An-Najah National University

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Implications of Water Management Policies on Water Poverty in Palestine

By

Rawand Bassam Othman Bushnaq

Supervisor

Prof. Marwan Haddad

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Implications of Water Management Policies on Water Poverty In Palestine"

Master Thesis

Submitted by

Rawand Bassam Bushnaq

This thesis was defended successfully on the 21st of September, 2004 and approved by:

Committee Member	Signature
Prof. Marwan Haddad/Chairman	
Dr. Anan Jayyousi/ Member	
Dr. Abed Al-Rahman Al-Tamimi/ Member	

Dedication

To

My Mother

My Ant

My Husband, Ashraf Quraish

My kids, Ahmad and Dala

Acknowledgment

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Abstract

This research aimed at understanding and describing the impacts of alternative governmental policies on water supply and demand, poverty and income, water quality and water-related eco systems, and food production and food security, on public, and estimating and analyzing water poverty index using various published methods.

To accomplish these objectives a field questionnaire and interviews have been developed.

The population of the questionnaire was the residents of the West Bank. Interviews were held with persons from West Bank Water Department, Palestinian Water Authority, and Municipalities.

The water poverty index was calculated using different approaches, Conventional Composite Index, Holistic, Matrix and WPI Pentagram, Simple Time Analysis, Falkenmark Water Stress.

It was found based on results of field survey that the best approach in estimating water poverty index was the Holistic approach, the estimated water poverty index was WPI= 39.5 percent which indicates that the region faces a serious water problem.

To analyze the results of the questionnaire, different statistical techniques have been used. These include means, standard deviations, and

percentages, one way analysis of variance and Scheffe Post Hoc test, and independent T test.

The main findings of the research were:

1. Significant differences between mails and females in the consumptions of water domain in favor to males.

2. Significant differences due to differences in the place of living for consumption of water, health situation, and sanitation services domains in favor to peoples living in cities. This may be due to the fact that still there are some villages not connected to network, also due to the economic situation for peoples living in villages and refugee camps.

3. Significant differences due to differences in the number of families in the house hold for the consumption of water and sanitation services domains. No differences are shown for the other domains. It is found that houses of one family consume less water than houses of two and three families. For sanitation services it is found that houses of one family have better services than houses of two and three families.

4. Significant differences due to differences in family members number for: supply of water, consumption of water, health situation, and water quality domains with favor to families of fewer members.

5. Significant differences due to differences in monthly income for: supply of water, sanitation services, and water quality domains with favor to higher monthly income.

6. No significant differences due to water percentage from monthly income for all domains. It was found that 15.4% of people's sample pay from 21-40% of their monthly income for water services which is a considerable percentage.

7. According to the sample surveyed, it was found that the standard of living was distributed according to the following categories as:

8. 46.3% of the sample surveyed was of better-off category,

9. 50.4% of the sample surveyed was of middle category,

10. 3.2% of the sample surveyed is of worse – off category.

11. Significant differences between existence of water tank and not for all the domains with favor to house with water tank.

12. Still there are some regions not connected to safe water and sanitation. As a consequence, water – and sanitation – related diseases are spread there. About 20% of the sample members were affected by water related diseases.

13. From the results of the interviews, it was found that the existing tariffs do not encourage water conservation, and are generally inadequate to recover operation and maintenance costs.

14. From the results of the interviews, it was found that the future tariff structure (developed by PWA) did not take into consideration those class of peoples whom can not pay for water.

15. Imports of virtual water on one hand could reduce agricultural water and as a consequence could help in alleviating water scarcity (by

saving water for other purposes). But on the other hand could have negative impacts on Palestinians economical situation.

16. Low water prices and subsides for capital investment and operation and maintenance threaten the financial viability of irrigation and water supply.

17. There is no role for private sector in management or expansion of water sector services

18. The existing water allocation mechanisms are characterized as inefficient and not clear as they are a continuation of the system practiced before peace negotiation.

19. Clarifying and strengthening water rights can play an important role in improving water allocation equity and efficiency, while a lack of effective water rights systems creates major problems and inequities for managing increasingly scarce water.

20. Making the water rights tradable may have disadvantages more than benefits under the current situations.

21. Access to safe water is crucial for poor residents. Often women, the poor, and disadvantaged groups, including minorities and indigenous peoples, have unequal access to water, which can lead to even greater increases in poverty.

22. Privatization of water sector could help in improving access to water for the poor if privatization is done in a studied way.

23. Trade-off among multiple uses of water is possible if practiced under complete control.

24. Under the current situation, no real control over the complete system can be practiced, so policies and action regarding water pollution and quality are difficult to implement.

Chapter One

Introduction

Millions of people throughout the world do not have enough water to sustain their livelihoods so they have reduced capacity to lift themselves out of poverty. The relationship between poverty and water is complex, but water is such a valuable resource that it must be managed responsibly, to ensure long term sustainability for future generations. Water is essential for life, and an adequate water supply is a prerequisite for human and economic development. It has been recognized that human behavior can impact both water, and the global ecosystem, resulting in the need to regulate human behavior in order to stabilize and sustain our future.

In the Palestinian Territories, water is the most specious natural resource and its relative scarcity is a major constraint on economic development. Furthermore, the control and allocation of water resources in Palestine are considered crucial issues in the bi and multilateral peace negotiation.

1.1 Water resources in Palestine

Palestine's natural water resources are relatively limited and scarce. The existing regulations imposed by the Israeli government on Palestinian water utilization and the denied access to the ground water aquifers, the Jordan River, have further reduced water quantities at hand. Lack of permits to construct water reservoirs and structures to capture runoff water has also decreased the efficiency of utilizing rain water. The present fresh water supply in Palestine originates from four main water aquifers: three in the West Bank and one in the Gaza Strip. Water from these aquifers reaches the surface through either wells or as natural springs. The total annual replenishable water in these aquifers is estimated at 600 million cubic meters (MCM) in the West Bank and 60-80 MCM in the Gaza Strip.[2]

Palestine's ground water aquifers depend solely on rainfall for the replenishment of their water. However, in Palestine, a semi-arid region, annual rainfall ranges from 150 mm in the east and south to 600 mm in the north with drastic fluctuations from year to year. Therefore, rain water infiltration to the groundwater aquifers in Palestine barely makes up for the current water consumption levels from these aquifers. Consequently, quantities and methods of water utilization for aquaculture from these aquifers are limited and must not affect water availability for either domestic or agricultural uses. Palestinian use of groundwater is strictly regulated by Israel. Palestinians in the West Bank and Gaza Strip are confined to a total water quota of approximately 200 MCM out of the available 660-680 MCM while the remaining water is used by Israel. In spite of the peace negotiations between the Israelis and the Palestinians, limitation on groundwater use is continuing and likely to remain in effect.[2] Table 1.1 summarizes some water resources data for Palestine including the West Bank, and the Gaza Strip.[2, 24, 44]

Table 1.1 Summary of water resources data for Palestine.

	Population		
	West Bank	**Gaza Strip**	**Palestine**
	2,356,810	1,364,733	3721543
Total annual renewable water (MCM)	600	60-80	660-680
Water use for agriculture (MCM/Year)	86	80	166
Water use for domestic purposes* (MCM/Year)	34	45	79

*Industry's share about 3%.

1.1.1 West Bank water resources

Approximately 364 Palestinian-owned and 32 Israeli-controlled water wells are currently tapping water from the West Bank aquifers. The total pumping from the Palestinian wells reaches approximately 58 MCM every year for both domestic and agricultural uses. Few permits are given to Palestinians after 1967 to drill new water wells and water pumpage from the aquifers is strictly limited. Most Palestinian wells operate at low efficiency and are low in depth in the groundwater table. Thus, water availability for aquaculture from underground sources is limited. Fewer restrictions are imposed on use of springs in Palestine. As water is stored deep underground, it maintains a constant temperature ranging from 18-22°C throughout the year. Water in these aquifers is also unpolluted and of high quality for aquaculture.[2]

Spring water originates from underground aquifers, and discharges to the surface from naturally existing water holes or wet spots on the hillsides of the West Bank middle mountain range and along the banks of the wadis (Valleys). While none exist in the Gaza Strip, West Bank springs constitute an important component of the total water resources available for aquaculture. There are approximately 527 known springs in the West Bank and many other smaller springs and seeps. The total annual flow of the West Bank springs has been estimated at over 57 MCM a year, approximately 50% of the annual West Bank water consumption. Nearly 42% of these springs are used for irrigation at some level and about 25% are used for drinking and domestic purposes. The remaining 33% of West Bank springs remain unused.[2]

The way springs are utilized in Palestine varies with location and discharge. In most locations, water flows by gravity in open dirt or cement channels or in pipes to irrigate the fields. This simple method is used in more than forty locations, mainly in Valleys of Bidan and Fari'a, in the northern parts of the Eastern Slopes region. To increase the efficiency of utilization, many farmers have built various sized water storage ponds. When farmers receive their share of water at times inconvenient for irrigation (e.g., after dark or during sleeping hours) or in quantities exceeding their needs, water is stored in these ponds for later use. Currently, there are over 85 sites that use water storage ponds. Springs with large flow, in most cases exceeding 50,000 m3 per year, are regularly monitored by the Hydrology Department of the Israeli Ministry of Agriculture with regard to flow rates and salinity. The remaining springs are small in discharge, many amounting to little more than seepage. Not all springs are perennial and many are independent on the annual rainfall where their discharge rises to high levels in years of substantial rainfall and drastically falls off in dry years. For fish farmers utilizing such springs, monitoring the rainfall rate during the rainy season (mostly between November and March) enables them to predict a spring's discharge for the rest of the year and thus avoid unpredictable water shortages. This information is also crucial for reaching decisions on farm management issues such as aquaculture technique and stock density for the year.[2]

Several springs in Palestine are affected by pumping groundwater from nearby water wells. Excessive pumping may drop the water table in the underground aquifer to a level below the outflow point of the spring. In such cases, springs may frequently dry out. A’uja spring is one example.

Most springs are community owned and managed. Access to water and water rights is earned with the title to a piece of land in the community. Water from springs, for drinking purposes, is made available for all community inhabitants, while irrigation water is distributed to farmlands in quantities corresponding to the farm size.

The water share of each farm and supply hours are strictly controlled and agreed upon by all beneficiaries. Gate valves ensure the diversion of spring water to only a certain number of farmers at a time, depending on a spring's discharge, to allow enough water flow.

The prevalent water distribution system limits the type and scale of aquaculture projects which may depend on these springs for water supply. A steadier water supply can be obtained at sites near major water channels or adjacent to a spring's headwater. To respect the existing water shares and distribution schedule, aquaculture systems based on spring water should be designed to maintain the continuity of the water flow in the main water channel at the regular rates. Flow-through aquaculture systems would satisfy this requirement.

Although direct contamination of spring water with pesticides is not likely to happen, constructing aquaculture farms near the headwater will certainly reduce risks of water contamination by other pollutants such as feces from animals drinking from the water channels, or oil spillage from water pumps. Operating at areas near the headwater also allows the utilization of water with relatively constant temperature over the year. Table 1.2 below gives the total available water whether it originates from wells or springs for both domestic and agricultural uses.[18]

Table 1.2 Total water available through springs and wells in West Bank.

Available water MCM/Y	Wells	Springs	Total
Domestic water	32.37	1.63	34
Agricultural water	26.85	59.15	86
Total	59.22	60.78	120

1.2 Palestinian economic situation

The economic situation in the Palestinian Territory and the living conditions of the Palestinian people, have worsened over the last two years. In fact, the economic situation and living conditions in many respects are worse now than they had been before the signing of the Declaration of Principles in 1993.

The GDP dropped by about 9% in 1995 and projections indicate that it will likely fall by about 15% this year. The per capita income of Palestinians has dropped from $2,600 to $1,800, (In Israel, income is approximately $16,000). The Palestinian unemployment rate reached the unprecedented high of 50%, and Palestinian exports have dropped by 50%. Furthermore, the budget deficit of the Palestinian National Authority is increasing and accompanying social and political problems are on the rise.[26]

1.3 Definition of terms

This section includes definitions of the most important terms.

1.3.1 Water poverty

Water poverty is defined as a situation where a nation or region cannot afford the cost of sustainable clean water to all people at all times.[10] Water

poverty is the relationship between availability and access to water and the socioeconomic status of an individual or group of people.[15] People can be 'water poor 'in the sense of not having sufficient water for their basic needs because it is not available. They may have to walk a long way to get it or even if they have access to water nearby, supplies may be limited for various reasons. People can be 'water poor' as they are 'income poor'; although water is available, they cannot afford to pay for it.[15]

There is a strong link between 'water poverty' and 'income poverty'. A lack of adequate and reliable water supplies leads to low levels of output and health. Even where water supply is adequate and reliable, people's income may be too low to pay the user costs of clean water and drive them to use inadequate and unreliable sources of water supply.[15]

1.3.2 Water management policies

Management is essentially a social process. It is believed that better water management would increase the productivity of land and water, and empower poor people to improve their lives. Water management policies may affect all aspects of life including the level of water supply coverage by space and class of people, the proportion of domestic budget spent on water resource and supply development, the level of community involvement, the guarantees given to local, private, and international funding sources, and the institutional arrangement development.

1.3.3 Water poverty index

To get a better understanding of how water can best be managed to meet people needs, the Water Poverty Index (WPI) will be introduced. The water poverty index is a new holistic water management tool that is mainly

relevant at the community level. It can be used to determine priorities for action and to monitor progress towards targets. The water poverty index (WPI) provides such a simple and easy-to- use indicator for the water sector. It can be used by water managers and planners. But, at the community level, it is also possible for people to apply it to their own situations to understand how water can best be managed to meet their own needs, and to lobby for action. The idea of a water poverty index (WPI) is to combine measures of water availability and access with measures of people's capacity to access water.[15] So, water Poverty Index (WPI) is used:

- To provide a better understanding of the relationship between the physical extent of water availability, its ease of abstraction, and the level of community welfare.
- As a mechanism for the prioritization of water needs.
- As a tool by which progress in the water sector can be monitored.

The water poverty index must follow the following criteria in order to ensure that it will be useful:

- Easy to calculate
- Cost effective to implement.
- Based mostly on existing data.
- A transparent process.
- Easy to understand.

1.4 Research objectives

The main objectives of this research are to:

1. Understand and describe the impacts on people of alternative governmental policies on water supply and demand, poverty and income, water quality, and food production and food security.

2. Estimate and analyze water poverty index using various published methods and decide on the best estimation method suitable for the Palestinian case.

Chapter Two

Background

Water is increasingly seen as one of the most critically stressed resources, a resource requiring the attention of policy makers, resource managers, and governments. The real proportion of people in developing countries served with water supply remains between 30 and 40% and those with effective sanitation even less.[17] This makes us to ask where does the problem lies? I would propose that the problem lies with the overriding conditions of poverty which has become a defining characteristic of developing nations. Developed nations are rich and developing nations, by definition, are poor. One of the problems in the water supply and sanitation sector is the tendency to work in isolation both from other sectors and from the broad economic, political and social realities which exist in these countries.

Poverty effects all levels and all aspects of society

The first element of the nature of poverty which needs to be understood is that poverty affects all aspects of society. An understanding of the all pervasive nature of poverty is important when assessing its impact on any particular individual sector. Poverty effect the whole range of institutional life from the public institutions of government to the individual level. Institutional poverty has the following characteristics:-

- Public institutions are not able, because of the poverty of individuals and the corporate private environment, to raise funds from taxes and revenues.

- public sector conditions of service are therefore very poor with extremely low salaries and inadequate working conditions, public spending on basic necessities such as education and health

care are very low, it is difficult to attract and keep good caliber public servants and capacity building programs are often tickets to leave public service for more attractive opportunities, the capacity and experience of officials is consequently often inadequate, fertile grounds are laid for corruption and graft, systems of patronage and nepotism often result in political interference, mounting foreign debt is accompanied with an inability to compete on international markets, and the gap of technological advancement, particularly in information technology, is ever widening.

Individual poverty is characterized by:-

- Very low levels of formal employment, particularly in rural areas and poor urban fringes.
- Access to basic services is very difficult and is often comparatively very expensive.
- For the vast numbers of people surviving below the poverty line each day requires enormous skill and creativity in order to survive.
- Disease and poor health are constant realities.
- Even minimal costs for basic services represent a large proportion of disposable income.
- Education, if available, is of a very low standard and literacy levels are very low.

All of these factors contribute towards the "poverty cycle" where each element is both a cause and an effect. For example, the lack of adequate education is an indicator of poverty and a cause of poverty. The same is the

case for water supply and sanitation. Thus, the vast populations which find themselves trapped within the cycle of poverty are unable to escape. In order to break the cycle effective measures on necessary at all levels from national government to the individual. It is extremely unlikely that any single element such as health care, education or the provision of basic water services will be able to transcend the constraints of the poverty cycle whilst the rest remain constrained.

2.1 Poverty and water supply management

Scarcity is a function of demand and availability. The traditional neo-Malthusian view is that resources are fixed while demand rises as a function of population growth. This view underlies the most widely used indicator of water stress or scarcity, which is based upon renewable water resources per capita (or number of people depending on a unit of renewable freshwater).

Falkenmark (1986)[9], who advanced this indicator, she assumed countries need to be self-sufficient in terms of food due to their low purchasing power. Hence she defined water scarcity and stress as a function of the ability to maintain food self-sufficiency.

According to the conventional use of this index today water scarcity is defined as occurring when the annual per capita water supply of a country is less than $1700m^3$. Above this level a country would generally be suffering from little or no water scarcity, while below this level it would be suffering from water stress, as water shortages become more pervasive. Below $1000m^3$/capita a country would be facing water scarcity where water shortages threaten economic development and human health and well-being. Below $500m^3$ /capita, a country faces absolute water scarcity (Raskin,

Gleick, Kirshen, Pontius & Strzepek, 1997). Demand for water is not constant. Rather it is expected to grow as a function of population growth. Thus a country with existing water stress and high population growth can expect to face growing water stress or scarcity over time (Falkenmark, 1986).

Raskin *et al*. (1997)[30] riticize this indicator, as it does not reflect the significant differences in water use patterns between countries. Moreover, this type of indicator does not account for the multiple in-stream uses of water. They suggest instead a use per resource indicator, based upon the percentage of available water resources withdrawn for different uses. Such an indicator highlights the water remaining for in-stream usage (including ecological use) that are disregarded in the per capita indices. They also suggest augmenting this index with a figure noting the percent of water whose sources lie outside the country, thus highlighting the dependency on transboundary water, which are less certain from the lower riparian's perspective. These indicators, however, do not include water quality aspects or the economic capacity of countries to develop water resources, a lacuna that is acknowledged by Raskin *et al*., (1997).

