gaza, yet the crisis there is far more severe (Kelly, K. and Homer-Dixon, 1995). The net effect of Israeli's policies is to buffer Israelis from the effects of declining levels of water quality and quantity, while Palestinians bear the brunt of water scarcity. This inequity has contributed to a prosperous Israeli settler economy co-existing directly alongside a stagnant Palestinian economy (Kelly, K. and Homer-Dixon, 1995).

The water sector can't be managed successfully without a suitable water pricing policy especially in Gaza Strip, where the main resource of potable water "the ground water" needs solutions for its salinity and contamination to become suitable for human use. This will increase the cost of water supply service, but there are limitations for the ability and willingness to pay according to the socio-economic situation. So decision makers have to take into account that the successful management of water sector must provide an acceptable quality and quantity of water according to the World Health Organization (WHO) standards or national standards if any with low charges that meet the socio-economic situation.

Pricing is not the only instrument that can solve water resources problems. However, pricing must be given due consideration to ensure it promotes more efficient and less pollution use of scarce water resource. Water pricing will need to be integrated with other measures to ensure environmental, economic and social objectives are met cost-effectively. Thus all the social costs of the water supply service should be included in the price. Unmeasured environmental costs should also be included. As Organization for Economic Co-operation and Development OECD (1987) points out that "to those who claim that unmeasurables cannot be reflected in water pricing schedules, the answer must be that for many years various equity objectives, also essentially immeasurable, have been influential in tariff design".

United Nations (1981) pointed out that in 1980 the expert group organized by the Economic and Social Commission for Asia and the Pacific (ESCAP) in Thailand considered the following factors related to water charges: marginal cost pricing, average cost pricing, benefit pricing and socio-political pricing. Benefit pricing means that users are charged for the actual benefits they receive from productive use of water, particularly irrigation. Socio-political pricing means that the government finances most of the costs and thus equates them with subsidies. The water charges

used must be accepted by the consumers. A complicated pricing structure might not be acceptable to consumers. In such a case education of the public and social marketing should be seriously considered. Besides, it is important that decision-markers accept and understand the need for proposed system of water charges. This problem, which is often political in nature, might also be alleviated by increasing awareness or public relations. The charging systems employed should not cause too high administrative costs. This means that the tariff structure should be appropriately simple but should encourage efficiency. In addition, the administrative costs of fee collection must not be too high.

This study aims to identify the main factors that affect the water pricing in Gaza Strip. There are many factors that affect water pricing. This study have limitations, where it can not overcome all factors, so it concentrates on essential factors especially in Gaza Strip, which have special socioeconomic conditions. These factors are like, water consumption, ability and willingness of consumers to pay for improved water service, the level of submitted service either quality or quantity of supplied water, the socioeconomic situation in Gaza Strip, the public awareness of residents and their degree of satisfaction with municipal services. Another important issue related to water pricing is that a high percentage of residents in Gaza Strip are refugees, who used to receive water supply service from UNRWA without any charge for a long period of time. This situation may affect directly their willingness to pay. This study may help decision-makers to take correct actions and decisions for continuity in improvement and development.

1.4 Research Aim

The overall aim of this research is to study the major factors on which water pricing should be built in Gaza Strip and to suggest an appropriate water pricing in order to play a key role in the development of a sustainable water service.

1.5 Research objectives

The specific research objectives are

1. To understand the relationship between water consumption and water pricing.
2. To identify the impact of water service level, either quality or quantity, on water pricing.
3. To assess the socioeconomic situation and its impact on water pricing.

4. To measure the affordability and the willingness to pay for improved water service.
5. To identify the relationship between water pricing and illegal connections.
6. To determine the impact of public awareness and community participation on water pricing.
7. To study the impact of poverty on water consumption.
8. To investigate the impact of political situation on water pricing.

1.6 Importance of the study

As indicated before, the crisis of water in Gaza Strip is more sever due to the lowest degree of groundwater quality and the shortage of quantity. This should be reflected on the residents' level of satisfaction with water service. The crisis will continue to increase with time, if no suitable actions are taken as soon as possible. PNA gives a special attention for this issue by establishing the Palestinian Water Authority (PWA) under the law No.2 of 1996. The National Water Council (NWC), under the same law, was appointed as the competent policy making body for developing and exploiting water resources in the territories administrated by the council of the PNA (Article (9) 2, 1996). Strategic responsibility for implementing NWC policy through the management of water assets and the provision of water and waste water services is delegated to the PWA (Article (3) 2, 1996). In 1996 PLO signed an agreement with the World Bank to get a credit of $25 million. According to this PWA advertised for an international competitive tender. A private contractor (joint venture between Lyonnaise Des Eaux Khatib and Alami) (LEKA) was awarded a four year water services management contract. The objectives of this project were mainly to improve the availability of water through improving the efficiency of the distribution system, the quality of water supply and wastewater treatment, better revenue collection and better customer service.

Inspite of the recent improvement in the water sector due to this project, a main problem which is related to a finance system still without solution, where each municipality has a separate water tariff that differs than others. This is due to different conditions of water production and cost recovery; as example in the middle governorate water supply depends mainly on Mekorot (Israeli company) water supply, which costs more than the produced water from local wells. The quality and

quantity of water differs also from one area to another, the average household income is not equitable in all governorates of Gaza Strip and so on the water consumption. All these factors and others make it difficult to use a unique water tariff for all Gaza Strip. The strategic solution for water supply management in Gaza Strip according to the understanding memorandum that signed in May 2000 between PWA, Municipalities and Ministry of Local Government (MoLG) is to establish the Coastal Municipalities Water Utility (CMWU). When the CMWU starts, it is also not convenient to deal with different tariffs in different areas, so it will use a unique water tariff for all Gaza Strip. PWA used consultants to assist for this purpose, but there is doubt about the prepared studies if they are suitable or not, so this study comes to highlight the main essential factors that should be taken into consideration when building on any water tariff in Gaza Strip to achieve efficiency, affordability and equity.

Chapter (2)

Literature Review

An appropriate water pricing has a key role to play in the development of sustainable water policies. However, to play an effective role in enhancing the sustainability of water resources, water pricing policies need to take into account both the financial costs of providing services as well as environmental and resource costs. A price directly linked to the volume of water used, or pollution produced, can ensure that pricing has a clear incentive function for consumers to improve water use efficiency and reduce pollution. So, the integration of economic and environmental objectives into water pricing policies must be highly considered.

This chapter consists of four sections, the first one indicates some theoretical considerations concerning with the research subject such as, development theories and strategies, basic concepts (scarcity and pricing, price elasticity of demand, willingness to pay, cost concepts and economies of scale), pricing objectives and institutional aspects. The second section deals with paying for water in developing countries indicating some related issues like, water pricing in developed countries and cost recovery of water supply in developing countries, which contains main concepts such as, benefits and costs of water supply, predictability of consumer contributions, water tariffs, and fee collection and financial management. The third section indicates the tariff studies that were done for Gaza Strip. This section includes many subsections such as; introduction, output of the Capital Investment Program (CIP) and outputs of LEKA's tariff study. The fourth section concludes the factors that affects water tariff in Gaza Strip.

2.1 Theoretical considerations

2.1.1 Development theories and strategies

The term "development" is related to the change promoted by social policies. Conventionally "development" was considered to be synonymous with economic growth. The stages of economic growth theories dominated in the 1950s and 1960s,

followed by the " structural-internationalist" theories in the late 1960s and 1970s (Todaro, 1982).

Development theories can be classified into three major group : 1) modernization theories, 2) dependency theories, and 3) alternative theories. Modernization theories, born after World War II, point out that the development constraints of a country are typically internal. The theories favour the strengthening of economies and industry, often with the help of external support (Katko, 1991). Dependency theories, related to Marxist views, argue that the reasons for underdevelopment are caused by external forces. The supporters of such theories are concerned with the effects of imperialism in peripheral countries and the idea that underdevelopment must be understood in the context of world capitalism. These theories gained momentum in the 1970s. Modernization and dependency theories both stress the evolutionary nature of development, and try to explain, what "development" actually is (Katko, 1991).

Alternative theories do not try explain, how development proceeds, but rather how it should proceed. This line of thought gained ground in the mid-1970s. Instead of considering only the third world, Hettne (1990) applied development theory to the " three worlds": industrial capitalism, real socialism, and the underdeveloped areas. He further stressed that "there can be no fixed and final definition of development, only suggestions of what development should imply in particular contexts." Development theory is especially concerned with cultural, political, social and economic change and therefore the theory is interdisciplinary (Katko, 1991). Development theory is closely related to development strategies, i.e., changes in economic structures and social institutions. These strategies are usually worked out by the state. Jameson et al (1989) identified a three-ring circus of development strategies. The center ring economists work on installing or removing price controls, on agricultural mechanization, debt restructuring, technology transfer, project evaluation or structural adjustment. The last factor means economic reforms in developing countries which limit the role of government and restore the role of markets. In one of the side rings mainstream economists expostulate on the working of the markets, the effectiveness of export promotion, the desirability of growth versus basic needs, and the centralicity of freedom. In the other side ring political economists are

concerned about planning, the role of peasantry, gender and development, surplus value, social articulation, accumulation and classes (Katko, 1991).

Water and sanitation has often been considered, as one of the essential basic needs. Yet, water authorities seek to meet financial targets and consider customers, not needs, as pointed by Kirke and Arthur (1984). The risk with the basic need approach is that " the needs" would be satisfied for "free" or at a low price. If the same approach was applied to all basic needs huge amounts of funds would be needed. Besides, the basic need approach would not sufficiently consider demand. According to Max-Neef (1986) "fundamental human needs are finite, few and classifiable, and they are the same in all countries and all historical periods". Max-Neef identified nine such needs: permanence (or subsistence), protection, affection, understanding, participation, leisure, creation, identity (or meaning) and freedom. From this it follows that housing, food and income should not be seen as basic needs, but rather as satisfiers of the fundamental human need of permanence (Katko, 1991).

Development strategies can be viewed from the grassroots or the central level: these views are seldom in agreement. Yet, in water supply the views of consumers and utilities need not be contradictory. The importance of community participation has been stressed: the active involvement of the local population in the decision-making concerning development projects or their implementation. Since the 1980s the role of women in development, were emphasized. These Women In Development issues are important to water supply and sanitation, since women are the main drawers and user of water (Katko, 1991). Malinen (1989) stated that development theories may, however, be misleading, if they do not take into account barriers to development. Trudrill (1990) presents sequential model on barriers to find solutions for environmental problems. The barriers of agreement, knowledge, technology as well as economic, social and political barriers must be overcome to reach a solution. The barriers will often, but not always, come up in this sequence. These can certainly be applied to water and sanitation, the oldest sector in environmental protection; appropriate development cooperation requires also that political and policy issues be discussed.

2.1.2 Basic Concepts

2.1.2.1 Scarcity and Pricing

A commodity or resource is economically scarce when it is not free, i.e., when money or some other scarce commodity has to be given up to obtain it. Therefore, scarcity gives rise to price. In any economy it is the scarce resources that are the limiting factors or constraints on developments. In rich nations capital goods such as machinery and equipment are in abundant supply while human labour is relatively scarce. These nations attempt to develop labour-saving machines while in most poor nations production should be capital-saving or labour-intensive (Todaro, 1982).

2.1.2.2 Price Elasticity of Demand

Economic theory suggests that an individual's demand for a product is a function of the price of the product, price of substitutes and complementary products, and the individual's income and states (Mycoo, 1999). Whether actual money prices are used the concepts of supply and demand are fundamental to all of economics. When the price of a commodity falls, people will purchase more of it. Consumers' responsiveness to price changes is described by the price elasticity of demand (e) (United Nations, 1980).

$$e = \frac{\text{Percent change in quantity}}{\text{Percent change in price}} = \frac{\Delta Q / Q}{\Delta P / P} \qquad (1)$$

For a single linear demand curve (Figure 2.1) elasticity has a value equal to one (e=1) along a locus of points at equal distance from the two axes. Elasticity value is more than one in the upper half of the quadrangle and less than one in the lower half. In water supply the values are typically between 0 and 1, i.e., in the inelastic range (United Nations, 1980).

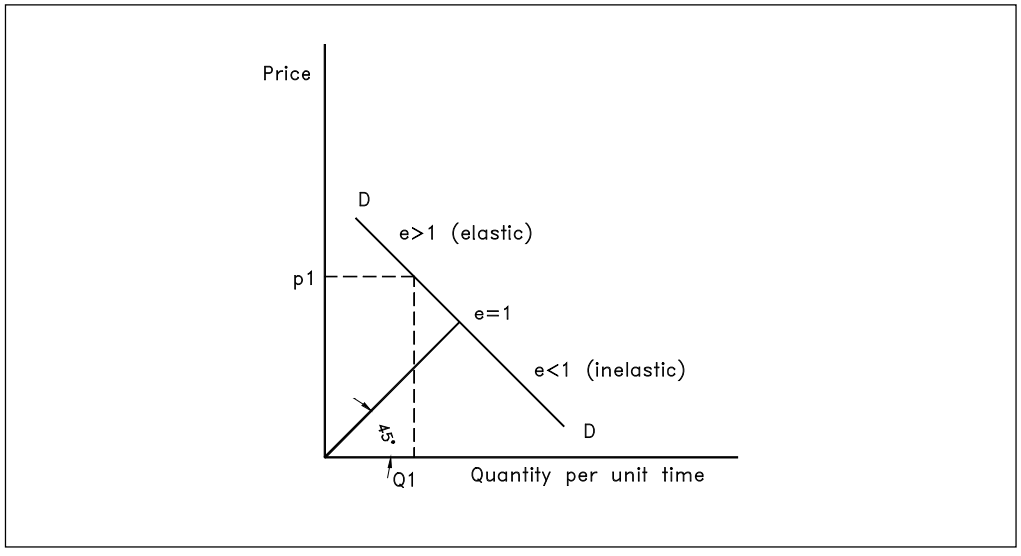


Figure 2.1 Linear demand curve (D) and the related price elasticity (e) values (United Nations, 1980).

2.1.2.3 Consumers' willingness to pay

In economics consumers' willingness to pay (WTP) means the maximum amount that a person would be willing to pay for a service rather than do without it. The demand curve (Figure 2.2a) is based on the idea that the lower the price of a good, the more consumers will be willing to pay. The area below the demand curve represents willingness to pay. The total willingness to pay is not simply the amount paid for a service, but rather that amount plus the "consumers' surplus" (Figure 2.2b). In this case the supply curve shows the production cost of various quantities of the good. The price times the quantity equals the water system revenue. The shaded triangle represents the consumer's surplus which is not revealed (Cromwell, 1988).

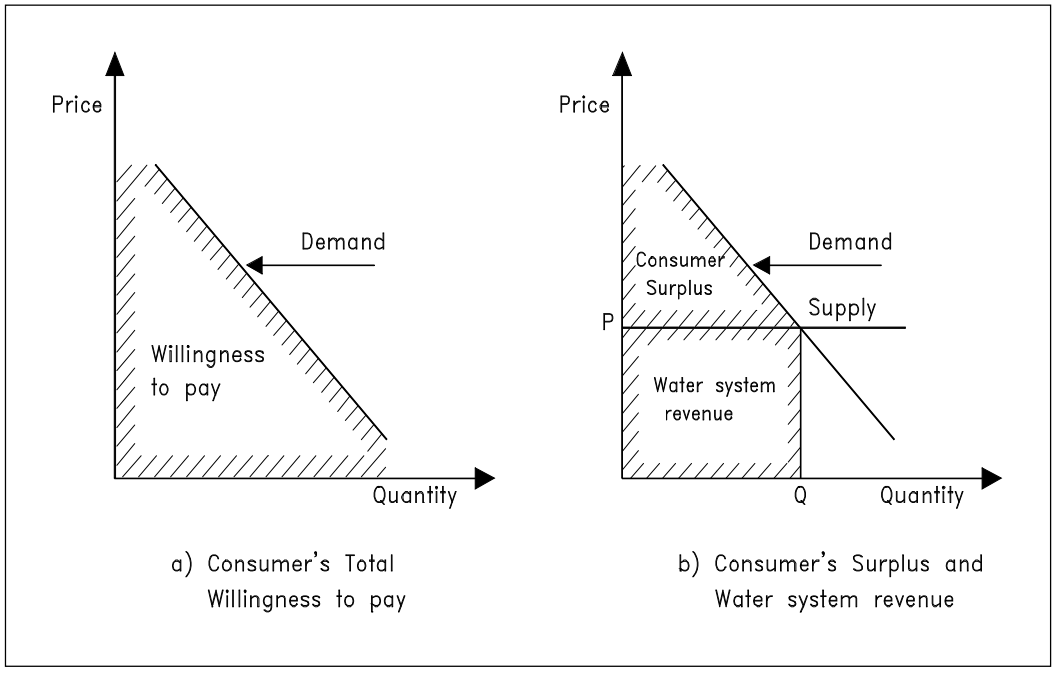


Figure 2.2 The demand curve and the supply curve related to individual consumer's willingness to pay and consumer surplus. (United Nations, 1980).

In 1776 Adam Smith asked (cited by Speight 1969) that "how is it that water, which is so very useful that life is impossible without it, has such a low price-whilst diamonds which are quite unnecessary have such a high price?" Smith and other classic economists failed to distinguish marginal utility from general utility. Because diamonds are scarce their marginal utility is high. Since water is often relatively abundant its marginal utility, and thus its price, is relatively low. Cromwell (1988) pointed out that when water is not scarce the water supply curve is low and the area consumer's surplus is very large. When water resources become less abundant, the supply curve rises and the area of surplus become smaller. According to Cromwell during the last two decades a slow change has happened from the era of cheap water to an era of expensive water. This means that the supply curve has risen up to the extent that people will become more sensitive to further price changes.

Hanke and Boland (1971) stated that the term " water demand" and "water requirement" have been used interchangeably. They also noted that conventional engineering practice has tended to ignore price-demand relationships. Instead of assuming that communities are stable, the " water demand" should be estimated: water quantity that will be demanded, given specific price levels and other parameters.

2.1.2.4 Cost Concepts

The economic cost of supplied water means the benefits foregone elsewhere in the economy by using scarce resources for a given purpose. Economic cost has three components: the cost of water itself, the investment cost and the operation cost. The cost of water consists of drawing-related charges, important with increasing scarcity of water resource. Together the three components are commonly called the total costs. The first cubic meter is very expensive to produce but thereafter total costs increase only slowly (IBRD, 1985).

Total Costs = Water Itself + Capital Cost + Recurrent Cost (2)

Capital costs include interest and depreciation. Capital costs depend on the interest rate required and the assumptions related to depreciation, such as economic life time and depreciation method. Recurrent costs include the maintenance and operation costs. The average cost is determined by dividing the total costs by production. Average cost starts at a very high level and falls rapidly with increasing volume. It is

at a minimum at the optimum production level. With higher production the average cost rises again (IBRD, 1985).

$$\text{Average Cost} = \frac{\text{Total Cost}}{\text{Water Production}} \quad (3)$$

2.1.2.5 Marginal Cost: Short Run and Long Run

The marginal cost is the increase in the total cost of producing each successive increment of an output, i.e. the cost of the producing M+1 units, minus the cost of producing M units. As a concept it may be regarded as including social and environmental costs, although it is often construed more narrowly in accountancy terms. The short-run marginal cost is the cost incurred in making marginal (small) changes, say in the energy output of a system, within existing capacity. Long-run marginal costs include the marginal costs of changes in the capacity of the system.

References to marginal costs need to be quite clear on this distinction, particularly when referring to marginal cost pricing (Gilpin, 2000).

Figure 2.3 presents a simplified example of the principle and dynamics of marginal cost pricing. As demand grows from D_1 to D_3, prices equal marginal costs. The short-run marginal costs (SRMC) are assumed to be constant at P_1 AB. When capacity reaches B, the SRMC becomes vertical.

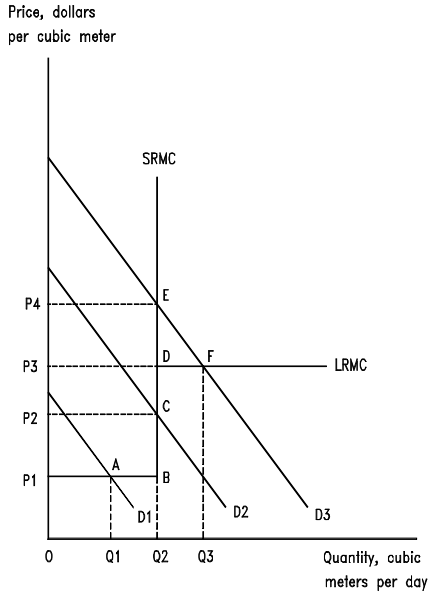


Figure 2.3 Principle and dynamics of marginal cost pricing (SRMC refers to short-run marginal cost and LRMC to long-run marginal costs (United Nations, 1980).

The long-run marginal cost (LRMC) is reached at P_3DF and it includes both the marginal capacity costs and marginal operating costs. At initial demand level D_1 the optimum price P_1 covers only operating costs. At the higher demand level D_2 the optimum price P_2 covers costs as well as a part of capacity costs (rectangle P_1BCP_2). When demand grows further, the optimal price rises up to P_3, which equals long-run marginal costs (LRMC). When demand gets higher, new additional capacity Q_2 Q_3 is needed. The value (benefit) of the additional capacity is Q_2 EFQ_3. Thus the net benefit is shown by the triangle DEF (United Nations, 1980).

Bhattacharya (1985) presented two different conditions under which marginal costs are to be determined. In the first case, the average costs of service are decreasing for a certain range of output. This can happen, particularly in large urban schemes where economies of scale apply. In this case marginal costs are below average costs. The opposite is the case where the average cost is increasing. This can be result of, for instance, expansion of the service area, development of more remote water sources or more cases of peak demand. Thus the marginal cost is above the average cost. In this case average cost pricing results in inefficiency. However, marginal cost pricing involves several application difficulties and has so far been used to a very limited extent in charging for water. It is rare that one encounters any reference to marginal cost pricing in practice, since even economists do not agree on the details of its practical implementation (United Nations, 1980). Marginal cost pricing can be applied when demand is expanding, where present facilities are fully used and new facilities are being installed. In such a case the long-run marginal cost can be recommended as the price. In a case where new facilities are not used all the year round and where they must be expanded to meet peak demand, marginal cost pricing is also applicable. However, when applying seasonal or time-of-day pricing, administrators must often moderate the economist's view to achieve acceptable differences (United Nations, 1980).

According to the United Nations (1980) one of the biggest problems in using marginal cost pricing is the lack of appropriate market pricing. Marginal cost pricing is based on some assumptions on competitive models such as a complete knowledge of future conditions, economic rationality of decisions by suppliers and consumers and existence of many buyers and sellers. In the developing world in particular such conditions do not exist. Besides, government interference with market forces is extensive (United Nations, 1980).

Based on Turvey's (1969) approach, Hanke (1981) has developed a method for applying marginal cost for water pricing. Gibbs (1978) noticed in his studies in Florida that the average price model significantly overestimated the response of consumption to price and income charges. Bohman (1983) made a survey on pricing and investment incentives in water and sewage works in Sweden. He showed that marginal cost pricing dose not guarantee efficient resource use either in the short or in the long run. This is because the marginal cost concept is associated with investment strategy that assumes a fully inelastic demand, whereas in price setting the elasticity is taken to be significant. One special feature in the water and sanitation sector is that it is typically capital intensive. The share of the fixed costs at water and sewerage works is typically 80 to 90 percent (Katko, 1991). WHO (1988) pointed out the differences in the relative shares of investment costs and recurrent costs in water supply and household sanitation. In water supply the share of capital costs is 60 to 70 per cent whereas in household sanitation it is about 90 per cent.

In developed countries, such as Finland, water utilities may have excess capacity and therefore may sell their excess water to other utilities in bulk at a price corresponding to the marginal cost of production. Especially the larger municipal water works operate in this manner. In developing countries this practice has little use, since excess capacity seldom exists. Marginal cost pricing is optimum from the efficiency point of view. Yet, it is difficult to apply in practice mainly for two reasons. First, the marginal cost price should be changed continuously according to production which is administratively very difficult. Second, water supply investments are lumpy.

In particular development cooperation projects contain a lot of external support services, which has a cost: these costs are often forgotten but they should be taken into account in estimating the total costs (Katko, 1991).

2.1.2.6 Economies of Scale

The concept of economies of scale refers to "economies of growth resulting from expansion of the scale of productive capacity of a firm or industry leading to increases in its output and decreases in its costs of production per unit of output (Todaro,1982). Ideally this would mean that the larger the water supply system, the lower the unit cost of water production. According to Saunders and Warford (1976) there is empirical evidence for developed countries and the developing world for economies of scale in water supply. They further concluded that for equivalent levels of service, per capita costs of urban systems are usually lower than those of rural ones. The per capita cost of rural systems, however, can be lower since per capita consumption and the service level may be lower. According to Hebert (1984) the economies of scale factor varies from 0.5 to 0.8 for most water supply systems. Economies of scale are linked with economic growth, which may also have negative effects. Automated production, division of labour and the use of machinery may have dehumanizing aspects. Large-scale production may also means growth in bureaucracy and administration. On the other hand, economies of large scale may bring a wider rang of services to the reach of lower income workers (Todaro,1982). Sometimes the water works per capita operation and maintenance costs express diseconomy of scale, which can be explained by the fact that water supply systems of various sizes are technically and organizationally different. The differences in the per capita construction cost can be explained by the length of water pipe per household, which is roughly proportional to population density. When one compares the cost containing factors of the older systems, which were designed and implemented conventionally, and the modern systems, a clear difference in cost per household is detected. The conventional design criteria used for large systems would lead to overcapacity in dispersed rural areas.

2.1.3 Pricing Objectives

2.1.3.1 Major Principles

The first and primary requirement for water pricing and tariff development is that the water supply system is operative. Organization for Economic Cooperation and Development (OECD, 1987) mentions the following objectives of water charging: (i) allocative efficiency, (ii) equity, (iii) financial requirement, (iv) public health, (v)

environmental efficiency, (vi) acceptability and understanding, (vii) administrative costs, (viii) energy, and (ix) employment. (OECD, 1987) stated that allocative efficiency "means that water services should be provided in such a way that the community's net benefits are maximized. Ideally, this would determine both quantity and quality" (OECD, 1987). Herrington and Webb (1982) distinguished two concepts of equity: the horizontal equity, which means the equal treatment of persons in equal positions and the vertical equity, which means the proper structure of the unequal positions. This demands the use of the ability-to-pay criterion. Consumers with similar levels of income should thus pay the same charge. Equity (or fairness) is a highly subjective concept as pointed out by OECD (1987). Equity involves the national income distribution which may be dependent on government policy.

Financial requirements differ between nations as well as between the private and public sectors. Regarding the private sector, regulations can ensure that a monopoly is not used for exploitation. In the public sector the financial targets are based on national policies. Water works are usually required to cover such a part of the debt that is not covered by grants. Recently there has been a trend to provide for current cost depreciation (OECD, 1987). OECD (1987) pointed out that any charging system introduced should not endanger public health. It further stated that excessive charges should be avoided for (i) connecting new consumers to the system, (ii) use of the public water supply, (iii) connecting new consumers to a sewerage system, and (iv) use of the existing sewerage system. The public health criterion has been sometimes used for arguing against domestic water metering. The argument for free water in this case presents a dilemma. If free water leads to increased water usage the risk of uncollected or untreated sewage can cause more health risks.

2.1.3.2 Other Principles

The principles of enforceability mean that there should be effective sanctions for those consumers who do not pay their bills. Call (1977) pointed out that water rates should lead to stable revenues and they should reflect a sense of historical continuity. Venugopalan and Nadakumar (1986) mentioned also the concept of enforceability, i.e., effective sanctions for non-payment of bills. According to Warford and Julius (1979) the financing of the utility is normally the primary concern in designing water rates in developing countries. Extension of service to the poor and the avoidance of

wasteful consumption also have a high priority. They also pointed out that the water tariff policies of developed countries could be improved by studying the experiences of the developing world. IBRD (1985) summarized the pricing objectives under four main elements: efficiency, social equity, financial autonomy and administration. Evidently these objectives are contradictory and, therefore, some compromises are necessary. Yet, IBRD (1985) mentions that institutional capacity is often more important than the theory surrounding the tariff setting.

2.1.3.3 Institutional Aspects

Samuels (1988) distinguishes three historic reasons for institutional economics. First, it has been a protest against the market economy. Second, it has been problem-solving and third, it has attempted to create a body of knowledge. Institutionalism differs from the main stream of economics by emphasizing (1) that the economy is more than the market, (2) that the economy has to be studied evolutionally, and (3) that in addition to studies on individuals it is important to study group problems, forces and processes. Kapp (1968) preferred the term " evolutionary economics" to institutional economics. Adams (1980) pointed out the holistic nature of institutionalism. Hodgson (1988) points out, e.g., that economic coordination can never be merely a matter of price, but is supported by a wide range of other economic and social institutions. The institutional approach includes both technology and individual tastes and preferences. The term " socio-economic system" emphasizes the fact that the economy is inseparable from social and political institutions (Figure 2.4).

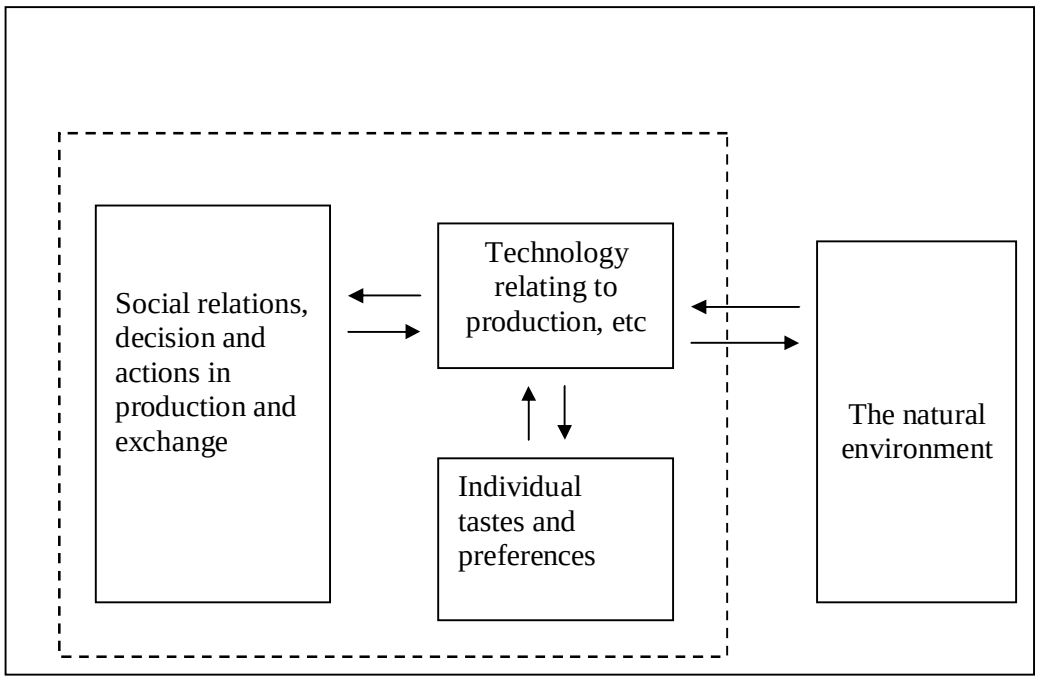


Figure 2.4 The projected domain of institutional economic theory (Hodgson 1988)

Institutional economics has, according to DeGregori (1980), tried to create a logic of economic change. Technology development is not static, but brings change, the basis of future change. Thus it is argued that development and technological change must be deeply rooted in historical understanding.

Miller (1978) divided economic science into (1) resource allocation, (2) levels and rates of growth of employment, income, production, and prices, (3) income distribution, and (4) the structure of power. Normal economic science traditionally deals with the first three categories, institutionalism with the last. Since institutionalists view technology as the dynamic element in society, human intelligence is seen as the basic directive force. Hirschman (1970) introduced the concept of exit and voice into public services. The first concept is related to the public's ability to exit if dissatisfied with the service. The second one is concerned with whether public services differ in the degree to which beneficiaries can make their voices heard, if dissatisfied with the service. Paul (1990) developed the approach further and classified various public services into four combinations according to their level of exit and voice. His argument was that "public accountability can be sustained only when hierarchical control over service providers or agents is reinforced by the public's willingness and ability to exit (alternative sources of supply) or to exert pressure on agents to perform (voice). "His view was that rural water supply has low exit and low voice, whereas urban water supply has low exit but high voice.

2.2 Paying for Water in Developing Countries

2.2.1 Water Pricing in Developed Countries

The study on water pricing, in Finland and some other OECD countries, showed that water and sewage charges tend to control water use and reduce wastage of water. The effect of price on water consumption is also related to housing type and metering

practices in Finland. In municipal rental flats with one common meter and invisible water billing arrangement (a part of monthly lump sum rent) water consumption is usually 210 to 250 liters per capita per day. The consumption figure decreases where individual meters and more recognizable water bills are introduced. In owner-occupied single family houses the consumption is under 100 liters per capita per day (Katko, 1989a).

Stadtfeld and Schlaweck (1988) compared metered and estimate-based water prices in 15 European countries. In six of them practically all water consumption was metered, in five of them 80 to 90 per cent of water use was metered and only in two countries were charges based on estimates. In Finland, as in most developed countries, water tariffs are not regionally uniform, but are based on the needs of each individual system. Water tariffs and especially sewerage and effluent treatment charges often do not cover the costs fully. The electricity and telecommunication sectors cover more of their costs and are much better off than water services. Yet, the rate of cost recovery is highly dependent on the calculation method applied, especially on the interest rate and depreciation method (Katko, 1991).

Conventional water supply and sewerage systems show that about 80 per cent of the total costs are fixed, i.e., independent of water consumption. Therefore, water charges should have a fixed, non-volume-based part covering from 20 to 40 per cent of the total income. If the non-volume based share of income is higher, the controlling effects of volume-based charges will not be effective (Katko, 1991).

2.2.2 Cost Recovery in Water Supply in Developing Countries

Sustainable investments in urban infrastructure present major analytical and management challenges. Where citizens' needs are addressed and real benefits are produced, infrastructure investments contribute fundamentally to the quality of life and the economic development of urban areas. These investments can also be financially viable. Where client needs are ignored, infrastructure investments generate debt and decay. Recent research shows the potential for using economic valuation methods to understand citizens' perceptions of infrastructure services and to measure their willingness to pay for alternative services. In particular, certain forms of contingent valuation appear particularly adept at characterizing the services received by citizens' and at estimating the associated economic values. (Hoehn,

1998). A cost recovery for improved water supply in developing countries has four key elements: benefits and costs of water supply, predictability of consumer contributions, water tariffs, and fee collection and financial management (Katko, 1989a).

2.2.2.1 Benefits and Costs of Water Supply

Cost-benefit analysis (known in the USA as benefit -cost analysis) is a procedure for comparing alternative possible courses of investment or action by references to the net benefits that they are likely to produce. The term " net social benefits" refers to the difference between social benefits and social costs, the one being subtracted from the other. The results may be positive or negative. As far as possible, the costs and benefits are measured in monetary terms; where costs and benefits cannot be readily assigned dollar figures (the intangibles) they are separately identified and described for assessment in a wider context by the decision-maker. In general, a program having a high benefit-cost ratio will take priority over others with lower ratios, although political factors may intrude.

Cost-benefit principles have been applied to the design of public polices in various areas such as electricity power generation, irrigation, water supply, airports, road projects, rail services, shipping, urban development and new towns, health services, education and welfare, and to social issues such as equity and social justice, income distribution, and employment opportunities. It has also been extended to a whole range of environmental issues such as global warming, parks and open spaces, environmental planning, and to the framework of environmental impact assessment and sustainable development.

Cost-benefit analysis may be viewed as an attempt to improve the quality of decision -making and social outcomes. It is an application of modern welfare economics, improving the economic efficiency of resource application, broadly considered. Figure 2.5 sets out the key steps in the cost-benefit analysis process as outlined in the current handbook used by the Australian government.

The primary obstacle to the benefits assessment was the difficulty in obtaining economic measures of benefits. Economic benefits are the value of improved water

and wastewater services. Typically, the amount households actually pay for services define the value of those services. In Cairo, however, charges for water and wastewater services are tariffs that are invariant with respect to the quantity of services used. Because these fixed tariffs prevent households from making tradeoffs between the quantities of water and wastewater services consumed and the cost of

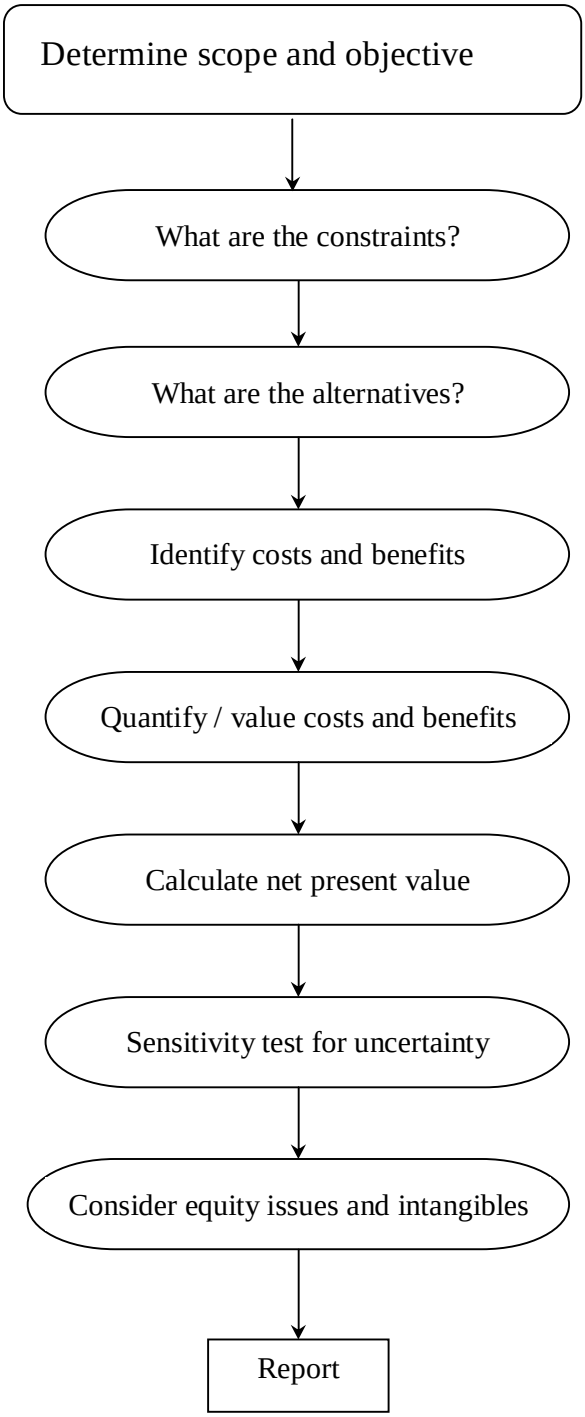


Figure 2.5 Key steps in the cost-benefit process. Source: Department of Finance (1991) Handbook of Cost-Benefit Analysis, Australian Government Publishing Service, Canberra.

the services to the households, the tariffs do not reveal the economic value of the services. (Hoehn, 2000).

The concept of low-cost technology is often misleading. Costs should always be compared with benefits. The expected benefits should be considered first and compared with costs. The most economical selection should be based on worth-cost analysis. It is not enough to consider life-cycle costs only, we have to look at life-cycle economics, i.e., the benefits and costs over the life-time. This means that various water supply alternatives and their benefits and costs, must be considered.

This may often mean low-cost solutions in rural areas, but not necessarily for every area and all the consumers. Benefits of improved water and sanitation services can be related to economic effects, health improvements, and other direct and indirect effects. Economic effects can be achieved by timesaving and water use for productive purposes.

Esrey et al (1990) reviewed 144 studies of the impact of improved water supply and sanitation. The results show that the impact is significant. Water supply should be as close to the home as possible to increase water quantity. Safe excreta disposal and proper use of water for personal and domestic hygiene appear to be more important than water quality. In any case improved water supply is a basic requirement for health improvement. Other direct benefits are related to convenience.

Cost data on water supply systems in developing countries are usually very scarce and unreliable (WHO 1986, Okun 1987, Dabbagh 1991). There are various alternatives for cost containment, such as intersectoral action, decentralization, privatization and divestiture, metering and minimizing non-revenue water, preventive maintenance, and community-managed operation and maintenance (WHO, 1988). The case of Beira, mozambique, is an example where cost data were neither properly collected, nor evaluated. Data should be collected for each

operational unit with adequate accuracy using such items as materials, personal, electricity, fuel, transport, and other services. The major bottlenecks and possible misuse of resources can be identified by using simple performance indicators. Often the financial allocations come from governmental budgets but are not necessarily used as intended. The problem can be solved only by the financial autonomy of water utilities so that payments and revenue collection can be compared (Katko, 1991).

2.2.2.2 Predictability of Consumer Contributions

The predictability of Consumer Contributions has two elements: consumers 'Ability and willingness to pay. The ability to pay traditionally been evaluated by the criterion that households should not be obliged to pay more than five percent of their income for water. This criterion is a broad guideline and is not necessary applicable everywhere, since it does not take into consideration local conditions. It should be used only as an indicative criterion. Later a figure of six percent has been introduced to cover the total costs of water and sanitation. UN-Habitat stated that a figure of (1-2) percent has been introduced to cover the total costs of solid waste collection in developing countries. Quick surveys on housing and housing materials could also be used for indicating the affordability. Consumers' willingness to pay can be predicted by: (i) asking consumers in advance about their own estimate of their future willingness or by (ii) looking at and monitoring consumers' previous or present behaviour (Katko, 1991).

Contingent Valuation Method

The Contingent Valuation Method (CVM) uses prefilled questionnaires and bidding games in finding out consumers' own hypothetical estimates of their willingness to pay. Since 1987 this method has been tested in several developing countries. The reliability of the results will be tested only after suggested water supplies have been implemented. For instance, Yacoob (1990a) was critical that willingness -to-pay methodologies are imprecise as predictors of actual behavior. Whittington et al (1987) noted that " hypothetical"," strategic", " compliance", and " starting - point" biases can influence the CVM. Compliance bias occurs, when a respondent wants to please the interviewer. Jyrinki (1977) calls this the "social desirability effect". It seems obvious that the CVM can be used successfully either in combination with other methods on actual behavior, or to create a contingent market when no actual

water selling happens. According to Lauria (1990) the CVM could play a major role in rural areas, where water is usually hauled from natural sources and not paid for. In peri-urban areas, where proposed and existing levels of water service are about the same, studies on existing markets may be a sufficient basis for planning.

Reselling and Vending

The widespread practices of water reselling and vending demonstrate consumers' actual behavior and their willingness to pay for operative service. Yet, especially the practices of reselling are hardly documented. These practices have for long been ignored by water utilities, who should try to learn from these activities and improve their own services. Besides, the results of vending and reselling surveys are beneficial in negotiating and renewing water tariffs. By such studies water utilities can demonstrate the feasibility of expanding piped water supply instead of vending and reselling. In cases where piped systems cannot meet the ever-growing demand, vending and reselling could be improved or even institutionalized, and the costs of these practices could be made fairer to consumers. In many developing countries water reselling is officially forbidden and often meter readers or other water utility staff members are ordered to fine the resellers.

Two small case studies are from Mozambique and Tanzania. In 1988 these countries had the very lowest and the third lowest Gross National Product (GNP) per capita in the world (The World Bank 1989). The important discovery is that the poor consumers in these poor countries already pay for operative service. Yet, if alternatives to vended or resold water do not exist, the practices do not necessarily indicate consumers' actual willingness to pay. Together with surveys on water use patterns and source selection criteria, vending and reselling surveys are valuable in revealing the actual demonstrated willingness to pay. These studies can be also used to estimate the value of time savings.

Water Source Selection

In developing countries consumers usually have more alternative water sources than in developed countries (Warford and Julius 1979). Regarding Beira, Mozambique the collection time and the distance seemed to dictate the selection. According to Morel a' I' Huissier (1990) the distance, topography and other obstacles as well as cultural habits and attitudes affect the selection. The selection by consumer is conventionally based on the assumption of equal weight of possible losses and gains. The decision - maker is assumed to be able to consider about ten central properties in selection (Figure 2.6a). According to kahneman and Tversky (1984) the value function of an individual is considerably steeper for losses than for gains (Figure 2.6b). Rinne (1989) found out that the value function is asymmetric in the selection of an investment good (Figure 2.6c). The curve is vertical for negative properties and concave for positive properties. Altogether about ten different properties are recognized by various decision -makers. Yet, an individual decision - maker was able to take into account only about three properties. The final selection will avoid accepting any negative properties. In water supply the use of negation is indirectly seen in the study of Whittington et al (1990) in Nsukka district, Nigeria. There consumers do not want to commit themselves to a fixed monthly rate or otherwise commit themselves in advance to a service, they are not sure they will ever get (Katko, 1991).

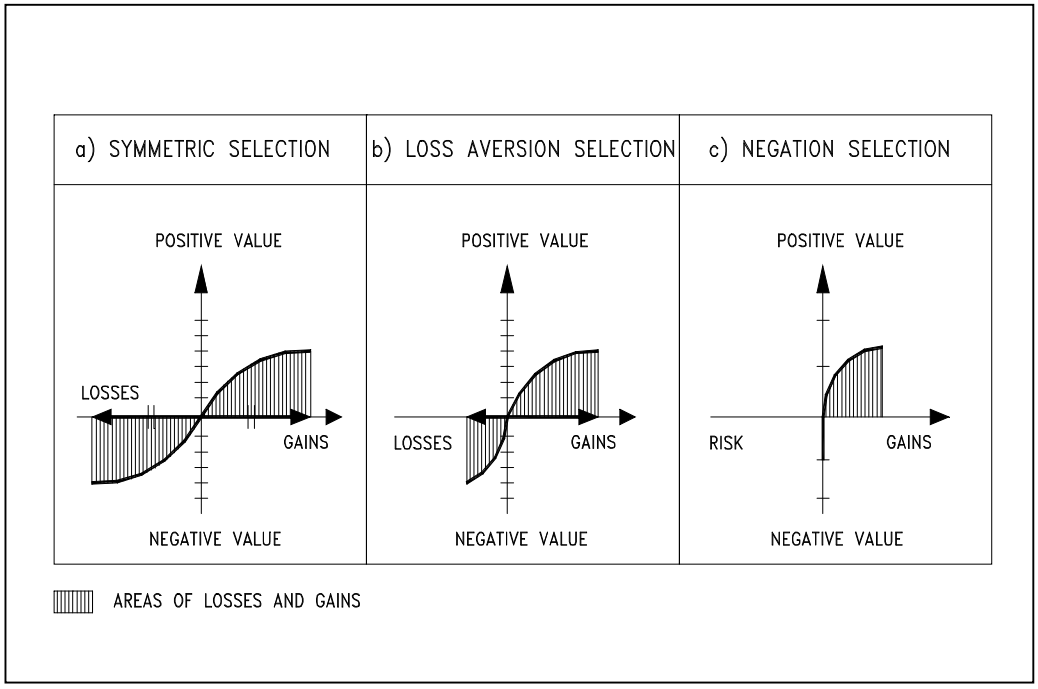


Figure 2.6 Models of consumer selection of goods showing a) symmetric selection assuming rational behaviour, b) Loss aversion model of Kahneman and Tversky (1984), and c) negative selection of Rinne (1989).

Willingness to Pay and Join

Mean willingness to pay is the key component of the benefit- cost evaluation that compares the present value of investment benefits to the present value of costs (Hoehn, 2000).

In countries where the policy of "free water" has been followed, consumers' willingness cannot be decidedly improved without changing the official policies. Public education and promotion activities are also required and these can be carried out by water utilities. On this issue the sector professionals and external support agencies have the possibility to exert influence, although the policies can be changed only by the government of the recipient country. As demonstrated by the case of Beira, Mozambique, waiting time at public standpost can be a major discouraging factor in source selection. Sitari (1989) reported that, in developing rural water supply in western Kenya, the distance to the water source is essential; not the technology. If the system is unreliable, the willingness to pay is low or negligible. Unless consumers are involved in rural water supply systems, they are reluctant to pay. Other discouraging factors are related to financial management and institutional aspects.

Willingness to pay (WTP) is normally linked to regular payments to cover operational costs. If a connection fee, to cover capital costs is introduced, the issue of willingness to join gains importance. The connection fee is normally to be paid in one or two lump sums. The willingness of households to join a common water supply system follows a logistic curve (Figure 2.6). The growing bottled water industry in the developing countries is, on one hand, an indication of the willingness of some consumer groups to pay very high unit prices for water, which is believed to be of good quality. On the other hand, this industry creates a risk in that the professionals

of public water supply may have less incentive to provide proper service. This tradition was born in the developed world, where consumers could not rely on the quality of public supplied water (Ellis 1990). In today's developed countries the bottled water industry's effect on public confidence can be a bigger danger than the economic effect as stated by AWWA (1988).

Yacoob (1990a) pointed out that in poor rural communities with a subsistence economic base willingness to pay often exists, but it is the ability to pay that is lacking. On the other hand, the evidence of reselling and vending of water and of bottling industries indicates that there are consumer groups that are able and willing to pay even higher amounts. It is therefore very important to design tariff structures and alternative fee collection methods so that any group of users dose not have to pay unfair charges related to their income.

2.2.2.3 Water Tariffs

A tariff is a document setting forth rates, rules, regulation, terms or conditions that the utility must follow in providing service to its customers (ICC, 2002). Among the lessens learnt world -wide, failure to maintain investments in water infrastructure leads to unaccounted- for -water; the difference between the volume delivered to a supply system and the volume of water accounted for by legitimate consumption. An other lesson learnt by service providers all over the world is that low tariffs are insufficient to offset operating costs, provide funding for routine maintenance, upgrade the system, expand the services into new areas, and discourage waste by users. (Mycoo, 1999).

In assessing the private provision of public services in developing countries Roth (1987) stated that "when water is sold in containers by private vendors in France, and throughout the developing world, there is no problem in charging for it: customers pay on delivery, as they do for milk, wine, or fuel oil. But when water is delivered from pipes, the levying of payments creates substantial moral, political technical and administrative problem". Figure 2.7 shows the dramatic decline of real water tariffs in Kenya and Tanzania. Ever since their independence in the 1960s there has been a strong decline of water tariffs in real terms. Both countries are recipients of Finnish development cooperation in the water sector. In Tanzania the water tariff decline was caused by the gradual introduction of the "free water" policy . The water tariffs are

geographically uniform and have to be decided at Cabinet level. With this arrangement tariffs can only occasionally be adjusted, and then without adequate consideration of inflation and cost increase.

Cunningham (1969) reported that the policy of providing water free of charge by the government goes against the original idea of villagisation and self-help. This policy prevented the first opportunity to mobilize self-help. In reviewing the project identification report of the Mtwara - lindi water resources development in Tanzania,

Figure 2.7 Water tariffs in real terms in a) Kenya (Hukka et al 1990) and b) Tanzania (Central Bureau of Statistics 1989, National Urban Water Authority 1990).

Forbes (1971) pointed out the disregard of water payments. The criticism that was expressed was never taken seriously by the authorities. The policies of many governments were too ambitious to consider these views (Katko, 1991).

In Mozambique, after independence in 1975 water tariffs were not adjusted until 1985. At that time, differentiation of tariffs was introduced according to the purpose of water use. In Sri Lanka, the tariff structure effective from 1984 favored the house connection owners. The first ten cubic meters were free of charge, while standpost water was charged for (Ratinen, 1987). By 1991 FINNIDA has supported or planned to support bilateral water projects in Egypt, Ethiopia, Kenya, Mozambique, Nepal, Sri Lanka, Tanzania, Vietnam and Zanzibar (United Republic of Tanzania). In all these countries the acute need for developing water pricing policies is evident (Katko, 1991).

Tariff design can be based on several objectives, many of which are contradictory (Katko, 1989a). In a number of cases, such as Tanzania, the equity criterion was earlier overemphasized, since the efficiency criterion was not considered. Water charges are either volume or non-volume based. The formers are often based on metered consumption. Water use can be also estimated, e.g., by rental value, water using fixtures or various consumption units (tariffication points) (Katko, 1991).

Flat rates are applicable to small consumers only such as standpost users. In water supply, consumption charges, meter charges, fixed (e.g., annual) charges, connecting charges and service charges are the most common ones. In sewerage, effluent treatment charges, fixed charge, connecting charges and service charges are typically used. Sewage charge are normally based on the metered or estimated water consumption. Figure 2.8 presents the principles of flat rate, declining block rate and increasing block rate for price per unit and total bills to consumer.

Both the equity and efficiency criteria can be met by using cross-subsidized minimum block consumption and increasing block rates for higher consumption. In addition to volume based tariffs fixed charges can be used. These should be lower to small water users, but water should not be free for any consumer group except for emergency cases.

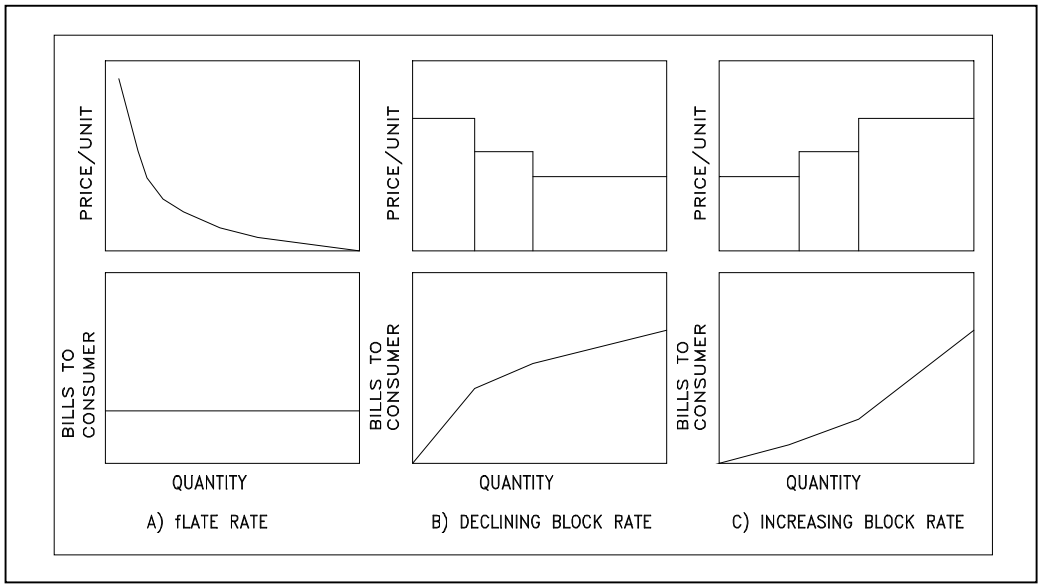


Figure 2.8 Principles of a) flat rate, b) declining block rate, c) increasing block rate (Bhattacharya 1985, modified by Katko 1989a).

This is the more important since there are relatively fewer high-and middle-income consumers in developing countries than in the developed world.

In developed countries such as the United States and Canada, decreasing block rates have been largely used. In the 1980s there has been a trend away from these rates to uniform or even increasing block rates. In developing countries increasing blocks have been more widely used, which is a good lesson for otherwise developed countries (Katko, 1991).

2.2.3 Consumer-Managed Water Supply

Institutional aspects are viewed in this thesis from the historical experiences in today's developed countries. First, diffusion of water innovations in urban versus rural areas is shown in Finland. This is followed by evidence on consumer - managed

water supply systems in other countries. The first public water supply and sewerage system in urban Finland was built for the capital of Helsinki in 1876. Other urban areas started to develop similar systems in the 1890s. Development started in the largest urban settlements and spread gradually to smaller ones. Water supply and sewerage systems were established usually simultaneously and they were typically managed by departments under the municipal council as today (Katko, 1991).

Rural water supply was initially based on traditional wells owned and used by one or few households. The first piped water supply systems emerged in the 1870s in the western part of the country. They used spring water and gravity flow via wooden, bored pipes. These served at first only few households, but gradually the systems became larger. The diffusion of piped water in rural areas was the opposite of that in urban areas. On the other hand, the urban systems were also developed gradually. However, they started in the areas with highest population density. Urban water supply systems were built mainly for fire-fighting purposes, since houses were made of wood at that time. Another important reason was the public health requirement. In rural areas the development was based on demand created by household production and cattle farming and later industrial uses. In urban areas water supply systems used surface waters extensively, but gradually the share of ground water increased. Rural systems have always used ground water (Katko, 1991).

The water authorities have become increasingly involved in the sector development, but they still concentrate on initiating and policy-making. Financial support from the government to the sector has always been under ten percent and that from municipalities has gradually increased. Consumers as water users, beneficiaries and owners of the systems, have always paid the major part of capital costs and all of the recurrent costs. The private sector, i.e., consulting companies, contractors and service enterprises, has increasingly assumed responsibility for planning, implementation, maintenance and accounting services. However, the roles vary from case to case.

The development of rural water supply in Finland is closely linked to the overall development of society. The development of common water supply systems in rural areas started with the structural change of society. The agrarian reforms, political rights, primary education and literacy as part of the development of the society contributed to water supply development. Support from the health sector was

received, but the water and sanitation sector developed much more on its own. The integrated approach often emphasized in development cooperation would seem to be quite unrealistic in the light of the Finnish experience (Katko, 1991).

Consumer Managed Systems in Other Countries

- **Developed Countries**

The simultaneous diffusion of public water supply and sewerage systems in Sweden was very similar to that in Finland: from larger population centers to smaller ones. The development started in the 1860s and the peak occurred by the turn of the century. In France big cities established public water supply systems as early as in the 1820s and 1830s. In the late 1890s sewerage systems were still less developed than water supply (Goubert 1988). Coffrey and Reid (1976) analyzed the long -term historical development of water supply systems since the times of the Greeks and Romans. They pointed out that there was usually a time-lag between the discovery of a technology and its application. Old practices often continued along with new ones. The breakthrough of the new innovation was a gradual process. Technological progress was linked to demographic expansion. Processes of urbanization and industrialization are other important issues. As for institutions, in the 1800s private companies were often active in starting urban water supply, e.g., in the United Kingdom and the United States. Gradually, by the end of the 1800s urban water supply became a public service.

Rural water supply in Sweden was for a long time based on the use of traditional wells and springs. The field mission to Sweden revealed that municipalities have since the 1930s been mainly in charge of developing water supply systems in their own territories. This has been influenced by the long tradition of municipal administration in the country. Out of about 30 sector professionals interviewed, none was aware of the existence of water supply associations. Hult (1991) found out that there were about 1200 small water associations in Sweden. These have been officially registered by the municipality. There were in addition 1600 non-registered private systems supplying water to more than ten households. The Swedish water

associations are small, since any larger systems have been taken over by the municipal systems (Katko, 1991). In 1945 out of the 204000 farms in Denmark only 15 percent got their water from public water supply systems. The majority used hand pump wells. According to Westh (1951) unlike in urban areas and larger centers in rural areas municipalities did not supply water to everyone. Water supply was instead based on private initiative through associations or in special cases totally private systems. In the latter case a private person constructed a system and sold water to others. According to Westh (1951) the Danish private systems had several advantages and a high level of independence. Even so there was still a number of problems, as there was often no technical supervision during construction. These private systems often applied for municipal guarantees for their loans. On such occasions the municipalities could set technical and supervisory requirements. By 1990 there were about 3900 water supply systems in Denmark, out of which 300 were municipality- managed and the rest were run by associations, mainly cooperatives. The associations supplied about 40 percent of the total water consumed in the country with 5.1 million people. The evolution of the Danish water supply associations was in many ways similar to the Finnish ones. The largest systems supply water to about 30000 people, but the majority of them from 500 to 600 people (katko, 1991).

Water supply development in the rural part of the United States dates back to the early 1900s. Yet, it was not until the 1960s that the federal government became an active partner in the process. Peterson Jr. (1971, cited by Warner and Dajani1975) studied 52 rural communities in Mississippi. He concluded that where a water system serves a single community, the process of organizing the systems tends to strengthen local leadership. Tamm (1991) made a study on water users' associations in the United States. These systems are based on the Farmers Home Administration (FmHA) program, which is a rural credit institution. Community members initiate the action and the private sector often promotes improved systems. The water users' associations are responsible for overall system management. The National Rural Water Supply Association (NRWA) offers technical advice and training services. (Katko, 1991).

In France, only few rural places had a modern water works before the end of the 1800s. Especially in cattle- breeding areas every village had its own watering place. Rural water supply developed slowly, step by step. Progress was made by thousands of plans which remain unknown, unlike the large systems in cities (Goubert, 1988).

Fairburn and Wise (1989) reported the experiences of rural water supply in New Zealand, and their possible transferability to developing countries. Their objective is to provide each consumer daily with a predetermined quantity of water to his/her property. That quantity is called a unit, but consumers may apply for several units, if needed. The constant volume of a water unit is gained by low pressure supply through a restrictive valve. The consumer has to provide his or her own storage capacity. The community is involved in promotion, implementation, operation and maintenance phases. Promotion includes public meetings, the establishment of local committee and raising of funds through loans, grants and consumer payments. In implementation labour and farm equipment are contributed by consumers as partial payment of their share of the costs. A local authority provides administration and technical support, financial and accountancy services and trained water operatives. The water committee undertakes operation and maintenance (Katko, 1991).

- **Developing Countries**

Southern Tanzania's Makonde Water Development Corporation was established by the colonial government in the early 1950s. The corporation charged a mandatory membership fee of ten shillings from every adult resident in the district. An additional ten to fifteen cent per container had to be paid at the water kiosks. The pumped and piped system supplied a plateau area where alternative sources were very far. After independence the policy was changed and the system became soon unoperational. Since the late 1970s the system was rehabilitated with external support from FINNIDA and UNICEF. In 1991 discussions were started to re-establish a similar corporation or cooperative where consumers should cover a substantial share of the running costs. In Kenya, there are at least tens, if not hundreds of rural piped water systems that operate on a private basis, where consumers pay the full costs of water. Bess (1990) surveyed two such cases that are registered as water societies and that supply water to more than 1 000 members. Both of them received management assistance from a Non Governmental Organization

(NGO) and material and technical support from the Ministry of Water Development. The societies are obliged to operate on a self-sustaining "Businesslike" basis. As members consumers have specified obligations and responsibilities, and face penalties for possible non-compliance. Entrance, deposits and advance charges are to be paid prior to connection to the system. Most of the connections are metered. Bess (1990) concludes that the societies operate on a much more sustainable basis than many larger public utilities in the developing world. Unfortunately, the existence of such systems in developing countries has often been disregarded, since they have been considered contrary to official development policies (Katko, 1991).

In Tunisia, USAID has supported the Rural Potable Water institutions Project which introduced the concept of water user association. The idea is that the association will assume some of the costs and responsibilities of operating the systems. The association is in charge of preventive maintenance and minor repairs, but doesn't have the overall management responsibility. Roth (1987) reported that water cooperatives are common in Argentina, Bolivia and Chile, in the Philippines and in the Middle East. All Water cooperatives have not been successful, but many have contributed significantly towards water supply development. For example, the Saquapac cooperative in Santa Cruz, Bolivia, started a Water supply service when the municipal company was converted into a cooperative to overcome inefficiencies that were blamed on government control. The cooperative provides water to 350 000 people, but in the neighboring areas the cooperatives are much smaller. In peru, so-called juntas have been promoted to take responsibility for operation and maintenance of water supply systems. The administrative junta is a duly constituted legal entity, with the offices of president, treasurer, secretary and one or two spokespersons elected by the community. The junta decides, e.g., on water tariffs. The problems encountered in this externally supported approach include inadequate training and supervision (Katko, 1991).

2.3 Tariff Study for the Gaza Strip

2.3.1 Introduction

As a part of its assignment in the Gaza Strip, the Joint Venture Lyonnais des Eaux Khatib & Alami (LEKA) is to conduct a Tariff study. LEKA has successfully implemented part of the study in June 1997. This part was concentrating on some

preliminary aspects such as, assessment of the Water demand, assessment of the existing water resources, demand versus resources, a first appraisal of the cost of the water was developed from extracting this cost from the various municipalities and as an out-put some methodological recommendations were made for short and long term for both tariff structure and tariff setup (LEKA, 1997).