Ohlsson (1999)[19] followed by Turton (1999) [20] raise a more fundamental critique, as they point out that the neo-Malthusian type of indicators do not address the ability of a nation to adapt to reduced per capita water availability. Allan (2001)[1] showed, for example, that for the Middle East water for irrigation is being substituted for by what he terms ''virtual water'' (more widely known as food imports). Across much of the region to a greater or lesser extent, and even in many arid Middle Eastern countries of moderate income, food needs have been largely met by virtual

water for many years. This observation has wide implications in discussions of water indicators, as it shows that the food self-sufficiency assumption underlying them is unfounded. In practice, food imports are available also in non-affluent countries. Allan (2001) therefore argues that the question of food sufficiency should be analyzed at the global level. Yet as Gleick (2000, Chap. 4)[13] has recently shown analyses of the relations between water and food supply at this level have to address a series of questions to which we do not have ready answers at present. As a result of this realization the focus of the water discourse in recent years has been shifting toward water as a human rights issue, focusing on the basic water needs of households for domestic use and household access to such water (Gleick, 1996, 1998, Chap. 1; 2000, Chap.1).[11, 12]

None of the indices noted so far indicates the severity of problems from the household perspective. Moreover, none of these indices explicitly addresses water quality, an issue of primary importance for domestic use. Conversely, the WHO/UNICEF (2000)[43] does address issues relating to access to water at a domestic level but does not address the state of the water resources themselves. The challenge is how to merge these two different perspectives in a policy relevant way.

In the last decade the World Bank (1993)[42], as well as many analysts, encouraged a shift to an economic view of water. From an economic perspective water is seen as a commodity (Winpenny, 1994)[41] At the heart of the economic approach is the view that most resources are scarce, and that scarcity is reflected in prices. As demand rises relative to supply, prices rise. This should be true for water as for any other commodity. Thus, if water is indeed viewed as a commodity, and treated as such, then price

mechanisms should offset demand and supply. In other words, water scarcity should be no more of an issue than scarcity in any other commodity. The only difference between water and other commodities lies in the greater difficulty in setting water prices, due to the several market failures typical of water economics: economies of scale generating local natural monopolies, a wide range of externalities, frequent cross-boundary effects, and the substantial transaction costs involved in pricing water effectively, not least the need to meter all use (Rogers, 1992).[31] Therefore, the most pertinent water policy issue from this perspective is how to establish an appropriate price system for water, or a market for water in which prices will be determined (Winpenny, 1994).

From a theoretical stance, the introduction of prices suggests an endogenous response to supply limitations. As water prices escalate, it becomes worthwhile to tap into less accessible water resources, assuming a closed market. In other words, as prices go up additional financial resources become available so that the cost impediments to the use of less accessible water can be overcome.

As water prices escalate, new more costly water supplies are tapped, thus increasing supply quantities and raising both marginal and average water supply costs. The new water sources can be deeper aquifers, more distant surface water, and reclaimed wastewater, desalinated brackish water, or at the extreme, desalinated seawater. Thus, from this perspective all water on earth, including seawater, should be viewed as potentially available for human use. The only reasons for water scarcity from this perspective are human failures, manifest in institutional structures that lead to under pricing of water, thereby annulling the equilibrating price mechanism.

Biswas (1991)[4] notes that a major impediment to the use of water pricing is the disregard for the socio-political implications of such pricing, especially in developing countries. In particular, such proposals disregard the role of water subsidies as tools to achieve socio-political goals, such as the provision of clean drinking water to the poor, so as to improve health and living conditions, or to support specific groups that possess political clout. This concern is part of a wider concern regarding the ability of such countries to meet the costs of the water projects that will be required to supply their populations with clean water (Allan, 2001). Thus, despite the fact that potential additional water supplies exist and can be tapped from a technical point of view, they may remain inaccessible to significant population groups due to the lack of funds. This suggests that the concept of water poverty and the related problem of affordability of adequate water supplies are both issues that are fundamental to the development of an appropriate water indicator. Critical to the question of whether an economic approach to water scarcity or a related approach can be adopted by a country is the issue of adaptive capacity. Adaptive capacity is the sum of social resources that are available within a society that can be mustered in order to effectively counter an increasing natural resource scarcity. There are at least two distinct components to adaptive capacity (Ohlsson, 1999). Firstly, the structural component comprises the sum of the institutional capacity (including financial capacity) and the intellectual capital which allows for the generation of alternative solutions by technocratic elites. Secondly, the social component consists of the willingness and ability of the social entity to accept these technocratic solutions as being both reasonable and legitimate. Ohlsson and Turton (1999)[20] argued that water scarcity should be decomposed into first-and second-order scarcities, where second-order

scarcity pertains to the lack of adaptive capacity. They suggest that second-order scarcity is often the more important of the two.

Homer-Dixon (1995)[14] follows a similar strain, though he suggests that there is a reciprocal relationship between first-and second-order scarcities, when both are stressed.

Ohlsson (1999) suggests that the Human Development Index (HDI) together with water scarcity can be used to generate what he terms a social water scarcity index. The HDI is itself a composite index measuring human development annually on a national basis, through measuring life expectancy at birth, the adult literacy rate, the combined education enrolment ratio, and the adjusted per capita income in purchasing power parity in US dollars (United Nations Development Programme, 2000, p.147). Yet, as Dasgupta (2001)[7] points out, only the adult literacy rate has any causal relation with human capital formation, and hence with the generation of capacity. Moreover, even this relationship is tentative at best and does not pertain to the development of institutional capacity. Thus, while this index of social water scarcity may indeed be an improvement on the basic indexes of water scarcity developed previously (as Ohlsson (1999) shows), it is dependant on a proxy rather than a causal connection or direct means for assessing the adaptive capacity of society. It fails to provide a direct measure of whether a country has the ability to deal adequately and effectively with water scarcity through adaptive and technological processes. Moreover, it does not address directly water quality issues or the financial aspects of water provision.

Recently, the term water poverty has been advanced as an indicator. Salameh (2000)[34] described a ‘‘water poverty index’’ defined as ‘‘the ratio

of the amount of available renewable water to the amount required to cover food production and the household uses of one person in one year under the prevailing climate conditions''(p.146). Yet, as Sullivan (2001)[37] notes in her comment to his paper this definition does not relate to the poverty notions as they are currently referred to and does not address sufficiently the non-food aspects, the importance of which is rising. It also ignores the ''virtual water'' import options identified by Allan. Sullivan (2000)[36] advances an alternative notion, suggesting that water poverty should be an aggregate index based upon the percentage of water being used in a region combined with percentage of the population with access to safe water and sanitation, and the percentage of the population with easy access to water for domestic use .

While this index has the advantage of focusing on the domestic sector and poor people's need and improves on the WHO practice by adding the water use ratio, it too does not incorporate water quality aspects, and does not assess the capacity to address water issues. Moreover, the aggregation of any such multi-dimensional index is always fraught with conceptual and practical problems (Dahl, 1997)[6]. Using a collective expert judgment to determine the weightings of a multi-dimensional index results in an index that is subject to the value judgments and cultural biases of those who created it, while arbitrarily adopting an equal weighting for all components of an index is a de facto weighting in itself that is no less problematic.

Feitelson (2002)[10] describe a different approach for portraying the structural water situation faced by different countries in a comparative manner. The approach is based upon several observations. One, water can be supplied in increasing quantities at increasing cost. Two, water quality

restricts water usage if health and well-being are to be maintained. Three, water usage cannot be limited to the perspective of the current generation. Rather, it is necessary to take future generations into account. Four, in many countries with ample rainfall, by international comparisons, many people do not enjoy access to water for basic health and sanitation needs. Five, water can be used more than once, but increasingly this necessitates that effluents be treated. This is also necessary so as to reduce negative health and environmental externalities. In other words, water quality can also be maintained or improved at a cost. On the basis of these premises, the definition of water poverty that they propose is: Water poverty is a situation where a nation or region cannot afford the cost of sustainable clean water to all people at all times.

2.2 Water poverty index and its estimation

The purpose of a water poverty index must be to identify the degree to which countries or regions are likely to face problems in addressing their water supply needs, taking into account water quality and affordability issues. Such an index could focus either upon the current situation, in terms of the water supply and sanitation conditions present in each country or region, or it could focus more on structural issues, in particular the ability to provide water in a sustainable manner, where sustainability is broadly defined to include intra-generational as well as inter-generational equity.

A number of methods could be used to produce a Water Poverty Index. The structure of the Water Poverty Index would be determined, possibly as a definition of a ‘‘water poverty line,’’ perhaps as a calculation of ‘‘the water poverty gap,’’ even as a GIS-based decision tool, or perhaps a combination of all of these. While this still is an issue which needs to be determined by

consensus, some suggestions are provided as to how the Water Poverty Index can be brought into being.

2.2.1 Falkenmark water stress index [39]

Malin Falkenmark, a widely respected Swedish hydrologist, pioneered the concept of a "water stress index, "based on an approximate minimum level of water required per capita to maintain an adequate quality of life in a moderately developed country in an arid zone. Falkenmark began with the calculation that 100 liters per day (36.5 cubic meters per year) is a rough minimum per capita requirement for basic household needs to maintain good health. The experience even of water- efficient and moderately developed countries shows that roughly five to 20 times this amount tends to be needed to satisfy the requirements of agriculture, industry and energy production, she found. Based upon these findings, Falkenmark suggests specific thresholds of water stress and water scarcity.

A country whose renewable fresh water availability, on an annual per capita basis, exceeds about 1,700 cubic meters will suffer only occasional or local water problems. Below this threshold 'Countries begin to experience periodic or regular *water stress.* When fresh water availability falls below 1,000 cubic meters per person per year, countries experience chronic *water scarcity,* in which the lack of water begins to hamper economic development and human health and well-being. When renewable fresh water supplies fall below 500 cubic meters per person countries experience *absolute scarcity.*

These levels should be considered rough benchmarks, not precise thresholds. The exact level at which water stress sets in varies from region to region, a function of climate, level of economic development and other

factors. Water stress can also be eased by comprehensive programs of water conservation and more efficient technologies. But the basic concept of scarcity thresholds provides a useful tool for considering how changes in population can affect per capita water supply, and hence abundance on country-wide scales.

The 1000-cubic-meter benchmark has been accepted as a general indicator of water scarcity by World Bank and other analysts. Gleick, of the Pacific Institute, has called it the "approximate minimum necessary for an adequate quality of life in a moderately developed country. Israel, a relatively prosperous country, is commonly cited for surviving on much less--461 cubic meters of fresh water per person (although Israel also depends on some non-renewable groundwater). But even countries with high water availability may experience problems because of regional disparities or very high water demand. Acknowledging such discrepancies, however, hydrologists and water use experts find 1,000 cubic meters serves as a useful benchmark for water scarcity around the world. Falkenmark's higher stress benchmark of about 1,700 cubic meters per capita per year is a "warning light "to nations whose populations continue to grow. In time, in the absence of conditions that lead to population stabilization, most water-stressed nations will fall into the scarcity category. Therefore Falkenmark index: water resources per capita per year.

2.2.2 The Conventional composite index approach [38]

In this approach, the index itself would be constructed from a series of variables which capture the essence of what is being measured. This can be done using national scale data (a top-down approach),or at a local level, using locally determined values and parameters (a bottom-up

approach).Using the composite index approach, the WPI could comprise various elements, such as:

(i) Water availability,

(ii) Access to safe water,

(iii) Clean sanitation, and

(iv) Time taken to collect domestic water.

This would result in the WPI formula as follows:

$$WPI = W_aA + W_sS + W_t(100-T) \quad (1)$$

Where,

A: adjusted water availability (AWA) assessment as %. Calculated on the basis of ground and surface water availability related to ecological water requirements and a basic human requirement, plus all other domestic demands, as well as the demand from agriculture and industry (The value of A should also recognize the seasonal variability of water availability).

S: the population with access to safe water and sanitation (%).

T: the index (e.g., between 0 and 100) to represent time and effort taken to collect water for the household (e.g., from proportion of population having access in or near the home etc. This could be modified to take account of gender and child labor issues). (100 T) is the structure used to take account of the negative relationship between the time taken to get water, and the final level of the WPI.

W_a, W_s and Wt are the weights given to each component of the index (so that $W_a + W_s + W_t = 1$)

Since A, S and T are all defined to be between 1 and 100, and W_a, W_s, and Wt are between 0 and 1,to produce a WPI value of between 0 and 100,the formula needs to be modified as follows:

$$WPI = 1/3(W_aA + W_sS + W_t(100-T))$$

To use this method effectively, it would be necessary to define and identify the ‘‘base rate’’ on which to calibrate the index values, and to provide an explanation of what exactly the resultant scores meant.

In this method, the higher the value of WPI, the lower the degree of water stress.

2.2.3 Matrix approach [38]

A matrix approach in order to keep the WPI simple and easy to understand, the main characteristics of water stress and human welfare could be combined into a two-dimensional matrix. This would involve the identification of key indicators, representing a suite of appropriate characteristics, and these would then be combined on a suitable scale. It is possible that this could be developed from the analysis discussed in the composite index approach. With this method, the characteristics underlying the WPI could be expressed in a two-dimensional matrix, as shown in Figure 2.1.

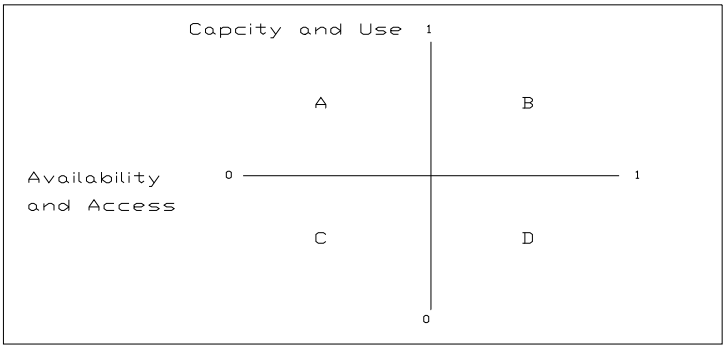


Figure 2.1 A WPI quadrant or matrix approach.

Quadrant A indicates a country or community which scores relatively high on capacity and use, but has a low score on availability and access.

Quadrant B shows relatively high scores on both sets of factors.Quadrant C indicates both water and income poverty, while quadrant covers relatively low capacity and use but high availability and access.

2.2.4 Simple time-analysis approach [38]

A simple time-analysis approach another possible way of addressing the methodology of constructing a WPI, is to use a time analysis approach, where time is used as a numeraire for the purpose of assessing water poverty. In this method, the WPI is determined by the time required (per capita) to gain access of a particular quantity of water. As such, the WPI would be as follow:

$$WPI = T/1000\ m^3$$

Here T is the time required per person to collect a quantity of water (here, 1000 m^3). In cases where the water is provided by infra structure (e.g., in more developed areas) the value of the WPI would be equivalent to the

wage-earning labor time required by residents to enable them to pay the appropriate fee for that level of water provision. In rural areas where infrastructure was less relevant, the figure T would be based on the actual measurement of time required by persons in that household or community, to collect the standard measurement unit (e.g., 1000 m^3).

2.2.5 Holistic approach [5, 15]

This approach is based on constructing an index consisting of five major components, each with several sub-components; the main components are identified below:

Key components of the WPI:

- **Resources**: the physical availability of surface and ground water, taking account of the variability and quality of the resource as well as the total amount of water.
- **Access**: the extent of access to water for human use, accounting for not only the distance to a save source, but the time needed for domestic water collection, and other significant factors. Access means not simply safe water for drinking and cooking, but water for irrigating crops or for industrial use.
- **Capacity**: the effectiveness of people's ability to manage water. Capacity is interpreted in the sense of income to allow purchase of improved water, and education and health which interact with income and indicate a capacity to lobby for and manage a water supply.
- **Use**: the ways in which water is used for different purposes; it includes domestic, agricultural and industrial use.

- Environment: An evaluation of environmental integrity related to water and of ecosystem goods and services from aquatic habitats in the area.

Mathematical structure of WPI

The WPI is calculated using a composite index approach. The five key components are combined using the general expression:

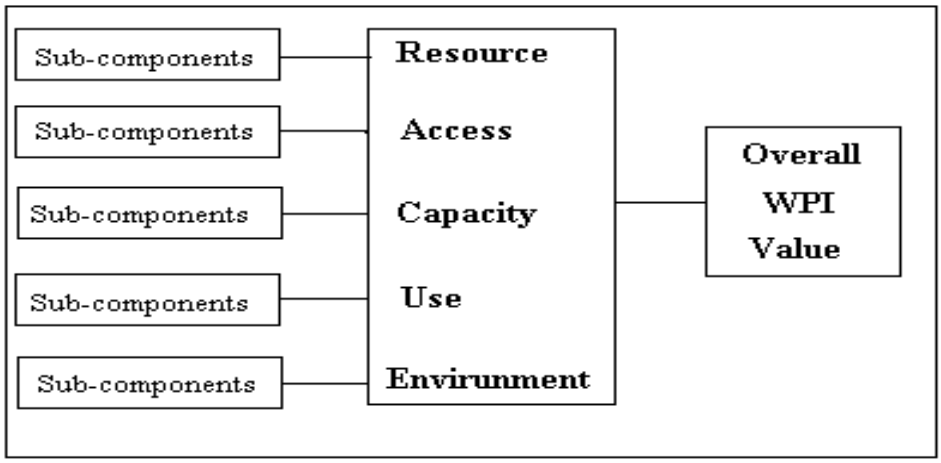
$$WPI = (\sum w_i X_i) / (\sum w_i)$$

Where WPI is the Water poverty Index value for a particular location, X_i refers to component i of the WPI structure for that location, and w_i is the weight applied to that component. Each component is made up of a number of sub-components, and these are first combined using the same technique in order to obtain the components. For the components listed above, the equation can be re- written:

$$WPI = (w_r R + w_a A + w_c C + w_u U + w_e E)/(w_r + w_a + w_c + w_u + w_e)$$

Which is the weighted average of the five components Resources (R), Access (A), Capacity (C), Use (U), and Environment (E). Each of the components is first standardized so that it falls in the range 0 to 100; thus the resulting WPI value is also between 0 and 100.

How the components and sub-components fit into the WPI Structure:



The scores of the index range on a scale of 0 to 100; the highest value is taken to be the best situation-that is, the lowest possible level of water poverty-while 0 is the worst.

A description of each sub-index follows:

1- Resources

This index combines two separate indices: one of internal water resources and the second of external water inflows. Both are calculated on a log scale to reduce the distortion caused by high values, and expressed on a per capita basis. External water inflow amounts are reduced by 50%; this is an arbitrary factor, but it is an attempt to give reduced weight to external water inflows because these resources are less secure than those generated internally within a country. The resources index is a basic indicator of water availability. A significant additional factor that affects availability is the reliability or variability of the resource; it should be included because the more variable the resource, the smaller is the proportion of the total resource that can actually be used. However, we were unable to find an indicator of

variability that is available at the national scale, and this factor had to be omitted. Finally, water quality is also an important factor influencing the availability of the resource. Data on this were found, but have been included under the environment component (see below). To avoid duplication, it was not also considered as art of the resources component.

2- Access

There are three components to this index:

• Percentage of the population with access to safe water

• Percentage of the population with access to sanitation

• An index which relates irrigated land, as a proportion of arable land, to internal water resources. This is calculated by taking the percentage of irrigated land relative to the internal water resource index and then calculating the index of the result. The idea behind this method of calculation is that countries with a high proportion of irrigated land relative to low internal available water resources are rated more highly than countries with a high proportion of irrigated land relatively to high available internal water resources. This index tries to take into account basic water and sanitation needs for relatively poor agriculturally-based countries, recognizing that water availability for growing food is as important as for domestic and human consumption.

3- Capacity

There are four components to this index.

• Log GDP per capita (PPP)(US$). This is the average income per head of population adjusted for the purchasing power of the currency. This is considered to be a much more accurate measure of the average standard

of living across countries. These data are resented in log form in order to reduce the impact of very high values.

• Under-5 mortality rate (per 1000 live births). This is a well-established health indicator, and it is one that is closely related to access to clean water.

• UNDP education index from the *Human Development Report* 2001.

• The Gini coefficient. This is a well known measure of inequality based on the Lorenz curve which gives the distribution of income across the population. Where the Gini coefficient is not reported, the Capacity index is based only on the first three sub-indices. This index tries to capture those socio-economic variables which can impact on access to water or are a reflection of water access and quality. Introducing the Gini coefficient here is an attempt to adjust capacity to enjoy access to clean water by a measure of the unequal distribution of income.

4- Use

This index has three components:

- Domestic water use per capita (m^3/ca /yr). This index takes 50 liters per person per day as a reasonable target for developing countries.

  We then construct a two-way index such that countries at 50 liters = 1. Countries below the minimum have an index calculated such that the lower the value the more they are below the minimum. Countries above the minimum have a lower value on the index the higher they are above 50 liters. This gives some measure of ‘excessive ’use.

- Industrial water use per capita (m^3/ca /yr). Here the proportion of GDP derived from industry is divided by the proportion of water used by industry. The index is derived in the usual way: the higher the ratio of industrial value added share to industrial water use share, the higher the score on the index. This gives a crude measure of water use efficiency.
- Agricultural water use per capita (m^3/ca /yr). The index is calculated in the same way as for industrial water use.

5- Environment

This index tries to capture a number of environmental indicators which reflect on water provision and management and which are included in the Environmental Sustainability Index (ESI)(World Economic Forum *et al.*, 2001). These indicators not only cover water quality and 'stress', but also the degree to which water and the environment generally, and related information, are given importance in a country's strategic and regulatory framework.

This index is calculated on the basis of an average of five component indices. These are:

- An index of *water quality* based on measures of
  - dissolved oxygen concentration,
  - Phosphorus concentration,
  - Suspended solids
  - Electrical conductivity;
- An index of *water stress 6* based on indices of

- Fertilizer consumption per hectare of arable land,
- Pesticide use per hectare of crop land,
- Industrial organic pollutants per available fresh water
- The percentage of country's territory under severe water stress (ESI 's terminology)

- An index of *regulation and management capacity* based on measures of
  - Environmental regulatory stringency,
  - Environmental regulatory innovation,
  - Percent of land area under protected status
  - The number of sectoral EIA guidelines;
- An index of *informational capacity* based on measures of availability of sustainable development information at the national level, environmental strategies and action plans, and the percentage of ESI variables missing from public global data sets;
- An index of *bio diversity* based on the percentage of threatened mammals and birds.

Table 2.1 Structure of index and data used

WPI Component	**Data Used**
Resources	internal freshwater flows external Inflows population
Access	% population with access to clean water % population with access to sanitation % population with access to irrigation adjusted by per capita water resources
Capacity	ppp per capita income under-five mortality rates education enrolment rates Gini coefficients of income distribution.
Use	domestic water use in liters per day share of water use by industry and agriculture adjusted by the sector 's share of GDP.
Environment	indices of: water quality water stress (pollution) environmental regulation and management informational capacity bio diversity based on threatened species. (Note: In the absence of any acceptable figures to represent environmental integrity or environmental water needs, proxy data can be used).

Table 2.1 above provides a summary of the structure of the index and data used to build it.

2.2.6 Comparison between approaches

Table 2.2 provides a comparison between different approaches used for calculating water poverty index.

Table 2.2 Comparison between approaches

Approach	Advantages	Disadvantages
Falkenmark water stress index	Provides a useful tool for considering how changes in population can affect per capita water supply.	
Conventional composite index approach.	The problem of incommensurability does not arise in this method as the index is composed of parts which can be compared as they are all expressed as a percentage (or index number). In addition, by using water access and time spent to collect water as a proxy for socioeconomic well-being (the two can be shown to be highly correlated), so the problems associated with calculating incomes, exchange rates, etc. were avoided.	This approach does not take into consideration environmental issues, and requirements of water for food and other productive uses.
Holistic WPI calculation approach	This approach does not neglect the issues of environmental integrity and ecosystem water needs, or of the requirements of water for food or other productive uses versus domestic needs. It provides a means of understanding the complexities of water issues by integrating the physical, social, economic and environmental aspects, and linking water and poverty issues.	
Matrix approach	The characteristics under laying the WPI are expressed in a two dimensional matrix	This is not a complete description of the frame work because the fifth factor, environment has been omitted for presen-tational simplicity.
WPI pentagram	Using this approach, it is possible to understand more explicitly which attributes of the water sector most need to be developed. So, WPI pentagram can be used to examine the strengths and weakness of the	

	water management components.	
Simple time analysis approach	Very simple, and provides a measure which is universally easy to understand.	The single figure simply reflects domestic issues, and fails to include ecosystem needs and commercial concerns; nor does it really address the water assessment issue in an interdisciplinary, holistic way. In addition, it does not fully address the supply side

2.3 Water management instruments policies

2.3.1 Overall and national policies

Policies are the framework within which resources are managed. To be integrated, water resources policy must mesh with overall national economic policy and related national sectoral policies. Since the multiple users of water are competing, and the pressure on resources is increasing because of growing pollution, the participation of as many different stakeholders and authorities in the management of water resources as possible is crucial.[21]

Environmental concerns the ways in which water policies may have an impact on other environmental media and vice versa must be recognized. At the same time, economic and social policies need to take account of possible water resource implications. Developments outside the water sector – for example national energy and food policies should be evaluated for possible impact on the water resource. Water is a core development issue; its development and management therefore affects almost every activity within the wider economy and society, including migration, land use and settlement

growth and changes in industrial activity. Policy formulation is a core government role. Through its policies, government can delimit the direct and indirect activities of all stakeholders groups, including itself. Government can be a direct provider, or regulate and support other providers. Appropriate policies can encourage participatory, demand–driven and sustainable development. Policies that encourage integrated water resources management include reference to the nation's wider social and economic objectives that make up the development goals of the society. Policies lead to the development of laws and rules and regulation designed to achieve the overall policy goals. Appropriate policies can deal with the many inter-related and complex issues including:

- Assessing the relative environmental, economic and social values of water;
- Recognizing the role of women as users and managers of water resources;
- Taking into account sustainability and environmental issues in planning, design, construction, operation and management of major water projects;
- Assessment of the social impact of water developments;
- Restoring and protecting the quality of surface and ground waters;
- Introducing procedures to designate, evaluate and conserve surface waters;
- Introducing flexible drought and flood management strategies;
- Mandating the provision of easily accessible, accurate and up-to-date data on water resources and needs;

- Linking water policies with other ecosystem policies;
- Estimation of the costs of policies and identifying the means for financing them.

A National Water Resources Policy sets goals and objectives for the management of water resources at the national scale and includes policies for regions, catchments, shared or trans-boundary water resources, and inter-basin transfers. It addresses both the quantity and quality aspects of both surface and groundwater resources and also deals with delivery of water services. A national policy may include matters of jurisdiction and delegation and items like: the extent to which management is decentralized or consolidated, the use of economic incentives, capacity building to meet institutional challenges, and the monitoring and control to reduce ecosystem degradation. Policies entail measures with require investments and their costs and benefits should be considered before their adoption Policy reform may be incremental in recognition of changing political and resource priorities, or may be able to respond to major shifts in external circumstances, which enable comprehensive redevelopment of water resources policies. Policies are more useful if they are designed proactively, not just as a short-term response to a crists (although a crists may provide an opportunity for policy change). By failing to anticipate change, and taking a narrow sectoral view, water resources policy development has frequently ignored both macroeconomic and development needs. Some key points for effective integrate policy making are:

- Ensure policies clarify the roles of government and other stakeholders in achieving overall goals and especially define the

role of government as regulator, as organizer of the participatory process and as a last resort adjudicator in cases of conflict.

- Identify and set priorities for key water resources issues to insure a focused policy.
- Recognize that considering water as a social and economic good means designing policies to allocate resources to where they offer the greatest value to society, starting with fulfillment basic needs.
- Make explicit in the policy the links between land use and other economic activities.
- Engage stakeholders in policy dialogue, recognizing potential conflicts and the need for tools for conflict resolution.
- Recognize the importance of subsidiarity, so that water resource allocation decisions are taken at the lowest appropriate level.
- Take into account trade-offs between short tern costs and long tern gains.
- Make functional arrangements and cost allocation explicit.

Governments, at both the national and local level, develop policies, plans and programs of action which directly or indirectly affect water resources management. These include policies and plans for land use (particularly at the local level), environmental protection and conservation, economic development (in such areas as energy, agricultural, industrial developments), and trade. In most countries, water is dealt with by many ministries, for example, agriculture, transport and navigation, power, industry and environment, but there may be little coordination between

them, and their focus is likely to be more on development type issues, than on water resource management.

It is therefore important to recognize the direct impact of non-water policies on water use and management. Tools for coordinating policies and insuring that water implications are taken into account (and that other pectoral interests are recognized in water policies) include the establishment of institutional structure, such as:

- Inter-ministerial coordinating bodies
- Apex bodies for water resources
- Catchments coordination bodies.
- Local coordinating teams.

To succeed, cross-sectoral mechanisms for coordination need to be driven by strong political champions, committed senior bureaucrats and intemal financial and administrative support. The mechanisms should be setup at the level at which the policy is formulated. Cross-sectoral understanding and commitment is difficult to achieve, but many tools can be used to support the process, including assessment of water resources and needs, and planning processing where recognition of other sectoral needs and priorities are made explicit. The legal frame works itself can setout procedures for working with other economic and social activities.

2.3.2 Regional [3]

Water is one of the reasons standing behind conflicts in the world and especially in the Middle East. The Jordan River system shared by Jordan, Israel, the Palestinians of the occupied territories, Syria and Lebanon is a

major concern in Middle Eastern politics. A solution to the problem of land division in the area will not alone guarantee a successful peace process. In an area with such limited water resources, water management can significantly influence the peace process.

According to Hinduism, the rivers of the earth, such as the Indus, the Ganges, and the Brahmaputra, originated from the mythical Mount Meru, the home of God. In the Christian tradition, water originated from the Garden of Eden and divided the world with the great streams of the Nile, the Tigris, and the Euphrates. Islam gives water its due importance either. The Holy Koran describes how every living thing is made from water. Irrespective of race or nationality water is a spring of life for every living thing. Water is not however available to everyone equally. As shown in Table 2.3 more than forty countries in seven related river basins are involved in sharing the resources as riparian countries, and more than 500 million people growing agricultural products are dependant on their boundary rivers.

Most of the trans-boundaring river basins are situated in developing countries, which are the most critical areas in the world. According to Just & Netanyahu (1998) strengthening co-operation between these riparian countries is one of the most important issues to assist in building long-term mechanisms for sustainable water management. Co-operation will minimize the information gaps and will provide for more efficient assessment of water resources.

Table 2.3 Number of riparian countries and trans-boundary water resource areas Gleich *et. al*.1993, modified by Asheesh 2000)[3]

Water resource area	No. of riparian countries	Area Km^2
Nile	12	3,030,700
Niger	10	2,200,000
Mekong	6	786,000
Lake Chad	6	1,910,000
Volta	6	379,000
Ganges-Brahmaputra	5	1,600,400
The Aquifer (Israel Syria, Jordan, Lebanon Palestine)	5 (Israel & Palestine)	total: 28,300 Km^2 [1] land: 20,330 Km^2 water: 440 Km^2

The area of Middle East belongs to those trans-boundary water resource areas where the problem of water scarcity and sharing developed into a water conflict. Wolf (1995) pointed out that the Middle East is the site of both severe water shortage and intense, often violent, political conflict. Because water scarcity and political tensions have been shown to be inextricably linked in the arid and volatile region, it is crucial to understand the political consequences of hydrological action as well as the hydrological ramifications of political decision-making. Table 2.4 displays data describing Middle Eastern countries population, growth rate and the annual water budget.

Table 2.4 The population, growth rate, and the minimum water requirement (MWR) for the Middle Eastern countries estimates for 2000 and 2020 (Isaac & Shuval 1994 modified by Asheesh June, 2000).[3]

Area	Pop. 2000	Pop. 2020	WRP Mm^3/y	TWC/y 2000 $m^3/P/y$	TWC/y 2020 $m^3/P/y$	Total MWR in 2020 Mm^3/y	Total excess or shortage Mm^3/y	GR (%)
Israel	6.0	9.8	1500	250	153	1229	271	2.5
Jordan	4.7	9.9	1100	234	111	1239	-139	3.8
Palestine	2.6	5.1	300	115	59	634	-334	3.4
Syria	14.9	25.9	10500	705	406	3236	7264	2.8
Lebanon	3.3	4.4	3700	1121	849	545	3155	1.4
Turkey	61.9	83.4	105000	1696	1259	10421	94579	1.5
Egypt	64.3	120.7	60000	933	497	15091	44909	3.2

Pop= population in millions; WRP= Water Resource Potential; TWC= Total Water Capita; GR= growth rate The "minimum water requirement" proposed for consideration is 125 cubic meter/person/year for domestic, urban and industrial use (Isaac & Shuval 1994). According to the research carried out by Shuval this amount of water per person per year has been found to be generally adequate in Israel and other areas shortage with similar climate with water to maintain reasonable hygienic level and a high standard of living based on employment in the urban, industrial sector not including the agriculture. The total minimum water requirement (MWR) is increasing with time due to development and other social economic factors. The population growth rate in Israel increases due to massive Jewish immigration. The population is estimated to be more than two million within the next ten years. This will increase the consumption of water to 30% of the available water resources. In parallel, the returnees into the Palestinian area will also increase the water demand and the need for new water resources as more than 4 million refugees are registered worldwide to return back (Wolf, 1995). Cultural and religious aspects are also important factors securing continuity of population growth; the disproportional

development of population growth and the total water resources per capita in the Middle East will lead to real concerns. By the year 2020 the area will possibly be classified as a catastrophe area in addition to the present conflict.

To minimize the scarcity of water storage and avoiding the conflict the following alternatives have been considered:

For a short term transporting water from the neighboring countries like Turkey could be one solution but not in the long run (Barker 2000). Desalination of sea water is one available option in the long run, Long tern planning and looking for secure water supply and new water resources is an alternative for secure future (Anon, 2000). A water scarcity index should be considered as Falkenmark (1998) pointed out. In any case as long as the relevant hydrological data are not available to the riparian parties it is not possible to know the degree of water availability needed for all water use purposes.

The situation in water consumption in Israel, the West Bank and Gaza Strip around the year 1995 is described in Table 2.5 (Jägerskog, 2000). The study carried out by Järgerskog (2000) implies the inequality in distribution of water in the area. The Israelis are using about 80% of the available West Bank underground water, which is supplying the northern and western part of Israel known as Samaria area, while the remaining 20% is used by Palestinians.

To achieve a balance for both sides the Palestinians and the Israelis including the Jewish settlements inside the West Bank, the water demand is expected to grow to be twofold of the water consumption in the area.

Table 2.5 The consumption of the water in Israel, West Bank and Gaza (Jägerskog 2000, modified by Asheesh)[3]

Area	Water consumption (m^3/capita/a)
Israel close area	407
Palestinians close area West Bank	100
Jewish settlement in side the West Bank	650
Palestinians inside the Israeli area	100
Jewish settlement inside Gaza strip	1700*
Gaza strip	100

*The biggest share of the water amount is taken from the Israeli water network.

Thus water in the Middle East is one of the key resources for life and future social economic development as well as a pretext for a war. The Jordan River system shared by Jordan, Israel, Palestinians of the occupied territories, Syria, and Lebanon is a major transnational political issue in the region (AL-Safir, 2000). The mere solving of the land division problem will not guarantee a successful peace process. Table 2.5 provides that in a region with such limited water resources the peace process may also be significantly affected by water sharing and proper water management.

There have been various proposals made to increase the water potential in the Middle East. Transporting water from the neighboring countries like Turkey, however, can be one solution of water shortage in the Middle East for in the short run but not in the long run (Barker 2000). Desalination of sea water is one of the options available in the long run. Anon (2000). These findings also stress that long term planning and looking for secure water supply and new water resources are important for the future. Falkenmark (1998) recommended also a water scarcity index to be used. However, as long as complete relevant hydrological data are not available to all the riparian parties it is not possible to know the degree of water availability needed for all water use purposes. This weakness has been attempted to

remove by Wolf who developed a computer projection model; the model can project water supply and demand into the future. Initial conditions for population growth, water supply, and current use are used to forecast future water demand as a function of population, while future water supply is assumed to remain constant.

Though the conflict over water in the Middle East or the Israeli-Palestinian area has been researched, the technical and administrative aspects have so far been given insufficient attention. Especially water administration has been neglected and its importance in the political conflict has been overlooked. The need to concentrate on the issues was stressed already by the study carried out by Falkenmark (1989) and related round table discussions. These provided advice on how to adjust the problem and suggested the following when approaching and transcending the water barrier (Falkenmark, 1989):

- Vision the technology available to increase and to improve the component of available water resources, ground water storage, wastewater reuse, dams to increase the potential availability; desalination and applying new methods can be the only way to secure the Israel water situation, water transfer and to decrease the water demands and needs by reducing the conveyance of losses.

- Identify the administrative measures to import food rather than water; in case of the Middle East in general and particularly the Jordan River riparian countries encourage the efficiency of the industrial action so that water demands between the three countries are reduced.

While the Palestinian-Israeli water conflict is seemingly political in its nature, any political solution presupposes a strong technical and administrative solution. Development of the technical and administrative aspects of the water system is thus an essential part of the peace process. Eventually, the peace negotiations offer a real possibility to study the technical and administrative questions and proffer solutions that could be agreed on by both parties.