The total tariff study was issued by LEKA in June 1998. It depends mainly on the Capital Investment Program (CIP) issued by LEKA in 1998 and the Water Tariff Study issued by Norconsult January 1998. Based on these new documents and taking into consideration the suggestions of PWA, the study concentrated on the following new aspects. Firstly, assessment of the average cost of the water while taking into consideration the Capital Investment Program for water and wastewater. Secondly, the design of the tariff structure compatible with cash flow requirements and affordability for low level income. Thirdly, an action plan to "phase in" the convergence of the tariffs across the Coastal Utility Region (LEKA, 1998). This tariff study includes water supply and wastewater, but here focusing will be on water supply only to meet the scope of this thesis.

2.3.2 Output of the Capital Investment Program (CIP)

PWA has embarked in a very ambitious program (CIP) aiming at bridging the gap between a growing demand and the declining availability of the existing resources. Basically the objectives are to supply the population with potable water matching the WHO standards, supplying all the population on a permanent basis with 120 1/c/d and targeting a 80% efficiency for the potable water system. The CIP is built on the assumption of supplying additional quantities of potable water by the sea water desalinization plant whose out flow is estimated 54 million m^3/year for phase I and additional 56 million m^3 for phase II. The exercise is more complicated for the rest of the investment package since some items are not directly related to additional m^3 produced. This refers for instance to reservoirs, meter readers, and pumping or booster stations which participate to the increase of the quality of service, but do not produce additional resources to be made available for distribution. However, for simplification purpose the study considered an increase of 42.8 million m^3 made available for distribution by virtue of gradual commissioning of the installations and related to reduction of Unaccounted For Water (UFW). The complete process is

described under table 2.1.The capital expenditure for phase I is estimated to be US $ 411,807,906 and US $ 225,052,765 for phase II (LEKA, 1998a).

Table 2.1 Additional m^3 available for distribution upon implementation of the CIP (LEKA, 1998a)

M^3/Year	**1998**	**Phase I 2003**	**Phase II 2020**	**Cumulated TOTAL**
Existing water production	48 707 060			
Sea Water desalinisation		54 400 000	56 575 000	110 975 000
Other projects (Efficiency, wells rehab.)		24 900 000	17 925 000	42 825 000
Additional water production from Mekorot		5 000 000		
Total Requirements		84 300 000	74 500 000	158 800 000

2.3.3 Outputs of LEKA's Tariff Study

The main out puts of LEKA's tariff study are related with three issues; the anticipated cost of the water, the tariff structure and the gradual introduction of the new tariff. A brief description of these outputs will be described in the following sub-sections.

2.3.3.1 The Anticipated Cost of the Water

The first objective of LEKA's tariff study is to give a first estimate of the full cost recovery. This refers to Capital expenditure, operation and maintenance costs and taking into consideration reasonable assumptions for "both unaccounted for water" and billing efficiency ratios. The methodology for extracting that cost is based on the Long Term Marginal Cost (LTMC), where two scenarios are proposed for this purpose. Scenario No.1 is based on the theoretical assumption that all the CIP is to be realized and commissioned at one time and that we will get benefit immediately upon "opening the valve". This will give a first estimate. The results show that the long

term marginal cost per m^3 in US $ at the point of production for phase No.1 and phase No.2 are 0.91 and 0.78 respectively. Table 2.2 shows the impact of system losses and billing efficiency on these results.

Scenario No.2 is based on the same premises and assumptions except timing, which is different. The tariff study issued by LEKA considered a specific timing for each separate project for potable water taking into consideration reasonable construction

Table 2.2 The impact of system losses and collecting/billing efficiency ratio.
(Scenario No. 1) (LEKA, 1998)

Potable Water in us $	**Existing situation Phase I**		**Target situation Phase I**	
Production		0.91		0.91
Physical and commercial losses	45%	0.40832315	20%	0.18147696
Billing efficiency	90%	0.09073848	99%	0.00907385
Long Term Marginal Cost		1.41		1.10

periods. For example the sea water desalinization plant is not to be commissioned before year 2002 (the implementation of CIP is delayed due to urgent political conditions). In terms of additional water resources made available for distribution, a gradual increase has been introduced as illustrated in table 2.3 below. Again, this one of the possible scenarios, many others can be envisaged, but for simplification purpose, it is considered only one. Results of this scenario are as shown under table 2.4 (LEKA, 1998).

2.3.3.2 The Tariff Structure

The second objective of LEKA's tariff study is to introduce progressive tariff structure, which is based on block of tariff provided that the level of each block is to be affordable and acceptable for each category of customers concerned. The whole exercise is to be worked out bearing in mind that the tariff structure should penalize excessive use of potable water. One of the key issues for introduction of a progressive tariff is to define the first block of tariffs, provided that this first block takes into consideration the affordability at the household level and the cash

requirement for the coastal utility. The whole system is to be seen on a long term perspective for ensuring sound management and sustainability of the system. The proposed methodology for this purpose is based on identification of the pattern of consumption for each category of consumers, definition of the poverty line, which should be taken into consideration for charging low level incomes, definition of the minimum consumption per capita for low level income, assessment of number of persons concerned for each connection and Proposal for a tariff structure with the escalation multipliers (LEKA, 1998).

Table 2.3 Project time schedule and related additional m^3 available for distribution.(Scenario No. 2) (LEKA, 1998)

Year	**Project Item**	**Capital Expenditure (capex)**	**Operating Expenditures**	**Additional m3/year/av-ailable for distribution**
			3.5% of capex	
1999	Rehabilitation of Existing wells	1 920 000	3 252 200	4 900 000
1999	Well water carrier	8 741 800	305 963	
1999	Construction of blending reservoirs	3 750 000	131 250	
2000	Construction of storage reservoirs	15 125 000	529 375	
2000				5 000 000
2000	Construction of balancing reservoirs	22 812 500	2 448 438	
2001				10 000 000
2001	Water pumping/booster stations	7 700 000	269 500	
2001	Water force mains	130 825 000	4 578 875	
2001	Rehabilitation of water distribution system	1 664 358	58 253	
2001	Water distribution system extension	5 575 275	195 135	
2001				5 000 000
2001	Water meter within extended system	1 084 080	37 943	
2001	House connections within extended system	903 400	31619	
2002	Sea Water Desalinization	178 737 240	41 615 803	54 400 000
2002	Blended Water carrier	31 500 000	1 102 500	
2002	Rehabilitation of water meters	823 590	28 826	
2002	Replacement of existing connections	645 663	22 598	5 000 000
	TOTAL	**411 807 906**	**54 608 277**	**84 300 000**

Table 2.4 The long term marginal cost and related impact of system losses and collecting/billing efficiency ratio. (Scenario No. 2) (LEKA, 1998)

Potable Water in US $		**Phase I**		**Phase I**
Production		0.95		0.95
Physical and commercial losses	45%	0.4264994	20%	0.18955529
Billing efficiency	90%	0.09477764	99%	0.00947776
Long Term Marginal Cost		**1.47**		**1.15**

The average monthly income available at the household level for low income family is ranging from 1212 NIS (Gaza city camp) up to 2372 in Gaza city (Nor- consult, 1998). Another source refers to an average income ranging from 960 in rural areas up to 976 NIS (Jica, 1996). Expenses available for water facilities are estimated to 40 NIS per month, while self reported expenditures by households rang from 22.3 to 26.4 NIS, where the average household in Gaza spends from 1.1 to 2.9 percent of their income on water, which may include a potential for increased tariffs (Fafo, 1998). So, LEKA's study considered 4% of the income which is a conservative attitude (LEKA, 1998). Surveys demonstrate that although people are not willing to pay for sewage services, they are ready to pay up to 30% more for having permanent and quality supply of water (Norconsult, 1998).

The Proposed Tariff Structure

As a combination of the above findings, it is recommend a combined system taking into consideration 5 blocks of tariff. Blocks A & B refer to social tariff, while blocks C, D and E refer to economic consideration. In other words, the differential charging in the tariff structure will allow higher income groups to cross subsidize the poor. As the result of the first calculation, the first blocks of tariff for consumption ranging from 0 to 20m^3 should take into consideration the maximum acceptable rate for low level incomes. Furthermore a more conservative attitude would lead to reduce the rate for the first bracket ranging from 0 to 10 m^3, bearing in mind that for this category the fixed charge is considering 10m^3 consumption regardless of real consumption.

Block A: 0 to 10m^3 ---------- 2.54 * 0.7 NIS
Block B: >10 to 20m^3 ----------2.54 NIS

The 0.7 multiplier was selected for matching the average real consumption for this category of consumers (~ 7 m^3 / month).

The proposed multipliers for block C and D reflect existing situation in other developing countries.

Block C: >20 to 30m^3 ---------- 2.54 * 1.3 NIS
Block D: >30 to 40m^3 ---------- 2.54 * 1.8 NIS

For block E, consumers will be charged taking into consideration the Long Term Marginal Cost (US $ 1.45 = NIS 5.31, this price includes wastewater price)

Block E: >40m^3 ----------5.31 NIS

There is a temptation to increase these escalation multipliers and then over charge large customers. This can introduce pernicious effects such as illegal connections, water meter reading falsification, etc. For large consumers this might also encourage them to disconnect and develop alternative solution such as digging illegal wells. In the Gaza Strip case, considering the few number of customers involved in large categories this will be of a limited effect on the coastal water income. As the final result the proposed tariff structure can be described as in Figure 2.9.

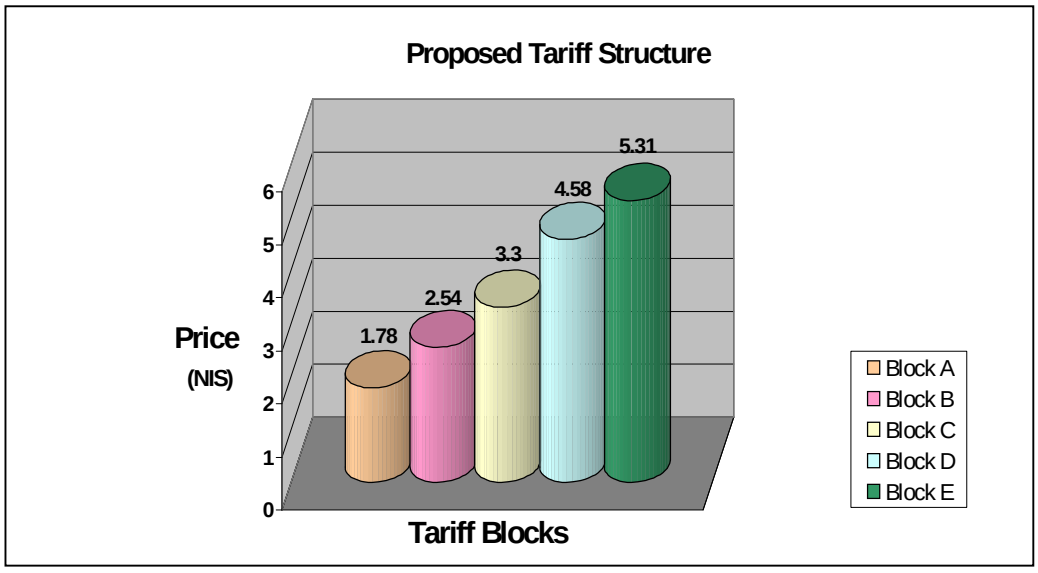


Figure 2.9 LEKA's proposed tariff structure (Block A & B are social blocks)

2.3.3.3 Gradual Introduction of the New Tariff

It is necessary to introduce the new system gradually, taking into consideration the gaps between the average selling prices of the various municipalities as indicated in Table 2.5. The third objective of LEKA's tariff study is to describe the methodology for introducing the new tariff system, identifying the main constraints as well as giving a tentative time schedule. Basically the introduction of the new tariff must be

managed by single entity for ensuring standard procedures be applied, and consequently municipalities are not the appropriate bodies. Furthermore the system will require a new electronic system for billing which is to be under the control of this entity. Introducing the new tariff will necessarily be accompanied by other measures for monitoring and follow up actions. Finally a prerequisite is that this

entity has full control and authority on the meter readers for ensuring the success of the project.

Table 2.5 Municipal Tariffs - Domestic Use. June 1998 (NIS)

Municipality	Fixed Charge if no meter reading (m^3)	0-10	20	30	40	50	over
Gaza	10	0.3 s/m^3	0.5 s/m^3	0.9 s/m^3			
Rafah	20	15.3 s		0.70 s/m^3		1 s/m^3	
K. Younis	20	20s		1 s/m^3	1.50 s/m^3		2 s/m^3
B. Suhyla	10	15s	1.6 s/m^3	1.7 s/m^3	2 s/m^3		
Abassan K	10	18s	2 s/m^3				
Abassan S	10	15s	2 s/m^3				
Khzaa'	10	16s	1.7 s/m^3	1.8 s/m^3	2 s/m^3		
Qurarh	20	20s		1.2 s/m^3			
D. Balah	15	15s	1.2 s/m^3	1.5 s/m^3			
Zwaida	10	15s	1.7 s/m^3	1.8 s/m^3	1.9 s/m^3		2.5 s/m^3
Nusairat	10	15s	1.7 s/m^3	1.8 s/m^3	1.9 s/m^3		
Maghazi	10	15s	1.7 s/m^3	1.8 s/m^3	1.9 s/m^3		
Burej	10	15s	1.7 s/m^3	1.8 s/m^3	1.9 s/m^3		
Jabalya	50	29s					0.70 s/m^3
B. Lahya	30	30s		0.70 s/m^3			
B. Hanoun	30	30s		0.70 s/m^3			

Note: (s = NIS).

Ensuring a smooth transition is of an utmost importance and it is strongly suggested to take advantage of the monthly billing system for a gradual introduction of the new tariff structure, where timing is a crucial issue in introducing the new tariff structure.

Such introduction must necessarily be accompanied by a real improvement of the level of service. In other words the commissioning of the new installation is a prerequisite to the introduction of the new system. The whole process can be introduced taking into account a 3 step approach as indicated in table 2.6 (LEKA, 1998)

Table 2.6 Tentative time schedule for gradual introduction of the new tariff (LEKA, 1998).

	Step No. 1 Introducing Block A + 10m^3 consumption Standard tariff structure	**Step No. 2 Introducing Block B+ Standard tariff level**	**Step No. 3 Introducing Block C, D & E**
Month	1 2 3 4 5 6 7 8 9 10 11 12	13 14 15 16 17 18	19 20

2.4 Conclusion

From the literature review, it has been noticed that there are many factors which may affect water pricing in the Gaza strip. These factors can be classified into five groups, financial factors, socio-economic factors, level of service factors, technical and managerial factors and political factors. Each group of them contains many factors as follow.

Group one: Financial Factors

1. Cost recovery components which include
- Capital expenditure
- Operating cost
- Maintenance cost
- Investment cost
- Depreciation cost
- Cost of water itself
- Administrative cost

2. Financial support (National or international, grant or debts, small or large).

3. Collection efficiency

Group two: socioeconomic factors

1. Ability and affordability
2. Willingness to pay
3. Customers' satisfaction with water service
4. Community awareness
5. Community participation in decision making
6. Social equity
7. Income level
8. Allocative efficiency
9. Cost Benefit analysis

Group three: level of service factors

1. Quality
2. Quantity and pressure
3. Continuity
4. Private alternatives for water service

Group four: Technical and managerial factors

1. Network efficiency (Leakage, blocked meters, losses, …)
2. Illegal connections
3. Water consumption
4. Number of customers
5. Methods of sewage disposal and treatment
6. Housing type and metering practice
7. Institutional aspects
8. Meter reading accuracy

Group five: political factors

1. Closure, which affects the development projects, operation and maintenance process and increases sharply the percentage of idleness.
2. Declining of GDP and GNP.
3. Damages of water network assets due to Israeli military actions.

The tariff study, which prepared by LEKA, took into consideration some of these factors but not all of them. Mainly it concentrated on cost recovery according to the

proposed Capital Investment Program (CIP), but it did not give a sufficient interest for the socio-economic and political situation which is unstable in the Gaza strip. For example it is proposed to start the CIP in the year 2000 but it did not start till now because of Intifada conditions.

LEKA's study depended in determining the social blocks on the volume of water consumed. It has considered the social blocks as that of low consumption, but the actual situation indicated that some poor households may lie in the blocks C, D and E for two reasons. The first one is that there are many households sharing in one connection because they live in a multistory building or in neighboring houses especially in refugees' camps. The second reason is that some poor house holds have a great number of persons which cause more consumption for water while some rich house- holds may contain less number of persons which may cause a low consumption of water, consequently they will lie in the social blocks.

The tariff study prepared by LEKA considered the average number of persons per water connection is twelve persons while the current average number of each household is seven person. Consequently, LEKA raised the average household income from 950NIS to 1628 NIS (i.e 950x12/7=1628 NIS), This modification may be suitable for some houses especially those who joining in one connection but not for all cases, so it can't be considered as a benchmark.

This study will concentrate on some factors that have been not given sufficient attention by LEKA's study such as socio-economic factors and political factors. This study will investigate the impact of some factors on water pricing such as, water consumption, ability and affordability, willingness to pay, quality and quantity of water supplied, illegal connections and political situation.

Chapter (3)
Institutional Arrangements

3.1 Introduction

Until 1967, the Department of Municipal and Rural Affairs in Gaza administered the water sector. During the Occupation, the Israeli army has severely controlled the utilization of the water resources by striving to limit access of Palestinian population to water. The Agriculture Gaza Department of the "Civil Administration" has prepared in 1969 the wells and drillings inventory, then from this date, has followed up of the aquifer by measuring periodically levels of ground water and making regularly physico-chemical analysis. All this gross data was sent for processing and centralization to the Israeli Hydrological Department. Water Officers of "Civil Administration" restrained access to the data base, annual reports of the Israeli Hydrological Department constitute the only available statistical sources on the aquifer of the Gaza Strip for that period. The Agriculture Gaza Department also gave new drilling authorizations and was entrusted with the monitoring of abstracted quantities. Meteorological data were collected by the Department of Transportation. Israeli companies Mekorot, for infrastructures and operations, and Tahal, for surveys and studies, had the quasi-monopoly in water and sanitation sector (LYSA, 1995).

The institutional arrangements for the water sector in Palestine is currently in the process of being developed, and institutional reform takes place at the local government level transforming the present municipal water departments into regional water utilities. The present situation of water supply service in the Gaza Strip is one of the extreme fragmentations. There are many institutions involved in this field. The main institutions involved in this field are:

- Local authorities, which include municipalities and village councils.
- Ministries of PNA such as, Ministry of local government, Ministry of Agriculture, Ministry of Health and Ministry of Environmental affairs.

- Multilateral organizations especially (UNRWA, World Bank).
- Non Governmental organization (NGOs).
- Palestinian Water Authority.

In this chapter, the role of each institute will be described briefly. Then an illustration of the proposed institutional arrangement will be demonstrated which depends on establishment of Coastal Municipalities Water Utility (CMWU). Finally, a number of conclusions will be drawn.

3.2 Local Authorities

Prior to the Cairo Agreement of August 1994, under which the Israeli Civil Administration withdrew from Gaza, water resources were administrated by the Water Department of the Civil Administration. Water services were and still carried out by the Water Departments of the 16 Municipalities and Village Councils (Al-Jamal, K., and Shoblak, M., 2000). In the Gaza strip, water is managed by the 16 municipalities and Village Councils. Most of them are supplied with water from the local aquifers, through wells, some of them are partly or totally relying on Mekorot facilities. Water quality ranges from good (north and south aquifers) to poor (middle aquifers); water is frequently polluted and contaminated by salinity intrusion. The past decades have weakened the Municipalities and their capacity to properly operate and maintain their water facilities (LEKA, 1998b).

Each Municipality has its own organizational structure, which includes the structure of water department. The staff and capacity of water departments differ in number and qualifications from one municipality to another. The level of service also differs either in quality or quantity according to the available water resources. Water tariff is not unique according to the cost recovery, which varies from one municipality to another. So, the responsibilities of managing water sector in the Gaza strip is divided between the overall municipalities and Village Councils in Gaza strip.

The present fragment institutional structure in the Gaza Strip, with responsibility divided between 16 municipal water departments is incompatible with efficient service delivery and the integrated management of the limited groundwater

resources. This forms the key sector challenges, which include improving water resources management and environmental health conditions, improving water supply delivery systems, enhancing new water resources to meet current and future demands, and strengthening the institutional, financial and regulatory framework of the management of water sector (Al-Jamal, K., and Shoblak, M. 2000).

To develop the current situation of water sector in the Gaza Strip, with support of the world bank, the PWA on behalf of the Palestinian National Authority has embarked on a deep and wide rehabilitation of the water and sewerage facilities throughout the Gaza Strip. A 4-year contract has been signed with LEKA (Lyonnaise des Eaux - Khatib and Alami) to assist in this rehabilitation program, and the improvement of the water and wastewater services in all municipalities and village councils. The support from LEKA started in September 1996 (LEKA, 1998b).

3.3 Ministries of PNA

3.3.1 Ministry of Local Government

The main role of MOLG in the water sector in the Gaza strip is to monitor, coordinate and determine priorities for water projects in all municipalities and Village Councils in the Gaza Strip as indicated in figure 3.1. This General role includes: -

- Assisting municipalities and Village Councils in solving their water problems.
- Identifying priorities for water and wastewater problems in Municipalities and Village Councils.
- Effective Coordination between municipalities and PWA, which supports projects for digging new water wells, construction and rehabilitation of water and wastewater networks, wastewater treatment plants and maintenance for water and wastewater networks.
- Monitoring water service Council in north, middle and eastern Municipalities and Village Councils.
- Representing Municipalities and Village Councils in assigning the water agreements or contracts.
- Collecting monthly water reports about production, consumption and water network efficiency from all effective Municipalities and Village Councils of the Gaza Strip.

- Approval of water departments' budgets and expenses.
- Intervening particularly in tariff issues.

3.3.2 Ministry of Health

The ministry of health (MOH) plays an important role in the water industry regulation. This covers setting the standards, which are related to the public health

such as, drinking water quality and disinfection of drinking water storages (Al-Jamal, K., and Shoblak, M. 2000). The ministry of Health also monitors the quality and potability of water distributed by the Municipalities and Village Councils through periodic chemical and microbiological tests. The microbiological tests are made for short periods of time (weekly) and the samples are taken from consumers' taps, but the chemical tests are made for long periods of time (about six months) and the samples for tests are taken from the main resources of available water such as water wells either Municipalities wells or private wells. The Ministry of Health sends a report of each test result to the related Municipality or Village Council. There is no direct role for MOH in water tariff setting, but the standards of MOH affect directly the water tariff.

3.3.3 Ministry of Environmental Affairs

The Ministry of Environmental Affairs (MENA) plays a complementary role to the Ministry of Health. This covers setting the standards, which are related to the conservation and protection of the environment such as, minimum water requirements to preserve the environment, disposal of treated sewage in wadis, streams rivers, lakes and seas and finally disposal of brine from the desalination plants. The MENA also controls the quality of effluents (Al-Jamal, K., and Shoblak, M. 2000). The role of MENA is not direct the water tariff, but the stated standards by MENA affect directly the water tariff setting.

3.3.4 Ministry of Agriculture

In the administrative framework of the PNA, the Ministry of Agriculture has preserved its former prerogatives and insures the centralization and the distribution of hydrological data collected. It manages the aquifer resource (LYSA, 1995). Until the implementation of the PWA, water resources were the responsibility of the Ministry of Agriculture. At present, the permissions (licences) for drilling and exploiting new wells for domestic, industrial or agricultural purposes are given jointly by the Ministry of Agriculture and the PWA. In the near future, all water

resources -related activities shall be transferred to the PWA, including the control and monitoring of the aquifers. The Ministry of Agriculture is also responsible at present for the operation and maintenance of a distribution network, which distributes water to municipalities in the eastern and central areas of the Gaza Strip. (LEKA, 1998). This role should be taken into consideration when estimating the cost recovery of the water supply service.

3.4 Multilateral organizations

3.4.1 UNRWA

Since 1967 the UNRWA has started to provide a humanitarian assistance to the refugees and has provided essential of public utilities in 8 existent camps. In addition to education and health departments, the agency has distributed free water in the 8 camps from the wells that it operates directly (LYSA, 1995). This role of UNRWA is diminished by establishing the Municipalities and Village Councils in refugees camps in the late of 1970's, where the municipalities and village councils started to provide the refugees camps with potable water. Although of this, UNRWA still providing partly some refugees camps with water till now, where some areas are not connected with municipal water networks or in the areas of refugees camps that suffer from water shortage.

Now, UNRWA provides water service in three camps, which are Jabalia, Khan-younis and Rafah. In Jabalia water is pumped through three wells (ESA1, ESA2, ESA3) of about 2000m^3 per day. In Khan-younis only the well (L86) is used which produces about 400m^3 per day. In Rafah, 300m^3 per day is produced from the well (P10) (UNRWA, 2002). Thus the total amount of water provided by UNRWA is about 2700m^3 per day which is considered very low if compared with the total demand of Gaza Strip. So, now, the role of UNRWA in water supply sector in very limited in the Gaza Strip. This service hasn't a separated department in UNRWA, but it is managed through the activities and responsibilities of Special Environmental Health Program. Figure 3.2 shows the organization chart of this program. However, UNRWA doesn’t play a key role in water tariff setting, but the free charge service may affect the willingness to pay for refugees in the Gaza Strip.

3.4.2 The World Bank

The World bank is entrusted with the international coordination of multilateral aid programs. It has drawn up several studies that constitute the reference of the aid to the development of Palestine (West Bank and Gaza Strip) such as:

- **Emergency Assistance Program**

Program of 44.3 million USD in 3 years for the Gaza Strip (LYSA, 1995).

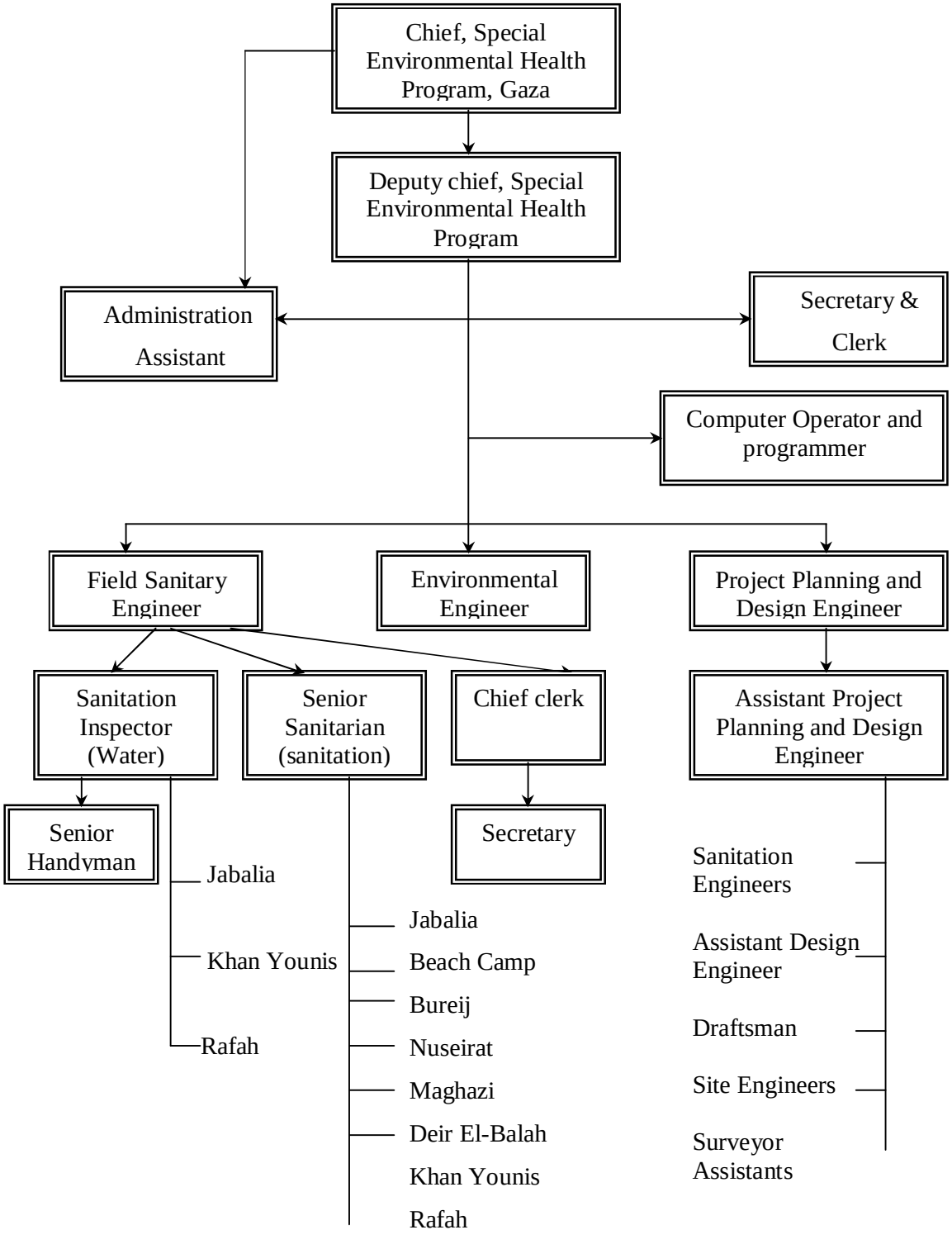


Figure 3.2 Special Environmental Health Programme Organization

UNRWA, Gaza

- **Technical Assistance Program**

In the water sector, the following projects have been retained:

- creation of a consultancy department to prepare projects for rehabilitation (wells).
- survey on wastewater treatment and definition of a reuse policy for treated water.

- **Emergency Rehabilitation Program**

Program of 16.4 million USD for the Gaza Strip, of which 8.4 million USD for the first year.

For this sub-component, it is anticipated that the implementation of Water works is confided to Municipalities, Palestinian Economic Council for Development and Reconstruction (PECDAR), …etc, (LYSA, 1995).

3.5 NGOs

3.5.1 American Near East Refugee Aid (ANERA)

ANERA has been active in the Gaza Strip since its formation in 1968, drawing largely on financial support from individuals, foundations and corporations, and official source of funding in the United States. Projects in the Gaza Strip include markets, drainage, water , wastewater & irrigation. In addition to ANERA's support of health institutions (clinics, nursing, schools), the organization has assisted projects of pertinence to the environmental health sector. The most important example in ANERA's funding of the Gaza Strip town rainwater conservation project completed in 1980s, involving capture and storage of rainwater for purpose of recharge the groundwater aquifer. ANERA has good potential for further involvement in the public health sector in the Gaza Strip, (Nassar, A. Majid, 1996).

3.5.2 United Nation Development Program (UNDP)

The UNDP has an office in Gaza. Sector projects implemented by UNDP have been mostly interested with water and sewage development projects in the Gaza Strip. A shortcoming in UNDP's project development work, which should be addressed in its future activities, is that it has designed and built projects without fully ensuring that the subsequent operation of the works can be maintained or paid for, that there are sufficiently trained operators, or that there is a demand for other phases to achieve the goals of the project. Awareness of this constraints underscores the need to include effective institutional support activities environmental health, (Camp Dresser and McLee, 1993).

3.5.3 Save the Children Federation (SCF)

This is a foreign NGO, funded jointly by SCF (USA) and SCF (UK) and operational in the Gaza Strip since 1978. Since 1989, SCF has reduced their contact with the Civil Administration and has concentrated only on projects that can be carried out with Palestinian community groups without reference to higher authority. As a result, the projects tend to be of small scale, and beneficiaries are thought to number around 6,000 per year. SCF, as a foreign NGO, reportedly enjoys a more secure status and finds it easier to operate than do the local NGOs, who are restricted in their permitted activities. SCF has sponsored community projects in areas of water, sewerage, drainage, income generation and promotion of primary health care services. It has helped people to connect to existing sewerage systems and has assisted private water wells that supply to peri-urban and rural areas (Nassar, A. Majid, 1996).