Chapter Three

Water Management in Palestine

Palestine consists of West Bank and Gaza Strip; these territories were parts of historic Palestine consisting of Israel, West Bank and Gaza Strip. The West Bank and Gaza Strip came under the full Israeli military control after 1967 war. The authority over parts of these territories was handled to the Palestine Liberation Organization (PLO) in 1993 and 1995 under Oslo Declaration of Principles and accordingly the Palestinian National Authority (PNA) was created. [24, 25]

The transfer of authority from Israel to the PNA was planed in 1995 and considered by Palestinians as the start of new era with high new expectations: better economic and prosperous life. Better water supply was among these high expectations. However, agreement was not reached between the two sides on transfer of water authority, and coordinated water management was proposed by the Israeli side and agreed upon by the Palestinian side to help easing water services to Palestinian population.

The peace process and the completion of peace agreement negotiation stopped and conflict between both sides turned into armed. This wary situation with negative economic growth and development in the Palestinian areas resulted in poverty levels increase.

3.1 Palestinian national water policy [24,25]

Palestine must develop and manage its scars water resources efficiently in order to meet present and future water needs in an environmentally sustainable way. The main elements of a Palestinian water policy, based on the principle of a sustainable development, have been established as a base for decisions on the structure and tasks of water sector institutions and water sector legislation. This policy lays down the principle of integrated water

resources management and stresses an economic sustainable development of all available water resources. The development and the management of the water resources in Palestine must be coordinated on a national level and carried out on the appropriate local level. This should ensure that domestic, industrial and agricultural development and investments will be compatible with the quantity of water resources available.

At the service delivery level, Palestinian Water Authority's policy is to have four regional utilities in the West Bank and one utility in Gaza. This strategy will in the long term encourage the involvement of the private sector in the implementation of certain projects that could be contracted out by the utilities. The Palestinian Water Policy, as set out in the following principles, will be the basis for decisions on the structure and tasks of water sector institutions, and the water sector legislation:

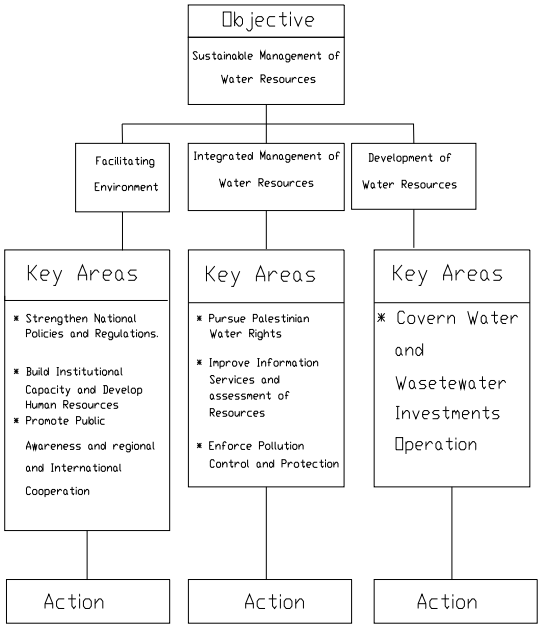
- All sources of water should be the property of the state.
- Water has a unique value for human survival and health, and all citizens have a right to water of good quality for personal consumption's at costs they can afford.
- Domestic, industrial and agricultural development and investments must be compatible with water resource quantity available.
- Water indeed is an economic good, therefore the damage resulting from the destruction of its usefulness (pollution) should be paid the party causing the damage (polluter); polluter pays principle.
- Water supply must be based on a sustainable development of all available water resources.

- The development of the water resources of the resources of Palestinian territory must be coordinated on the national level, and carried out on the appropriate local level.
- The national water sector management should be carried out by one responsible body; with the separation of institutional responsibility for policy and regulatory functions from the service delivery functions.
- Public participation in water sector management should be ensured.
- Water management at all levels should integrate quality and quantity.
- Water supply and waste water management should be integrated at all administrative levels.
- The optimal development of water supply must be complemented by a consistent water demand management.
- Protection and pollution control of water resources should be ensured.
- Conservation and optimum utilization of water resources should be promoted and enhanced.
- The Palestinians will pursue their interests in connections with obtaining the right of water resources shared by other countries.
- The Government will cooperate with regional and extra- regional parties to promote the optimum utilization of water resources to identify and develop new and additional supplies, and to collect and share relevant information and data.

While Palestinian National Authority policies towards water management need to be on one hand efficient, with equal-equitable water distribution and allocation among various public groups, and sustainable in time and space and in quality and quantity, PNA have no access and mobility to Palestinian Water resources and inherited a water system where their capacity is limited from administrative- legal, technical, technological, financial, and institutional aspects. Therefore, PNA has no real power and – or authority over the system. PNA water policies were very limited and added to water poverty.

3.2 Strategy [24, 25]

Strategy statement: "To secure an environmentally sound and sustainable development of water resources, through efficient and equitable water management".



3.3 Key elements of the water management strategy

The overall development objective of the Water Management Strategy is to translate the messages of the National Water Policy into strategic imperatives the strategy emphasizes the necessary aspects water development as the establishment of a comprehensive framework for sustainable management of Palestine's water resources. In addition to development of appropriate institutional set-up for reforming and strengthening the water sector in co-ordination with relevant stakeholders. This long term and coordinated strategy for the water sector will be used as an overall basis for the further planning of the activities and tasks in the water sector. The overall objective for Palestine in the water sector is to secure environmentally sound and sustainable development water resources through efficient and equitable water-management. The multi-objective water resources-management strategy builds upon the eight key elements which intend to meet this objective and the challenges outlined previously.

The key elements of the strategy are:-

1- Secure Palestinian water rights

This strategy emphasizes the Palestinian right for sovereignty and full control over their own water resources. The strategy for the short term is to define and pursue Palestinian water rights. A first step will be the implementation and full utilization of the water allocations committed in Article 40 of the Oslo 2 Agreement. The next step will be to prepare the negotiation strategies for the final status negotiations and finally to agree upon a final water agreement between Palestine and Israel.

2- Strengthen national policies and regulations

This strategic component responds to the need for improving the existing policy and the legal framework in the water sector by introducing new rules and regulations that provide incentives and enforcement mechanisms for sustainable water resources management and development

3- Build institutional capacity and develop human resources

The long term strategy regarding the water sector institutions is to achieve the most appropriate Institutional arrangement in the water sector based on the principles of sustainability. This includes the establishment of autonomous regional local water utilities. For the Human Resources Development and executive capacity that is necessary for the water sector.

4- Improve information services and assessment of water resources

The information management strategy is to develop a comprehensive information system on water resources with the required analytical capacity to deliver relevant information products to the decision makers, planners, development agencies and the public.

5- Regulate and co-ordinate integrated water and wastewater investments and operations

The overall strategy is to provide and co-ordinate the framework and strategic interventions and investments to ensure long-term water supply with sufficient quantity and quality for the water users, including the integration of wastewater services as a key element for improving socio-economic conditions in the country.

6- Enforce water pollution control and protection of water resources

The strategy is to develop the appropriate efficient legal regulatory and institutional instruments to enforce pollution control and protection of the water resources through coordinated efforts with relevant institutions.

7- Build public awareness and participation

The strategy is to enhance public awareness and understanding about the particular importance of the scarce water resources, as well as to raise their knowledge on the management decisions taken in the sector. In addition it is to create the proper mechanisms and incentives for public participation in all stages of the project cycle.

8- Promote regional and international co-operation

As one of the core areas in the Peace Process, and as water is scarce in he region, Palestine commits itself to co-operate regionally and internationally to develop new and additional water resources and any other water related matters.

3.4 Implementation of the strategy

1- Approach

The institutional and regulatory framework for water resources management in Palestine will have to cope with a situation of growing water demand, deteriorating quality and conflict between different user categories as well as issues of water rights between neighboring countries. The needed approach to completion and implementation of the Water Management Strategy is the one that builds and utilizes local capacity and strengthens ownership, commitment and awareness among local institutions -public, private, non-governmental -and more broadly with civil society.

2- Institutional arrangement

The implementation of the Water Management Strategy will entail specific analysis and actions related to a range of physical, hydrological, water use, institutional, human resources, economic, and environmental issues affecting the sector. An important aim of the implementation process is to strengthen national capacity for carrying out complex, multi-sectorial management and regulations in the water sector. The implementation of the Water Management Strategy will be a participatory process involving PW A staff and other key institutions and stakeholders such as the national water council, water related ministries, municipalities, and organizations in conjunction with limited outside experts if necessary, to carry out specific tasks.

There are a large number of stakeholders and in Figure 2.2 some of the main connections with the ministries are identified. After the adoption of the Water Strategy one important step for PW A will be to invite the involved ministries and authorities to take part in the implementation and to establish a framework for the cooperation.

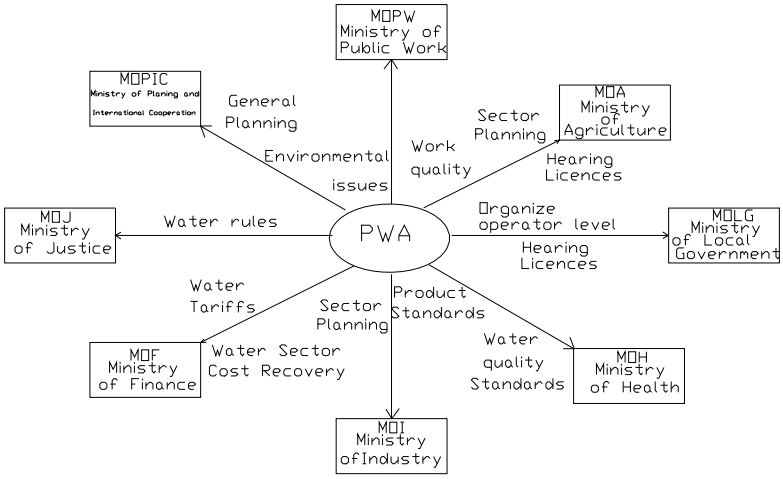


Figure 3.1 Main Interfaces with ministries

3- Phasing

The figure 2.3 gives an overview of the time schedule for the implementation. The implementation of additional studies and accomplishment of water management actions according to agreed task descriptions. The periods of intensive activity versus periods of more routine-like work varies for each implementation block.

Implementation	**1998-2000**	**2001-2002**	**2003-2005**
1- Palestinian water rights	♦♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
2- Policies and regulations	♦♦♦♦♦♦	♦♦♦♦♦	♦♦♦***
3- Implementations and human resources	♦♦♦♦♦♦	♦♦♦♦♦	*****
4- Information and resources assessment	♦♦♦♦♦♦	♦♦♦***	*****
5- Water supply and sanitation regulation	♦♦♦♦♦♦	♦♦♦***	
6- Pollution control and resource protection	******	♦♦♦♦♦	♦♦♦***
7- Public awareness and participation	******	***♦♦♦	♦♦♦***
Intensive Activity ♦♦♦♦♦			
Periodic Activity *****			

Figure 3.2 Time schedule for implementation

4- Funding of the implementation:

PWA has submitted a project document (Phase 2) to Norwegian Government (NORAD) with a request for continuing support to institutional building from 1998 to 2000 with a budget of 57mill NOK. This budget has already been approved by NORAD. This program will cover most of the-

funding needed for institutional building to supplement what is already in place from other donors. The implementation process was extended until 2002. The Netherlands has agreed to join the Norwegian Government in its program for the third phase.

Chapter Four

Methodology

This chapter covers the procedure as well as the instruments used to carry out this research. It also describes the population and the area where the research was conducted, the research design, and the statistical methods adopted in analyzing the results of the research. The purpose of the research is to determine the implications of water management policies on water poverty in Palestine, also to estimate the water poverty index (WPI).

4.1 Research design

The research work was divided into three parts:

The first part of the research is descriptive through the design of a questionnaire to measure the implications of water management policies on water poverty. This part of the research involves two types of variables, namely dependent and independent variables. The dependent variables are mainly:

- Water supply.
- Water consumption.
- Health and water quality.
- Sanitation.
- Water pollution.

The main independent variables are:

- Gender (Mail or Female)
- Place of residence (City, Village, Camp).
- Management system (Municipality, Village, Camp Manager).
- Age.

- Social responsibility (single, father, mother).
- Family Size.
- Income Variable.

The second part of the research work was the interviews which were developed and conducted to complete the research. The third part was estimation of water poverty index using different methods and comparisons between these methods.

4.2 Target population

The population of this research is the population of West Bank. The size of the proposed population is 385089 households [Palestinian Central Bureau of statistics]. They are distributed to eleven governorates. Table 4-1 below shows the distribution of the population.

Table 4.1 Distribution of population

Governorate	Households
Jenin	42181
Tubas	7454
Tulkaram	28574
Nablus	54314
Qalqilya	15037
Salfit	10144
Rmallah and Albira	46186
Jericho	6900
Jerusalem	69183
Bethlehem	29463
Hebron	75653
Total	**385089**

4.3 Sample of the study

The sample is taken as a random sample with a size of 2000 households. The distribution of the sample according to governorates is shown in Table 4.2.

Table 4.2 Sample distribution according to governorates

Governorate	Households	Percent
Jenin	219	11
Tubas	39	2
Tulkaram	148	7.4
Nablus	282	14.1
Qalqilya	78	3.9
Salfit	53	2.65
Rmallah an Albira	240	12
Jericho	36	1.8
Jerusalem	359	17.69
Bethlehem	153	7.65
Hebron	393	19.65
Total	2000	100

However, the number of valid questionnaires obtained was 926. These were distributed according to independent variables as shown in Tables 4.3 to 4.7 below.

Table 4.3 Sample distribution according to gender variable

Gender	Frequency	Percent %
Male	745	80.5
Female	181	19.5
Total	926	100.0

Table 4.4 Sample distribution according to place variable

Place	Frequency	Percent %
City	476	51.4
Village	236	25.5
Camp	214	23.1
Total	926	100.0

Table 4.5 Sample distribution according to authority variable

Authority	Frequency	Percent %
Municipality	852	92
Council	74	8
Total	926	100.0

Table 4.6 Sample distribution according to age variable

Age	Frequency	Percent %
Less than 20	161	17.4
From 21-35	555	59.9
From 36-50	152	16.4
51 and more	58	6.3
Total	926	100.0

Table 4.7 Sample distribution according to social responsibility variable

Social responsibility	Frequency	Percent %
Single	620	67
Father	228	24.6
Mother	78	8.4
Total	926	100.0

4.4 Research instruments

Instruments used in this research were:

1- The questionnaire.

2- The interviews

3- Other data collection methods.

4.4.1 The field survey

One of the main instruments used in this research is the questionnaire which was used to help in measuring the implications of water management policies on water poverty in Palestine. The questionnaire was developed then reviewed and modified to obtain the final form of the questionnaire

which will appear in Appendix A. The questionnaire includes 39 items divided into 3 topics. Table 4.8 below shows the distribution of these items to the topics.

Table 4.8 Topics and items of the questionnaire

Topic	Items
General information	1-11
Information about housing	12-18
Information about water supply, sanitation, use, and health situation	19-39
Total	39

Questionnaire reliability

To measure the reliability of this instrument, the reliability test of Cronbach Alpha formula was applied. The result of the reliability coefficient was 0.75. Based on this result, the questionnaire developed can be considered as a reliable instrument and fit the purpose of the study.

4.4.2 The interviews

Another main instrument used in this research is the interviews. They are important to complete the study of water management policies implications on water poverty. Questions of the interviews will appear in Appendix B. Twenty interviews were conducted. The following are list of the interviews held:

- Environmental Authority.
- Palestinian Water Authority.
- West Bank Water Department.
- The managers of water Department of the following Municipalities.

1. Jenin
2. Tubas
3. Tulkaram
4. Nablus
5. Qalqilya
6. Salfit
7. Rmallah and Albira
8. Jericho
9. Jerusalem
10. Bethlehem
11. Hebron

- Ministry of Planning
- Ministry of Economics
- Ministry of Local Authority
- Ministry of Agriculture
- Ministry of Tourism
- Negotiation Office.

4.4.3 Other data collection

Data also were collected from reports, studies, visits and calls. Reports and studies from Palestinian Water Authority were used in data collection. A study from the Ministry of Planning was used; also, studies from Palestinian Central Bureau of Statistics were used. Some data for calculating water poverty index were collected through a visit to the ministry of Agriculture, also through contact with Wild Life Protection Committee.

4.5 Statistical analysis

The following statistical techniques were used:

- Means, standard deviations, and percentages.
- Walks lamda test.
- Sidak post Hoc Test.
- Independent T Test.
- One way analysis of variance (ANOVA).
- Scheffe post Hoc Test.
- Alpha equation to determine the reliability of the questionnaire.
- Factor analysis to differentiate between variables impacting water poverty.

Chapter Five

Results and Discussion

In the following sections study, results and their discussions were presented in three groups:

- Water poverty index estimation.
- Field Survey (Questionnaire).
- Interviews.

5.1 Results and analysis of water poverty index estimation

This section will include results and analysis of water poverty index estimation. The following are the results of various methods used in this research for estimation of water poverty index:

(a) The conventional composite index approach

The results of the approach are summarized in the following Table 5.1

Table 5.1.WPI calculated using the composite index approach

	Water availability %	**Access to water %**	**Index of time spent in water collection**	**WPI**
Weights	0.5	0.4	0.1	
	44	65.7	5.5	58

In this approach, the index itself is constructed from three variables which capture the essence of what is being measured.

These variables include:

- Water availability.
- Access to safe water and sanitation.
- Time taken to collect domestic water.

This method was used effectively since there was a defined base rate, so the problem of incommensurability does not arise in this method as the

index is composed of parts which can be compared as they are all expressed as a percentage (or index number). In addition, by using water access and time spent to collect water as a proxy for socioeconomic well-being (the two can be shown to be highly correlated), so the problems associated with calculating incomes, exchange rates, etc. were avoided.

The results in Table 5.1 show that the physical assessment of water is 44, access to safe water and sanitation is 66, and the index of time spent in water collection is 6. The value of the calculated water poverty index is 58 (index numbers), this figure indicates that there is a problem of water stress. From the components of water poverty index, policy makers can see that their priority for future water management may be to allocate more investments for exploiting of new water resources to increase available water and to increase the number of people who have access to safe water and sanitation. The calculation of the water poverty index using this procedure is shown in appendix A.

(b) Holistic WPI calculation approach

The results of this approach are summarized in Table 5.2.

Table 5.2 WPI calculated using the holistic approach

	Resources	**Access**	**Capacity**	**Use**	**Environment**	**WPI**
Weights	0.2	0.2	0.2	0.2	0.2	
	44	68.1	37.4	22.8	25.4	39.5

The WPI in this approach is based on a holistic frame work. The components of the WPI were identified in order to capture the wide range of issues which are relevant.

The components of the WPI include the following:

- Resources: The physical availability of surface and ground water.
- Access: The extent of access to water for human use. Access means not simply safe water for drinking and cooking, but water for irrigating crops or for industrial use.
- Capacity: The effectiveness of people's ability to manage water. Capacity is interpreted in the sense of income to allow purchase of improved water, and education and health which interact with income and indicate a capacity to lobby for and manage a water supply.
- Use: The ways in which water is used for different purposes; it includes domestic, agricultural and industrial use.
- Environment: An evaluation of environmental integrity related to water and of ecosystem goods and services.