3.6 The Palestinian Water Authority (PWA)

3.6.1 The Role of the Palestinian Water Authority

Since its creation in 1996, the Palestinian Water Authority (PWA) has practiced its role in an attempt to achieve its mission which is" ensure equitable utilization and sustainable management and development of Palestinian Water Resources ". In the course of achieving this mission, PWA will guarantee the most efficient management of available water resources in Palestine to achieve the balance between available water quantities and qualities, and the needs of the Palestinian people in the present and the future (Al-Jamal, K., and Shoblak, M., 2000). The law No. 2 of 1996 identified the role of PWA in the following areas:

i. Responsible for strategic planning for the water resources to find the optimal way to manage, protect, conserve the limited national water resources and to guarantee the right of access to water of a good quality for both present population and future generations at cost that they can afford.

ii. Monitoring and protection of water resources. This is considered as an important role to enable PWA to assess the existing resources and protect them as a precious resource. PWA has developed a comprehensive monitoring program. The program identified the needs, the number of monitoring wells and their locations (PWA Monitoring, 1998).

iii. Regulating the water industry to maximize the benefit from the water resources and due to existing conflict of interests, it is necessary to have a mature regulator for the water sector in general. Regulations should organize the relationship between service providers, users environment and water resources.

3.6.2 Regulatory Framework

In order to regulate the water industry, a Presidential Decree was signed in Gaza City on 18/1/1996, where the Palestinian Regulatory Framework has been developed as shown in Figure 3.3 (Al-Jamal, K., and Shoblak, M. 2000).

The main players, according to this framework, are:

1. The National Water Council (NWC).
2. The Palestinian Water Authority (PWA).
3. The Ministry of Health.
4. The Ministry of Environmental Affairs.
5. Service Utilities.

3.6.3 the National Water Council (NWC)

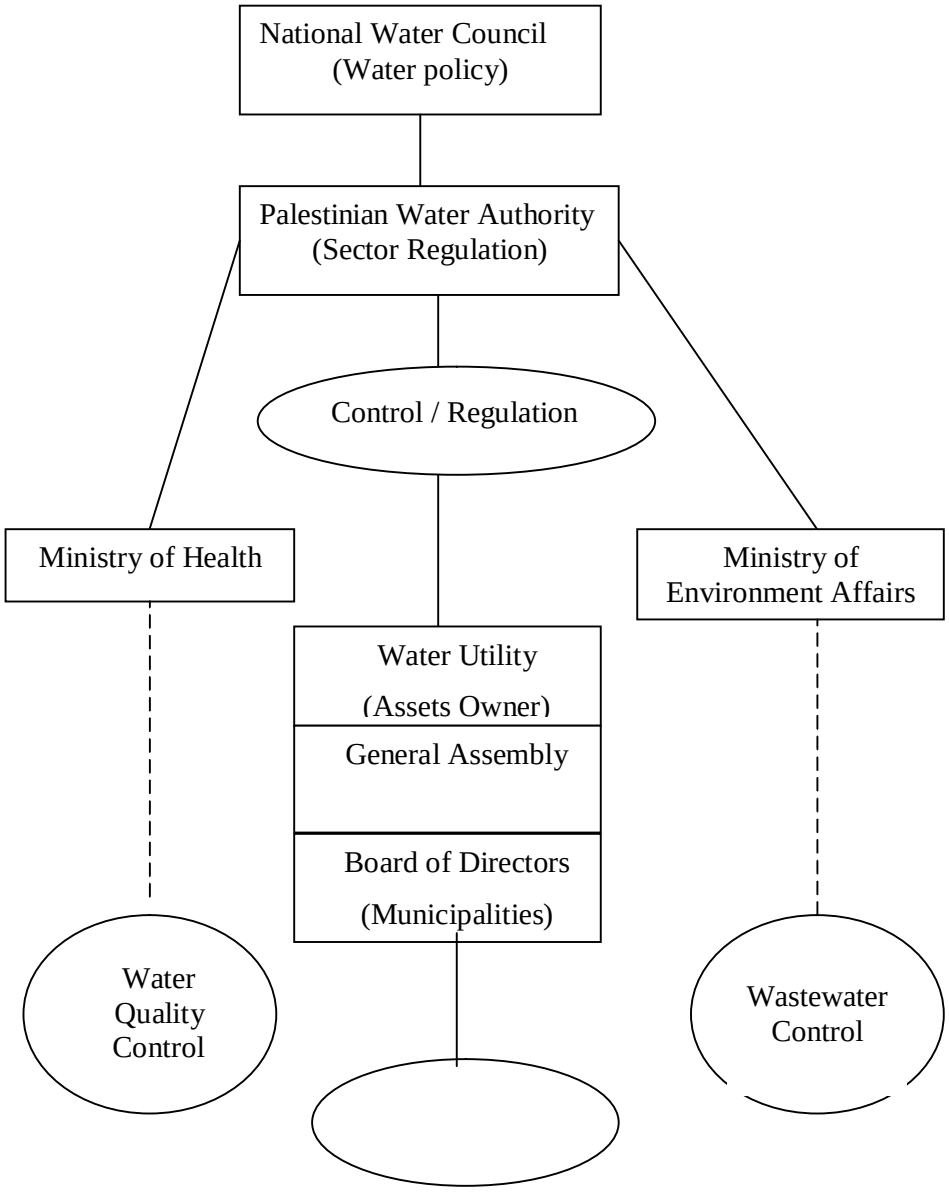
According to Article 8 of the law No.2 for 1996, the NWC consists of:

1. The President of the National Authority (Chairman of the Council).
2. Minister of Agriculture (Member).
3. Minister of Justice (Member).
4. Minister of Planning and International Cooperation (Member).
5. Minister of Local Government (Member).

6. Minister of Industry (Member).
7. Representative of the Palestinian Universities (Member).

The NWC is responsible for the following:

1. Setting the water policy for Palestine and submitting it to the Council of the PNA for approval.
2. Setting the policy for developing and exploiting the water resources in Palestine in cooperation with relevant parties.
3. Reinforcing regional and international cooperation in water matters.
4. Implementing the strategic decisions relating to the execution of the water policy of the PNA including monitoring pollution and environmental protection.
5. Determining the money required for investment in the water sector.



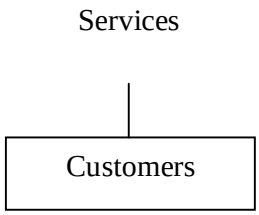


Figure 3.3 Strategic Institutional Setup for the Water Sector in Palestine
(Al-Jamal, K., and Shoblak, M. 2000).

6. Reinforcing and supporting the work of the PWA and overcoming any difficulties that obstruct its work.
7. Any other important matters that are referred to it by the PWA.

The roles of PWA, MOH and MENA were discussed in the previous sections.

3.6.4 The Proposed Coastal Municipalities Water Utility (CMWU)

The first serious discussion for the regional utilities idea was held in a workshop at Birzeit University on April 21-24, 1995; the participants from national institutions, donors, UNDP and NGOs have recommended that four Regional All Water Autonomous Utilities (Coastal, Northern, Central and Southern) should be established within the framework of arranging the national water management and services delivery. Those utilities will be responsible for design, construction, operation and maintenance of retail consumer services including: wastewater collection, treatment and re-use, storm-water collection, treatment and re-use; and water and treated wastewater supplies for irrigation. The utilities will be owned by local authorities, with community representation on their boards. They will be administratively and fiscally autonomous, although tariffs will be reviewed, and water abstraction and discharge will be licensed and monitored by the PWA. The utilities must therefore also seek full cost recovery in their operations (Birzeit Workshop, 1995).

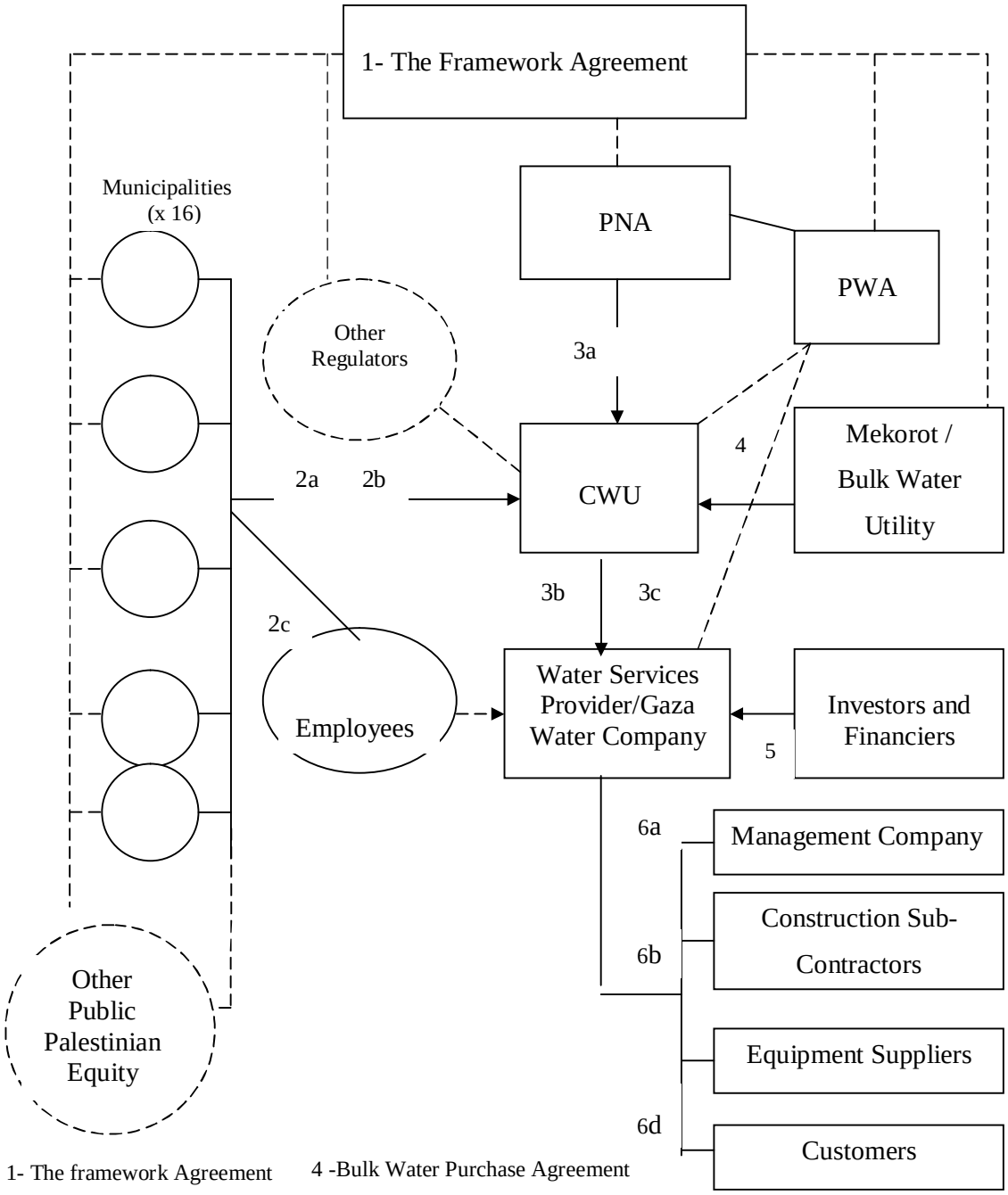
Based on the above-mentioned recommendations, PWA has adopted in its strategy that a future situation is envisaged in which management of the separate municipal and village council water and wastewater departments would be consolidated into a

single, efficient regional water and wastewater utilities (Al-Jamal, K., and Shoblak, M., 2000). So, the PWA has engaged LEKA to examine and to assist the PWA to resolve the different financial, operational, regulatory and institutional issues that a single water utility (CMWU) should be created to own the water infrastructure in the Gaza Strip and directly or indirectly to provide water and wastewater services in the Gaza Strip (LEKA, 1998c). This engagement was built on the objective of the PWA's water management strategy which is " To secure an environmentally sound and sustainable development of water resources, through efficient and equitable water management" (PWA Strategy, 1998).

The mission of the sustainable utility should be consistent with the national policy and goals to achieve the overall mission of the water resources management. Thus the utility mission may appear as:

"To provide the water and water services adequately to all users in accordance with the national policy at a price consistent with the cost". Under this mission the utility should comply with the national defined policy. The PWA has adopted in its policy the following principles in relation to the utility performance; Water is an economic good, all citizens have a right to water of good quality for personal consumption at cost that can be afford and separation of institutional responsibility for policy and regulatory functions from the service delivery function (Al-Jamal, K., and Shoblak, M. 2000).

However, LEKA had finished this study in 1998, which gives a clear vision for the institutional building of the CMWU. Figure 3.4 illustrates the proposed contractual and legal structure. All Municipalities and Village Councils of Gaza governorates have expressed their support to the establishment of a single utility by signing the Memorandum of Understanding with participation of PWA and MOLG representatives in May 2000. The Memorandum of Understanding specifies that the coastal water and wastewater utility would serve the whole Gaza governorates (implicitly, has the monopoly), would be jointly owned and directed by the local administrations of the Municipalities and Village Councils that it serves, would be administratively and financially independent, and would operate in accordance with sound financial practices (MOLG and PWA, 2000).



1- The framework Agreement 4 -Bulk Water Purchase Agreement

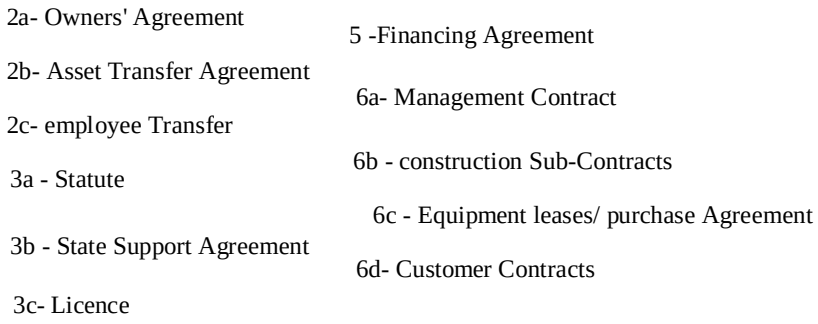


Figure 3.4 LEKA'S Proposed Contractual and Legal Structure (LEKA, 1998c)

This chapter has described the institutional structure of water supply sector in the Gaza Strip. Its main conclusions are:

1- Responsibility for water supply service is scattered across a great number of multilateral, governmental and non-governmental organizations.

2- There is no coordinated policy as regards cost recovery, water tariff, choice of technology and service level.

3- The municipal and village council organizations play an important role in operation and maintenance, but they are financially weak and understaffed.

4- The role played by UNRWA of supplying water and sanitation for free charges provides a disincentive for people in the other parts of the Gaza Strip to pay.

5- The fragmentation of responsibility in the Gaza Strip for the provision of services between different public bodies has prevented the evolution of an integrated approach to deal with the problems of water management in the Gaza Strip especially the financial problems. The creation of a central system of control is therefore vital to the implementation of long term solutions.

6- There is an urgent need to develop an institutional framework and assign national, regional and local responsibilities in the water sector and to develop the water pricing policies.

Chapter (4)
Methodology

This chapter discusses the methodology that used in this research. The adopted methodology, or framework, to accomplish this study, depends on many techniques and approaches, which were used in an integrated form to secure an acceptable achievement of the research objectives. The basic methodology is not unique and may be used in many other areas of science, business and government. The starting point of the methodology is a comprehensive assessment of the existing situation. This assessment will explore the following: -

- An assessment of institutional arrangements for water supply service in Gaza Strip.
- A literature survey of proposed alternatives for water tariff in Gaza strip.
- A field study to stand on the socio-economic situation in Gaza strip which strongly affects any water pricing policy.
- Data collection related to the existing water tariffs and cost recovery in different municipalities in Gaza Strip.

The chapter provides information about the research design, target populations and samples, instrumentation and the process of data collection. Issues of scientific accuracy such as validity and reliability were explicitly demonstrated. The chapter also addresses issues of ethical concerns, eligibility criteria and piloting process. Clarification was provided regarding data analysis and procedure followed to achieve the objectives of the study.

4.1 Study Design

There are many approaches to empirical work such as; modeling, simulation, experimental design, qualitative approaches, quantitative approaches and collecting data from respondents (Fellows, and Anita Liu, 1997).

The type of this study is a quantitative cross-sectional study. This design was selected because of its advantages such as, it is economical in saving time and money and it is used for evaluative studies. It has been selected because it is useful for descriptive, correctional, interpretative and evaluative purposes. Cross-sectional studies are generally carried out in a population at a point of time or over a short period. Cross-sectional studies usually are quick (snap-shot) and economical. Cause and effect are being examined at the same point of time. It may give some insight and understanding of the association between the cause and the effect (Abul kumboz, 2002).

4.2 Study Methodology

After reviewing the literature concerned the subject of the study, it is noticed that there are many factors affecting the water pricing in developing countries. The degree of importance differs from one factor to another as it differs from one country to another. A questionnaire with an interview was administered to stand on the opinions of the experts who deal or have contact with the study subject. The questionnaire was developed with closed and open-ended questions and it was designed in the Arabic Language, as some of the target population was not familiar with the English Language, (Annex1).

According to the results of the interview with the experts, factors to be studied were determined and a questionnaire was developed for this purpose. The target group of this questionnaire was the customers of water supply in the Gaza strip. This questionnaire was administered by the assistance of focusing groups. A focusing advisory group was selected from 3-8 persons in each governorate and the purpose of the questionnaire was explained for them and how to be filled.

4.3 Study Period

The study started in January 2002, When the researcher started by seeking approval and setting up the administrative procedures. Data collection started soon after the ethical approval was obtained. Questionnaires were made available and data collection continued until the first August 2002, then followed by data analysis,

results statement, discussion, conclusion and recommendations. The study was completed in the first of October 2002.

4.4 The Interview Population and Sample Size

The population consists of subjects who had contact or were dealing with the water supply sector in the Gaza strip and having a wide experience in this field. This population was estimated to be not more than 150 persons. Forty-four of them were randomly selected from different locations such as ministries, universities, municipalities, PWA, private sector, international agencies, community institutions and others. Each interview includes two parts of questions. The first part is related to personal questions and consists of five questions. One of them is an open-ended question. The others are dichotomous, quintuple gradual and eight gradual questions. The second part is about the factors that affect water pricing in the Gaza strip. This section consists of twenty-eight questions. Some of them are open-ended questions. The other questions are quintuple and sixfold gradual questions.

Many points and suggestions were raised to be considered and there was agreement on certain issues by all or most of interviewees such as their points of view about the low level of water service, either quality or quantity, and the high necessity for water service improvement. Most of them also (88.6%) agreed that there was a need for further studies about water tariff to measure willingness to pay, ability and affordability, the relationship between water consumption and water tariff, the relationship between illegal connections and water tariff and the effect of customers' satisfaction on water tariff. The data collected from this interview was statistically analyzed by the Statistical Package for the Social Sciences (SPSS) program. The results were used in designing a questionnaire for water customers' population to measure the factors that affect water pricing in the Gaza Strip.

4.5 The questionnaire

4.5.1 The questionnaire Design

According to the review of literature related to the concern subject and after interviewing experts who were dealing or having contact with the subject at different levels, a questionnaire was developed with closed and open-ended questions. The questionnaire was designed in the Arabic Language, as most of the target population were unfamiliar with the English Language (Annex 2). Unnecessary personal data,

complex and duplicated questions were avoided. In each questionnaire, an explanatory letter was attached to cover some ethical considerations and to facilitate questionnaire filling (Annex 3). The questionnaire consisted of three sections. The first section was related to the background of the respondent and it included several areas of questions such as age, gender, educational level, marital status, demographic data, family size, type and condition of housing and family income. This section consisted of 18 questions. Some of them are open-ended questions. The other questions are dichotomous, tripartite gradual, quadruple gradual, quintuple gradual and sixfold gradual questions.

The second section included 39 questions about the current situation of water supply service such as quality and quantity of the service, the customers' satisfaction, community participation, willingness to pay, ability and affordability, water consumption, illegal connections, capacity building of municipalities, public awareness….etc. Three questions in this section are open-ended questions. The other questions are dichotomous, tripartite gradual, quadruple gradual , quintuple gradual and sixfold gradual questions.

The last section is appointed for measuring the willingness to pay by using the contingent valuation method, particularly the bidding games method. The first seven questions of this section are dichotomous questions while the eighth question is an open-ended one.

Questions were arranged in logical sequence to facilitate filling the questionnaire. Some variables such as family size, house area, average of monthly water consumption, average of monthly water bill and so on were left open in order to be categorized later on in the analysis. In other worlds, they were categorized according to the findings. A draft questionnaire was designed with the help of supervisor. This draft was discussed with a group of specialists. They advised some changes such as adding some questions to measure the relationship between poverty and water consumption. Modification, in the questionnaire to include all governorates of Gaza Strip, also was recommended. Some of them recommended adding questions to measure the public awareness. Some of them also recommended to merge two questions or more with each other. Other changes were also made after the pilot study to clarify confusion and ambiguity reported by the pilot study subjects.

Bishop and Heberlein (1990) argue that the ultimate choice of the questioning technique applied remains largely a matter of individual judgement and preference. This is not to be contradicted but there are arguments that favour one format over the other.

4.5.2 The Study Population and Sample Size

The population of the study is all the households in the Gaza strip, which was 80458 in 2001 (PWA and LEKA, 2002). A systematic random sample to ensure a representative sample of all households was selected in each governorate. The size of the sample in the whole Gaza Strip was 760. The sample size in each governorate is selected to befit the size of population of the governorate. Table 4.1 indicates the sample size in each governorate. The sample size in each governorate was distributed in different zones to represent the whole population in the governorate. Tables 4.1 illustrates the sample distribution in each governorate.

Table 4.1 Sample Size in the Gaza strip Governorates

Governorate	Zone	Sample size
North	Jabalia camp	55
	Jabalia city	55
	Beit Hanon village	40
	Total	150
Gaza	North Remal	50
	Southern Remal	50
	Beach camp	50
	Shegaia	50
	Tel- El- Hawa	50
	Total	250
Middle	Middle Refuqee camps	60
	Deir El-Balah city	40
	Wadi El-Salqa village	20
	Total	120
Khan younis	Khan younis city	65

	Khan younis camp	55
	Eastern villages	20
	Total	140
Rafah	Rafah city (the west region)	30
	Refugee camp(El-Shabora & Yebna)	25
	Tel As-Sultan	25
	Al-Barazeel & Jenaineh	20
	Total	100
Grand Total		760

4.5.3 Response Rate

The response rate for the entire study sample was 96.6%. North Governorate response rate was 100%, Gaza Governorate response rate was 93.2%, Middle Governorate response rate was100%, Khan younis Governorate response rate was100%, and Rafah Governorate response rate was 89%. The high response rate can be interpreted by the advisory groups that accompanied the respondents during the filling operation of questionnaires. These questionnaires were cleaned, where some of them were omitted to facilitate the statistical analysis because the responses were incomplete or inaccurate allover the questionnaire which make it difficult to achieve the research objectives. Table 4.2 indicates the sample size and distribution after data cleaning.

Table 4.2 Final sample size and distribution in Gaza governorates

Governorate	Frequency	Percent	Valid Percent	Cumulative Percent
North	136	22.3	22.3	22.3
Gaza	150	24.6	24.6	47.0
Middle	108	17.7	17.7	64.7
Khan Younis	128	21.0	21.0	85.7
Rafah	87	14.3	14.3	100.0
Total	609	100.0	100.0	
Total	**609**	**100.0**		

4.5.4 Ethical Matter

A formal approval to conduct the study in Municipalities was taken from PWA and related Municipalities. The following ethical considerations were dealt with:

- Every subject was given an explanatory form about the study. This form included: The purpose of the research, confidentiality of information and findings.
- Guarantees of anonymity and confidentiality were given and maintained.
- An official letter of request was sent to each related institution in the Gaza strip to obtain approval for subjects' participation in the study.

4.5.5 Validity and Reliability

4.5.5.1 Instrument Validity

The validity of an instrument is defined as: "an integrated evaluative judgement of the degree to which empirical evidence and theoretical rational support the adequacy and appropriateness of inferences and actions based on test scores or other models of measurement" (Abul kumboz, 2002). To accumulate evidence of validity, two types of validity were utilized in this study; face validity and content related validity. Face validity relates to the suitability, layout, appearance and arrangement of the questionnaire and assessed by independent evaluators who suggested useful remarks. By the end, the questionnaire was produced by a professional attractive manner. Content related validity examines the extent to which the method of measurement includes all the major elements relevant to the construct being measured. This evidence is usually obtained from three sources: the literature, representatives of the relevant populations and content experts. The domain of this study was determined and developed through a concept analysis and an extensive review of the literature. Seven experienced researchers were chosen to evaluate the initial research instrument. Specific instructions were given to them, such as conceptual definitions, operational definitions, numerical scales and so on. An instrument was adopted that determines the validity of the items provided in the questionnaire. Using this instrument, experts rated the content relevance of each item using a 4-point rating scale. The following scale has been adopted: 1= not relevant item and should be omitted; 2= not relevant unless major change are introduced; 3=relevant but needs minor modifications; 4= very relevant and succinct (Abul kumboz, 2002). Seven

experts rated the content relevance of each item. Experts' panel discussion took place and at least five (experts) had agreed on each item. Many items were added, modified or deleted.

4.5.5.2 Pilot Study

A pilot study was conducted before the start of data collection to test response rate, size of effect, validity and suitability of questionnaire as well as areas of ambiguity before the long expensive study started so that remodeling and reforming could take place. Thirty forms were distributed in the different study fields as a survey pre test. The chosen subjects were invited to participate in the piloting process so they received an explanation about the study and had been asked to complete the questionnaires. Some of them asked questions about the explanation of certain terms. By the end, discussion with study sample about the meaning of questions took place to ensure the validity and reliability of the questionnaire. The pre-test showed the need to modify some parts of the questionnaire which flowed inadequately, to change some of the redundancies, to delete some irrelative questions and to provide additional cards containing response choices for some questions. A number of phraseology changes were made to make it more understandable. This pre-test was useful to fit and cope precisely with the aim of the questionnaire.

4.5.5.3 Reliability Analysis

To compute the reliability of the questionnaire instrument, a random sample of 28 respondents was taken from the population. These respondents were asked to fill the questionnaire at the middle of may 2002, then they were asked to fill it again after two weeks. Reliability analysis was done by using test-retest analysis through SPSS program. The result shows that the reliability of the instrument equals 0.8353, which is acceptable for such instruments.

4.5.6 Data Collection

Data was collected quantitatively. Collection of data from the study population in the field took about two months. Arrangements started by conducting the ethical matters and the administrative arrangement with the institutions. Meetings were arranged between the researcher and the advisers groups at the concerned organizations to explain the purpose, importance and procedure of the study. It has been started with the whole areas in the Gaza strip in the same time. The questionnaire has been

explained to the advisers of the different locations and they were provided with the ethical form and the questionnaire. After the filled questionnaires were collected, data were obtained from bill & collection departments in municipalities about the average consumption & the average amount of bill to make check on the answers of the respondents. However, the average time for filling a questionnaire was about 25 minutes. The process of data collection from the different areas took around 50 days.

4.5.7 The Contingent Valuation Method

The survey methodology used to establish information about peoples' maximum willingness to pay for water service in this survey is called the Contingent Valuation Method (CVM). It was first developed in the early 1960s to price environmental public goods such as clean recreational areas and national parks to preserve wildlife. Later the CVM spread to such fields as water and sanitation, and the health sector. The choice of this tool in the study methodology stems from the belief that the CVM is an adequate technique for this purpose. Such a view is supported by conclusions from other studies, for example one from India: "Well-conducted contingent valuation studies can provide reliable and valuable information on behavioral responses to well-defined and well-understood goods such as household water supply" (Fafo, 1998).

A contingent Valuation Method (CVM) was applied as a protocol for the survey method in which respondents were asked directly through designed questions and answers to select from. (CVM) is the most straight forward method, however, is simply to ask people how much they would be willing to pay to have a specific quality improvement in water supply service. In this " stated preference" or contingent valuation approach individuals were asked directly to state or reveal their preferences for the service provided. If people were able to understand the change in the quality of service being offered correctly and would answer truthfully, then this direct approach would be ideal.

Comparing the number of the applications of the different valuation techniques: hedonic property value method, damage function and contingent valuation approach,

these are a large number of applications of the stated preferences method (OECD, 1994). This is in part because the method is flexible in terms of data requirement and can be applied to many different kinds of valuation problems. In short, the CVM employs survey techniques to ask people about the value they would place on hypothetical changes in some environmental resources or non-market commodities, in this case water supply services. All other methods of valuing publicly provided goods and services require linkages to actual market transactions.

Based on extensive research done by Carsonand Mitchel (1989), a CVM typically consists of three parts. First of all a CVM describes in detail the goods of service being valued and the hypothetical circumstances under which they are made available to the respondents. Secondly, the method entails valuation questions, which reflect the respondent's willingness to pay for the good of service being valued. It could simply be a yes or no questions. And thirdly, a CVM contains questions about the respondent's characteristics, their preferences relevant to the service being valued under their use of the good or service (El-Hawi, M. and Hamilton, 2002).

The CVM survey tool exists in a myriad of variants or different versions. Yet it is possible to make a distinction between two main types of willingness to pay contingent valuation studies: (1) Continuous methods: open-ended questions, where respondents are asked to state their maximum willingness to pay for the good being valued. (2) Discrete methods: the dichotomous choice format, where respondents determine whether their willingness to pay is larger or smaller than a set money value. A dichotomous choice question is often followed by an open question to allow the researcher to check for consistency (Fafo, 1998). In this study it is opted for a version of the second type. Within the discrete method of contingent valuation there exist several different ways to ascertain people's willingness to pay. (Mitchell and Carson, 1989) dedicated to the discussion of the strengths and weakness of the CVM mentions four questioning strategies: the bidding game; the payment card; the take-it-or-leave-it approach; and take-it-or-leave-it with follow up. A fifth strategy is called the bidding-tree technique, and is an attempt to combine bidding games and payment cards (Fafo, 1998).

The bidding game question format was chosen, which also called the referendum format, the oldest and most widely used method. The bidding game technique

imitates an auction, where the respondent is offered to pay a specific bid which is raised or lowered in an iterative manner until the maximum willingness to pay is reached. The auction format is one of the strengths of the procedure, because it is straightforward and likely to be familiar to the respondents. A crucial point in the scenario offered is an increase in the level of provision of the good or service. In fact, improvement of services is such a significant part of a willingness to pay survey and the Contingent Valuation Method that textbooks and articles in scholarly journals on the topic define the method by this characteristic. So the following elements were integrated into the scenario offered to the respondents:

> Imagine that your dwelling is connected to a national Palestinian water system. Also imagine that the water is available every day for most of the day, that the flow in the tape is always good, and that the water is safe/clean/healthy/potable. Such improved water services imply increased costs, which will have to be covered. Those who use more water will have to pay more.

There was an attempt to increase the likelihood of getting honest answers and "true" values by introducing the willingness to pay section of the questionnaire with the following statement:

> Now I would like to ask you some questions about how much your household would be willing to pay for improved water services. I will describe the nature of the improved services and then ask your whether you would like to have the service at a suggested price. During this procedure, you shall have to think about the advantages and disadvantages of subscribing to the improved service and to consider how much the service is valued to you and your household.

In addition, it is attached a special statement after the offered scenario:

> In the so-called bidding game that is about to start, we would like you to indicate your willingness to pay for the improved services within the total income of your household and your budget limit. We would like to inform you that it is in your best interest to indicate your true/real willingness to pay. Only by so doing can you help the related agencies to develop a fair national water tariff system. You should be aware that every household has different needs and economic standing. There exist no "right" answer. Please respond to the questions on the basis of your own needs and financial situation.

The Bidding Games

As explained before, there are several different ways to ascertain peoples' willingness to pay within the discrete method of contingent valuation. The bidding game question format was chosen, which imitates an auction, where the respondent is offered to pay a specific bid which is raised or lowered in an iterative manner until the maximum willingness to pay is reached.

An example of the exact auction format used is shown below:

Water fee bidding game-high starting point:

(I) If the price you are charged for water were NIS 8 per m^3, would you like to purchase this service?

Yes	(II)
No/DK/Not sure	(IV)

(II) If the price you are charged for water were NIS 16 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(III)

(III) If the price you are charged for water were NIS 12 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	Stop; enter NIS 8 below

(IV) If the price you are charged for water were NIS 4 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(V)

(V) If the price you are charged for water were NIS 2 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(VI)

(VI) If the price you are charged for water were NIS 1 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	Stop; enter zero below

HIGHEST BID ACCEPTED: ---------- NIS

What exactly is the maximum price per m^3, would be willing to pay for this improved water service? ---------- NIS

(The answer "Do not want improved service" was given a separate code.)

4.6 Data Coding and Data Entry

Questionnaires were numerically coded to enter the data systematically and efficiently. Data was entered using SPSS " The Statistical Package for the Social Sciences". Professional advisors were consulted for guidance. Filled questionnaires have been entered after overviewing them and excluding the incomplete and inaccurately filled ones. Data cleaning was carried out through double check both manually and through using the computer.

4.7 Statistical Analysis

Quantitative statistical analysis for questionnaires were done using SPSS as follows:

- Defining and coding of variables.
- Entering data to an entry model.
- Cleaning data.
- Frequency tables for all study variables.
- Re-coding of data.
- Cross tabulation of results.
- The statistical tests of significance were variant and various tests were used depending on the nature of data such as Chi square, ANOVA and t-test. The results were accepted as statistically significant when the P value was less than 5% ($P<0.05$).

4.8 Study Boundaries

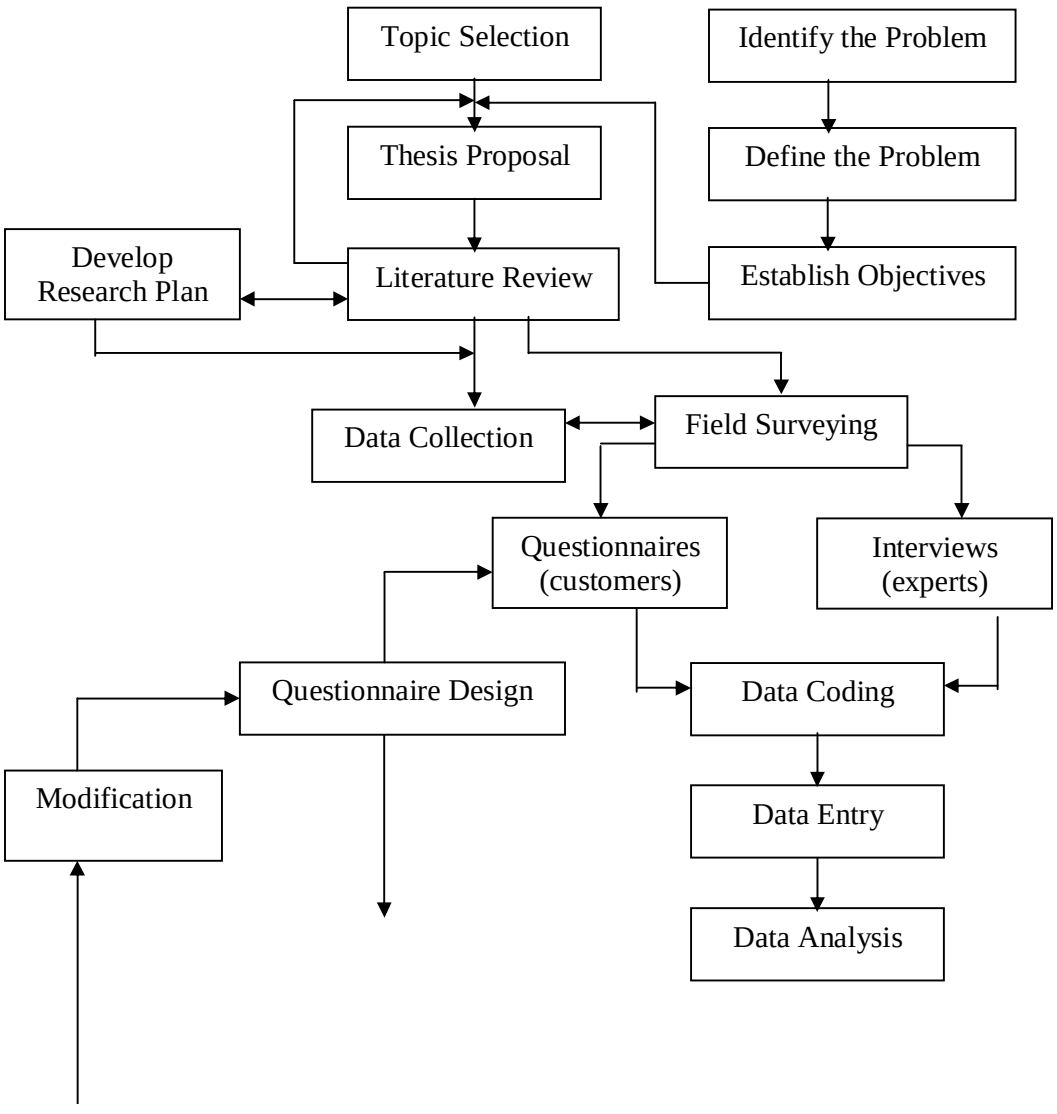
The study has the following limitations:

1. The study considered certain localities in the Gaza Strip only and not for the whole Palestine. Therefore generalisability is reduced. To extend the generalisability of this study, future comparative research could perhaps focus on samples from other places in Palestine.

2. The study is related with pricing of the water supply service without including wastewater service.
3. The study concerns only with the domestic use of water supply, where agriculture, industrial and commercial consumption are not included.
4. The surveyed questionnaires also inherit another limitation related to the fact that it directs the participant to give opinions in regard to certain given statements. There could be other factors that affect the studied issue but not mentioned in the questionnaire and the respondent may haven't the time to remember them.
5. Other limitations included limited time available, limited resources, such as educational materials, journals and books and lack of logistic facilities.

4.9 Methodology Chart

The methodology of the research can be presented simply by the Chart that indicated in figure 4.1.



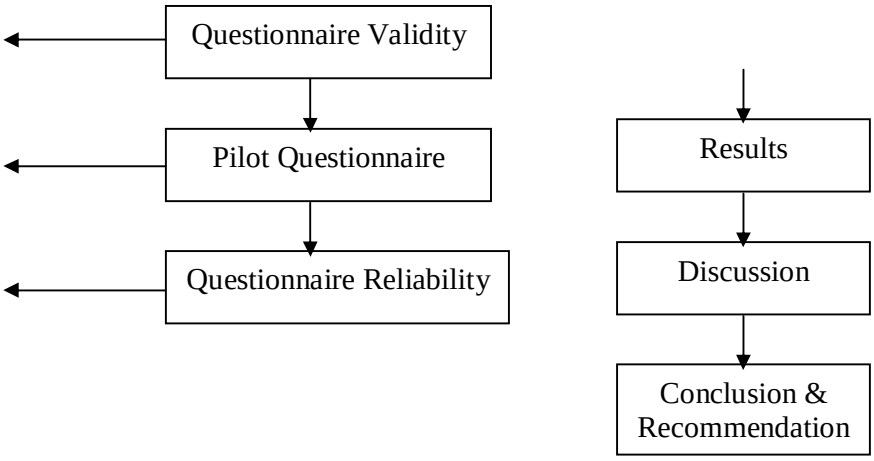


Figure 4.1 Methodology chart

Chapter (5)
Results

This chapter describes the results obtained from the field surveying through the administered interviews with persons who deal or have contact with the water supply sector in the Gaza strip and through the questionnaires filled by the customers of water supply. The chapter consists of two main sections; the first one concerns with the results of the interviews done with experts in the field of water supply and the other section explains the results obtained from the questionnaires that were filled by customers of water supply.

5.1 Results of Interviews with Experts

Interviews were administered with 44 Persons most of them (63.6%) were in the age category from (36-45) years and the vast majority of the study sample (90.9%) was from males. These results are shown in more details in figure 5.1 and 5.2.

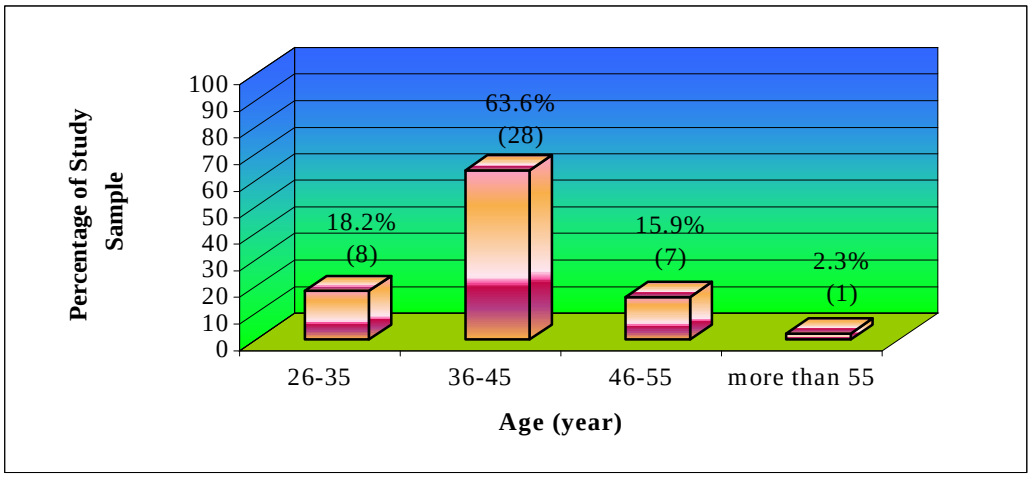


Figure 5.1 Distribution of the study sample by category of age

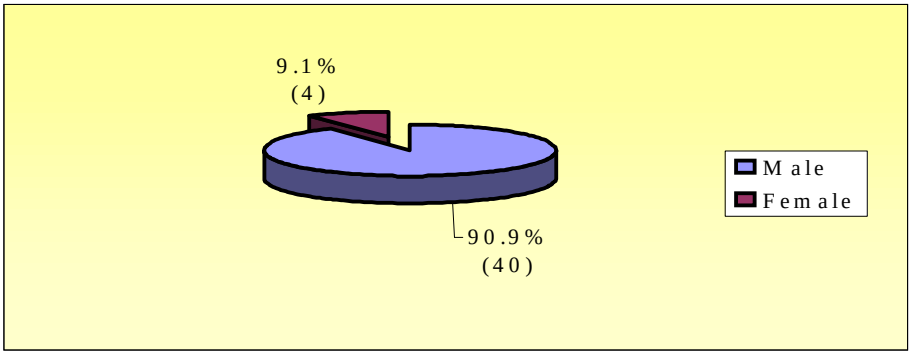


Figure 5.2: Distribution of the study sample by category of gender

Distribution of the study sample by category of qualification as indicated in figure 5.3 shows that 43.2% of interviewees were having bachelor degree, 29.5% were having master degree, 18.2% were having PHD degree and 9.1% were having diploma degree.

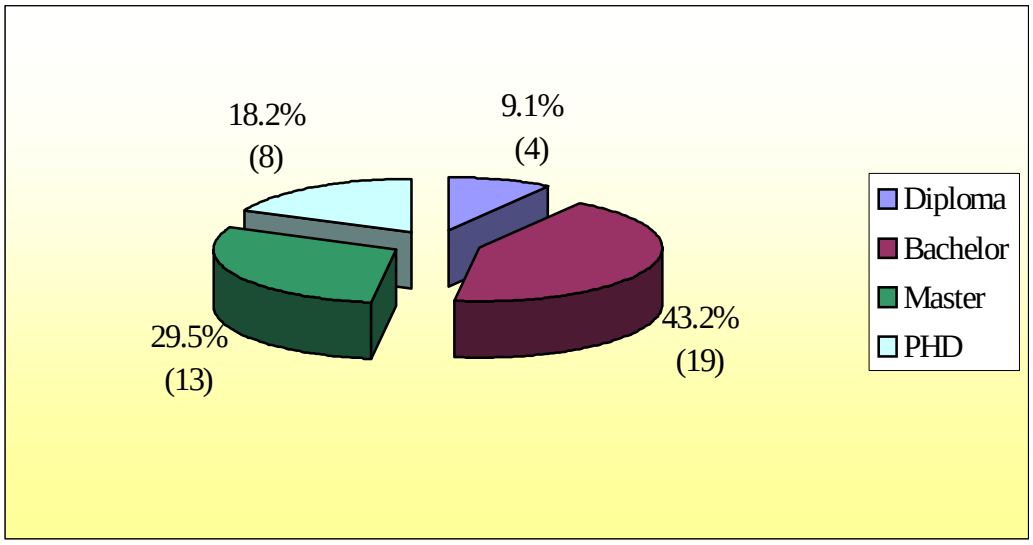


Figure 5.3 Distribution of the study sample by category of qualification

Distribution of the study sample by category of work place as shown in table 5.1 indicates that 43.2 of respondents were working in municipalities and PWA.

Table 5.1 Distribution of the study sample by category of work place

Work Place	Frequency	Percent

Ministry	4	9.1
University	5	11.4
Municipality	10	22.7
PWA	9	20.5
Private Sector	4	9.1
Community Institution	7	15.9
International Institution	5	11.4
Total	**44**	**100.0**

5.1.1 Points of View of the Participants Concerning their Evaluation of Water Quality, Quantity and Continuity.

The participants expressed their opinions about the quality of water that is being supplied for domestic consumption. The results indicated in figure 5.4 show that 47.7% of respondents considered the water quality as bad, 38.6% of them considered it acceptable, 11.4% said that it was good and the rest (2.3%) stated that it was very bad.

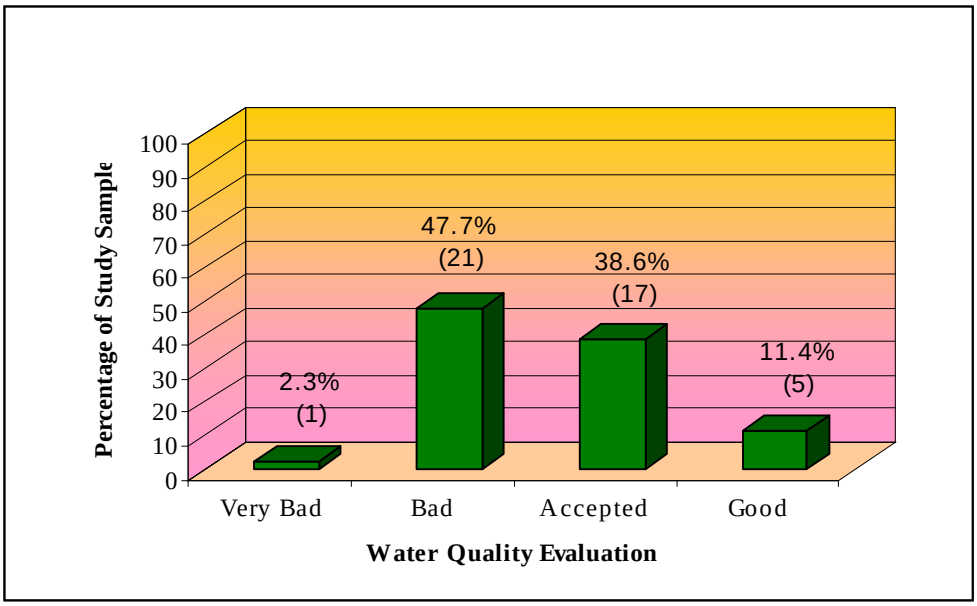


Figure 5.4 Points of view of the participants concerning their evaluation of water quality

As indicated in table 5.2, the majority (54.5%) of the study sample confirmed that the water quantity was accepted, 25% of them considered it good and the rest (20.5%) stated that it was bad.

Table 5.2:Points of view of the participants concerned their evaluation of water quantity.

Water Quantity Evaluation	Frequency	Percent
Bad	9	20.5
Accepted	24	54.5
Good	11	25.0
Total	**44**	**100.0**

The results also show, as indicated in table 5.3, that the majority of participants (56.8%) reported that the water continuity was accepted, 20.5% considered it good and 18.2% stated that it was bad.

Table 5.3 Points of view of the participants concerned their evaluation of water continuity.

Water Continuity Evaluation	Frequency	Percent
Don't know	2	4.5
Bad	8	18.2
Accepted	25	56.8
Good	9	20.5
Total	**44**	**100.0**

5.1.2 Points of View of the Participants Related to Water Improvement, Willingness to Pay and Affordability

All the participants expressed their agreement for the need to improve the level of water service in the Gaza strip, where 65.9% of them expressed their strong agreement for this purpose as in dictated in figure 5.5.

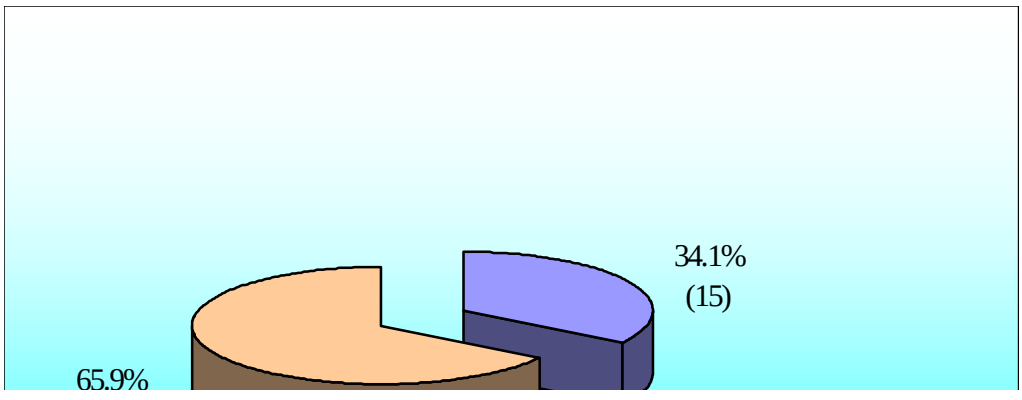


Figure 5.5: Points of view of the participants related to water improvement

The interviewees indicated their opinions in customers' willingness to pay for improved service, current affordability and the previous affordability before the Intifada. The results are shown in table 5.4, which indicates that 50% of the study sample agreed that the citizens were having the willingness to pay for improved service whereas 43.2% of them disagree.

Table 5.4 Points of view of the participants related to willingness to pay, current affordability & previous affordability

Point of View	**Category Of willingness to pay**		**Category of current affordability**		**Category of Previous affordability**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Don't know	3	6.8	1	2.3	3	6.8
Strongly Disagree	3	6.8	5	11.4	-----	-----
Disagree	16	36.4	32	72.7	5	11.4
Agree	21	47.7	5	11.4	29	65.9
Strongly Agree	1	2.3	1	2.3	7	15.9
Total	**44**	**100.0**	**44**	**100.0**	**44**	**100.0**

The vast majority of participants (84.1%) confirmed their disagreement for the customers' affordability to pay for improved water service in the current conditions while 81.8% of them agree that the customers were able to pay for improved services before the Intifada.

5.1.3 Existence of Water Tariff Studies and Policies

As indicated in figure 5.6 the results show that 54.6% of the study sample disagree that the relevant institutions have a clear policies about water tariff in the Gaza strip, while 38.6% agree.

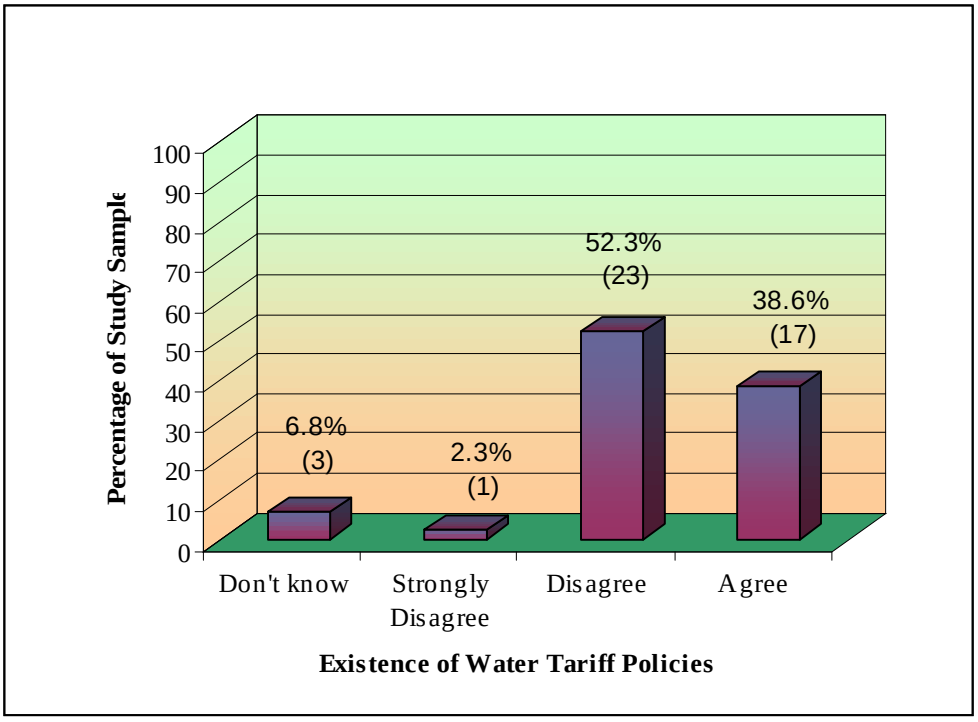


Figure 5.6 Points of view of the participants about existence of water tariff policies

The majority of the respondents (56.8%) considered that the water tariff studies for the Gaza strip were not enough and most of the participants (88.6%) confirmed that there was a necessity for further studies in this field while, only 9.19% considered it not necessary as shown in table 5.5 and 5.6.

Table 5.5 Points of view of the participants about existence of water tariff studies

Point of View	Frequency	Percent
Don't know	11	25.0
Strongly Disagree	1	2.3
Disagree	24	54.5
Agree	8	18.2
Total	**44**	**100.0**

Table 5.6 The need for further water tariff studies

Point of View	Frequency	Percent
Don't know	1	2.3
Not Necessary	4	9.1
Necessary	24	54.5
Strongly Necessary	15	34.1
Total	**44**	**100.0**

The literature review indicated that there were many factors that affect water tariff. The opinions of the study sample were investigated about the necessity of studying these factors and their impact on water tariff in the Gaza strip. The results are shown in table 5.7. The majority of the study sample (79.6%) stated that it is necessary to make field surveying to measure the willingness to pay for improved services whereas 20.5% said that it is not necessary. 52.3% of the participants gave a reason for this necessity which is "to get a data base that helps in development planning and in determining a practical water tariff to fit the socio-economic situation". 13.6% of the respondents saw it is not necessary to study this factor because they believed that the result is already known, where the citizens are not willing to pay due to the bad economic conditions.

The vast majority of the study sample (79.5%) reported that it is necessary to make a field surveying to measure the ability and affordability of customers to pay for improved services. On the other hand 20.5% of the study sample stated that it is not necessary. 70.5% of the study sample gave the same reason as in willingness to pay and 15.9% of the respondents justified their opinion of unnecessity due to the bad economic situation in the Gaza strip which make the people unable to pay. This means that the result is known without field surveying.

The majority of interviewees (72.7%) said that it is necessary to make field surveying to determine the community economic blocks whereas 25% considered it not necessary. 63.6% of the study sample reported that the reason of the necessity is to build a balanced water tariff that can meet the needs and the abilities of the different economic blocks of the society in the Gaza strip. 22.7% of the participants

stated that the unnecessity is due to the existence of such these studies in Palestinian Central Bureau of Statistics and in other institutions. The results show that the wide majority (86.4%) of the respondents confirmed the necessity of field surveying to measure the public awareness with water issues while 13.6% of them saw it is not necessary. The first team gave two main reasons for this necessity. The first reason, which was advocated by 50% of the study sample, is to assist in preparing the programs of public awareness that help in diminishing water problems. The second reason, that was a advocated by 25% of the respondents, is to increase the confidence between the customers and the utility and consequently to increase the inclination of citizens to accept changes in water prices.

The majority of the respondents (72.7%) stated that it is necessary to measure the relationship between water tariff and illegal connections. 18.2% of them contradicted this. The first view was justified by three main reasons; one of them, which was advocated by 29.5% of the respondents, is that there is a big number of illegal connections that increase the losses and consequently affect the water tariff. Another reason was advocated by 15.9% and stated that the increase of water prices may increase the number of illegal connections. The third reason, which was confirmed by 11.4%, is to assist in decreasing of illegal connections. 9.1% of the interviewees thought that there is no relation between water tariff and illegal connection because

they believed that the illegal connections is an ethical matter and it depends on the utility or municipality efforts to detect these connections.

The results show that most of the study sample (86.3%) confirmed that the participation of community in water decision making is necessary whereas 9.1% said that it is not necessary. The interviewees suggested many tools and procedures that can be used to achieve this participation. 31.8% of them suggested to establish popular committees or to activate the existing ones. 21.7% of the respondents recommended that the periodic meetings between municipalities and the community representatives are effective. 11.4% of the study sample advised to ask about the opinions of the community through questionnaires. 9.1% hint to use the available media for orientation and educational programs. Issuance of publications for awareness and establishment of web sites were also suggested. The vast majority of the interviewees (86.3%) stated that the measurement of the relationship between water consumption and water tariff is necessary. Only 6.8% of them said that it is not necessary. 47.7% of the participants believed the necessity to help in the design of a suitable water tariff that can protect the water resources to achieve the customers' demand for all social and economic blocks to recover costs and to diminish the excess consumption. 22.7% thought the necessity because they believed that there is a relationship between water tariff and water consumption. They outweighed adversary relation but they recommended the necessity to prove or disapprove this.

Measurement of the relationship between the water consumption and the existence of sewerage network is considered necessary by 86.3% of the study sample while 13.6% of them considered it not necessary. 36.4% of the respondents reported that this relation is necessary to determine customers demand in the existence or absence of sewerage network which will help in strategic planning for water tariff, development projects and environmental issues. 27.3% of the participants stated that it is necessary to measure this relation because they believed that the water consumption decreases if there is no sewerage network. Only 6.8% of the study sample thought there is no relation between water consumption and the existence of sewerage network.

The results also show that 70.4% of the respondents said that it is necessary to measure the impact of political situation on water tariff whereas 27.3% thought the

inverse. The first team justified their belief by the correlation between the economic and political situations ; this justification was advocated by 34.1% of the participants. 20.5 % of the respondents justified their belief by saying that the political situation affects the control of water resources . 9.1% also thought that the political situation affects the control of energy resources that are needed for operating water resources . On the other hand 6.8% of the respondents justified the unnecessary by considering the result is known and don't need any study, where they believed that the political situation is a necessary factor and already affects the economic situation which affects the water tariff.

The participants mentioned many political factors that may affect the water tariff. The majority of the respondents (61.4%) considered the political instability is the most important factor, which affect the stability of economy, investment, and idleness and poverty. 38.6% of the participants indicated that the domination of Israeli party on water resources is an important factor. 15.9% of the participants mentioned the type of the authority, national or militarism occupation, as an important factor. The validity of the local authority and the existence of laws, rules and clear polices is also an important factor that affects water tariff as remarked by 11.4% of the respondents. The existence of Israeli settlements in the Gaza Strip affects also the water tariff, where this factor was mentioned by 9.1% of the interviewees.

The results also show that 84.1% of the study sample confirmed that field surveying to measure the effect of customer's satisfaction on water tariff is necessary. On the other hand 11.3% of them said that it is not necessary. Those, who assured the necessity of this factor, mentioned three main reasons to justify their opinion. The first one, which was confirmed by 45.6% of the respondents, considered the measurement of customers satisfaction as a guide line to determine citizens demand to help in performance evaluation and in design of a suitable water tariff. The second reason was mentioned by 22.7% of the participants which regarded the strong relationship between customers satisfaction and willingness to pay that reflects on the success applications of water tariff. The third reason was mentioned by 11.4% of the participants which indicated the relation between customers satisfaction and the feeling of community participation in decision making. 9.1% of the respondents

justified the unnecessity by contemplating that the result is known, which is the dissatisfaction of the customers, according to the common culture.

The majority of the study sample (81.8%) confirmed that the measurement of citizens' use for private desalinated water is necessary whereas 13.6% considered it not necessary. 36.4% of the participants said that this factor gives an indication for the quality of water that supplied for people. 27.3% of them considered it as an indication for the ability and affordability of people to pay for service improvement.

18.2 % said that this will help in performance evaluation, future planning and design of a suitable water tariff.

The vast majority of the study sample (95.5 %) assured the necessity of measurement of water service level impact on water tariff while only 2.3 % of them saw it not necessary. 50% of the participants expressed their belief of the strong relationship between water tariff and the level of the supplied service as quantity and quality. Consequently, this will help in determining the suitable water tariff. 25 % confirmed the necessity because they believed that the water service level affects strongly the willingness to pay.

The results show that 75 % of the study sample stated that the measurement of the capacity building impact of municipalities or water utility on water tariff is necessary while 9 % only believed that it is not necessary.

25 % of the respondents have no doubt that the strong organizational capacity increases the ability of the institution to set a clear and strong plans and assists it for success applications of a suited water tariff. 9.1 % concluded that the strong organizational capacity decreases costs and efforts. 20.5 % of the interviewees related the necessity with their assumptions that the institutional capacity affects the level of service which affects the customers satisfaction and their confidence with the utility or municipality. Consequently, this will affect the willingness to pay.

Most of the study sample (93.2 %) assured that there is a strong relation between the validity of the local authority and the proper application of the water tariff. 50 % of the participants supported this relation to achieve justice and fairness for both consumer and operator.

5.2 Results of the Questionnaire

The study sample was distributed between different age categories as indicated in figure 5.7, where the largest percentage of respondents (33%) lies in the age category (36-45 years).

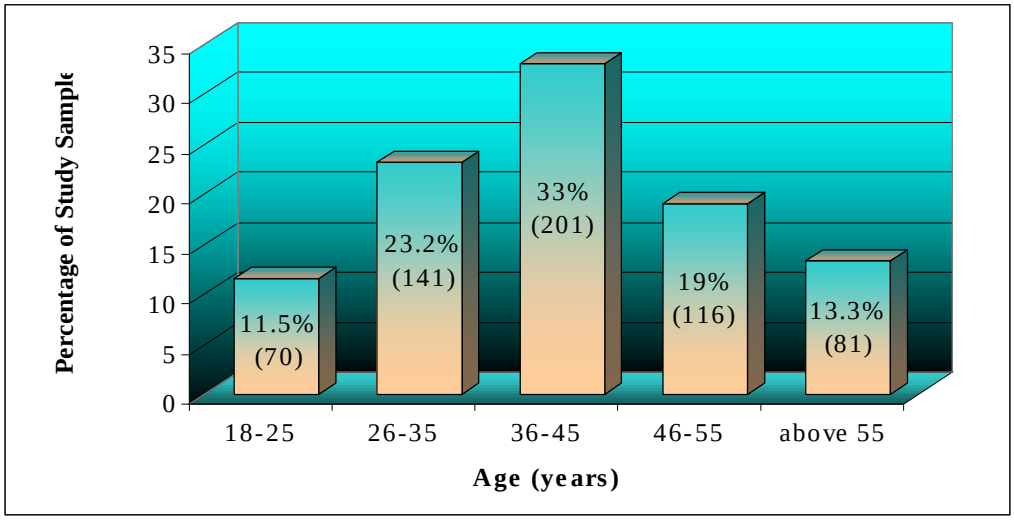


Figure 5.7 Distribution of the study sample by category of age

The results, as shown in figure 5.8, show that the wide majority of the study sample (77.8%) was from males while 22.2% from the females.