This approach does not neglect the issues of environmental integrity and ecosystem water needs, or of the requirements of water for food or other productive uses versus domestic needs. It provides a means of understanding the complexities of water issues by integrating the physical, social, economic and environmental aspects, and linking water and poverty issues. So, this approach could be considered as a more comprehensive and comparative approach and the value of water poverty index resulted from this approach could reflect to a great extent the real situation.

The results in Table 5.2 show that the value of water poverty index is 39.5, this value indicates that there is a serious problem of water facing our country. The results of sub-indices shown in Table 5.2 are relatively high in

access, low in capacity, use, and environment and relatively low in resources.

(c) Matrix approach and water poverty index (WPI) pentagram

(i) Matrix approach

The main characteristics of water stress and human welfare could be combined into a two-dimensional matrix. The characteristics under laying the WPI (calculated using the previous approach) are expressed in a two dimensional matrix as shown in Figure (5.1).

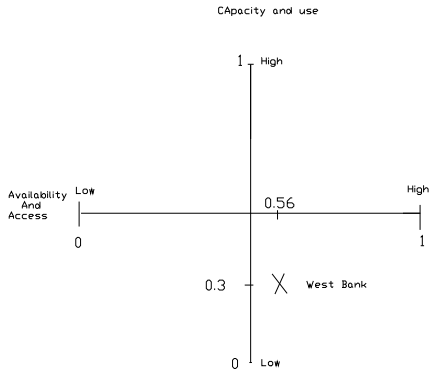


Figure 5.1 Using a matrix approach to express the WPI

This result shows that the situation of the West Bank is characterized by: Low capacity and use but relatively high availability and access. However, this is not a complete description of the frame work because the fifth factor, environment, should also be included, but has been omitted here for presentational simplicity. To overcome this and to incorporate the environmental factor the water poverty index pentagram will be used.

(ii) The water poverty index (WPI) pentagram.

Using this approach, it is possible to understand more explicitly which attributes of the water sector most need to be developed. So, WPI pentagram can be used to examine the points of strength and weakness of the water management components. Displaying the information in this format makes it easier for policy makers and stakeholders to understand.

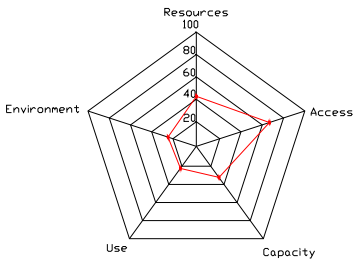


Figure 4.2
WPI Pentegram For West Bank

Figure 5.2 WPI pentagram for West Bank.

This analysis reveals that investment in physical and financial capital to promote more effective water use would be productive, as would capacity building in terms of human and social capital. It is important to note, that since the scale on each axis of the pentagram shown in Figure 5.2 extends to 100, there is much room for improvement on every characteristic.

(d) A simple time analysis approach

In this method the WPI is determined by the time required (per capita) to gain access of a particular quantity of water. This definition is acceptable in rural areas where infrastructure was less relevant.

The result of WPI using this approach was:

WPI=20

In cases where the water is provided by infrastructure the value of the WPI would be equivalent to the wage-earning labor time required by residents to enable them to pay the appropriate fee for that level of water provision.

While the method is apparently very simple, it does have a number of weaknesses. The single figure simply reflects domestic issues, and fails to include ecosystem needs and commercial concerns; nor does it really address the water assessment issue in an interdisciplinary, holistic way. In addition, it does not fully address the supply side, although it does produce a measure which is universally easy to understand.

(e) Falkenmark water stress index

This index measures per capita water availability and considers that a per capita water availability of between 1000 and 1600m3 indicates water stress, 500-1000m3 indicates chronic water scarcity, while per capita water availability below 500m3 indicates a country or region beyond the water barrier of manageable capability.

Falkenmark index: water resources per capita per year

The result of Falkenmark water stress index for West Bank was 53, which indicates absolute scarcity.

5.2 Questionnaire results and discussion

This section summarizes and discusses the results obtained from the statistical analysis of the questionnaire.

5.2.1 Characteristics of the sample surveyed

This section includes a description of the most important selected characteristics of peoples of the sample surveyed.

1. Gender and age categories

Tables 5.3 and 5.4 illustrate the distribution of sample members according to gender and age. From these tables we can see that 80.5% of the sample was males, and 59.9% were of age category (21-35 years).

Table 5.3 Sample distribution according to gender

Gender	Frequency	Percent %
Male	745	80.5
Female	181	19.5
Total	926	100.0

Table 5.4 Sample distribution according to age categories

Age	Frequency	Percent %
Less than 20	161	17.4
From 21-35	555	59.9
From 36-50	152	16.4
51 and more	58	6.3
Total	926	100.0

2. Locality type and family characteristics

Table (5.5) shows the distribution of the sample according to locality type. About 51.4% of sample members are living in cities, 25.5% in villages, and 23.1% living in refugee camps. Tables (5.6, 5.7 and 5.8) illustrate sample distribution according to number of families in the house hold, family member's number, and social responsibility. 80.1% of peoples in sample are of one family living in the house hold, 69.9% are of (4-7) family members.

Table 5.5 Sample distribution according to locality type

Locality	Frequency	Percent %
City	476	51.4
Village	236	25.5
Camp	214	23.1
Total	926	100.0

Table 5.6 Sample distribution according to number of families in the household

Families	Frequency	Percent %
One	742	80.1
Two	150	16.2
Three and more	34	3.7
Total	926	100.0

Table 5.7 Sample distribution according to family member number

Family member number	Frequency	Percent %
From 2-3	76	8.2
From 4-7	647	69.9
8 and more	203	21.9
Total	926	100.0

Table 5.8 Sample distribution according to social responsibility

Social responsibility	Frequency	Percent %
Single	620	67
Father	228	24.6
Mother	78	8.4
Total	926	100.0

3. Education

Table (5.9) shows the distribution of sample members according to educational level. About 34.3% are of Tawjihi level, 32.7% are of university degree level, 28% are less than Tawjihi and 5% are of master degree and higher**.**

Table 5.9 Sample distribution according to education level

Education level	Frequency	Percent %

Less than Tawjihi	259	28
Tawjihi	318	34.3
University degree	303	32.7
M.A and higher	46	5
Total	926	100

4. Employment and average income

Table (5.10) illustrates the distribution of sample numbers according to the number of employees in the family. It is shown that 56.2% of peoples of the sample having one employee in the family, while 41% having 2-3 employees in the family.

Table (5.11) illustrates sample distribution according to monthly income. It is shown that 58.2% of sample members have an average income of (1001-2500) NIS, 26.5% with an average income less than 1000NIS, 9.9% with an average income (2501-5000) IS, 5.4% with an average income more than 5000 NIS.

Table 5.10 Sample distribution according to number of employees in the family

Employees	**Frequency**	**Percent %**
One	520	56.2
Two to three	380	41
Four to seven	26	2.8
Total	926	100.0

Table 5.11 Sample distribution according to average income

Income (NIS)	**Frequency**	**Percent %**
Less than 1000	245	26.5
From 1001-2500	539	58.2
From 2501-5000	92	9.9
5001 and more	50	5.4
Total	926	100.0

5. House characteristics

Tables (5.12) to (5.18) illustrate house characteristics of the sample surveyed which have a grate impact on families heath situation and families behavior in response to water, also it reflects families economical situation in general. Tables (5.12) to (5.16) illustrate sample distribution according to house type, house area, garden availability, room numbers and kitchen availability, respectively. About 61.6% are living in independent houses, 38.4% are living in apartments. 28.8% are living in houses with area (141-200m^2, 9.3% are living in houses less than 60 m^2 in area. 47.3% living in houses with garden, 52.7% living in houses without area. About 19.5% of sample members are living in houses with one room, 29.9% with two rooms, 30.7% with three rooms, and 19.9% living in houses with four rooms and more. About 65.7% have kitchen in their house, while 34.3% have no kitchen in house.

Table 5.12 Sample distribution according to house type

House type	Frequency	Percent %
Independent	570	61.6
Apartment	356	38.4
Total	926	100

Table 5.13 Sample distribution according to house area

House area	Frequency	Percent %
Less 60	86	9.3
From 61- 100	179	19.3
From 101-140	251	27.1
From 141-200	267	28.8
201 and more	143	15.4
Total	926	100

Table 5.14 Sample distribution according to garden availability

Garden	Frequency	Percent %
Yes	438	47.3
No	488	52.7
Total	926	100

Table 5.15 Sample distribution according to room numbers

Room number	Frequency	Percent %
One room	181	19.5
Two rooms	277	29.9
Three rooms	284	30.7
Four rooms and more	184	19.9
Total	926	100

Table 5.16. Sample distribution according to kitchen availability

Kitchen	Frequency	Percent %
Yes	608	65.7
No	318	34.3
Total	926	100

Tables (5.17, 5.18) illustrate sample distribution according to availability of water tank for the house, and according to bath-room type. 59.4% of sample members having water tank for their houses, and 40.6% have no water tank. As shown in Table (5.18), 27.3% having internal bath-room, 13.9% having external path room, 13.9% having an internal bath-room without a pump, 39.8% having internal bath-room with shower and pump, and 5% having internal bath-room and shower without a pump.

Table 5.17 Sample distribution according to water tank availability

Water tank	Frequency	Percent %
Yes	550	59.4
No	376	40.6
Total	926	100

Table 5.18 Sample distribution according to bath-room type

Bath-room type	Frequency	Percent %
External	129	13.9
Internal	253	27.3
Internal + without	129	13.9
WC + with	369	39.8
WC + without	46	5
Total	926	100

5.2.2 Variables affecting water poverty

This section will show the study results, discuss and highlight the main outcome of these results**.**

Q.1 Are there any significant differences between water poverty domains?

To answer this question two statistical tests have been performed. The first is Wilks Lambda Test to know if there are differences in the sample responses towards the water poverty over all the domains. Table 5.19 shows the results of Wilks Lambda Test. The other test is Sidak Post Hoc to compare between the domains. Table 5.20 shows the results of Sidak Post Hoc. The results of these tests show that:

- Wilks Lambda Test results show that there are significant differences between the domains.

Table 5.19 Wilks Lambda results for differences in sample responses towards the water poverty according to the different domains.

Walks Lambda value	F	D. F	Error D. F	Sig*
0.021	2303.073	4	198	* 0.0001

* Significant at (α= 0.05)

Table 5.20 Sidak Post Hoc results for multiple comparisons between the domains

Water Poverty	**Supply of Water**	**Consumption**	**Health Situation**	**Sanitation Services**	**Water Quality (Pollution)**
Supply of water		-1.704*	-0.341*	-0.671*	0.072
Consumption of water			1.363*	1.033*	1.776*
Health situation				-0.330*	0.413*
Sanitation services					0.743*
Water quality (pollution)					

* Significant at (α= 0.05)

Q.2 Are there any significant differences in sample responses towards the water poverty due to the gender variable?

To answer this question, independent T-test has been used to analyze the data from questionnaire. Table 5.21 shows the results for both male and female groups over the different domains. The table includes the mean, the standard deviation, the T-test value, and the significance level (using a confidence level of 0.95). The results show that there are significant differences between males and females in the domains of consumption of water, sanitation services and water pollution. No significant differences between males and females were found in the domain of supply of water, health situation domains.

Table 5.21 T-Test results for differences in the water poverty according to gender variable for different domains.

Water poverty	Gender	N	Mean	SD	D.F	T	Sig.
Supply of water	male	745	1.918	0.55	920	1.035-	0.301
	female	177	3.61	0.44			
Consumption	male	316	3.42	0.67	431	2.873-	0.004 *
	female	117	3.61	0.56			
Health situation	male	165	1.94	0.26	254	1.756-	0.080
	female	91	1.99	0.17			
Sanitation services	male	328	2.41	0.38	431	2.904	0.004 *
	female	105	2.29	0.295			
Water quality (pollution)	male	233	1.53	0.20	348	7.248-	0.000 1*
	female	117	1.69	0.158			

* Significant at (α= 0.05) critical at (1.96)

The differences were significant differences in the domains of consumption of water in favor to males and in the domain of water pollution in favor to females. The results obtained on gender subject reveal that consumption of water for females was less than that of males, and for sanitation services it was better for males. This result reflects that more effort should be directed to enhance the situation of females from the aspect of water services.

Q.3 Are there any significant differences in sample responses towards the water poverty due to the place of living variable?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of the place of living overall the domains. Results of ANOVA test are shown in Table 5.22. The other is the Post Hoc test to measure the significance, if any, between the different places of living. Results of Post Hoc test are shown in Tables 5.23, 5.24 and 5.25.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences in the place of living for consumption of water, health situation and sanitation services domains.
- For the consumption of water domain, significant differences are shown between people living in cities and people living in villages and refugee camps. No significant differences are shown between people living in villages and those living in camps.
- For the health situation domain, significant differences are shown between people living in cities and people living in villages and refugee camps. No significant differences are shown between people living in villages and those living in camps.
- For the sanitation services domain, significant differences are shown between people living in cities and people living in villages and refugee camps. No significant differences are shown between people living in villages and those living in camps.

Table 5.22 One Way ANOVA results for differences in the water poverty according to place of living variable for different domains

Domains	S.O.V	S.S	D.F	M.S	F value	Sig
Supply of water	B.G	0.527	2	0.264	0.925	0.397
	W.G	262.817	923	0.285		
	Total	263.344	925			
Consumption of water	B.G	6.945	2	3.473	8.437	0.0001*
	W.G	178.635	434	0.412		
	Total	185.580	436			
Health situation	B.G	2.129	2	1.065	23.09	0.0001*
	W.G	11.755	255	0.046		
	Total	13.884	257			
Sanitation services	B.G	2.796	2	1.398	10.84	0.0001*
	W.G	55.698	432	0.129		
	Total	58.494	434			
Water quality - pollution	B.G	0.118	2	0.058	1.424	0.242
	W.G	14.492	351	0.041		
	Total	14.609	353			

Table 5.23 Scheffe Post Hoc results for multiple comparisons for the consumption of water domain**.**

Place	City	Village	Refugee camp
City		0.2557*	0.3083*
Village			0.052
Refugee camp			

Table 5.24 Scheffe Post Hoc results for multiple comparisons for the health situation domain**.**

Place	City	Village	Refugee camp
City		0.2042*	0.1559*
Village			0.048-
Refugee camp			

Table 5.25 Scheffe Post Hoc results for multiple comparisons for the sanitation services domain.

Place	City	Village	Refugee camp
City		01275*	0.1934*
Village			0.066
Refugee camp			

The results obtained from the sample surveyed show that the consumption of water for peoples living in cities is more than that for peoples living in villages and refugee camps. This may be because there are still some villages not connected to network so those people may have reduced their needs, also this may be due to people's economic situation (which is getting worse and worse due to Al-Aqsa Intifada).

The results show that the health situation for peoples living in cities is better than that for people living in villages and refugee camps. This may be because in some villages (not connected) different types of water supply are used so the water may be of worse quality which increases the probability to be affected by diseases. Also, most of refugee camps are not connected to sanitation network, so the health situation will be worse. Also, the economic situation plays an important role here as we discussed above. Table 5.28 shows that the sanitation services in cities are better than villages and refugee camps. It is an expected result for the reasons mentioned above.

Q.4 Are there any significant differences in sample responses towards the water poverty due to the management system variable?

To answer this question, independent T test has been used. Table 5.26 shows the results over the different domains. The results show that there are significant differences between Municipality and Village council as a

management system in the domains of supply of water, health situation and sanitation services in favor to Municipality system.

Table 5.26 T-Test results for differences in the water poverty according to management system variable for different domains

Water poverty	**Authority**	**N**	**Mean**	**SD**	**D.F**	**T**	**Sig.***
Supply of water	*Munici.	852	1.93	0.53	924	2.34	0.019 *
	Village Council	74	1.78	0.58			
Consumption of water	Munici.	405	3.45	0.62	435	1.56-	0.119
	Village Council	32	3.64	0.97			
Health situation	Munici.	236	1.96	0.28	256	2.214	0.028 *
	Village Council	22	1.85	0.13			
Sanitation services	Munici.	387	2.40	0.36	433	3.192	0.002 *
	Village Council	48	2.22	0.37			
Water quality/ pollution	Munici	326	1.59	0.21	352	1.948	0.052
	Authority	28	1.51	0.15			

*Munici: Municipality

Q. 5 Are there any significant differences in sample responses towards the water poverty due to the age variable?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of the age variable overall the domains. Results of

ANOVA test are shown in Table 5.27. The other is the Post Hoc test to measure the significance, if any, between the different ages (less than 20 years, 21-35 years, 36-50 years, more than 50 years). Results of Post Hoc test are shown in Tables 5.28-5.32.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences in ages for all domains.
- For the supply of water domain significant differences are shown between people of ages less than twenty and those of ages 21-35 and 36-50, and between people of ages 21-35 and people of ages more than 50, also between people of ages 36-50 and ages more than 50.
- For the consumption of water domain, significant differences are shown between people of ages 21-35 and of ages more than 50 years.
- For the health situation domain, significant differences are shown between people of ages less than 20 and of ages 21-35 years, and between people of ages 21-35 years and between 36-50 years.
- For sanitation services domain significant differences are shown between people of ages less than 20 and people of ages 36-50, and between people of ages 21-35 and of ages 36-50.
- For water quality domain significant differences are shown between people of ages less than 20 and ages 21-35, and between people of ages 21-35 and people of ages 36-50.

Table 5.27 One Way ANOVA results for differences in the water poverty according to age variable for different domains

Domains	S.O.V	S.S	D.F	M.S	F value	Sig.
Supply of water	B.G	16.191	3	5.397	20.134	0.00001*
	W.G	247.153	922	0.268		
	Total	263.344	925			
Consumption of water	B.G	3.362	3	1.121	2.663	0.048*
	W.G	182.218	433	0.421		
	Total	185.58-	436			
Health situation	B.G	2.236	3	0.745	16.252	0.00002*
	W.G	11.648	254	0.046		
	Total	13.884	257			
Sanitation services	B.G	5.333	3	1.778	14.411	0.0001*
	W.G	53.161	431	0.123		
	Total	58.494	434			
Water quality (pollution)	B.G	1.154	3	0.385	10.001	0.0003*
	W.G	13.456	350	0.038		
	Total	14.609	353			

Table 5.28 Scheffe Post Hoc results for multiple comparisons for the supply of water domain

Age	Less than 20	21-35	36-50	More than 50
Less than 20		0.2659-*	0.3318-*	0.086
21-35			0.066-	0.353*
36-50				0.419*
More than 50				

Table 5.29 Scheffe Post Hoc results for multiple comparisons for the consumption domain

Age	Less than 20	21-35	36-50	More than 50
Less than 20		0.059-	0.1464	0.3893
21-35			0.2050	0.4479*
36-50				0.2429
More than 50				

Table 5.30 Scheffe Post Hoc results for multiple comparisons for the health situation domain

Age	Less than 20	**21-35**	**36-50**	More than 50
Less than 20		0.1692-*	0.0625	0.0277
21-35			0.2317*	0.1414
36-50				0.0902-
More than 50				

Table 5.31 Scheffe Post Hoc results for multiple comparisons for sanitation services domain.