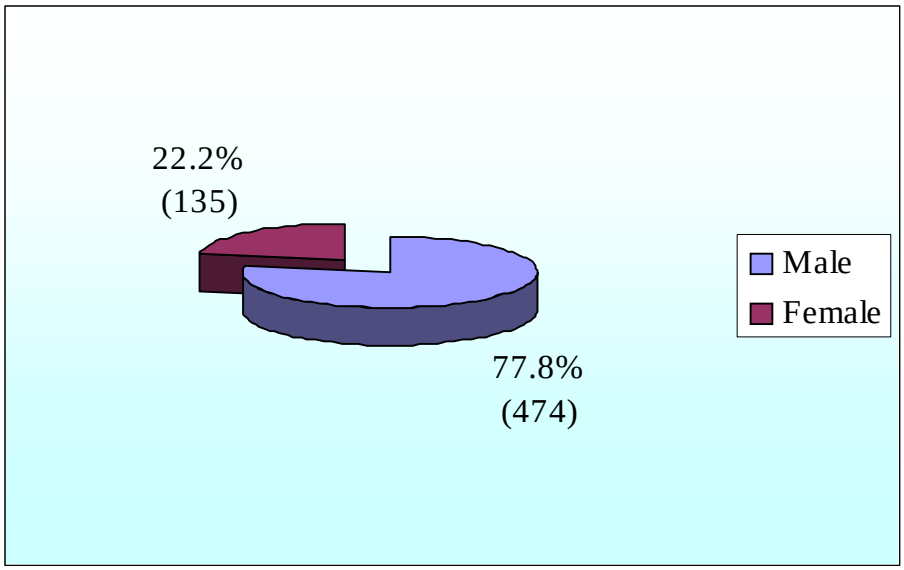


Figure 5.8 Distribution of the study sample by category of gender

The study sample was distributed to different people with different educational background, as indicated in table 5.8 which shows that 28.2% of the respondents were having bachelor degree or above, 16.4% were having diploma, 23.5% were

having secondary education, 17.4% were having preparatory level, 9.2% elementary and 5.3% were ignorants.

Table 5.8 Distribution of the study sample by category of qualification

Qualification	Frequency	Percent
Illiterate	32	5.3
Elementary	56	9.2
Preparatory	106	17.4
Secondary	143	23.5
Diploma	100	16.4
B.Sc. or above	172	28.2
Total	**609**	**100.0**

Figure 5.9 shows the distribution of the study sample according to location. 51.6% of the respondents were living in cities, 34.5% were living in refugee camps and the rest (14%) were living in villages.

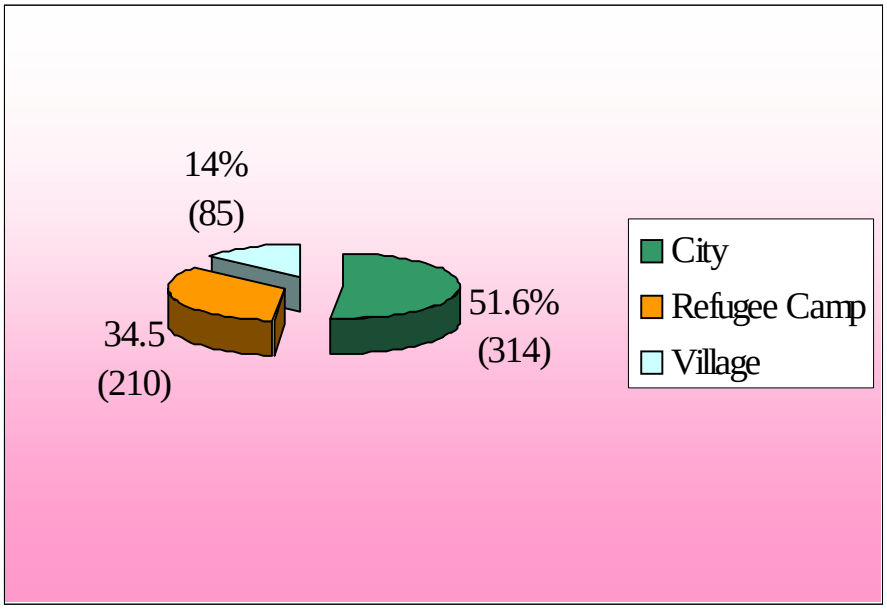


Figure 5.9 Distribution of the study sample by category of location

The results in figure 5.10 show that 70.8% of the respondents were refugees whereas 29.2% were not refugees.

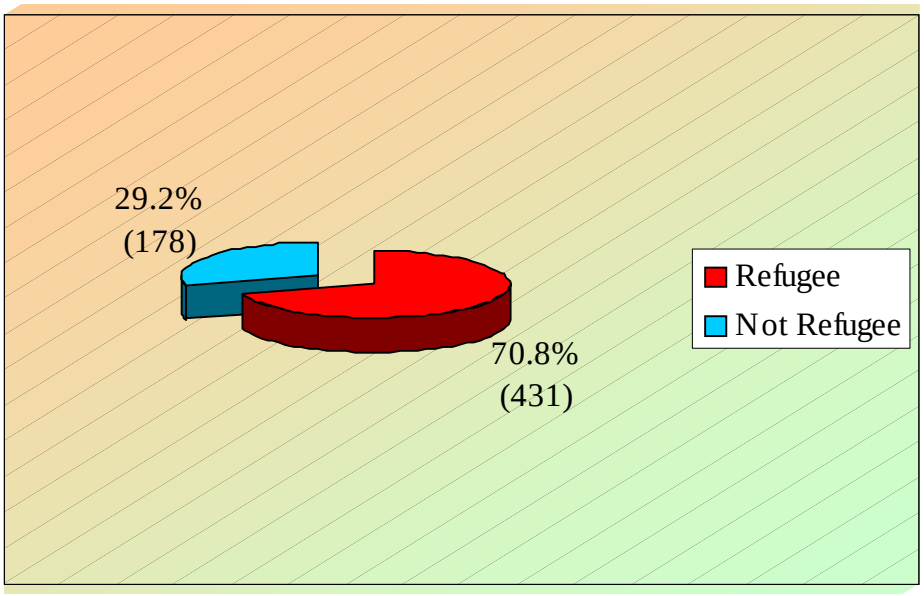


Figure 5.10 Distribution of the study sample by category of refugee or not

5.2.1 Economic Status

It is worth mentioning that, the researcher inspected the households income using three types of income; the first type was the income which was given by respondents before intifada. The second type was the current income which was given by respondents and the third type was the estimated income, which was estimated by the researcher depending on respondents data about labor force and employment. These results are shown in table 5.9a. However, the table shows a high statistical significant difference between the average income before Intifada and the current income (P value 0.00)

Table 5.9a Distribution of the study sample by category of household income

Income (NIS)	**Income before Intifada**		**Current Income**		**Estimated Income**		**P**
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**	0.00
<1000	115	18.9	219	36.0	124	20.4	
1001-1500	169	27.8	162	26.6	134	22.0	

1501-2000	128	21.0	99	16.3	125	20.5	
2001-3000	89	14.6	81	13.3	106	17.4	
3001-4000	60	9.9	27	4.4	47	7.7	
> 4000	48	7.9	21	3.4	73	12.0	
Total	**609**	**100.0**	**609**	**100.0**	**609**	**100.0**	

$\chi^2 = 738.229$, *DF = 25 , CI = 95%*

The results show that there was a significant declination in the households' income in 2002 due to Intifada conditions. Table 5.9b compares the income status before the Intifada with the current situation of income.

Table 5.9b Cross-tabulation of current income and income before Intifada

Current Income		**Income before Intifada**						
		<1000 NIS	1001-1500	1501-2000	2001-3000	3001-4000	>4000	Total
<1000 NIS	Count	96	62	31	15	11	4	219
	%within Current Income	43.8%	28.3%	14.2%	6.8%	5.0%	1.8%	100%
1001-1500	Count	15	92	26	16	8	5	162
	%within Current Income	9.3%	56.8%	16.0%	9.9%	4.9%	3.1%	100%
1501-2000	Count	2	10	63	15	5	4	99
	%within Current Income	2.0%	10.1%	63.6%	15.2%	5.1%	4.0%	100%

2001-3000	Count %within Current Income	2 2.5%	4 4.9%	8 9.9%	41 50.6%	20 24.7%	6 7.4%	81 100%
3001-4000	Count %within Current Income				2 7.4%	16 59.3%	9 33.3%	27 100%
>4000	Count %within Current Income		1 4.8%				20 95.2%	21 100%
Total	Count %within Current Income	115 18.9%	169 27.8%	128 21.0%	89 14.6%	60 9.9%	48 7.9%	609 100%

The average income per capita pert month was computed for the whole Gaza strip and for each governorate as indicated in table 5.10. These results were computed depending on the estimated income for the target households. It is noticed that Gaza governorate had the highest average monthly income in Gaza Strip (293.2 NIS/capita), while the lowest income was in Khan-Younis governorate. However, the results clarified a statistically significant differences between Gaza and Rafah governorates' income and the income of the whole Gaza Strip (P value = 0.012 and 0.03 respectively). Moreover, the table also shows a strong statistically significant difference between Khan Younis and Rafah income and the income of the whole Gaza Strip (P value = 0.0).

Table 5.10. The average income per capita in Gaza governorates

Governorate	**Test Value = 225.6967**			
	Mean (NIS/capita/month)	**T**	**DF**	**P**
North	231.3	0.236	135	0.814
Gaza	293.2	2.547	149	0.012*

Middle	245.4	1.111	107	0.269
Khan-Younis	151.8	-5.553	127	0.0*
Rafah	184.8	-2.211	86	0.03*

** Statistically Significant*

5.2.2 Water Consumption

Data concerned water consumption was collected from the respondents and from the municipalities. By comparison between citizens data and municipality data, it is noticed that the municipalities figures were more accurate, so it was more convincing to use these figures. Based on the municipalities' figures, table 5.11 shows the water consumption in liter per capita per day (l/c/d) in the whole Gaza strip and in each governorate. It is worth mentioning that the highest average of water consumption was in North governorate (154.7 l/c/d) and the lowest consumption was in Khan-Younis governorate (66.1 l/c/d). From the table it is clear that t-test revealed statistically significant differences among the average rate of water consumption in the different governorates comparing with the rate of the whole Gaza Strip (P value = 0.0 → .007)

Table 5.11 The average of water Consumption in Gaza governorates

Governorate	**Test Value = 111.9526**			
	Water Consumption (l/c/d)	**T**	**DF**	**P**
North	154.7	2.985	135	0.003*
Gaza	138.2	2.720	149	0.007*
Middle	86.8	3.967	93	0.0*
Khan-Younis	66.1	-8.432	126	0.0*
Rafah	94.0	-3.314	86	0.001*

** Statistically Significant*

The respondents were asked regarding their points of view about the impact of water pricing increase on the water consumption of the customers. The results are shown in table 5.12, where 46.5% of the study sample said that the increase in water prices

Table 5.12 The impact of water pricing on water consumption

Point of View	All Gaza Strip		North Gov.		Gaza Gov.		Middle Gov.		Khan Younis Gov.		Rafah Gov.	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Strongly Agree	84	13.8	13	9.6	40	26.7	15	13.9	10	7.8	6	6.9
Agree	199	32.7	38	27.9	48	32.0	37	34.3	49	38.3	27	31.0
Don't know	86	14.1	29	21.3	14	9.3	10	9.3	17	13.3	16	18.4
Disagree	191	31.4	42	30.9	37	24.7	36	33.3	48	37.5	28	32.2
Strongly disagree	49	8.0	14	10.3	11	7.3	10	9.3	4	3.1	10	11.5
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**
P	**0.00**											

$\chi^2 = 49.005$, $DF = 16$, $CI = 95\%$

would decrease the amount of consumed water. On the other hand 38.4 contradicted this opinion. The highest percentage that supported this argument was in Gaza governorate (58.7%) while the lowest support was in North governorate (37.5%) and in Rafah governorate (37.9%). The table shows that there are high statistical significant deferences among the different governorates (P value = 0.00)

The results also show that 54.7% of the study sample didn't use municipality water for drinking as indicated in table 5.13. Table 5.13 also show that 40.6% of the study sample purchased potable water from roving trucks, 11.8% used small filter devices inside houses for water desalination and only 2.3% used bottled water. The percentage for each governorate is shown in table 5.13. However, χ^2 test shows that there were high statistical significant differences among the different governorates.

Table 5.13 Resource of drinking water

Resource of drinking water	All Gaza Strip		North Gov.		Gaza Gov.		Middle Gov.		Khan Younis Gov.		Rafah Gov.	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**

Water Network	276	45.3	88	64.7	35	23.3	29	26.9	82	64.1	42	48.3
Bottles	14	2.3	5	3.7	2	1.3	1	0.9	5	3.9	1	1.1
Roving Trucks	247	40.6	31	22.8	97	64.7	57	52.8	34	26.6	28	32.2
Filter Device	72	11.8	12	8.8	16	10.7	21	19.4	7	5.5	16	18.4
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**
P	0.00											

$\chi^2 = 107.846, DF = 12, CI = 95\%$

The respondents were asked about the non-billed amount that paid for drinking water. The results show that the average monthly was 25.1 NIS for each household, as indicated in table 5.14, while the average monthly bill amount paid for municipalities was 37.3 NIS for each household according to the monthly bills' data that obtained from municipalities. Concerning paying for non-municipal drinking water, t-test showed strong statistically significant variations between the paid amount in governorates of North, Gaza and Khan Younis comparing with the average of all Gaza Strip (P value = 0.001, 0.0, 0.0 respectively).

Table 5.14: Paying for non-municipal drinking water

Governorate	**Test Value = 2.5532**			
	Mean (NIS/capita/month)	**T**	**DF**	**P**
North	1.5652	-3.422	135	0.001*
Gaza	4.2458	3.888	149	0.0*
Middle	3.0983	1.539	107	0.127
Khan-Younis	1.2963	-5.169	127	0.0*
Rafah	2.3516	-0.601	86	0.55

** Statistically Significant*

5.2.3 Customers' Satisfaction with Water Supply Service

Water supply service was examined by customers' satisfaction with water quality, quantity, continuity and network maintenance. As indicated in table 5.15, the results show that 71.5% of the study sample were dissatisfied with water quality whereas only 24.6% were satisfied. The highest percentage of satisfaction with water quality was in North governorate (56.6%). On the other hand the lowest percentage of quality satisfaction was in middle governorate (10.2%). It is cleared from the statistical analysis that there were strongly statistical significant differences among the various governorates in relation to their people satisfaction with water quality (P value = 0.0). The respondents were asked about the reasons for their satisfaction or dissatisfaction with water quality. The results show that 60% of the study sample considered the water salinity as the main factor for dissatisfaction. 44% said that the pollution in water is another reason for dissatisfaction. 4 % said that the water causes diseases such as kidney stones and 2% justified their dissatisfaction by discrimination and injustice in water distribution. On the other hand 6% of the respondents, who were satisfied with water quality, said that it is acceptable and suffice their demand and 2% of them justified their satisfaction by the difficult situation in Gaza strip.

Table 5.15 Customers' satisfaction with water quality

Satisfaction	**All Gaza Strip**		**North Gov.**		**Gaza Gov.**		**Middle Gov.**		**Khan Younis Gov.**		**Rafah Gov.**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Valid Strongly Satisfied	25	4.1	12	8.8	6	4.0	3	2.8	---	---	4	4.6
Satisfied	125	20.5	65	47.8	17	11.3	8	7.4	17	13.3	18	20.7
Don't Know	23	3.8	8	5.9	3	2.0	6	5.6	4	3.1	2	2.3
Dissatisfied	239	39.2	38	27.9	52	34.7	51	47.2	56	43.8	42	48.3
Strongly Dissatisfied	197	32.3	13	9.6	72	48.0	40	37.0	51	39.8	21	24.1
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**
P	0.0*											

** Statistically Significant* $\chi^2 = 132.739$, $DF = 16$, $CI = 95\%$

Water quantity was dissatisfied by 67.4% of the study sample as shown in table 5.16. In contrast, 31.2% of the study sample were evaluated the situation of water quantity as satisfactory. The highest percentage of customers' satisfaction with water quantity was in North governorate (50%). In contrast the lowest percentage of customers' satisfaction with water quantity was in Khan-Younis governorate (17.9%). The respondents were also asked about the reasons for their satisfaction or dissatisfaction with water quantity. 50% of them confirmed that their dissatisfaction was mainly due to the frequent breakup of water, 40% of the respondents said that the main reason for their dissatisfaction was the shortage of water quantity, which was not enough for domestic demand. 2% of the study sample related their dissatisfaction to the low pressure in water pipes and 2% of them mentioned another reason for dissatisfaction regard injustice in water distribution. In contrast 2% only of the study sample considered the water quantity is enough for their domestic demand.

Table 5.16 Customers' satisfaction with water quantity

Satisfaction	**All Gaza Strip**		**North Gov.**		**Gaza Gov.**		**Middle Gov.**		**Khan Younis Gov.**		**Rafah Gov.**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Valid Strongly satisfied	29	4.8	8	5.9	11	7.3	7	6.5	3	2.3	---	---
Satisfied	161	26.4	60	44.1	30	20.0	29	26.9	20	15.6	22	25.3
Don't know	9	1.5	3	2.2	1	0.7	4	3.7	1	0.8	---	---
Dissatisfied	247	40.6	54	39.7	53	35.3	37	34.3	55	43.0	48	55.2
Strongly Dissatisfied	163	26.8	11	8.1	55	36.7	31	28.7	49	38.3	17	19.5
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**
P	0.0*											

** Statistically Significant* $\chi^2 = 77.717$ *, DF = 16 , CI = 95%*

The results show, in table 5.17 that 59.7% of the study sample recognized the situation of water continuity as dissatisfactory while 33.4% of them were satisfied. The highest percentage of customers' satisfaction with water continuity was in North governorate (49.3%). In contrast the lowest percentage of customers' satisfaction with water continuity was in Khan-younis governorate (18%). The reasons for customers' satisfaction or dissatisfaction with water continuity were investigated. The results show that 30% of the study sample recognized the frequent breakup of water for long periods as the main reason for their dissatisfaction with water continuity. 12% of them considered it not enough for their use, 2% regarded their dissatisfaction to water distributions injustice and 2% returned their dissatisfaction to the bad administration in the municipalities. On the other hand, 4% of the respondents justified their satisfaction with water continuity by considering the available resources as the best of the possible alternatives. The statistical analysis demonstrated that there were highly statistical significant differences among the different governorates regarding their people satisfaction with water quantity and continuity (P value = 0.0).

Table 5.17 Customers' satisfaction with water continuity

Satisfaction	**All Gaza Strip**		**North Gov.**		**Gaza Gov.**		**Middle Gov.**		**Khan Younis Gov.**		**Rafah Gov.**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Strongly satisfied	21	3.4	6	4.4	9	6.0	4	3.7	---	---	2	2.3
Satisfied	183	30.0	61	44.9	34	22.7	27	25.0	23	18.0	38	43.7
Don't know	41	6.7	8	5.9	21	14.0	4	3.7	2	1.6	6	6.9
Dissatisfied	217	35.6	45	33.1	46	30.7	46	42.6	54	42.2	26	29.9
Strongly Dissatisfied	147	24.1	16	11.8	40	26.7	27	25.0	49	38.3	15	17.2
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**
P	0.0*											

** Statistically Significant* $\chi^2 = 78.068$ *, DF = 16 , CI = 95%*

The results, as indicated in table 5.18, show that 41.2% of the respondents were not satisfied with water network maintenance while 45% were satisfied. The highest percentage of satisfaction with water network maintenance was in Rafah governorate (58.6%) while the lowest percentage (24.29%) was in Kan-Younis governorate. The respondents were asked about the reasons for their satisfaction or dissatisfaction with water network maintenance. 10% of them said that there were not satisfied due to the wearing and corrosion in the old networks. 6% said that the municipalities didn't maintain water networks completely and correctly. 4% said that polluted water enters in water pipes during the maintenance operation of broken pipes and 4% said that there was no periodic maintenance. In contrast, 4% of the study sample said that they were satisfied because the municipalities maintain the damages as soon as possible. 4% justified their satisfaction by the replacement of water networks and 2% said that they were satisfied because the water networks were in a good manner and there were no major problems. It is worth noting that there were strong statistically significant differences among the governorates of Gaza Strip regarding their people satisfaction with water network maintenance (P value = 0.0).

Table 5.18 Customers' satisfaction with water network maintenance

Satisfaction	**All Gaza Strip**		**North Gov.**		**Gaza Gov.**		**Middle Gov.**		**Khan Younis Gov.**		**Rafah Gov.**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Valid Strongly satisfied	44	7.2	8	5.9	21	14.0	5	4.6	1	0.8	9	10.3
Satisfied	230	37.8	69	50.7	44	29.3	45	41.7	30	23.4	42	48.3
Don’t know	84	13.8	20	14.7	27	18.0	13	12.0	17	13.3	7	8.0
Dissatisfied	161	26.4	27	19.9	34	22.7	33	30.6	44	34.4	23	26.4
Strongly Dissatisfied	90	14.8	12	8.8	24	16.0	12	11.1	36	28.1	6	6.9
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**
P	0.0*											

** Statistically Significant* $\chi^2 = 72.843$ *, DF = 16 , CI = 95%*

5.2.4 Service Improvement and Willingness to Pay

The results show that most of the participants (97.2%) believed that it is necessary to improve the quality and quantity of water supply service and only 1.6% contradicted this. 74.5% of the study sample were convinced that the improvement process needs extra cost while 14.3% believed the inverse. The results also show that 82.8% of the respondents were willing to pay for improvement of water service whereas 17.2% preferred to remain the situation as it is without any improvement because they were not able to pay for improvement procedures. It is worth to mention that the mean amount for willingness to pay was 3.06NIS for each cubic meter of improved water, which meet the standards of WHO for domestic use. The highest mean of willingness to pay was in Gaza governorate, which was 3.29NIS per cubic meter. On the other hand the lowest mean of willingness to pay was in the middle governorate with its value 2.53 NIS per cubic meter. These results, that regarded willingness to pay, are shown in more details in table 5.19.

Table 5.19 Willingness to pay in Gaza strip governorates

Price (NIS/m^3)	All Gaza strip		North Gov.		Gaza Gov.		Middle Gov.		Khanyounis Gov.		Rafah Gov.	
	No	V. %	No	V. %	No	V. %	No	V. %	No	V. %	No	V. %
0.2	2	0.3	1	0.8	1	0.7	---	---	---	---	---	---
0.3	3	0.5	2	1.6	1	0.7	---	---	---	---	---	---
0.5	23	3.9	7	5.6	8	5.5	6	5.7	---	---	2	2.3
1.0	164	27.8	34	27.2	50	34.2	22	21.0	37	28.9	21	24.4
1.2	2	0.3	---	---	2	1.4	---	---	---	---	---	---
1.5	7	1.2	1	0.8	2	1.4	2	1.9	1	0.8	1	1.2
2.0	136	23.1	29	23.2	30	20.5	35	33.3	17	13.3	25	29.1
2.5	2	0.3	1	0.8	---	---	1	1.0	---	---	---	---
3.0	86	14.6	19	15.2	14	9.6	19	18.1	21	16.4	13	15.1
4.0	89	15.1	10	8.0	10	6.8	14	13.3	42	32.8	13	15.1
4.5	1	0.2	---	---	---	---	1	1.0	---	---	---	---
5.0	8	1.4	3	2.4	2	1.4	---	---	---	---	3	3.5

6.0	1	0.2	1	0.8	---	---	---	---	---	---	---	---
7.0	1	0.2	---	---	1	0.7	---	---	---	---	---	---
8.0	36	6.1	8	6.4	13	8.9	4	3.8	7	5.5	4	4.7
10.0	6	1.0	1	0.8	3	2.1	---	---	---	---	2	2.3
11.0	1	0.2	---	---	---	---	---	---	---	---	1	1.2
12.0	11	1.9	4	3.2	5	3.4	---	---	1	0.8	1	1.2
13.0	1	0.2	1	0.8	---	---	---	---	---	---	---	---
15.0	3	0.5	2	1.6	1	0.7	---	---	---	---	---	---
16.0	6	1.0	1	0.8	2	1.4	1	1.0	2	1.6	---	---
20.0	1	0.2	---	---	1	0.7	---	---	---	---	---	---
Total	590	100	125	100	146	100	105	100	128	100	86	100
Missing	19	---	11	---	4	---	3	---	---	---	1	---
Total	**609**	**---**	**136**	**---**	**150**	**---**	**108**	**---**	**128**	**---**	**87**	**---**

Table 5.20 shows that there is no statistical significant differences among the various governorates in this regard (P value = 0.321)

Table 5.20 Comparing participants' willingness to pay in different governorates

Independent Variable		**Sum of Squares**	**DF**	**Mean Square**	**F**	**Sig.**
Willingness to pay	Between Groups	40.860	4	10.215	1.175	0.321
	Within Groups	5085.552	585	8.693		
	Total	5126.412	589			

5.2.5 The Impact of the Water Pricing on Illegal Connections

The participants were asked, whether the increase of water prices will increase the illegal connections or not. The results, as indicated in table 5.21, show that 52.4% of the study sample advocated this argument while 27.4% of them contradicted. However, there were high statistical significant differences among the study

respondents in the different governorates regarding their points of view about the impact of water pricing on illegal connections (P Value = 0.0).

Table 5.21 The impact of water pricing on illegal connections

Point of View	All Gaza strip		North Gov.		Gaza Gov.		Middle Gov.		Khan Younis Gov.		Rafah Gov.	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Valid Strongly Agree	138	22.7	23	16.9	51	34.0	25	23.1	21	16.4	18	20.7
Agree	181	29.7	44	32.4	27	18.0	44	40.7	33	25.8	33	37.9
Don't know	123	20.2	27	19.9	41	27.3	14	13.0	28	21.9	13	14.9
Disagree	111	18.2	29	21.3	17	11.3	17	15.7	38	29.7	10	11.5
Strongly disagree	56	9.2	13	9.6	14	9.3	8	7.4	8	6.3	13	14.9
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**
P	0.0*											

** Statistically Significant* $\chi^2 = 72.843$ *, DF = 16 , CI = 95%*

The respondents also were asked about the reasons of illegal connections. Many choices were given such as high prices, bad service, no trust with municipality, non-responsibility of the citizens and others. The high price got 27.9% while the highest percentage of the sample study (32.3%) was given to the reason of non-responsibility of citizens. The cause of bad service got 16.6% and the absence of trust with municipalities gained 9.7%.

5.2.6 Public Awareness and Community Participation

To measure the public awareness concerned water supply issues; many questions were directed to the respondents. They were asked about the periodic meetings between municipalities and community. 13.6% of the study sample agreed that there were such these activities, 35.1% didn't know and 50.9% saw that there was non-of these activities. The respondents also were asked about the periodic awareness publications. The results show that 68.1% of the participants said that there were not periodic publications issued by municipality to increase the public awareness related

to water issues. Another question was directed to the respondents to measure their participation in awareness programs, where the results show that 85.2% of the study sample didn't participate in any public awareness activities concerned water issues such as lectures, workshops, meetings, conferences … etc, while 14.3% confirmed their attendance to these activities. For those who didn't attend these activities, 83.1% of them confirmed that they didn't receive any invitation, 8.7% of them believed that there is no benefit from these activities and 4.7% referred this to their limited time.

The respondents also were asked about the community participation in decision making concerned water issues. 34.7% of them agreed that there was community participation while 31.8% disagreed and 31.7% said that they don't know. The respondents were asked about the main problems and obstacles in community participation. 16% of the study sample mentioned that the centralization in decision making was a main problem, where the municipalities didn't allow the community to share in decision making. 8% of them said that the municipalities were not serious in this issue and they concentrated on personal issues, 6% of the respondents considered the weakness in administration of municipalities as another problem that faced the community participation. 4% evaluated the non-responsibility of people and lack of public awareness as important issues to be taken in consideration.

5.2.7 Water Pricing and Organizational Capacity

The results of this study revealed that 75% of the interviewed experts reported that it was necessary to measure the impact of capacity building on water prices. Many aspects were inspected to check the organizational capacity of water departments in the municipalities. The results show that 49% of the study sample went to water departments in municipalities to find a solution for their problems, but 38.5% of them didn't find the solution. The results also show that 74.4% of the study sample assured that the municipal staffs in water departments need more training and 56.6% confirmed the necessity to increase the number of employees in municipal water departments. It is noticed from the research findings that 37.5% of those who raised complaints to water departments stated that there weren't employees to receive their complaints and to help them in solving their problems. The research findings indicate that 38.9% of the study sample believed that there wasn't enough coordination

between the municipalities and the other governmental, popular and social institutions.

5.2.8Water Tariff and Local Authority

The respondents were asked about the necessity of the existence of strong local national authority to apply successfully a water tariff. The wide majority of the study sample (81.6%) expressed their belief that it is necessary whereas only 5.7% said that it is not necessary. These results are shown in table 5.22. As shown in the table, it is clear that there were high statistical significant differences among the people in the different governorates regarding their opinions about the relationship between the water tariff and the local authority (P value = 0.0).

Table 5.22 Water tariff and local authority

Point of View	All Gaza strip		North Gov.		Gaza Gov.		Middle Gov.		Khan Younis Gov.		Rafah Gov.	
	No	%	No	%	No	%	No	%	No	%	No	%
Strongly Agree	230	37.8	45	19.6	69	30.0	50	21.7	33	14.3	33	14.3
Agree	267	43.8	58	21.7	43	16.1	47	17.6	82	30.7	37	13.9
Don't know	74	12.2	19	25.7	25	33.8	8	10.8	8	10.8	14	18.9
Disagree	19	3.1	10	52.6	4	21.1	1	5.3	2	10.5	2	10.5
Strongly disagree	16	2.6	3	18.8	8	50.0	2	12.5	2	12.5	1	6.3
Total	606	99.5	135	100	149	100	108	100	127	100	87	100
Missing	3	0.5										
Total	**609**	**100**	**136**	**100**	**150**	**100**	**108**	**100**	**128**	**100**	**87**	**100**

P	0.0*

** Statistically Significant* $\chi^2 = 72.843$ *, DF = 16 , CI = 95%*

Chapter (6)
Discussion

The study subject is considered an essential issue due to the crisis of water in the Gaza Strip, which is more sever because of the poor quality of the groundwater and the shortage of quantity. The political instability of the Gaza Strip, which affects the socioeconomic situation, makes this research more essential. The research aim is to study the main factors on which water pricing should be built in the Gaza Strip to suggest an appropriate water pricing to play a key role in the development of sustainable water service. This chapter will demonstrate and illustrate the main findings of this study.

6.1 The Relationship between Water Consumption and Water Pricing

6.1.1 The Impact of Water Consumption on Water Pricing

The concept of economies of scale, as mentioned in chapter 2, indicates that the expansion of the scale of water productive capacity leads to increases in its output and decreases in its costs of production per cubic meter. Ideally this means that the

larger the water supply system, the lower the unit cost of water production. This concludes that for equivalent levels of service, per capita costs of urban systems are usually lower than those of rural ones. However, the per capita cost of rural systems can be lower since per capita consumption and the service level may be lower. According to Hebert (1984) the economies of scale factor varies from 0.5 to 0.8 for most water supply systems. This concept gives an evidence that it could be more economic for the Gaza Strip to unify the water supply system for all governorates of the Gaza Strip to increase the scale of productive capacity of water supply service, which consequently leads to decrease in costs of production per cubic meter. Further research is required to determine economies of scale factor for different alternatives of water supply system in the Gaza Strip.

6.1.2 The Impact of Water Pricing on Water Consumption

There are many arguments in regard to the impact of water pricing on water consumption. One of them say that there is no impact. Another argument confirms that the lower water prices, the higher water consumption. The results of the study show that the highest water consumption was in North and Gaza governorates (154.7 and 138.2 l/c/d respectively). It is worth to mention that the water prices are the lowest in these two governorates, where the average price in the north governorate is 0.85 NIS/m3 and 0.755 in Gaza governorate. In contrast, it is revealed from the study results that the water consumption is lower in the governorates of Middle, Khan Younis and Rafah (86.8, 66.1 and 94 l/c/d respectively). The averages of water prices are similar in these three governorates as indicated in table 6.1. This may interpret partially the high statistically significant variations among the average rate of water consumption in the different governorates of the Gaza Strip comparing with the average rate of the whole Gaza Strip governorates

(P value = 0.0 $\longrightarrow$ 0.007).

It is also noticed from the results that the average rate of water consumption in Gaza governorate is lower than it in the North governorate although the water prices is higher in the last governorate. This can be interpreted by the type of water quality, which is better in the North governorate. So, the people in the North governorate depends mainly on the municipality water, while the citizens in Gaza governorates use other resources due to the poor quality of water that supplied by the municipality.

This discussion was supported by the research findings, where 56.6% of the respondents in the North governorate were satisfied with municipal water quality while only 15.3% were satisfied in Gaza governorate. In addition the results show that 64.7% of the respondents in the North governorate use the municipal water for drinking whereas only 23.3% in the Gaza governorate use municipal water for drinking.

Table 6.1 Average of water prices in Gaza governorates

Governorate	**Average water price (NIS/m^3)**
North	0.85
Gaza	0.775
Middle	1.60
Khan-Younis	1.50
Rafah	1.50

The results also show that the lowest water consumption (66.1 l/c/d) was in Khan Younis governorate. This can be explained by two reasons; the first one is the lowest income in this governorate (151.8 NIS/capita /month) and the second reason is the absence of sewerage network in Khan Younis governorate, which encourages people to reduce their water consumption to decrease the costs of waste water disposal. Another argument is that the water consumption in the Middle governorate is more than it in Khan-Younis and Rafah governorates despite the water prices in the Middle governorate is higher than in Khan-Younis and Rafah governorates. This can be justified by the higher income in the Middle governorate (245.4 NIS/capita/month) while it was 151.8 NIS/capita/month in Khan-Younis governorate and 184.8 NIS/capita/month in Rafah as indicated in research results.

It can be concluded from this discussion that the water consumption will increase, to reach the highest level of water demand, if the water prices decrease and vice versa. This conclusion can be confirmed if the other factors are unified such as the average income of households, the water quality and the existence of sewerage network.

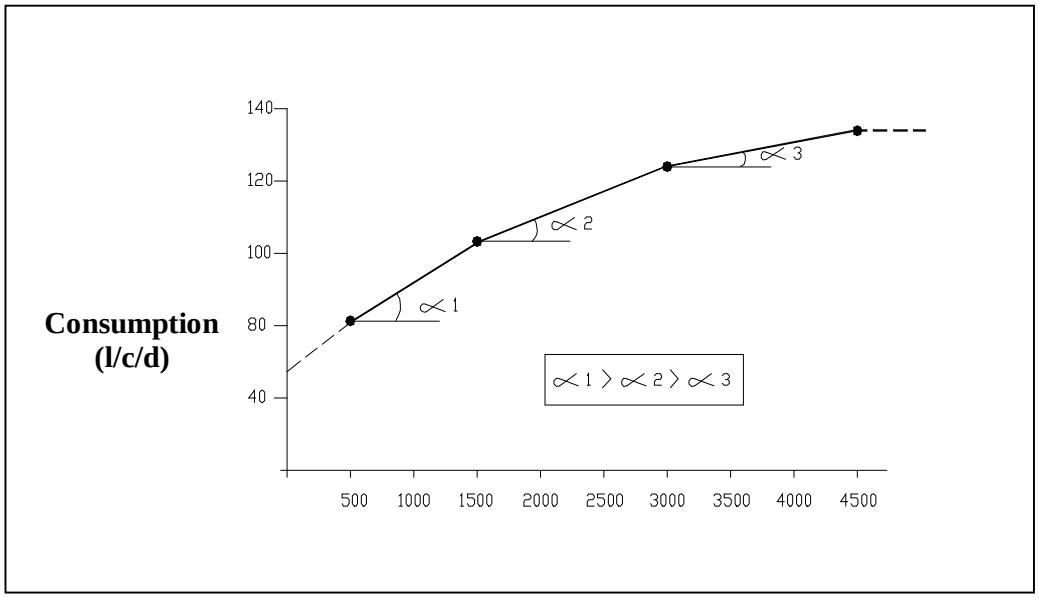
6.1.3 Poverty and Water Consumption

The study results confirm that water consumption is affected directly with the economic status of the consumers, where the water consumption will increase if the household income increases. Table 6.2 indicates that the lower household income, the lower also the water consumption. It is noticed from the table that there is a high significant difference in water consumption between the lower income groups and this difference is diminished gradually in the higher income groups.

Table 6.2 Income and Water Consumption

Income (NIS/household/month)	**Water Consumption (l/c/d)**
< 1000	81.62
1001 - 2000	115.78
2001 - 4000	122.1
> 4000	127.35

The results that obtained from the study sample were presented graphically as shown in figure 6.1. This figure indicates the relationship between poverty and water consumption. It is clear from the graphical presentation that the water consumption will stop increasing at some point of high income, where this depends on the high water demand for the high-income groups. On the other hand the water consumption will not decrease more at some point of lower income where the lowest water demand will not surely reach the zero value.



Income (NIS/household/month)

Figure 6.1 The relationship between income and water consumption

6.2 The Impact of Water Quality and Quantity on Water Pricing

The level of the water service, either quality or quantity, is an important factor that affects any water tariff. The water service with best quality and quantity will cost more and more according to the degree of improvement. Consequently, the prices of water will increase. The findings of this research indicate that the quality and quantity of the current water service were not satisfied by customers. The results of the interviews with experts indicate that 50% of them considered the water quality bad, 38.6 % considered it acceptable and only 11.4% said that it was good. Similarly the results of the questionnaire show that 71.5% of the study sample were dissatisfied with water quality. This finding is supported by the literature, which indicates similar findings (Fafo, 1998). Concerning water quantity, the results show that only 25% the experts considered it sufficient while 75% considered it insufficient or acceptable. The findings of the questionnaire also show that 67.4% of the study sample were not satisfied with water quantity. So, there was consensus of the experts and the customers for the need to improve the water supply service in its quality and quantity. According to this situation it is not logical to increase water prices without serious improvement in the water supply service. The research findings show that the people were willing to pay for improved services. 50% of the experts believed that the citizens were willing to pay for improved service. The results of the questionnaire show that 82.8% of the respondents were willing to pay for improved services. Because of the bad quality of water service, the results of the research show that 54.7% of the respondents didn't use municipal water for drinking. The results also show that the amount that paid for non-municipal water equals 67.3% of that paid for municipalities' bills.

Finally it is worth confirming that any water tariff should be related strongly with the level of water service either quality or quantity and the people will accept the increase in water prices if it is accompanied with the required improvement in water quality and quantity.

6.3 Socioeconomic Situation

6.3.1 Household Size and Density

The research findings show that the average family size was 7.2 for all the Gaza Strip, which is supported by the average figures of the Demographic Survey of the PCBS that indicated the average family size to be 6.9 for the Gaza Strip (PCBS, 1997). The results of the study show no statistical significant difference in the average of family size between cities and refugee camps that were 7.21 and 6.98 respectively. The findings of the research show that the average of water subscription size was 12.5 person, which was supported by literature (Fafo, 1998). This means that there was more than one family joined by one subscription in many cases. According to the research survey, the average number of persons per room in the Gaza Strip was 2.48 without any statistical significant among cities, refugee camps and rural areas. The PCBS figures stated that average number of persons per room1997 was 2.1 (PCBS, 2000).

6.3.2 Economic Status

The study results show that the average monthly income per capita was 225.7 NIS (NIS = USD 0.21) for the whole Gaza Strip. It is also shown that there was a statistical significant difference between the income of cities and refugee camps, where the average were 244.27 NIS and 199.44 NIS respectively. The results also, show that the highest income was in Gaza governorate (293.2 NIS/Capita/month) whereas the lowest income was in Khan-Younis governorate (151.8 NIS/Capita/month). It is indicated from the research findings that the households' income declined in the years of 2001 and 2002 due to the intifada status. The findings show that only 18.9% of the households were having monthly income less than 1000 NIS before the intifada while this percentage inclined in 2002 to 36%. On the other hand the percentage of the households that were having average monthly income more than 3000 NIS before the intifada was 17.8% whereas this percentage declined to 7.8% in the year 2002 due to intifada conditions. The study results indicate that more than 50% of the study sample was under the poverty line and they were living at subsistence level. This results is supported be literature, where PCBS indicated that 81.5% of households in the Gaza Strip were living under the poverty

line for the year 2001 (PCBS, 2001). These fluctuations and regional disparities are relevant to any new water tariff system as they indicate the existence of a sizeable percentage of households that have a precarious economic situation. The group of vulnerable households is significantly large in the Khan-Younis and Rafah governorates.

6.4 Willingness to Pay

A fundamental issue in water supply policy is predicting the response of consumers to a service to which they have not previously had access or characteristics of that service such as improved reliability and increased prices. Such information was collected through this research survey by presenting a realistic scenario to the respondents and asking them how much they would be willing to pay for the service. As mentioned before, the respondents were not asked for a price directly, but used the so-called bidding game whereby prices were offered increasingly or decreasingly (depending on the answer given) until a negotiated price have been settled.

The average household stated that it wants to pay about 3.06 NIS per m^3 of improved water, with the average bid being somewhat higher in rural and urban areas than in refugee camps. The average in cities was 3.1 NIS per m^3, in villages was 3.4 NIS per m^3 and 2.82NIS per m^3 in refugee camps. The highest average of willingness to pay in rural areas can be interpreted by the absence of the water supply service in many parts of these areas such as Wadi As- Salqa village. Some villages have no water network, so they are ready to pay more to get this service. Another reason for this significant variation between refugee camps and other areas is the lowest income of the households in refugee camps if compared with rural areas such as, Wadi As-Salqa and Al- Qarara villages and urban areas such as Gaza and Dir El- Balah cities. The results also show that the highest mean of willingness to pay was in Gaza governorate (3.29 NIS/m3) as indicated in table 6.3. This can be interpreted by the highest average income in Gaza governorate (293.2 NIS/ capita/ month), in addition to the poor quality of the current water service in Gaza governorate. On the other hand the lowest mean of willingness to pay, as shown in table 6.3, was in the middle governorate (2.53 NIS / m3) although it was not the lowest income of Gaza governorates. This can be interpreted by the high percentage of refugees in this area, who used to consume free discharge water from UNRWA for a long period of time.

Furthermore, the quality of water in this area is better than Gaza governorate because it depends mainly on Mekorot (Israeli company) water, which has a good quality.

Table 6.3 Average of willingness to pay in Gaza governorates

Governorate	**WTP (NIS/m^3)**
North	3.19
Gaza	3.29
Middle	2.53
Khan-Younis	3.15
Rafah	2.96
All the Gaza Strip	3.06

It is worth reporting that the research finding show that the average current price of water in the whole the Gaza Strip equals 1.08 NIS/m3. Comparing this price with the highest accepted price according to the results of willingness to pay, it reflects the willingness of people to pay for improved service, that matches the WHO standards, three times the current price in spite of the deteriorated economic situation. The high willingness to pay can be interpreted by the bad quality and quantity of the current water supply service as indicated in the previous chapter. So, the citizens were looking for a good service and they were ready to pay more to find a suitable solution for their sufferance. Moreover, these findings are supported by literature, which indicated that Gaza's Beach Camp maximum willingness to pay was 2.9 NIS/m3 in 1998 and 2.6 NIS/m3 in Gaza city outside the camp (Fafo, 1998). If a comparison of the average bid is done for the six income groups, it detects a similar pattern in the five governorates. There were considerably higher bids in the highest income group compared to the lowest income group in the whole Gaza Strip as indicated in table 6.4. However, the table shows that all the income groups were willing to pay more for improved water supply service.

According to LEKA's tariff study for the Gaza Strip, the suggested price for each cubic meter of water to meet the WHO standards, as reported in the capital investment program (CIP), was 2.54 NIS. This cost may rises to 3.0 NIS/m3 if the

significant variation of the ratio (USD/NIS) is taken into consideration. However the findings of this research indicate that the people in the Gaza Strip were willing to pay the suggested price for improved water service as stated in LEKA's tariff study.

Table 6.4 Willingness to pay according to households' income

Income Group (NIS/moth)	**WTP (NIS/m3)**
<1500	2.88
1501-3000	3.07
3001-4000	3.37
>4000	3.55

6.5 Ability and Affordability to pay

One of the important factors that affect the water tariff design is the ability and affordability of the citizens to pay for improved water supply service. The valid and reliable water tariff is to introduce a tariff structure, which is based on block of tariff provided that the level of each block is to be affordable and acceptable for each category of customers concerned. One of the key issues for introduction a progressive tariff is to define the first block of tariffs, provided that this first block takes into consideration the affordability of the vulnerable households.

The results show that the average monthly income per capita in the Gaza Strip was 225.7 NIS. LEKA's tariff study considered the water bill to be about 4% of the income which is a conservative attitude (LEKA, 1998). This means that each person can pay 225.7x0.04=9.028 NIS per month. If the price of improved service is stated to be 3.0 NIS per m^3, i.e, that each person can purchase $\frac{9.028x1000}{3x30} = 100.3$ l/c/d which equals about 90% of the average water consumption. The findings of the study also show that the people pay for non-municipal drinking water 25.1 NIS/month/household, while they pay for municipal bill 37.3 NIS/month/household. The non-municipal drinking water can be purchased from roving trucks and shops. Some households use small filter devices inside the houses. This is a strong indication to the ability of people to pay for improved water service, where they

already pay for drinking non-municipal water about 67.3% of the municipal bill. This analysis is concerned with the average figures, but there is an essential issue regards the vulnerable households that have an average a monthly income less than 1000 NIS. These households cannot pay 3.0 NIS/m3 for improved service. As example assume the size of this household to be 7 persons and the average monthly income to be 500 NIS. The water demand for this household per month would equal

m^3

The monthly price of the improved water supply would equal =23.52x3 = 70.56 NIS, which equals 70.56/ 500= 14.1% of the household income that can't be afforded. This problem can be solved by cross subsidy through a combined system taking into consideration many blocks of water tariff. The lower blocks refer to social tariff, while the higher blocks refer to economic consideration. In other words, the differential changing in the tariff structure will allow higher income groups to cross subsidize the poor ones. It is worth here to mention that many poor households may serviced by one connection especially in refugee camps. Some of these households live in multistory building or in neiboring houses. This situation will classify the consumption of these households in the high tariff blocks due to the large number of persons who use the same connection. For this reason, these households will not benefit from the social blocks. It is more convincing for these households to use separated subscriptions to lie in the social blocks with lower prices.

6.6 Water Pricing and Illegal Connections

There is no doubt that the existence of illegal connections affects the water tariff. The illegal connections increase the losses in the water network due to the non-metered amount of water. Consequently, the cost of the cubic meter of water will increase, which causes the increase in water prices. The study investigated if the water prices affect the illegal connections or not. The results of the study indicate that 72.7% of the interviewed experts reported that it is necessary to study the effect of water prices on illegal connections. So, the participants in the questionnaire were asked about the impact of high prices on illegal connections. The results show that 52.4% of the study sample confirmed that the increase in water prices would increase the number of illegal connections whereas only 27.4% contradicted this. The respondents also were asked about the reason of the existence of illegal connections. The research

findings show that 27.9% of the study sample selected the high price as the main reason that causes the increase of illegal connections.

However, the detection of illegal connections should continue according to a suitable program whether the water prices high or low because the study revealed that 32.3% of the participants said that the existence of illegal connections is returned to the non-responsibility of many citizens. 16.6% of the respondents said that the bad water service is the reason for illegal connections and only 9.7% returned the cause for the non-trust status between the community and the municipality.

Table 6.5 indicates the number and the percentage of illegal connections in the different governorates of the Gaza Strip (PWA and LEKA, 2002). It is clear from this table that there were high statistical significant differences in the existence of illegal connections among the governorates and in the same governorate for different years. From this table, there is no clear evidence to conclude a relationship between the water prices and illegal connections because there are different reasons for illegal connections as illustrated previously. The data in table 6.5 cannot be considered as a reference to connect between water prices and illegal connections in the different governorates because the exerted effort to detect illegal connections differs from one governorate to another as it also differs from one year to another for the same municipality. For the year 2000 and 2001 there is no data, neither in municipalities nor in PWA, about illegal connections.

Table 6.5 Illegal connections in Gaza governorates (PWA and LEKA, 2002)

Governorate	**1997**		**1998**		**1999**	
	No. of Illegal connections	**%**	**No. of Illegal connections**	**%**	**No. of Illegal connections**	**%**
North (Beit Hanun &Jabalia)	1275	14.63	2649	29.4	352	3.94
Gaza	872	3	618	2.06	---	---
Middle (Dir El Balah & Maghazi)	323	5.45	239	3.91	---	---
Khan-Younis (City &	796	8.1	5103	49.73	376	3.26

Camp)						
Rafah	103	1.08	139	1.4	---	---

6.7 Public Awareness and Water Pricing

Another issue, which is very important to the water pricing policy, is the public awareness. The public awareness activates highly the cooperation between the water utility and the customers. This help in stating water prices polices that could recover the costs of the water supply service and be afforded by the entire income groups. This study, as one of its objectives, aims to measure the public awareness concerning water supply. The research findings revealed that the water utilities or municipalities in the Gaza Strip didn't give a serious attention to increase the public awareness with regard to water supply issues. The respondents were asked about the existence of periodic meetings between municipality and community. 50.9% of the study sample confirmed that there was non-of these activities and 35.1% said that they didn't know. The results also show that 68.1% of the participants ascertained that there were not periodic publications issued by municipalities to increase the public awareness related to water supply service. The findings of the study indicate that 85.2% of the study sample didn't participate in any public awareness activity or program regard water supply issues such as, lectures, workshops and meetings. 83.1% of those , who didn't attend such these activities, confirmed that they didn't receive any invitation. It is noticed from the results that the municipalities didn't exert a sufficient effort to increase the public awareness. In spite of the lack to enhance the public awareness, the research findings indicate that there was an acceptable level of understanding of citizens regarding water issues. This can be understood from the attitudes of the participants from the water service improvement and their willingness to pay despite their difficult economic situation as mentioned before. This can be traced to the educational background of the Palestinians people, where the percentage of education of Palestinians is very high if compared with the developing countries.

6.8 Community Participation in Decision Making

The community participation in decision making concerned water issues, especially water pricing, is an important factor that encourages people to cooperate with utilities

and understand their polices. Community participation also increases the willingness of customers to accept and satisfy the applied water tariff where the people would feel that they participate in decision making of water pricing. The research findings show that 34.7% of the respondents said that there was community participation in water decision making while 31.8% disagreed this statement. 16% of the study sample confirmed that the centralization in decision making was a main problem, where the municipalities boarders didn't allow the community to share in decision making. These opinions of the respondents about community participation assure that the municipalities didn't exert their best effort to enhance the relationship between the municipality and the community. Consequently, this will diminish the trust of citizens with municipalities. The non-trust between the water utilities and the customers would affect negatively the water pricing polices. This status may let some of people to delay in paying for water bills. Others may use illegal connections, where the study results indicate that 9.7% of respondents assured that the absence of trust with municipalities is the main reason for illegal connections.

6.9 Existence of Water Tariff Studies and Polices in the Gaza Strip

It cannot be applicable to establish a sustainable water service and a practical water pricing system without a clear policy approved from the high management levels. The decision-makers should appoint the main principles and constraints for any water tariff structure to be able to cover the water service costs and to be affordable by all citizens, especially the poor people. Furthermore adequate studies should be done to design a suitable water tariff that can achieve the target objectives. The results of this study indicate that 54.6% of the interviewed experts believed that there were no clear water policies in regard to water tariff in the Gaza Strip, while 38.6% confirmed the inverse. This high significant difference in the experts points of view can be interpreted by the job positions of the interviewees. As example, for those who work in PWA may have the chance more than others to see the formal water policies.

The research findings show that 56.8% of the interviewed experts stated that the water tariff studies for the Gaza Strip were not enough and most of the participants (88.6%) ascertained that there was a necessity for further studies in this regard. This high percentage of the participants reflects the value and significance of this

research. Although many valuable studies were done in regard to water tariff such as , LEKA's water tariff study and Norconsultant study but it is still necessary and more valuable to do further studies to enhance or criticize the available studies . The water pricing in the Gaza Strip depends on many factors that vary from one time to another according to the variation in socio-economic and political conditions. This emphasizes the necessity to study periodically the variables that affect water prices in the Gaza Strip, where important changes may be taken.

6.10 Water Pricing and Organizational Capacity

As indicated in chapter (4), the present situation of water supply service in the Gaza Strip is one of the extreme fragmentations. There are many institutions that play different roles in this regard. The most important role is that played by municipalities, which directly manage the water supply sector. Each municipality has its separable system according to its organizational capacity.

The research findings indicate that there was weakness in the capacity building of municipalities. This issue, certainly, needs further research to state a strategic plan to support and build up the capacity of water departments, but it is worth here to assure that the capacity building of municipalities is an important factor that affects the water pricing system. The strong organizational capacity of water utility will improve the performance of the utility that reflects positive effect on customers' satisfaction and stepping up their willingness to pay. The effective capacity building also assists for precise monitoring and controlling the water networks to minimize the losses and consequently decreasing the costs. The strong organizational capacity makes the water department expenses to be more controllable. Therefore, these findings and discussion give signals for decisions makers in municipalities or water utilities to concentrate their efforts for promoting the capacity building of the water departments.

6.11 The Impact of Political Situation on Water Pricing

The political situation in the Gaza Strip put more difficulties and obstacles around the water sector management. The years of occupation have interacted with sever resource scarcities to produce a dismal socioeconomic environment. The situation is further complicated by the fact that resources and population in the Gaza Strip are administrated by several authorities, including the United Nations Relief Works

Agency (UNRWA), the Israeli military government and the Palestinian Authority (PA). Therefore it is essential to take into consideration the political situation when designing any water tariff.

The research findings show that the interviewed persons, who are familiar with water issues, emphasized that the political situation affects highly the economic situation. Some of them also mentioned that the political status affects the control of water resources. Others reported that the political conditions affect the control of energy resources that are required for operating water resources. The participants in the administered interviews mentioned many political factors that may affect the water pricing in the Gaza Strip:

- The political instability, which is the most important factor that affects directly the stability of economy, investment, idleness and poverty.
- The domination of Israeli Party on water resources is an important factor, where some areas in the Gaza Strip depend mainly on Mekorot water such as the middle governorate.
- The type of local authority; national or militarism occupation, is another important factor.
- The validity of the local authority and the existence of laws, rules, clear policies and strategies are also important factors that affect water pricing. The results show that 81.6% of the study sample confirmed the necessity of the existence of strong local national authority to apply, successfully, the water pricing system.
- The existence of Israeli settlements in the Gaza Strip also affects the water tariff, where these settlements dominate many water wells with good quality in Gaza Strip and they consume large quantities of water, which participate in increasing the water shortage in the Gaza Strip.

Finally, it is clear from this discussion that the political situation is an important factor that affects the water pricing system. So, it should be taken into consideration when stating or designing any water tariff.

Chapter (7)

Conclusions and Recommendations

This chapter consists of two sections. The first one is the conclusions of this study, where the main findings of the study are summarized in this section. The second section reports a number of valuable recommendations.

7.1 Conclusions

It can be concluded that any water pricing system in the Gaza Strip should take into consideration many factors such as, financial, socioeconomic, level of service, technical and managerial, and political factors. The research findings indicate that the previous studies about water pricing in the Gaza Strip didn't take all the required factors and there is a need for further studies in this regard. This study concentrates on some essential factors that have not been studied sufficiently such as water consumption, quality and quantity, socioeconomic situation, willingness to pay, ability and affordability, illegal connections, public awareness, community participation in decision making, organizational capacity and the political situation.

The relationship between water consumption and water prices was studied in this research. It can be stated that the water consumption will increase if the water prices decrease and vise versa. This relation is true if the other factors that affect water consumption are unified such as the income of households, water quality and quantity, and the existence of sewerage network. On the other hand the results

confirm that the increase of productive capacity of water supply service will decrease the cost of production per unit.

This research studies the impact of water quality and quantity on water prices. The findings show that the quality and quantity of the current water service in the Gaza Strip were not satisfied by customers and there was consensus by the participants to the necessity for improving the water supply service. The findings of the research indicate that the people in the Gaza Strip were willing to pay for improved services. So, any water tariff should be related strongly with the level of water supply service either quality or quantity.

One of the main issues that was studied in this research is the willingness to pay. The results show that the average willingness to pay in the Gaza Strip for improved water supply service was 3.06NIS per m^3 for characteristics that match the WHO standards. This price covers the costs of production, maintenance and operation for the improved water supply according to the CIP as explained in chapter 2. Ability and affordability also is another important factor that affects highly the water tariff design. This factor was investigated in this study. The study findings indicate that if the households pay 4% of their income to the water bill, they will secure their water demand and this payment will cover the costs of improved water. The vulnerable households that cannot afford this price should cross-subsidized with rich households through a combined system taking into consideration many blocks of water tariff. The lower blocks refer to social tariff, while the higher blocks refer to economic consideration.

This study researches the relationship between illegal connections and water pricing. The results show that there were many reasons for the existence of illegal connections. The high price, that cannot be afforded by many of households, was an important reason for the illegal connection.

Another issue that is studied in this research is the public awareness. The public awareness affects highly the cooperation between the water utility and the customers. This cooperation helps in stating water pricing system to cover the costs and to be afforded by all income groups. The study reveals that there was absence and lack of effective awareness programs to increase the public awareness, where the related agencies in the Gaza Strip didn't exert the required effort in this regard. Despite the

municipalities didn't exert a sufficient effort to increase the public awareness; the research findings show that there was an acceptable level of public awareness. This can be understood from the opinions of the participants concerning the water service improvement and their willingness to pay compared with their deteriorated economic situation as mentioned in the previous chapter.

The community participation in decision making is an important factor that encourages people to cooperate with water utility and to understand their policies. The results of the study show that there was a community participation in water decision making with statistical significant difference from one municipality to another. The existing participation is not enough as indicated in this study because municipalities or water utilities didn't exert their best effort to enhance the relationship with community.

The organizational capacity is another factor that affects the water pricing. The findings of this study show that there was weakness in the capacity building of municipalities, especially the capacity of water departments. This will affect negatively the performance of the water utility, which will affect the customers' satisfaction and their willingness to pay. These findings give signals for decision-makers to do their best effort to support the capacity building for water utilities or departments.

The last issue that was investigated in this study is the impact of political situation on water pricing. Due to the current political situation in the Gaza Strip, it is necessary to take these conditions into consideration when designing any water tariff. The research findings confirm that the political status affects highly the economic situation. It also affects the control of water resources and energy resources. Energy resources are necessary for operating water resources. The study results show that there are many political factors that affect water pricing in the Gaza Strip such as, political instability that affects the income status, the domination of Israel on water resources, the existence of Israeli settlements in the Gaza Strip and the existence of valid and strong local national authority.

7.2 Recommendations

This study has led to the following recommendations that may help in producing a suitable water pricing system to cover the cost of the water supply service and to be affordable by all households in the Gaza Strip:

1. There is an acute need for developing water pricing policies in the Gaza Strip.
2. It is recommended, as soon as possible, to start the improvement of quality and quantity of the water supply service in the Gaza Strip according to the consensus of participants from experts and customers about this issue.
3. It is recommended in these conditions to build the water tariff structure, for the improved service that matches the WHO standards, on the average price 3 NIS/m^3 according to the findings of this research. This price takes into consideration the cost recovery of the improved service as indicated in LEKA's water tariff study, willingness to pay and the affordability of all income groups.
4. There are significant variations in the economic situation of the household, so any new water tariff should take into consideration the group of vulnerable households. It is recommended to use cross subsidy technique to help the poor households that can't afford the average price. This can be achieved by using a combined system taking into consideration many blocks. The lower blocks refer to social tariff, while the higher blocks refer to economic consideration. This will allow the rich households to cross subsidize the poor ones. Moreover, the household that joint in one subscription should use separated subscription to benefit from social blocks.
5. Water utilities should maintain precisely and adequately the water network, follow up the leakage and blocked meters. They also should detect continuously the illegal connections to reduce the losses in the network and consequently decrease the cost of the water supply service.
6. The municipalities or water utilities should take serious steps to activate the public awareness programs through periodic meeting with community, publications, lectures, workshops, conferences, … etc.
7. It is recommended that it is more valuable and significant to enhance the community participation concerning water decision making, especially that in regard to water pricing. This community participation can be achieved through many activities such as invitations of community leaders and specialist persons to

participate in decision making. Another method that can be used is to take the people opinions through questionnaires that can be analyzed to stand on beneficial findings. However, this issue should be studied carefully by the water utilities to put the policies and programs that assist in this regard.

8. Because of water scarcity crisis in the Gaza Strip, the decision makers at the level of local government should do their best efforts to find additional water resources to meet the growth of water demand with suitable prices that can be afforded by all customers. At the political level they should negotiate to get our rights in water resources. Other resources may be obtained from neighboring countries, by digging new water wells and by reusing of storm water or treated sewage water.

9. To rationalize the water consumption, it is recommended to state high prices for high consumption blocks especially in the Gaza Strip, which suffers highly from water scarcity in quality and quantity.

10. It is recommended for the decision-makers, in municipalities or water utilities, to take into consideration the importance of capacity building, which affects any water pricing system. So, they should exert more efforts to promote the capacity building of concerned institutions that manage the water supply sector in the Gaza Strip.

11. To increase the capacity of the staff of water departments, it is recommended that the high management levels in municipalities or water utilities should train their staff through a valuable training programs. These training courses should concentrate on the obligations of the staff towards their job and towards treatment with customers to increase the trust between water utilities and community.

12. It is necessary to continue researches and studies to stand on the effect of the variables that affect water pricing system in the Gaza Strip and to make the relevant decisions for correct actions. Further studies also are needed about the water tariff for agricultural, industrial and commercial use.

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List of Annexes

Annex 3 Explanatory letter

Annex 4 Interview questions (English form)

Annex 5 Questionnaire (English form)

Annex 1

استبيان خاص بالعاملين والمختصين في قطاع المياه في قطاع غزة حول العوامل التي تؤثر على التعرفة المائية للاستهلاك المترلي في قطاع غزة

عزيزي المشارك :

- **نحن نقدر ونثمن وقتكم، لذا نتقدم لسيادتكم بالشكر الجزيل على مشاركتكم لإجراء هذه المقابلة والإجابة على بعض التساؤلات وذلك كجزء من البحث التكميلي لنيل درجة الماجستير في إدارة المشروعات الهندسية - كلية الهندسة - القسم المدني بالجامعة الإسلامية-غزة.**
- **إن هدف البحث هو دراسة بعض العوامل الهامة التي تؤثر في التعرفة المائية للأغراض المنزلية في قطاع غزة بهدف الوصول إلى التعرفة التي تناسب كافة شرائح المجتمع آخذة بعين الاعتبار الفوارق الاقتصادية والقدرات المالية.**
- **جميع المعلومات الواردة في الاستبيان ستستخدم لأغراض البحث العلمي فقط.**
- **سيتم توجيه بعض الأسئلة لمعرفة رأيكم في الأهمية لدراسة بعض العوامل التي تؤثر في التعرفة المائية لقطاع غزة**

القسم الأول : خلفية المبحوث .

1. العمر

☐ 25-18 ☐ 35-26 ☐ 45-36 ☐ 55-46 ☐ أكبر من 55

2. الجنس

☐ ذكر ☐ أنثى

3. **أعلى مؤهل علمي**

☐ ثانوي أو أقل ☐ دبلوم متوسط ☐ بكالوريوس ☐ ماجستير ☐ دكتوراة

4. مكان العمل

☐ وزارة ☐ جامعة ☐ بلدية ☐ سلطة المياه ☐ قطاع خاص

☐ مؤسسات مجتمعية ☐ مؤسسات دولية ☐ غير ذلك (حدد) .....

5. المهنة أو المسمى الوظيفي : .....

القسم الثاني : حول العوامل التي تؤثر في التعرفة المائية في قطاع غزة .