Age	Less than 20	**21-35**	**36-50**	More than 50
Less than 20		0.2368-*	0.188	0.0863-
21-35			0.2556*	0.1504
36-50				0.1053
More than 50				

Table 5.32 Scheffe Post Hoc results for multiple comparisons on water quality (Pollution) domain.

Age	Less than 20	**21-35**	**36-50**	More than 50
Less than 20		0.0994-*	0.0361	0.00006
21-35			0.1356*	0.0994
36-50				0.0361-
More than 50				

From the results obtained the consumption of water for peoples of age category (21-35 years) is more than peoples of age more 50 years, as we know always older peoples are more careful in saving than younger ones. As expected, for heath situation younger peoples are of better situation than older peoples.

Q.6 Are there any significant differences in sample responses towards the water poverty due to the social responsibility variable?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the

significance, if any, of social responsibility variable overall the domains. Results of ANOVA test are shown in Table 5.33. The other is the Post Hoc test to measure the significance, if any, between the different social responsibility overall the domains. Results of Post Hoc test are shown in Tables 5.34-5.38 for the different domains.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences in the social responsibility for all domains and overall the total domains.
- For the supply of water domain, significant differences are shown between single and householder (father) and between householder (father) and householder (mother).
- For the consumption of water domain, significant differences are shown between single and householder (father). No significant differences are shown between householder (father) and householder (mother).
- For the health situation domain, significant differences are shown between social responsibility (single) and householder (father). No significant differences are shown between single and householder (mother) and between householder (father) and householder (mother).
- For the sanitation services domain, significant differences are shown between social responsibility (single) and householder (father) and householder (mother). No significant differences are shown between householder (father) and householder (mother).

- For water pollution domain significant differences are shown between single and householder (father) and between householder (father) and householder (mother).

Table 5.33 One Way ANOVA results for differences in the water poverty according to social responsibility variable for different domains

Domains	S.O.V	S.S	D.F	M.S	F value	Sig
Supply of water	B.G	5.084	2	2.542	9.084	0.0001*
	W.G	258.260	923	0.280		
	Total	263.344	925			
Consumption of water	B.G	5.220	2	2.610	6.280	0.0002*
	W.G	180.360	434	0.416		
	Total	185.580	436			
Health situation	B.G	0.343	2	0.172	3.231	0.041*
	W.G	13.541	255	0.053		
	Total	13.884	257			
Sanitation services	B.G	2.612	2	1.306	10.096	0.0001*
	W.G	55.882	432	0.129		
	Total	58.494	434			
Water quality (pollution)	B.G	0.669	2	0.335	8.424	0.0001*
	W.G	13.940	351	0.040		
	Total	14.609	353			

Table 5.34 Scheffe Post Hoc results for multiple comparisons on the supply domain

Social Responsibility	Single	Father family	Mother family
Single		0.1547*	0.082-
Father family			0.2368-*
Mother family			

Table 5.35 Scheffe Post Hoc results for multiple comparisons on the consumption of water domain

Social Responsibility	Single	Father family	Mother family
Single		0.3264*	0.0967
Father family			0.2297
Mother family			

Table 5.36 Scheffe Post Hoc results for multiple comparisons on the health situation domain

Social responsibility	Single	Father family	Mother family
Single		0.0698*	0.0895
Father family			0.0196
Mother family			

Table 5.37 Scheffe Post Hoc results for multiple comparisons on the sanitation domain

Social responsibility	Single	Father family	Mother family
Single		0.1201*	0.2584*
Father family			0.1383
Mother family			

Table 5.38 Scheffe Post Hoc results for multiple comparisons on the water pollution domain

Social responsibility	Single	Father family	Mother family
Single		0.0712*	0.0626-
Father family			0.1338-*
Mother family			

From the results shown above, people of social responsibility (single) consume water less and are for better heath situation than people of social responsibility (house holder).

Q.7. Are there any significant differences in sample responses towards the water poverty due to the number of families in the household?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of the number of families in the household variable overall the domains. Results of ANOVA test are shown in Table 5.39. The other is the Post Hoc test to measure the significance, if any, between the

different number of families in the household (one, two, three and more). Results of Post Hoc test are shown in Table 5.40. The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences in the number of families in the household for sanitation services domain. No significant differences are shown for the other domains.
- For the sanitation services domain, significant differences are shown between one and two families in the household.

Table 5.39 One Way ANOVA results for differences in the water poverty according to number of families in the household variable for different domains.

Domains	S.O.V	S.S	D.F	M.S	F value	Sig.
Supply of water	B.G	1.461	2	0.730	2.574	0.077
	W.G	263.344	923	0.284		
	Total		925			
Consumption of water	B.G	0.538	2	0.269	0.631	0.533
	W.G	185.042	434	0.426		
	Total	185.580	436			
Health situation	B.G	0.222	2	0.111	2.073	0.128
	W.G	13.662	255	0.055		
	Total	13.884	257			
Sanitation services	B.G	1.039	2	0.519	3.906	0.021*
	W.G	57.455	432	0.133		
	Total	58.494	434			
Water pollution	B.G	0.219	2	0.110	2.673	0.070
	W.G	14.390	351	0.041		
	Total	14..609	353			

Table 5.40 Scheffe Post Hoc results for multiple comparisons on the sanitation services domain

Number of Families in the house hold	1	2	3 and more
1		0.1025*	0.0538
2			0.1563
3 and more			

For sanitation services, it is found that houses of one family have better services than houses of two families. The results show no differences in the supply of water, health situation and water quality due to the number of families in the house hold.

Q.8. Are there any significant differences in sample responses towards the water poverty due to the family members number?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of family members number overall the domains. Results of ANOVA test are shown in Table 5.41. The other is the Post Hoc test to measure the significance, if any, between the different family members number (2-3, 4-7, 8 and more). Results of Post Hoc test are shown in Tables 5.42-5.45, for the different domains.

The results of these tests show that:

1- ANOVA test results show that there are significant differences due to the differences in family members number for supply of water, consumption of water, health situation, water quality (pollution) domains.

2- For the supply of water domain, significant differences are shown between family members number (2-3) and (4-7), and between family members number (4-7) and (8 and more).

3- For the consumption of water domain, significant differences are shown between family members number (2-3) and (4-7), and between family members number (4-7) and (8 and more).

4- For the health situation domain, significant differences are shown between family member number (2-3) and (8 and more).

5- For water pollution domain significant differences are shown between family members number (2-3) and (4-7), and between family members number (2-3) and (8 and more).

Table 5.41 One Way ANOVA results for differences in the water poverty according to family members number variable for different domains

Domains	**S.O.V**	**S.S**	**D.F**	**M.S**	**F value**	**Sig.**
Supply of water	B.G	14.942	2	7.47	27.75	0.000*
	W.G	248.411	923	0.269		
	Total	263.344	925			
Consumption of water	B.G	12.859	2	6.430	16.156	0.000*
	W.G	172.721	434	0.398		
	Total	185.580	436			
Health situation	B.G	0.614	2	0.307	5.900	0.003*
	W.G	13.270	255	0.052		
	Total	13.884	257			
Sewage sanitation services	B.G	0.401	2	0.201	1.493	0.226
	W.G	58.093	432	0.134		
	Total	58.494	434			
Water pollution	B.G	0.445	2	0.222	5.512	0.004*
	W.G	14.164	351	0.0404		
	Total	14.609	353			

Table 5.42 Scheffe Post Hoc results for multiple comparisons on the supply of water domain

Family members number	**2-3**	**4-7**	**8 and more**
2-3		0.3712-*	1.448-
4-7			0.2264*
8 and more			

Table 5.43 Scheffe Post Hoc results for multiple comparisons on the consumption of water domain

Family members number	2-3	4-7	8 and more
2-3		0.4922-*	0.2155-
4-7			0.2767-*
8 and more			

Table 5.44 Scheffe Post Hoc results for multiple comparisons on the health situation domain

Family members number	2-3	4-7	8 and more
2-3		0.1424	0.2059*
4-7			0.064
8 and more			

Table 5.45 Scheffe Post Hoc results for multiple comparisons on the water pollution domain

Family members number	2-3	4-7	8 and more
2-3		0.0928*	0.1211*
4-7			0.02827
8 and more			

From the results shown above it is found that families with (4-7) members have better source of water than families with (2-3) or (8and more) members. The consumption of water for families with (4-7) members is more than families with (2-3 members). So the consumption of water increases as the number of family members increases. For the health situation, it is found that families with lower members number are better health situation than families with 8 members and more.

Q9 Are there any significant differences in sample responses towards the water poverty due to the number of employees in the family?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of the number of employees in the family overall the domains. Results of ANOVA test are shown in Table 5.46. The other is the Post Hoc test to measure the significance, if any, between the different number of employees in the family (1, 2-3, 4-7). Results of Post Hoc test are shown in Tables 5.47-5.50 for the different domains.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences in the number of employees in the family for supply of water, consumption of water, health situation, and water pollution domains.
- For the supply of water domain, significant differences are shown between the number of employees (1) and (2-3).
- For the consumption of water domain, significant differences are shown between the number of employees (1) and (2-3).
- For the health situation domain, significant differences are shown between the number of employees (1) and (2-3).
- For water pollution domain significant differences are shown between the number of employees (1) and (2-3).

Table 5.46 One Way ANOVA results for differences in the water poverty according to the number of employees for different domains

Domains	S.O.V	S.S	D.F	M.S	F value	Sig.
Supply of water	B.G	11.561	2	5.780	21.190	0.0001 *
	W.G	251.783	923	0.273		
	Total	263.344	925			
Consumption of water	B.G	16..845	2	8.423	21.664	0.0001 *
	W.G	168.735	434	0.389		
	Total	185.580	436			
Health situation	B.G	0.661	2	0.330	6.370	0.002*
	W.G	13.224	255	0.0518		
	Total	13.884	257			
Sanitation services	B.G	0.765	2	0.383	2.862	0.058
	W.G	57.729	432	0.134		
	Total	58.494	434			
Water pollution	B.G	0.424	2	0.212	5.245	.006*
	W.G	14.185	351	0.0404 1		
	Total	14.609	353			

Table 5.47 Scheffe Post Hoc results for multiple comparisons on the supply of water domain

The number of employees in the family	1	2-3	4-7
1		0.2292-*	-0.2292
2-3			0.1004
4-7			

Table 5.48 Scheffe Post Hoc results for multiple comparisons on the consumption of water domain

The number of employees in the family	1	2-3	4-7
1		-0.4030*	-0.3270
2-3			0.076
4-7			

Table 5.49 Scheffe Post Hoc results for multiple comparisons on the health situation domain

Number of employees in family	1	2-3	4-7
1		-0.088*	-0.2103
2-3			-0.1215
4-7			

Table 5.50 Scheffe Post Hoc results for multiple comparisons on the water pollution domain

Number of employees in family	1	2-3	4-7
1		-0.066*	0.060
2-3			0.1270
4-7			

From the results obtained, it is found that when the number of employees in the family gets more than one, the supply of water and the health situation is better, the consumption of water is more and the compliance from water quality is less.

Q10 Are there any significant differences in sample responses towards the water poverty due to the monthly Income variable?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of monthly income overall the domains. Results of ANOVA test are shown in Table 5.51. The other is the Post Hoc test to measure the significance, if any, between different monthly income (less

than 1000NIS, 1001-2500NIS, 2501-5000NIS, more than 5000NIS). Results of Post Hoc test are shown in Tables 5.52-5.54 for the different domains.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences monthly income for supply of water, sanitation services, and water pollution domains.
- ANOVA test results show no significant differences due to the differences in monthly income for consumption of water and health situation domains.
- For the supply of water domain, significant differences are shown between monthly income (less than 1000NIS) and (1001-2500 NIS) , and between (less than 1000) and (more than 5000), also between (2500-5000NIS) and (more than 5000NIS).
- For the sanitation services domain, significant differences are shown between monthly income (less than 1000NIS) and (1001-2500 NIS) , and between (1001-2500 NIS) and (more than 5000).
- For water pollution domain significant differences are shown between monthly income (2501-5000 NIS) and (more than 5000 NIS).

Table 5.51 One Way ANOVA results for differences in the water poverty according to monthly income for different domains

Domains	**S.O.V**	**S.S**	**D.F**	**M.S**	**F value**	**Sig.**
Supply of water	B.G	6.882	3	2.294	8.247	0.0001 *
	W.G	256.462	922	0.278		
	Total	263.344	925			
Consumption of water	B.G	0.582	3	0.194	0.454	0.714
	W.G	184.998	433	0.427		
	Total	185.580	436			
Health situation	B.G	0.148	3	0.049	0.914	0.435
	W.G	13.736	254	0.54		
	Total	13.884	257			
Sanitation services	B.G	3.482	3	1.161	9.092 *	0.0000 1*
	W.G	55.012	431	0.128		
	Total	58.494	434			
Water pollution	B.G	0.691	3	0.230	5.794	0.001*
	W.G	13.918	350	0.039		
	Total	14.609	353			

Table 5.52 Scheffe Post Hoc results for multiple comparisons on the supply of water domain

Monthly income	**Less than 1000**	**1001-2500**	**2501-5000**	**More than 5001**
Less than 1000		0.1612-*	0.047	0.3184-*
1001-2500			-0.1141	0.1572
2501-5000				0.2713-*
More than 5001				

Table 5.53 Scheffe Post Hoc results for multiple comparisons on the sanitation services domain

Monthly income	Less than 1000	1001-2500	2501-5000	More than 5001
Less than 1000		-0.1922*	-0.040	0.098
1001-2500			0.1518	0.2910-*
2501-5000				0.1392
More than 5001				

Table 5.54 Scheffe Post Hoc results for multiple comparisons on the water pollution domain

Monthly income	Less than 1000	1001-2500	2501-5000	More than 5001
Less than 1000		-0.066	-0.1406	0.061
1001-2500			-0.074	0.1277
2501-5000				0.2019*
More than 5001				

Income is an important variable affecting poverty and water poverty. If you have money you can buy what you want and so water. If you have a reasonable income, you will have a service for water. If your income is low, you may not have a service; and if you have, you should be careful about consumption and you may reduce your needs even in necessary items. From the results obtained for our sample, it is found that people with higher monthly income have a better source of water than people of lower income, and so was the result for sanitation services.

No significant differences are found due differences in monthly income for consumption of water and health situation; and this is a wrong result since monthly income should have an impact on consumption and health

situation. This wrong result may be due to mistakes in filling the questionnaires.

Q.11 Are there any significant differences in sample responses towards the water poverty due to the water percentage from monthly income variable?

To answer this question, one way analysis of variance test (ANOVA) test was performed to test the significance, if any, of water percentage from monthly income overall the domains. Results of ANOVA test are shown in Table 5.55. The results of this test show that there are no significant differences due to water percentage from monthly income for all domains.

Table 5.55 One Way ANOVA results for differences in the Water Poverty according to water percentage from income variable for different domains

Domains	S.O.V	S.S	D.F	M.S	F value	Sig.
Supply of water	B.G	0.040	2	0.020	0.072	0.931
	W.G	263.303	923	0.285		
	Total	263.344	925			
Consumption of water	B.G	1.644	2	0.822	1.940	0.145
	W.G	183.936	434	0.424		
	Total	185.580	436			
Health situation	B.G	0.005	2	0.026	0.048	0.953
	W.G	13.879	255	0.054		
	Total	13.884	257			
Sanitation services	B.G	0.487	2	0.243	1.812	0.165
	W.G	58.007	432	0.134		
	Total	58.494	434			
Water pollution	B.G	0.128	2	0.064	1.552	0.213
	W.G	14.481	351	0.041		
	Total	14.609	353			

From Figure (5.3), it is shown that 82.4% of the people of the sample surveyed pay less than 20% from their total income for water services; 15.4% of the peoples pay from 21-40%, and 2.2% of the people pay from 41-60% for water services. When we talk about 20% of the income to go for

water services, it is an unaffordable figure for an average Palestinian family, and when we talk about 15.4% of the people's sample pay from 21-40% for water services which is a considerable percentage. So, this reflects the needs for a policy to consider these poor people and to provide their needs of water with an affordable price.

Figure 5.3 Sample distributions according to water ratio from income

Q.12 Are there any significant differences in sample responses towards the water poverty due to the food percentage from monthly income variable?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of food percentage from monthly income overall the domains. Results of ANOVA test are shown in Table 5.56. The other is the Post Hoc test to measure the significance, if any, between different food

percentages from monthly income (less than 20, 20-40, 40-60) for the different domains. Results of Post Hoc test are shown in Tables 5.57 - 5.60.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to food percentage from monthly income for supply of water, consumption of water, health situation, and water pollution domains.
- For the supply of water domain, significant differences are shown between food percentage from monthly income (less than 20) and (20-40), and between (less than 20) and (40-60).
- For the consumption of water domain, significant differences are shown between food percentage from monthly income (less than 20) and (20-40), between (less than 20) and (40-60), and between (20-40) and (40-60).
- For the health situation domain, significant differences are shown food percentage from monthly income (less than 20) and (20-40).
- For water pollution domain significant differences are shown food percentage from monthly income (less than 20) and (20-40).

Table 5.56 One Way ANOVA results for differences in the water poverty according to food percentage from monthly income variable for different domains

Domains	S.O.V	S.S	D.F	M.S	F value	Sig.
Supply of water	B.G	11.266	2	5.633	20.626	0.0001 *
	W.G	252.078	923	0.273		
	Total	263.344	925			
Consumption of water	B.G	9.592	2	4.796	11.828	0.0001 *
	W.G	175.988	434	0.406		
	Total	185.580	436			
Health situation	B.G	0.392	2	0.196	3.707	0.026*
	W.G	13.492	255	0.053		
	Total	13.884	257			
Sanitation services	B.G	-0.022	2	0.011	0.083	0.921
	W.G	58.472	432	0.135		
	Total	58.494	434			
Water pollution	B.G	0.709	2	0.355	8.952	0.0001 *
	W.G	13.900	351	0.039		
	Total	14.609	353			

Table 5.57 Scheffe Post Hoc results for multiple comparisons on the supply of water domain

Food percentage	Less than 20	20-40	40-60
Less than 20		0.2175*	0.2677*
20-40			0.050
40-60			

Table 5.58 Scheffe Post Hoc results for multiple comparisons on the consumption of Water domain

Food percentage	Less than 20	20-40	40-60
Less than 20		0.2042*	0.7487*
20-40			0.5445*
40-60			

Table 5.59 Scheffe Post Hoc results for multiple comparisons on the health situation domain

Food percentage	Less than 20	20-40	40-60
Less than 20		0.074*	-0.057
20-40			-0.1326
40-60			

Table 5.60 Scheffe Post Hoc results for multiple comparisons on the water pollution domain

Food percentage	Less than 20	20-40	40-60
Less than 20		0.0950*	-0.0005
20-40			-0.0955
40-60			

From the results obtained, it is found that as the percentage of food from income gets smaller as the money spent on other purposes increases, so water services are better and so is health situation. According to the sample surveyed, it was found that the standard of living was distributed according to the following categories (Figure 5.4) as:

46.3% of the sample surveyed is of better- off category.