6. ما هي وجهة نظرك المتعلقة بجودة المياه التي تقدم للمواطنين في قطاع غزة بشكل عام

☐ جيدة جداً ☐ جيدة ☐ مقبولة ☐ لا أدري ☐ سيئة ☐ سيئة جداً

7. ما هي وجهة نظرك في كمية المياه التي تقدم للمواطنين في قطاع غزة بشكل عام ؟

☐ جيدة جداً ☐ جيدة ☐ مقبولة ☐ لا أدري ☐ سيئة ☐ سيئة جداً

8. ما هي وجهة نظرك في استمرارية المياه التي تقدم للمواطنين في قطاع غزة بشكل عام ؟

☐ جيدة جداً ☐ جيدة ☐ مقبولة ☐ لا أدري ☐ سيئة ☐ سيئة جداً

9. هل توافق على أن خدمة المياه في قطاع غزة بحاجة إلى تحسين ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

10.هل تعتقد أن السكان في قطاع غزة يرغبون في دفع مبالغ إضافية لقاء تحسين خدمة المياه ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

11.هل توافق على أن إمكانيات السكان المالية في الوقت الحالي تسمح لهم بدفع مبالغ إضافية لقاء تحسين الخدمة ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

12.هل تعتقد أن إمكانيات السكان المالية قبل انتفاضة الأقصى كانت تسمح لهم بدفع مبالغ إضافية لقاء تحسين الخدمة ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

13.هل توافق على أن الجهات المعنية بقضايا المياه تمتلك سياسات واضحة حول موضوع التعرفة المائية ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

14.هل قامت الجهات المسئولة عن قطاع المياه في قطاع غزة بعمل دراسات حول التعرفة المائية ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

اذكر هذه الدراسات :

15.هل تعتقد بأن هذه الدراسات - إن وجدت - كافية ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

16.هل ترى بأن هناك ضرورة لإجراء المزيد من الدراسات حول التعرفة المائية ؟

☐ضروري جداً ☐ضروري ☐لا أدري ☐ضروري ☐غير ضروري على الإطلاق

اذكر أهم الدراسات التي ترى أنه من الضروري إجراؤها

17.هل تعتقد بأن هتاك ضرورة لعمل مسح ميداني لقياس مدى رغبة السكان على الدفع لقاء تحسين الخدمة؟

☐ ضروري جداً ☐ ضروري ☐لا أدري ☐ضروري ☐غير ضروري على الإطلاق

اذكر السبب :

18.هل تعتقد بأن هناك ضرورة لعمل مسح ميداني لقياس مدى قدرة السكان على الدفع ؟

☐ ضروري جداً ☐ ضروري ☐لا أدري ☐ضروري ☐غير ضروري على الإطلاق

اذكر السبب :

19.هل تعتقد بأن هناك ضرورة لعمل مسح ميداني لمعرفة شرائح المجتمع الاقتصادية ؟

☐ ضروري جداً ☐ ضروري ☐لا أدري ☐ضروري ☐غير ضروري على الإطلاق

اذكر السبب :

20.هل تعتقد بأن هناك ضرورة لعمل مسح ميداني لقياس مدى وعي السكان بقضايا المياه ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ضروري ☐غير ضروري على الإطلاق

اذكر السبب :

21.هل تعتقد بأن هناك ضرورة لقياس مدى تأثير تعرفة المياه على الوصلات الغير قانونية ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ضروري ☐غير ضروري على الإطلاق

اذكر السبب :

22.هل تعتقد بأن هناك ضرورة لمشاركة المجتمع المحلي في صناعة القرارات المتعلقة بالمياه ؟

☐ضروري جداً ☐ضروري ☐ لا أدري ☐ غير ضروري ☐ غير ضروري على الإطلاق

كيف يمكن تحقيق ذلك من وجهة نظرك ؟

23.هل تعتقد بأن هناك ضرورة لقياس مدى العلاقة بين كمية المياه المستهلكة والتعرفة المائية ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ضروري ☐غير ضروري على الإطلاق

اذكر السبب :

24.هل تعتقد بأن هناك ضرورة لقياس مدى العلاقة بين كمية المياه المستهلكة ووجود شبكة صرف صحي؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ ضروري ☐ غير ضروري على الإطلاق

اذكر السبب :

25.هل تعتقد بأن هناك ضرورة لقياس مدى تأثير الوضع السياسي على التعرفة المائية ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ غير ضروري ☐ غير ضروري على الإطلاق

اذكر السبب :

26.ما هي العوامل السياسية التي تؤثر في التعرفة المائية من وجهة نظرك ؟

27.هل تعتقد بأن هناك ضرورة لقياس درجة رضا السكان عن خدمة المياه ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ ضروري ☐ غير ضروري على الإطلاق

اذكر السبب :

28.هل تعتقد بأن هناك ضرورة لقياس مدى استخدام السكان لمصادر مياه للشرب غير مصدر البلدية ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ ضروري ☐ غير ضروري على الإطلاق

اذكر السبب :

29.هل تعتقد بأن هناك ضرورة لقياس مدى تأثير مستوى الخدمة على التعرفة المائية ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ ضروري ☐ غير ضروري على الإطلاق

اذكر السبب :

30.هل تعتقد بأن هناك ضرورة لقياس أثر البنية الإدارية للمؤسسات الخدماتية على التعرفة المائية ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ ضروري ☐ غير ضروري على الإطلاق

اذكر السبب :

31.هل تعتقد بأن هناك ضرورة لوجود سلطة تشريعية وقضائية وتنفيذية لضمان نجاح تطبيق التعرفة المائية ؟

☐ ضروري جداً ☐ ضروري ☐ لا أدري ☐ ضروري ☐ غير ضروري على الإطلاق

اذكر السبب :

32.اذكر عوامل أخرى تراها مهمة وتؤثر في التعرفة المائية في قطاع غزة وتحتاج إلى دراسة .

33.اذكر أي اقتراحات أو ملاحظات تراها مناسبة من وجهة نظرك لاثراء الدراسة .

Annex 2

استبيان للمواطنين في قطاع غزة حول خدمة المياه للاستهلاك المنزلي

القسم الأول: خلفية المبحوث ومواصفات السكن

ضع علامة (x) في المربع أمام الإجابة الصحيحة

1.العمر

☐ 25-18 ☐ 35-26 ☐ 45-36 ☐ 55-46 ☐ أكبر من 55

2. الجنس

☐ ذكر ☐ أنثى

3. أعلى مؤهل علمي

☐ أمـــي ☐ ابتدائي ☐ إعدادي ☐ ثانوي

☐ دبلوم متوسط ☐ بكالوريوس فما فوق

4 . الحالة الاجتماعية

☐ متزوج ☐ أعزب ☐ أرمل ☐ مطلق

5. المحافظة

☐ الشمال ☐ غـــزة ☐ الوسطى ☐ خانيونس ☐ رفـح

6. مكان السكن

☐ مدينة ☐ مخيم ☐ قرية

7. هل أنت

☐

☐ لاجئ غير لاجئ

8. عدد الأسر المستفيدة من الاشتراك ----------

9. **عدد أفراد الأسرة/ الأسر المستفيدة من الاشتراك شاملاً الأب والأم** ---------- نسمة

10. **عدد الغرف التي تستخدمها الأسرة/ الأسر المستفيدة** " عدا المطبخ والحمام" ---------- غرفة

11. المنافـــع التي تستخدمها الأسرة/ الأسر المستفيدة

عدد الحمامات ---------- حمام
عدد الدورات ---------- دورة
عدد المطابخ ---------- مطبخ

12.نوع سقف البيت

☐ باطون ☐ أسبست ☐ زينكو ☐ قرميد ☐ غير ذلك (حدد)--------

13. مساحة البيت الذي تسكنه الأسرة/ الأسر المستفيدة بالأمتار المربعة ---------- مترا مربعا

14. مساحة القطعة المقام عليها البيت ---------- مترا مربعا

15. عدد طوابق المبنى

☐ طابق واحد ☐ طابقان ☐ ثلاثة طوابق ☐ أربعة طوابق فما فوق

16. عدد العاملين في الأسرة/ الأسر المستفيدة وطبيعة مهنتهم وقطاع العمل بما فيهم أنت

رقم العامل	المهنة	قطاع العمل (حكومي-خاص- وكالة - غير ذلك .....)
1	----------	----------
2	----------	----------
3	----------	----------
4	----------	----------

17. متوسط الدخل الشهري الحالي لأسرتك / مجموع الأسر المستفيدة

☐ أقل من 1000 شيكل ☐ 1001-1500 ☐ 1501-2000 ☐ 2001-3000
☐ 3001 -4000 ☐ 4001- فما فوق

18. متوسط الدخل الشهري قبل انتفاضة الأقصى لأسرتك / مجموع الأسر المستفيدة

☐ اقل من 1000 شيكل ☐ 1001-1500 ☐ 1501-2000 ☐ 2001-3000
☐ 3001-4000 ☐ 4001- فما فوق

القسم الثاني : أسئلة حول الوضع الحالي لخدمة المياه

1. من الذي يقوم بتزويدك بالمياه المنزلية ؟

☐ البلدية ☐ وكالة الغوث ☐ البلدية ووكالة الغوث
☐ بئر خاص ☐ غير ذلك "حدد"---------

2. هل أنت راض عن جودة المياه التي تقدمها البلدية ؟

☐ راض تماماً ☐ راض ☐ لا أدري ☐ غير راض
☐ غير راض على الإطلاق

اذكر الأسباب ----------

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3. هل تعتقد أن المياه الحالية سبب لبعض الأمراض التي تصاب بها أسرتك ؟
☐ نعم ☐ لا أدري ☐ لا

4. هل أنت راض عن *كمية* المياه التي تقدمها البلدية ؟
☐ راض تماماً ☐ راض ☐ لا أدري ☐ غير راض
☐ غير راض على الإطلاق
اذكر الأسباب ----------
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5. **عدد الساعات التي تصل فيها المياه للبيت**
☐ أقل من 4 ساعات ☐ 4-10 ☐ 11- 17 ☐ أكثر من 18 ☐ لا أدري

6. هل أنت راض عن *استمرارية* المياه التي تقدمها البلدية ؟
☐ راض تماماً ☐ راض ☐ لا أدري ☐ غير راض
☐ غير راض على الإطلاق
اذكر الأسباب ----------
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7. سعة الخزانات التي تستخدمها في البيت بالمتر المكعب (كوب)
☐ أقل من ا كوب ☐ 1-2 كوب ☐ 2- 4كوب ☐ أكثر من 4 كوب

8. هل أنت راض عن طريقة صيانة شبكة مياه الشرب ؟
☐ راض تماماً ☐ راض ☐ لا أدري ☐ غير راض
☐ غير راض على الإطلاق
اذكر الأسباب ----------
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9. هل تشعر بوجود مشاركة للمجتمع المحلي(أفراد-لجان أحياء- مؤسسات أهلية ....) في اتخاذ القرارات المتعلقة بخدمة المياه ؟
☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة
اذكر الأسباب ----------
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10. هل تعرف متوسط استهلاك أسرتك الشهري للمياه بالمتر المكعب (الكوب) ؟
☐ نعم " حدد " ---------- ☐ لا أعرف

11. ما هو متوسط قيمة فاتورة المياه الشهرية بالشيكل ؟ ----------

12. مصدر المياه التي تستخدمها للشرب
☐ مياه البلدية أو الوكالة أو بئر خاص ☐ شراء عبوات صغيرة جاهزة ☐ تعبئة الجالونات من
☐ السيارات المتجولة أو المحلات ☐ فلتر داخلي ☐ غير ذلك "حدد"----------

13. ما هو المبلغ الذي تدفعه الأسرة/ الأسر المستفيدة من الاشتراك شهرياً بالشيكل لمياه الشرب من غير مصدر البلدية ؟----------

14. هل توافق على أنه من الضروري إجراء تحسينات على خدمة المياه من حيث النوعية والكمية ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

15.هل توافق على أن مثل هذه التحسينات ستكلف مبالغ إضافية ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

16. إذا كان تحسين الخدمة يستلزم دفع مبالغ إضافية فهل تفضل

☐ إبقاء الوضع على ما هو عليه ؟

☐ تحسين الخدمة مع دفع مبالغ إضافية ؟

17. إذا اخترت الخيار الثاني في السؤال السابق فما هو المبلغ الإضافي الذي توافق علي دفعه من أجل تحسين الخدمة ؟

☐ أقل من ربع المبلغ الحالي ☐ ربع المبلغ الحالي ☐ ضعف المبلغ الحالي

☐ ثلاثة أرباع المبلغ الحالي ☐ قيمة المبلغ الحالي ☐ ضعف المبلغ الحالي أو أكثر

18. هل توافق على أن الزيادة في أسعار المياه قد تدفع البعض إلى الوصلات الغير قانونية "سرقة المياه" ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

19. برايك ما هو الدافع للجوء بعض الناس للحصول على المياه بطرق غير قانونية ؟

☐ التكلفة المرتفعة ☐ سوء الخدمة ☐ عدم الثقة بالبلدية ☐ انعدام المسئولية

☐ غير ذلك " حدد"----------

20. هل توافق على أن زيادة أسعار المياه تقلل من الكمية التي تستهلكها أسرتك ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

21. يتم التخلص من المياه العادمة (مياه المجاري) عن طريق

☐ شبكة الصرف الصحي ☐ قنوات مفتوحة ☐ حفر امتصاصية

☐ غير ذلك "حدد"----------

22. هل تعرف القنوات التي يتم من خلالها مراجعة البلدية في حال وجود مشكلة مياه عندك ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

23.. **هل يهتم الأشخاص العاملون في البلدية بقضايا المياه التي يعرضها المواطنون عليهم ؟**

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق ☐ لا أوافق بشدة

24. هل سبق ولجأت إلى البلدية لحل مشكلة مياه تعرضت لها ؟

☐ نعم ☐ لا

25. إذا كانت الإجابة في السؤال السابق نعم فهل تمكنت من حلها ؟

☐ نعم ☐ لا (السبب)

اذكر السبب ----------

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26. هل توافق على أن موظفي البلدية في قسم المياه بحاجة لتدريب أفضل ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة

27. هل تعتقد بأنه يجب زيادة عدد موظفي البلدية العاملين في قسم المياه أو زيادة عدد ساعات العمل ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة

28. هل تقوم البلدية بإصدار نشرات توعية لتوضيح الإجراءات اللازمة لإنجاز المعاملات المتعلقة بقضايا المياه ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة

29.هل يوجد موظفون في البلدية لاستقبال المراجعين وإحالتهم على المختصين ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة

30. هل تشعر بأن هناك تنسيق كاف بين البلدية والجهات الرسمية والشعبية والمجتمعية ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة

31.هل يتم عقد اجتماعات دورية بين البلدية والجمهور لمناقشة مشاكل المياه ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة

32.هل تقوم البلدية بإصدار نشرات توعية بشكل دوري حول قضايا المياه ؟

☐ نعم ☐ لا أدري ☐ لا

33. هل سبق أن شاركتم في ورشات أو ندوات أو محاضرات للتثقيف والإرشاد والتوعية المتعلقة بخدمة المياه ؟

☐ نعم ☐ لا

34. إذا كانت الإجابة في السؤال السابق نعم فكم عدد المرات التي شاركت فيها منذ خمسة سنوات ؟

☐ مرة واحدة ☐ 2-5 ☐ 6-10 ☐ أكثر من 10 مرات

35. إذا كانت الإجابة في السؤال رقم " 33 " نعم فهل تشعر أن هذه المشاركة مفيدة ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق
☐ لا أوافق بشدة

36. إذا كانت الإجابة في السؤال رقم " 33 " لا فما هو السبب ؟

☐ لانه لم يتم الدعوة لمثل هذه الأنشطة ☐ ضيق الوقت ☐ عدم الجدوى منها
☐ غير ذلك "حدد"----------

37. وجود عداد مياه

☐ لا يوجد ☐ عاطل ☐ سليم

38. هل تعتقد بضرورة وجود سلطة قوية لضمان تطبيق أي تعرفة مائية ؟

☐ أوافق بشدة ☐ أوافق ☐ لا أدري ☐ لا أوافق

☐ لا أوافق بشدة

39. دون من فضلك أي اقتراحات تجدها مناسبة لتحسين خدمة المياه وتحديد التسعيرة المناسبة

القسم الثالث: قياس مدى رغبة السكان للدفع مقابل تحسين خدمة المياه

أخي المواطن :-

تخيل أنه سيتم تحسين خدمة المياه بحيث تتوفر المياه لديك يومياً معظم الوقت، وستكون نوعية المياه عذبة ونظيفة وصحية ومطابقة لمواصفات منظمة الصحة العالمية بحيث يمكنك الاستغناء عن أي مصادر أخرى للشرب، ولكن مثل هذه التحسينات ستكلف مبالغ إضافية ومن يستهلك أكثر سيدفع أكثر.

والآن سيتم توجيه بعض الأسئلة حول مدى استعدادكم للدفع مقابل تحسين هذه الخدمة أم إنكم ترغبون في إبقاء مستوى الخدمة كما هو كي لا تدفعوا مبالغ إضافية. لذا فإننا نأمل منكم إعطاء الحقيقة بكل مصداقية لعلها تساعد في تطوير هذه الخدمة بما يتناسب مع إمكانيات السكان ووضع التعرفة المائية المناسبة على مستوى الوطن.

يجب الانتباه إلى أن الاحتياجات والمستوى الاقتصادي يختلف من أسرة لأخرى والمطلوب هو أن تجيب حسب احتياجات أسرتك وإمكانياتك المالية.

1. إذا كان سعر المتر المكعب للمياه (الكوب) هو 8 شيكل، هل ترغب في شراء هذه الخدمة ؟

☐ نعم ← اذهب للسؤال رقم (2)

☐ لا/غير متأكد ← اذهب للسؤال رقم (4)

2. إذا كان سعر المتر المكعب للمياه هو 16 شيكل، هل ترغب في شراء هذه الخدمة ؟

☐ نعم ← قف وأدخل السعر في نهاية الاستبيان

☐ لا/غير متأكد ← اذهب للسؤال رقم (3)

3. إذا كان سعر المتر المكعب للمياه هو 12 شيكل، هل ترغب في شراء هذه الخدمة ؟

☐ نعم ← قف وأدخل السعر في نهاية الاستبيان

☐ لا/غير متأكد ← قف وأدخل سعر 8 شيكل في نهاية الاستبيان

4. إذا كان سعر المتر المكعب للمياه هو 4 شيكل، هل ترغب في شراء هذه الخدمة ؟

☐ نعم ← قف وأدخل السعر في نهاية الاستبيان

☐ لا/غير متأكد ← اذهب للسؤال رقم (5)

5. إذا كان سعر المتر المكعب للمياه هو 3 شيكل، هل ترغب في شراء هذه الخدمة ؟

☐ نعم ← قف وأدخل السعر في نهاية الاستبيان

☐ لا/غير متأكد ← اذهب للسؤال رقم (6)

6. إذا كان سعر المتر المكعب للمياه هو 2 شيكل، هل ترغب في شراء هذه الخدمة ؟

☐ نعم ← قف وأدخل السعر في نهاية الاستبيان

☐ لا/غير متأكد ← اذهب للسؤال رقم (7)

7. إذا كان سعر المتر المكعب للمياه هو 1 شيكل، هل ترغب في شراء هذه الخدمة ؟

☐ نعم ← قف وأدخل السعر في نهاية الاستبيان

☐ لا/غير متأكد ← اذهب للسؤال رقم (8)

8. ما هو أعلى سعر بالشيكل يمكن أن تدفعه للمتر المكعب لقاء تحسين خدمة المياه ؟---------- شيكل
السعر الذي أرغب بدفعه هو ---------- شيكل

Annex 3

استبيان خاص بالعوامل التي تؤثر على التعرفة المائية في قطاع غزة المقدم للمواطنين في قطاع غزة

اسم المشترك : ----------
رقم اشتراك المياه : ----------

رقم الاستبيان ----------
رقم الكـــــود ----------
التاريخ ----------

أخي المواطن :

- نحن نقدر ونثمن وقتكم، لذا نتقدم لسيادتكم بالشكر الجزيل على مشاركتكم في تعبئة هذا الاستبيان الذي يعتبر جزء من البحث التكميلي لنيل درجة الماجستير في إدارة المشروعات الهندسية من كلية الهندسة - القسم المدني بالجامعة الإسلامية - غزة.
- إن هدف البحث هو دراسة بعض العوامل الهامة التي تؤثر في التعرفة (التسعيرة) المائية للأغراض المنزلية في قطاع غزة بهدف الوصول إلى التعرفة التي تناسب كافة شرائح المجتمع آخذة بعين الاعتبار الفوارق الاقتصادية والقدرات المالية.
- نرجو تحري الدقة والحقيقة بقدر الإمكان عند تعبئة الاستبيان وذلك من أجل الوصول لأفضل النتائج التي تعود بالنفع على الجميع.
- جميع المعلومات الواردة في الاستبيان ستستخدم لأغراض البحث العلمي فقط.
- نلتزم باطلاع من يرغب منكم على ملخص لنتائج البحث وذلك تقديراً لمشاركتكم الفاعلة.

Annex 4

Interview Questions

The First Section: The Respondent Background

1. Age

☐ 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ > 55

2. Gender

☐ Male ☐ Female

3. Educational Level

☐ Secondary or Less ☐ Diploma ☐ B.Sc ☐ M.Sc ☐ PHD

4. Work Place

☐ Ministry ☐ University ☐ Municipality ☐ PWA

☐ Private Sector ☐ Social Institution ☐ International Institution

☐ Others (Determine) ……

5. **Job Title** …….

The second section: Factors Affecting Water Tariff in the Gaza Strip

6. **What is your opinion about the quality of water service in the Gaza Strip?**

☐ Very Good ☐ Good ☐ Accepted ☐ Don't Know ☐ Bad ☐ Very Bad

7. **What is your opinion about the quantity of water service in the Gaza Strip?**

☐ Very Good ☐ Good ☐ Accepted ☐ Don't Know ☐ Bad ☐ Very Bad

8. **What is your opinion about the continuity of water service in the Gaza Strip?**

☐ Very Good ☐ Good ☐ Accepted ☐ Don't Know ☐ Bad ☐ Very Bad

9. **Are you agree that there is a need to improve the water service in the Gaza Strip?** ☐ Strongly agree ☐ Agree ☐ Don't know ☐ Disagree ☐ Strongly disagree

10. **Do you agree that the residents in the Gaza Strip are willing to pay more for improved water service?**

☐ Strongly agree ☐ Agree ☐ Don't know ☐ Disagree ☐ Strongly disagree

11. **Do you agree that the current economic status allows the residents to pay more for improved water service?**

☐ Strongly agree ☐ Agree ☐ Don't know ☐ Disagree ☐ Strongly disagree

12. **Do you agree that the current economic status before Al-Aqsa's Intifada was permitting the residents to pay more for improved water service?**

☐ Strongly agree ☐ Agree ☐ Don't know ☐ Disagree ☐ Strongly disagree

13. **Do you agree that the related agencies have a clear water tariff policies?**

☐ Strongly agree ☐ Agree ☐ Don't know ☐ Disagree ☐ Strongly disagree

14. Do you agree that the relevant agencies prepared studies about water tariff in the Gaza Strip?

☐ Strongly agree ☐ Agree ☐ Don't know ☐ Disagree ☐ Strongly disagree

Mention these studies

……..

15. Do you agree that these studies, if existed, are enough?

☐ Strongly agree ☐ Agree ☐ Don't know ☐ Disagree ☐ Strongly disagree

16. Do you think it is necessary to do further researches about water tariff in the Gaza Strip?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary

Mention the more important studies to be done

……..

17. Do you think that it is necessary to do field surveying to measure the willingness to pay for improved water service?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary

☐ Strongly not necessary

Mention the reasons

……..

18. Do you think that it is necessary to do field surveying to measure the residents' ability to pay for improved water service?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary

☐ Strongly not necessary

Mention the reasons

……..

19. **Do you think that it is necessary to do field surveying for the economic blocks of the community?**

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

20. Do you think that it is necessary to do field surveying to measure the public awareness concerning water issues?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

21. Do you think that it is necessary to measure the impact of water tariff on illegal connections?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

22. Do you think that there is necessity for community participation in decision making with regard to water issues?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

23. Do you think that it is necessary to measure the relationship between water consumption and water tariff?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

24. Do you think that it is necessary to measure the relationship between water consumption and the existence of sewerage network?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

25. Do you think that it is necessary to measure the impact of political situation on water tariff?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

26. Mention the political factors that affect the water tariff according to your opinion

……

…..

27. Do you think that it is necessary to measure the customers' satisfaction with water supply service?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

28. Do you think that it is necessary to measure to what extend the people purchase non-municipal water for drinking?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary ☐ Strongly not necessary

Mention the reasons

……..

29. Do you think that it is necessary to measure the impact of water supply service level on water tariff?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary

☐ Strongly not necessary

Mention the reasons

……..

30. Do you think that it is necessary to measure the effect of organizational capacity on water tariff?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary

☐ Strongly not necessary

Mention the reasons

……..

31. **Do you think that the existence of a strong local authority is necessary to apply successfully the water tariff** ?

☐ Strongly necessary ☐ Necessary ☐ Don't know ☐ Not necessary

☐ Strongly not necessary

Mention the reasons

……

……..

32. Mention any other factors that may affect the water tariff to be studied :

……

…..

……

…..

……

…..

33. Mention any valuable suggestions or comments:

……

…..

……

…..

……

…..

Annex 5
Questionnaire Form

The First Section: The Respondent Background

1. Age

☐ 13-25 ☐ 26-35 ☐ 36-45 ☐ >55

2. Gender

☐ Male ☐ Female

3. Educational level

☐ Ignorant ☐ Primary ☐ Preparatory ☐ Secondary

☐ Diploma ☐ B.Sc or above

4. Marital Status

☐ Married ☐ Single ☐ Widow ☐ Divorced

5. Governorate

☐ North ☐ Gaza ☐ Middle ☐ Khan Younis ☐ Rafah

6. House location

☐ City ☐ Refugee camp ☐ Village

7. Are you

☐ Refugee ☐ Not refugee

8. Number of households that connected in one subscription……

9. Number of persons that benefit from the subscription including the parents

……

10. Number of rooms …….

11. Facilities

Number of baths ……..

Number of W.C.s ……..

Number of kitchens ……..

12. Type of House roof

☐ Concrete ☐ Asbestos ☐ Eternite sheets ☐ Cement Tiles

☐ Others (specify) ……..

13. House area ……..

14. **Land area** ……..

15. Number of stories of the building

☐ ☐ ☐ ☐

One Two Three Four or more

16. Number of employees or workers .

S.N.	Job	Type of work (Government - Private Sector - UNRWA -Others)
1	---------	----------
2	---------	----------
3	---------	----------
4	---------	----------

17. The average monthly of the current household income

☐ < 1000 NIS ☐ 1001-1500 ☐ 1501-2000 ☐ 2001-3000
☐ 3001- 4000 ☐ > 4000

18. The average monthly of household income before Al-Aqsa's Intifada

☐ < 1000 NIS ☐ 1001-1500 ☐ 1501-2000 ☐ 2001-3000
☐ 3001- 4000 ☐ > 4000

The Second Section: The Current Situation of Water Supply Service

1. The resource of water supply for domestic use is

☐ Municipality ☐ UNRWA ☐ Municipality + UNRWA
☐ Private well ☐ Others (Specify)

2. Are you satisfied with water quality that supplied by municipality

☐ Completely Satisfied ☐ Satisfied ☐ Don't know
☐ Dissatisfied ☐ Completely Dissatisfied

3. Do you think that the current supplied water causes some diseases for your family ?

☐ Yes ☐ Don't Know ☐ No

4. Are you satisfied with water quantity that supplied by municipality?

☐ Completely Satisfied ☐ Satisfied ☐ Don't know
☐ ☐ Completely Dissatisfied Dissatisfied

5. The water is available per day for

☐ Less than 4 hours ☐ 4-10 ☐ 11-17 ☐ more than 18
☐ Don't know

6. Are satisfied with water continuity that supplied by municipality?

☐ Completely Satisfied ☐ Satisfied ☐ Don't know
☐ Dissatisfied ☐ Completely Dissatisfied

7. The capacity of water storage in your house is

☐ Less than $1m^3$ ☐ 1-2 ☐ 2-4 ☐ more than $4m^3$

8. Are you satisfied with the water network maintenance?

☐ Completely Satisfied ☐ Satisfied ☐ Don't know
☐ Dissatisfied ☐ Completely Dissatisfied

9. Do you agree that there is a community participation in decision making regarding water issues?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

Mention the reasons ……..

10. Do you know the average monthly water consumption of your household?

☐ Yes (Determine) ……. ☐ No

11. The average amount of water bill per month is ……. NIS

12. The resource that your household use for drinking water

☐ General water network ☐ Bottled water ☐ Roving trucks
☐ Filter device ☐ Others (specify)

13. The amount that paid monthly for non-municipal drinking water is ……NIS

14. Are you agree that it is necessary to improve the level (both quality and quantity) of the current water supply service?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

15. Are you agree that the improvement of the water supply service needs additional costs?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

16. If the improving process needs additional cost, which do you prefere?

☐ Remaining the existing situation without improvement
☐ Improving the water supply service with paying the improvement costs

17. If you choose the second choice in the previous question, how much could you pay for the improved service?

☐ Less than 1.25 of the current price ☐ 1.25 of the current price
☐ 1.50 of the current price ☐ 1.75 of the current price
☐ twice the current price ☐ More than twice the current price

18. Do you agree that the high prices may be considered as a main reason for illegal connections?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

19. What is the main cause for illegal connection as you see?

☐ The high price ☐ The bad service ☐ No trust with municipality
☐ Non responsibility of the citizen ☐ Others (specify) ……..

20. Do you agree that the increase in water prices will decrease the water consumption of your household?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

21. Disposal of wastewater occurs through:

☐ Sewerage network ☐ Open channels ☐ Cesspits
☐ Others (specify) ……..

22. If you have a water problem, do you agree that you know the municipal channels through which you could rise your problem?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

23. Do you agree that the municipal staff gives the sufficient attention to citizens' problems concerning water supply service?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

24. Have you gone to the municipality to solve a water problem for you?

☐ Yes ☐ No

25. If the answer in the previous question was "yes", have you found a solution for your problem?

☐ Yes ☐ No (mention the reason) …….

26. Do you agree that the municipal staff in water department needs more training?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

27. Do you agree that it is necessary to increase the municipal staff of water departments or increasing the number of working hours?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

28. Do you agree that the municipality prepares awareness publications to clear the required procedures for water treatments?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

29. Do you agree that there is a reception department to receive people problems?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

30. Do you agree that there is a sufficient coordination between the municipality and the other governmental, social and popular agencies?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

31. Do you agree that there are periodic meetings between the municipality and community to discuss water problems?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

32. Are there issuance of periodic municipal awareness publications regarding water issues?

☐ Yes ☐ Don't know ☐ No

33. Did you participate in awareness activities concerning water supply service

☐ Yes ☐ No

34. If the answer in the previous question was "yes", how many times did you participate since five years?

☐ Once ☐ 2-5 ☐ 6-10 ☐ More than 10 times

35. If the answer in question 33 was "yes", did you agree that your participation was useful?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

36. If the answer in question 33 was " No ", what is the reason?

☐ No invitation ☐ Limited time ☐ No benefit
☐ Others (specify)

37. The status of your water meter

☐ Not exist ☐ Damaged ☐ Working

38. Do you agree that the existence of strong local authority is necessary for successful application to water tariff?

☐ Strongly agree ☐ Agree ☐ Don't know
☐ Disagree ☐ Strongly disagree

39. Please, record any valuable suggestions that help is establishing abase line for a suitable water tariff for improved water supply service.

……
……

The Third Section: Measurement of Willingness to Pay for Improved Water Supply Service.

Dear /

Imagine that your dwelling is connected to a national Palestinian water system. Also imagine that the water is available every day for most of the day, that the flow in the tape is always good, and that the water is safe/clean/healthy/potable. Such improved water services imply increased costs, which will have to be covered. Those who use more water will have to pay more.

Now I would like to ask you some questions about how much your household would be willing to pay for improved water services. I will describe the nature of the improved services and then ask your whether you would like to have the service at a suggested price. During this procedure, you shall have to think about the advantages and disadvantages of subscribing to the improved service and to consider how much the service is valued to you and your household.

:

In the so-called bidding game that is about to start, we would like you to indicate your willingness to pay for the improved services within the total income of your household and your budget limit. We would like to inform you that it is in your best interest to indicate your true/real willingness to pay. Only by so doing can you help the related agencies to develop a fair national water tariff system. You should be aware that every household has different needs and economic standing. There exist no "right" answer. Please respond to the questions on the basis of your own needs and financial situation.

1. If the price you are charged for water were NIS 8 per m^3, would you like to purchase this service?

Yes	(2)
No/DK/Not sure	(4)

2. If the price you are charged for water were NIS 16 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(3)

3. If the price you are charged for water were NIS 12 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	Stop; enter NIS 8 below

4. If the price you are charged for water were NIS 4 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(5)

5. If the price you are charged for water were NIS 3 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(6)

6. If the price you are charged for water were NIS 2 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(7)

7. If the price you are charged for water were NIS 1 per m^3, would you like to purchase this service?

Yes	Stop; enter bid below
No/DK/Not sure	(8)

8. What exactly is the maximum price per m^3, would be willing to pay for this

improved water service? ---------- NIS

HIGHEST BID ACCEPTED: ---------- NIS