50.4% of the sample surveyed is of middle category.

3.2% of the sample surveyed is of worse off category.

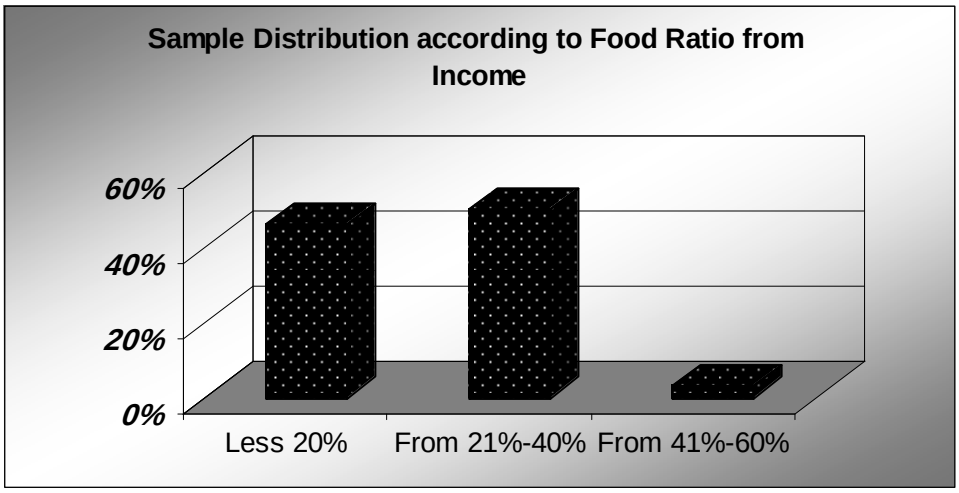


Figure 5.4 Sample distribution according to food ratio from income

Q.13 Are there any significant differences in sample responses towards the water poverty due to the house type variable?

To answer this question, independent T-test has been used to analyze the data from questionnaire. Table 5.61 shows the results for both independent and apartment house types over the different domains. The table includes the mean, the standard deviation, the T-test value, and the significance level (using a confidence level of 0.95). The results show that there are significant differences between both independent and apartment house types in the domains of supply of water, consumption of water. No significant differences between both independent and apartment house types were found in the domains of health situation, sanitation services and water pollution.

Table 5.61 T-Test results for differences in the water poverty according to house type variable for different domains

Water poverty	House type	N	Mean	SD	D.F	T	Sig.*
Supply of water	Independent	570	1.85	0.54	920	-5.144	0.001*
	Apartment	352	2.03	0.49			
Consumption of water	Independent	317	3.70	0.59	433	-4.741	0.001*
	Apartment	118	3.37	0.74			
Health situation	Independent	196	1.95	0.24	256	-0.754	0.452
	Apartment	62	1.97	0.19			
Sanitation services	Independent	355	2.39	0.37	433	1.487	0.138
	Apartment	80	2.32	0.33			
Water pollution	Independent	264	1.57	0.21	352	-1.244	0.214
	Apartment	90	1.60	0.17			

The results show that the consumption of water for independent houses is higher than that for apartments.

Q.14 Are there any significant differences in sample responses towards the water poverty due to the house area variable?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of the house area overall the domains. Results of ANOVA test are shown in Table 5.62. The other is the Post Hoc test to measure the significance, if any, between the different house areas overall the domains. Results of Post Hoc test are shown in Tables 5.63-5.67.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences in the house areas for all domains.
- For the supply of water domain, significant differences are shown between house area (101-140m^2) and (141-200m^2), and between house area (101-140m^2) and (201m^2 and more).

- For the consumption of water domain, significant differences are shown between house area (less than 61 m^2) and (101-140m^2) and between (61-100m^2) and (101-140m^2), and between (101-140m^2) and (141-200m^2).

- For the health situation domain, significant differences are shown between different house areas.

- For the sanitation services domain, significant differences are shown between different house areas.

- For the water pollution domain, significant differences are shown between different house areas.

Table 5.62 One Way ANOVA results for differences in the water poverty according to house area variable for different domains

Domains	**S.O.V**	**S.S**	**D.F**	**M.S**	**F value**	**Sig**
Supply of water	B.G	9.372	4	2.343	8.497	0.0001 *
	W.G	253.971	921	0.276		
	Total	263.344	925			
Consumption of water	B.G	27.143	4	6.786	18.503	0.0001 *
	W.G	158.437	432	0.367		
	Total	185.580	436			
Health situation	B.G	2.372	4	0.593	13.034	0.0001 *
	W.G	11.512	253	0.045		
	Total	13.884	257			
Sanitation services	B.G	3.873	4	0.968	7.623	0.0001 *
	W.G	54.621	430	0.127		
	Total	58.494	434			
Water pollution	B.G	1.180	4	0.295	7.667	0.0001 *
	W.G	13.429	349	0.038		
	Total	14.609	353			

Table 5.63 Scheffe Post Hoc results for multiple comparisons on the pollution domain**.**

House area m^2	**Less than 61**	**61-100**	**101-140**	**141-200**	**201and more**
Less 61		0.0259	0.1807	-0.0534	-0.0805
61-100			0.1548	-0.07934	-0.1065
101-140				-0.2341*	-0.2612*
141-200					-0.02712
201 and more					

Table 5.64 Scheffe Post Hoc results for multiple comparisons on the consumption of water domain**.**

House area m^2	**Less than 61**	**61-100**	**101-140**	**141-200**	**201 and more**
Less than 61		0.1383	0.6336*	0.2307	0.2848
61-100			0.4953*	0.09240	0.1465
101-140				-0.409*	-0.3488
141-200					0.05407
201and more					

Table 5.65 Scheffe Post Hoc results for multiple comparisons on the health situation domain

House area m^2	**Less than 61**	**61-100**	**101-140**	**141-200**	**201 and more**
Less than 61		0.1707*	0.1802*	0.03987	0.2020*
61-100			0.0094	-0.2106*	0.03125
101-140				-0.2200*	0.021802
141-200					0.2418*
201 and more					

Table 5.66 Scheffe Post Hoc results for multiple comparisons on the sanitation services domain

Area	**Less than 61**	**61-100**	**101-140**	**141-200**	**201 and more**
Less than 61		-0.0532	-0.04717	-0.0858	0.4665*
61-100			0.006113	0.1392	0.4665*
101-140				0.330	0.4604*
141-200					-03274*
201and more					

Table 5.67 Scheffe Post Hoc results for multiple comparisons on the water pollution domain

House area m^2	**Less than 61**	**6-100**	**101-140**	**141-200**	**201 and more**
Less than 61		0.138*	0.1240*	0.04376*	0..1704*
61-100			-0.014*	-0.095*	0.04639
101-140				-0.08027	-0.04446
141-200					-0.1267
201 and more					

The results show that as the house area increases the consumption of water increases and health situation comes better.

Q.15 Are there any significant differences in sample responses towards the water poverty due to the house garden availability variable?

To answer this question, independent T test has been used to analyze the data from questionnaire. Table 5.68 shows the results for house garden availability over the different domains. The table includes the mean, the standard deviation, the T test value, and the significance level (using a confidence level of 0.95). The results show that there are significant differences between existence of house garden and not in the domains of supply of water, consumption of water. No significant differences between existence of house garden and not were found in the domain of health situation, sanitation services and water pollution.

Table 5.68 T-Test results for differences in the water poverty according to house garden availability variable for different domains.

Water poverty	Garden	N	Mean	SD	D. F	T	Sig.*
Supply of water	Yes	438	1.8297	0.5280	924	-5.092	0.001*
	No	488	2.0061	0.5252			
Consumption of water	Yes	246	3.5927	0.6207	435	-3.669	0.001*
	No	191	3.3650	0.2713			
Health situation	Yes	146	1.9521	0.2067	256	-0.342	0.733
	No	112	1.9621	0.2631			
Sanitation services	Yes	224	2.3780	0.3640	433	-0.123	0.902
	No	211	2.3823	0.3712			
Water pollution	Yes	180	1.5922	0.1965	352	0.596	0.551
	No	174	1.5793	0.2108			

The results show that houses with a garden consume water more than houses without a garden.

Q.16 Are there any significant differences in sample responses towards the water poverty due to the availability of water tank variable?

To answer this question, independent T test has been used to analyze the data from questionnaire. Table 5.69 shows the results for availability of water tank over the different domains. The table includes the mean, the standard deviation, the T test value, and the significance level (using a confidence level of 0.95). The results show that there are significant differences between existence of water tank and not for supply of water, health situation, sanitation services and water quality domains.

Table 5.69 T-Test results for differences in the water poverty according to water tank variable for different domains

Water poverty	Water tank	N	Mean	SD	D.F	T	Sig.*
Supply of water	Yes	550	1.8407	0.4752	924	-5.75	0.001*
	No	376	2.0426	0.5894			
Consumption of water	Yes	279	3.4179	0.5972	435	-1.99	0.47
	No	158	3.5468	0.7347			
Health situation	Yes	169	2.00	0.22	256	4.526	0.001*
	No	89	1.87	0.23			
Sanitation services	Yes	327	2.43	0.36	433	5.203	0.001*
	No	108	2.22	0.35			
Water pollution	Yes	241	1.60	0.20	352	2.257	0.025*
	No	113	1.55	0.21			

From the results obtained, houses with water tank, have better water supply, better health situation, better sanitation, and better water quality.

Q.17 Are there any significant differences in sample responses towards the water poverty due to the number of rooms in the house?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the significance, if any, of the number of rooms in the house overall the domains. Results of ANOVA test are shown in Table 5.70. The other is the Post Hoc test to measure the significance, if any, between the different number of rooms (one, two, three, four and more). Results of Post Hoc test are shown in Tables 5.71- 5.74.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the differences in the number of rooms in the house for supply of water, consumption of water, health situation, and water quality domains.

- For supply of water domains significant differences are shown between different numbers of rooms.
- For the consumption of water domain, significant differences are shown between different numbers of rooms.
- For the health situation domain, significant differences are shown between different numbers of rooms.
- For water pollution domain significant differences are shown between different numbers of rooms.

Table 5.70 One Way ANOVA results for differences in the water poverty according to rooms number variable for different domains

Domains	**S.O.V**	**S.S**	**D.F**	**M.S**	**F value**	**Sig.**
Supply of water	B.G	17.069	3	5.690	21.301	0.0001*
	W.G	246.275	922	0.267		
	Total	263.344	925			
Consumption of water	B.G	22.702	3	7.567	20.117	0.0001 *
	W.G	162.878	433	0.376		
	Total	185.580	436			
Health situation	B.G	0.836	3	0.279	5.423	0.001*
	W.G	13.049	254	0.051		
	Total	13.884	257			
Sanitation services	B.G	0.954	3	0.318	2.381	0.069
	W.G	57.540	431	0.134		
	Total	58.494	434			
Water pollution	B.G	0.983	3	0.328	8.415	0.0001*
	W.G	13.626	350	0.039		
	Total	14.609	353			

Table 5.71 Scheffe Post Hoc results for multiple comparisons on the supply domain.

Rooms number	1 Room	Two rooms	Three rooms	Four and more
One room		-0.3009*	0.0107	-0.0419
Two rooms			0.3116*	0.2590*
Three rooms				-0.0526
Four and more				

Table 5.72 Scheffe Post Hoc results for multiple comparisons on the consumption of water domain**.**

Number of rooms in house	1 Room	Two rooms	Three rooms	Four and more
1 Room		-0.3665*	0.2579*	0.6244*
Two rooms			0.1800	0.5465*
Three rooms				-0.078
Four and more				

Table 5.73 Scheffe Post Hoc results for multiple comparisons on the health situation domain

Number of rooms	1 Room	Two rooms	Three rooms	Four and more
1 Room		0.0226	-0.1361*	-0.0413
Two rooms			-0.1587*	-0.0639
Three rooms				0.0947
Four and more				

Table 5.74 Scheffe Post Hoc results for multiple comparisons on the pollution domain

Rooms Number	1 Room	Two Rooms	Three Rooms	Four and more
1 Room		0.1069*	-0.0486	-0.0172
Two Rooms			-0.1555*	-0.1242*
Three Rooms				-0.0313
Four and more				

The results show that as the number of the rooms in the house increases as the consumption of water increases, and the health situation gets better.

Q.18 Are there any significant differences in sample responses towards the water poverty due to the kitchen availability variable?

To answer this question, independent T-test has been used to analyze the data from questionnaire. Table 5.75 shows the results for kitchen availability over the different domains. The table includes the mean, the standard deviation, the T test value, and the significance level (using a confidence level of 0.95). The results show that there are significant differences for existence of kitchen and not in the supply of water and health situation domains. No differences were shown for other domains.

Table 5.75 T-Test Results for differences in the water poverty according to kitchen variable for different domains

Water poverty	Kitchen	N	Mean	SD	D.F	T	Sig.*
Supply of water	Yes	608	1.84	0.48	922	-6.553	0.0001 *
	No	316	2.08	0.59			
Consumption of water	Yes	296	3.55	0.62	433	-1.945	0.52
	No	139	3.43	0.70			
Health situation	Yes	183	1.98	0.21	254	2.344	0.020*
	No	73	1.90	0.27			
Sanitation services	Yes	346	2.39	0.37	431	1.490	0.137
	No	87	2.39	0.33			
Water pollution	Yes	261	1.59	0.20	350	1.321	0.187
	No	91	1.56	0.21			

The results show that houses with a kitchen consume water more and the health situation is better than houses without a kitchen.

Q. 19 Are there any significant differences in sample responses towards the water poverty due to the bath-room type variable?

To answer this question, two statistical tests have been performed. The first is the one way analysis of variance test (ANOVA) to test the

significance, if any, of bath-room type overall the domains. Results of ANOVA test are shown in Table 5.76. The other is the Post Hoc test to measure the significance, if any, between the different path room types (external bath-room, internal bath-room, internal without water pump, internal with pump + shower, internal + shower without a pump). Results of Post Hoc test are shown in Tables 5.77-5.81.

The results of these tests show that:

- ANOVA test results show that there are significant differences due to the type of the bath-room for all domains.
- For supply of water domain significant differences are shown between different types of bath-room.
- For the consumption of water domain, significant differences are shown between different types of bath-room.
- For the health situation domain, significant differences are shown between the external and internal types.
- For the sanitation services domain, significant differences are shown between the external and internal types.
- For water pollution domain significant differences are shown between different types of bath-room.

Table 5.76 One Way ANOVA results for differences in the water poverty according to bath-room type variable for different Domains

Domains	S.O.V	S.S	D.F	M.S	F value	Sig
Supply of water	B.G	39.420	4	9.855	40.533	0.0001*
	W.G	223.924	921	0.243		
	Total	263.344	925			
Consumption of water	B.G	22.338	4	5.584	14.778	0.0001*
	W.G	163.243	432	0.378		
	Total	185.580	436			
Health situation	B.G	1.319	4	0.330	6.637	0.0001*
	W.G	12.566	253	0.049		
	Total	13.884	257			
Sanitation services	B.G	8.036	4	2.009	17.120	0.0001*
	W.G	50.458	430	0.117		
	Total	58.494	434			
Water pollution	B.G	1.653	4	0.413	11.133	0.0001*
	W.G	12.956	349	0.037		
	Total	14.609	353			

Table 5.77 Scheffe Post Hoc results for multiple comparisons on the supply domain

W.C	External	Internal	Int. without	WC+ with	WC+ without
External		-0.024	-0.4605*	0.1686*	-0.1856
Internal			-0.4369*	0.1921*	-0.1621
Int. without				0.6291*	0.2749*
WC+ with					-0.3542*
WC+ without					

Table 5.78 Scheffe Post Hoc results for multiple comparisons on the consumption of water domain

Bath room type	External	Internal	Int. without	Int. + shower with	Int. + shower without
External		0.3949*	-0.1941	0.4549*	-0.038
Internal			-0.5890*	0.0599	-0.4335
Int. without				0.6490*	0.1556
Int. + shower with					-0.4934*
Int. + shower without					

Table 5.79 Scheffe Post Hoc results for multiple comparisons on the health situation domain

Bath room type	External	Internal	Int. without	Int. + shower with	Int. + shower without
External		0.1939*	0.0153	0.1105	0.1314
Internal			-0.1786	-0.0833	-0.0625
Int. without				0.0952	0.1161
Int. + shower with					0.0283
Int. + shower without					

Table 5.80 Scheffe Post Hoc results for multiple comparisons on the sanitation services domain

Bath room type	External	Internal	Int. without	Int. + shower with	Int. + shower without
External		-0.1134	0.1984	0.1488	0.4068*
Internal			0.3118*	0.2622*	0.5201*
Int. without				-0.049	0.2083
Int. + shower with					0.2579
Int. + shower without					

Table 5.81 Scheffe Post Hoc results for multiple comparisons on the pollution domain

W.C	External	Internal	Int. without	WC+ with	WC+ without
External		0.1157*	0.1485	0.1620*	-0.1015
Internal			0.033	0.046	-0.2172
Int. without				0.013	-0.2500
					-0.2635*
WC+ without					

5.3 Interviews results and discussion

This section will include

- Interviews results.
- Important Issues related to Palestinian Water Authority (PWA) institution.
- Alternative policies affecting water and water sector and their impacts.

5.3.1 Interviews results

The results are shown in Appendix D.

5.3.2 Important issues related to PWA institution

Policies and institutions for water must evolve to: (1) maintain growth in irrigated and rainfed agricultural production; (2) facilitate efficient intersectoral allocation of water, likely to include transfers of water out of agriculture; (3) reverse the ongoing degradation of the water, irrigated land, and water-related ecosystems, including the watershed, irrigated land base, and water quality; (4) increase incomes and enhance and safeguard the rights of poor and socially-excluded groups to domestic and irrigation water supplies; (5) improve the effectiveness of water use in rainfed agricultural areas, including less favorable and dry land areas; and (6) better management of conflicts over water use.

As we know, the institution responsible for managing water resources in West Bank is Palestinian Water Authority (PWA), some important issues related to this institution will be discussed below to see the effectiveness of this institution in managing water resources, also to see whether the objectives mentioned above are accomplished or not.

(a) Responsibilities and tasks

1- Execute the National Water Policy as approved by the National Water Council.

2- Ensure most efficient management of available water resources in Palestine.

3- Seek to achieve and develop water security through optimal planning and management of water resources and explore further resources to ensure balanced management between supply and demand.

4- Set standards and establish technical specifications to assure quality control and quality assurance.

5- License the exploitation of water resources including the construction of water projects.

6- Seek to achieve strong co-operation between PWA and other relevant parties.

(b) Economic funding of the PWA

The PWA has many sources of income such as:

1- Funds from the general budget of the Palestinian Authority.

2- Grants and support from international development agencies

3- Fees on licenses, permits and concessions.

Good management of these financial resources will contribute to great extent in solving the problem of water poverty (i.e. new water resources, helping poor people in someway to pay for water).

(c) Water tariff

In the National Water Policy, water has a high social, environmental and economic value. Accordingly this resource has to be managed in terms of both quality and quantity in an economically effective manner. A tariff policy has to be adopted in order to insure both the efficient use and conservation of water. This tariff policy has to take into consideration the social conditions of the people including affordability, i.e., the ability to pay. The existing tariffs do not encourage water conservation, and are generally inadequate to recover operation and maintenance costs. This is a combined effect of several factors:

1- High level of unaccounted for water (which may reach 60% in some areas because of the oldness of the networks or of the stolen water).

2- Poor revenue collection efficiency;

3- High cost of water production from a deep well or purchase from the Israeli state water company, Makarot.

4- Flat or little progressive tariffs below marginal production costs.

The future tariff structure (developed by PWA) should be based on the following principles:

1- The overall water and wastewater services shall be economically sustainable covering both operational and investment costs.

2- The sewerage fee shall be integrated in the water charge.

3- The tariff structure shall encourage water conservation.

4- Cross subsidization will be considered a measure to provide water for basic needs at affordable prices.

5- The tariff system shall be practical to implement and enforce.

6- A pollution charge shall be considered added on for industrial pollution.

To reach an integrated tariff policy which accomplishes all goals intended from it we should consider those class of people whom can not pay for water and we should solve their problems in some ways (i.e., social studies can help in determining the targeted peoples, developing laws in order to subsidize water price for this class of people).

(d) Development planning

In the PWA institution there is a department involved in development and development planning in which are working a qualified number of employees, but according to PWA's managers, this department need more employees to work in it.

There is no budget from PWA institution specified for development plans but the USAID studying the ways for financing these developmental plans. There is a specified budget for development from the government of France. Also there is some future development plans for: enhancing water networks, reservoirs and water pumps, the number of wells and their capacity, reducing water losses, treatment and reuse of wastewater, applying laws and regulations.

(e) Public awareness and participation

It is important to link the policies to people, keeping in mind that policy formulation and the setting of national priorities should occur with the involvement of all major water stakeholders (both users and managers). Stakeholders can be linked to policy-makers through existing organizations and forums at national, district and community level. The decentralization of responsibility and increasing accounting to primary stakeholders is an important success factor. As popular participation increases with an effective, two-way flow of information, existing policies may need to be revised. The PWA has implemented an interactive awareness process to transfer important messages and information to the public. The awareness program also helps to foster positive attitudes regarding water services and the PWA. Given the current political conditions, central objectives of the awareness program are the enhancement of public understanding regarding Palestinian water resources and water rights, and, the continued effort to keep the public updated on water emergency procedures.

The PWA is striving to utilize modern communication approaches in its Public Awareness program:

Mass Media

- *Radio*: Public awareness slogans to promote efficient use of water seminars to acquaint the public with water sector issues.
- *Television*: Public service announcement. Creative water utilization and public health spots. A documentary describing the water reality in Palestine.

- *Print – Newspapers and Magazines*: Water conservation contests. Press Releases on Water situation in Palestine.

Direct communication with the public

- *Seminars and lectures* in schools to encourage water protection and efficient utilization of scarce water resources.
- *Workshops* in coordination with municipalities and local councils to improve water and sanitary services.
- *Participation* in international conferences and workshops where Palestinian water reality and the role of the PWA are presented.

Indirect communication with the public

- *Posters:* Stressing the value of water and public health issues.
- *Brochures:* Aiming at efficient water utilization in house gardens. Illustrating the importance of rain harvesting wells. Addressing farmers on water pumping from wells and use of pesticides. Explaining methods for efficient utilization of water and protection from contamination. School schedules including water related slogans and posters drawn by school children. School activities and competitions addressing the water cycle, the value of water and water as a public health issue.

Awareness of water resources challenges, issues, and opportunities is an essential activity of improving water resources management in Palestine and needs to be enhanced:

- ♦ At the political level, to create understanding and commitment;
- ♦ At the executive level in PWA, as part of building capacity; and among the public, to create society wide commitment;

- Growing awareness will encourage public support of policy initiatives, such as tariff reforms, good governance, and de-centralization of public decision-making;
- Promoting and enabling local participation in planning, operation and management of water resources is a fundamental strategy for achieving sustainable development. Local involvement is a key to ensuring water demand management to monitor the performance of public and private institutions;
- Local participation and unity is a cultural tradition in Palestine, rooted perhaps in coping strategies for collective survival under difficult conditions. It would be possible to benefit from this tradition to promote public involvement and enhance water resources responsibility and management in society at large. PWA should also consider incorporating community members in the preparation and implementation of projects.

(f) Violations and punishments

The PWA has many water management laws and regulations in the West Bank. Some cases are addressed below to illustrate some of these laws and regulations:

- The municipalities, village councils, and camp councils can not sell water or change the water tariff without the agreement of the PWA.
- When somebody digs a well or sells water without having a permit from PWA, he will be punished and his well will be closed.
- When the owner of the well or the municipalities exceeds the allowed maximum limit of water from their wells, and if they use the

water for other purposes than specified in the license, there is a law that punishes them (pay a fine).

- When village councils do not pay for water, the PWA will stop supplying water for these councils.

So because of the current situation in the West Bank (occupation, political instability), these laws and regulations actually are not applied efficiently. We hope that these laws and regulations will be effectively studied and applied to protect water resources and enhance water management policies in West Bank.

5.3.3 Alternative policies affecting water and water sector and their impacts

Five broad areas of policies that affect the future of water and food will be considered here: (1) economy-wide policies that influence water resource demand, supply, and quality, including globalization, trade and macroeconomic policy, agricultural output and input pricing and taxation policies; (2) public investment and financing of irrigation and water supply; (3) policies for water allocation; (4) water quality and environmental policies; and (5) trans-boundary water policies. Key issues and research questions in each of the categories of policies will be addressed and discussed in the following sections.

(1) Globalization, trade, macroeconomic and sectorial polices

Key research issues include:

- What is the relationship between national policies and water sector policies and how can they be effectively coordinated?

Water sector policies are prepared by Palestinian Water Authority and then revised and adopted by National Authority.

Water sector policies will be coordinated in national policies by:

1. Adopting the general water policy.
2. Adopting water resources use and development policy.
3. Adopting plans and programs aimed at regulating water usage and reducing consumption.
4. Adopting pricing policies.
5. Approving money allocation for investment in water sector.
6. Adopting and approving annual balance for water authority.

- To what extent can imports of virtual water through food imports be utilized to conserve water domestically and achieve water and food security goals?

There is an impact of food imports on water situation and security. Increasing food imports have an impact on agricultural production. It will reduce agricultural water and may help in alleviating water scarcity. But since agriculture is considered, one of the major economic sector in Palestine and its production contributes 30% to national income. So increasing food imports will worsen economical situation. Palestinian Water Authority can do nothing regarding this aspect since according to Oslo, there is a fixed quantity of water to Palestine (500,000,000m3/year).

(2) Public investment and financing of irrigation and water supply

Important research issues include the following:

- To what extent can and should full capital and/or operations and maintenance costs be recovered from water users and other beneficiaries in each sector?

  At present, full cost recovery has not been achieved by water suppliers for both domestic and agricultural use. Even though some utilities have achieved operation and maintenance (O&M) cost recovery, it should be pointed out that none has achieved the full cost recovery of both the O&M and the capital costs. This situation is not solely due to the existing socio-economic factors or to the affordability of payment of the public, as there are other internal and external factors within the utilities and their surrounding environment. One of the most important causes of the inability to achieve cost recovery in the Palestinian water authorities is the high percentage of unaccounted -for- water which reaches in certain cases 60%. The small scale of the water networks the poor management and the inappropriate pricing policies are other main obstacles.

- What water pricing and water rights policies will best contribute to appropriate levels of cost recovery and to economic and social valuation of water that will provide incentives for efficient and effective water use in each sector?

Economic development is to a large extent dependent on adequate water supply. Both agriculture and wide range of industries depend on water. However, the current pricing system in West Bank does not reflect the real value of water, since it is not based on an economic analysis to estimate this value. In the national water policy, water has a high social environmental and economic value. Accordingly this resource has to be

managed in terms of both quality and quantity in an economically effective manner. A tariff policy has to be adopted in order to insure both the efficient use and conservation of water. This tariff policy also has to take in the consideration the social conditions of the people including affordability (the ability to pay). The current responsible institutions for running the drinking water extraction and distribution are regional utilities, municipal departments, village committees. The water for agriculture is either operated by individual farmers or families or by collective or cooperative management. These different bodies suffer from overall in efficient management, poor financial records, from high unaccounted – for – water and don't have any sound financial records that one can rely on and use in deciding the present or actual cost for extracting and distributing the water. Thus, it is difficult to get the necessary information or the present cost of water that is needed for documented calculations. The marginal cost of water is the cost of producing and distributing the additional quantities needed to cover demand, including covering the needs of localities without piped networks, industry and agriculture. In Palestine there is lack of elasticity in covering the water demand due to limited financial resources which are needed for investment in the infra structure, lack of plans, the existing political situation and the institutional and operational short comings of the water institutions. Therefore, it is assumed that the existing Palestinian needs will take at least 3 – to- 4 years to be covered. The outcome of the Palestinian Israeli peace talks concerning water issues was supposed to be the agreement of both sides on doubling the water quantities the Palestinians can extract in order to cover the immediate Palestinian needs over the coming 3 years. However, the Palestinian water rights in the water resources in the West Bank have not been defined; the whole issue of

water rights has been shifted to the final stage talks. Therefore, when calculating the present marginal cost of water in a simple presentable way, certain assumptions must be made concerning quantities, investment, average depreciation ratio for assets and infrastructure capital and energy cost (according to different scenarios).

- What institutional mechanisms are most effective in minimizing the cost and price of water?

  This can be done by:

  1- Reducing the losses.

  2- Preventing stolen water.

  3- Reducing operational cost.

- What is the relative role of private investment for management, expansion and maintenance of irrigation, water supply and sanitation systems?

  There are some distribution points and some irrigation wells owned by some people, elsewhere there is no role for private sector in management or expansion of water sector services.

- Will water allocation for agriculture, industry, tourism and drinking be changed in future and how?

  Water allocation will be changed in the future; some new wells will be dogged to increase the total quantity.

(3) Policies for water allocation

Research questions are discussed and summarized below:

Determinants of water allocation mechanisms

- What are the characteristics and determinants of existing water allocation mechanisms?

The existing water allocation system is a continuation of the system before the negotiation of Oslo. The system was inefficient since it was not based on a clear mechanism. The Israeli divided the wells for persons and municipalities to serve the Israeli benefits. As an example that the agricultural wells at the Jordan Valley were divided for the persons who have large farms and have good relations with Israeli. The PWA planed to have its own allocation policy, for example, they are going to cover the localities by digging wells and to be independent of Makarote (the Israeli) as possible. If the PWA is independent of Israeli, the allocation policy may be cleared.There are some previous negative practices that influence indirectly the allocation system, for example, exceeding the determined quantity of the water allowed from some wells. Nowadays, the PWA is going to stop these negative practices, but the current political conditions stopped the application of the laws and legislations imposed for such cases.

Water rights

Key research questions include:

- What is the relationship between water rights and water needs?

Our water needs are more than water rights that agreed in the negotiations.

- What are the benefits and costs of making water rights tradable?

Making the water rights tradable has disadvantages more than benefits. Some of these disadvantages are:

1- The cost may be uncontrolled.

2- Making the water rights tradable may follow the people modes.

3- Because of the political situation, the PWA has no real power over the system so making rights tradable may cause some troubles such as when a person sell his agricultural water rights for other purposes (i.e. drinking) the water quality may be unsuitable for this purpose.

On the other hand, if there is an excess of water in one of the wells, it is better to be used in other places, in the presence of a complete control over the system.

Impacts on access and poverty

- How can the rights and access to water be established and safeguarded during the processes of demographic, economic and political change?

Palestinian Water Authority (PWA) look forward through negotiation to obtain permissions for well digging as much as possible to assure that water is available for all localities.

- What are the barriers to access for the poor under existing policies and institutions for water, and how can these be overcome?

The most important barrier is the financial problem. The PWA does not have plans and policies to help this class of people but some of municipalities and village councils refer to social affairs to solve this problem. Most of the poor are living in unconnected localities and there are

no real statistical studies about their water needs. But those poor people who are living in connected localities have only the financial problem.

- How can poor people participate and give their opinion of water services and affect existing water policies?

This can be done through their representatives at the Legislation Council to make laws and legislation to help these people to solve their problems. This legislation may help the PWA to make special policies for this class of people. Also, media must talk about their water problems (economical problems, the connection to water network, … etc) and help them to give their opinion of water services and cost.

- How can water policies and institutions be designed to improve access for the poor, and to improve participation of the poor?

The PWA must have a policy that every municipality and village council must have a suggestion and complement box that helps the poor to give their opinion and their problems. These boxes must be studied by a specialized committee.

- Could privatization of water sector help in improving access to water for the poor?

If privatization is done in a studied way, and the needs of the poor are studied well, so the coordination between the Authority, the Associations, the NGOs and the water private company, will help to find a solution to cover the water problem of the poor.

Impacts on intersectoral water demand

- What institutional tools can be developed and utilized to inform the trade-off among multiple uses of water?

Trade-off among multiple uses of water is possible , but there are restrictions, as an example, we can use agricultural water as drinking water if there is an excess of agricultural water and if the PWA do not allow any of the well owners to exceed the quantity allowed. In this case it is necessary to apply lab tests to insure that the quality of water is suitable for drinking.

(4) Policies and institutions for water quality and environmental sustainability

Key research questions are summarized below:

- Who should bear the costs of pollution?

Any one who causes pollution in any of water sources, or any water system supplying water, has to remove the pollution and to pay the cost for this. In any case he rejects or resists doing so, the authorities have to clean the pollution on the expense of the person who caused it, and to collect the costs by law.

Chapter Six

Conclusions and Recommendations

6.1 Conclusions

Based on the results obtained and their discussions, the following conclusions were reached:

6.1.1 Poverty index (WPI)

- The Water Poverty Index (WPI) was an effective tool for integrating the wide variety of issue relevant to water management and planning. The WPI was calculated using different approaches (Conventional Composite Index, Holistic, Matrix and WPI Pentagram, Simple Time Analysis, Falkenmark), it was found that the holistic WPI calculation approach was the best one because it integrates the physical, social, economic, and environmental aspects, and links water and poverty issues. The result of this approach was 39.5% which indicates that the region faces a serious water problem. The situation will continue to worsen dramatically as population grows unless a reform of water management policies and institutions and a cooperative management of shared water are practiced.

- From the results of conventional composite index approach it was found that policy maker's priorities for future water management may be to allocate more investments for exploiting of new water resources to increase available water and to increase the number of people who have access to safe water and sanitation.

- For the holistic WPI calculation approach the results of sub- indices were found: relatively high in access, low in capacity, use, and environment, and relatively low in resources.

- From the result of matrix approach it was found the situation of the West Bank is characterized by: low capacity and use but relatively high availability and access.

6.1.2 Field survey (Questionnaire)

From the results of the questionnaire it was found:

- Significant differences between mails and females in the consumption of water domain are in favor to males.
- Significant differences due to differences in the place of living for consumption of water, health situation, and sanitation services domains are in favor to peoples living in cities. This may be due to the fact that there are still some villages not connected to network, also due to the economic situation for people living in villages and refugee camps.
- Significant differences between municipality and village council as a management system in the domains of supply of water, health situation and sanitation services are in favor to municipality system.
- People of social responsibility (single) consume water less and are of better health situation than people of social responsibility (house-holder).
- Significant differences due to differences in the number of families in the house hold for the consumption of water and sanitation services domains. No differences are shown for the other domains.

  It is found that houses of one family consume less water than houses of two and three families. For sanitation services it is found that

houses of one family have better services than houses of two and three families.

- Significant differences due to differences in family members number for: supply of water, consumption of water, health situation, and water quality domains with favor to families of fewer member numbers.
- Significant differences due to differences in monthly income for: supply of water, sanitation services, and water quality domains with favor to higher monthly income.
- No significant differences due to water percentage from monthly income for all domains were found.

  It was found that 15.4% of people's sample pay from 21-40% of their monthly income for water services which is a considerable percentage.
- According to the sample surveyed, it was found that the standard of living was distributed according to the following categories as:

  46.3% of the sample surveyed was of better-off category,

  50.4% of the sample surveyed was of middle category,

  3.2% of the sample surveyed is of worse – off category.
- Significant differences between both independent and apartment house types in the domains of supply of water, and consumption of water with favor to apartment house type.
- Significant differences due to differences in the house areas for all domains. The results show also that as the house area increases, the consumption of water increases, and the health situation becomes better.

- Significant differences between existence of house garden and not in the domains of supply of water, and consumption of water.
- Significant differences between existence of water tank and not for all the domains with favor to house with water tank.
- Significant differences due to differences in the number of rooms in the house for consumption of water and health situation domain.

  As the number of rooms in the house increases as the consumption increases and the health situation gets better.
- There are still some regions not connected to safe water and sanitation. As a consequence, water–and sanitation– related diseases are spread there. About 20% of the sample members were affected by water related diseases.

6.1.3 Interviews

- From the results of the interviews, it was found that the existing tariffs do not encourage water conservation, and are generally inadequate to recover operation and maintenance costs.
- From the results of the interviews, it was found that the future tariff structure (developed by PWA) did not take into consideration those class of peoples whom can not pay for water.
- Awareness of water resources challenges, issues, and opportunities is an essential activity of improving water resources management in Palestine and needs to be enhanced.

- Laws and regulations of the PWA should be effectively studied and applied to protect water resources and enhance water management policies in West Bank.

- Imports of virtual water on one hand could reduce agricultural water and as a consequence could help in alleviating water scarcity (by saving water for other purposes). But on the other hand could have negative impacts on Palestinians economical situation.

Water for agriculture is critical for food security. So investment and policy reforms in water and irrigation management will be significant determinants of future food production, demand, prices, and trade. Rapidly growing municipal and industrial water demand will increase water scarcity for agricultural, and with a continued slowdown in water investments, could be a serious threat to future growth in food production. Food production, demand, trade, and prices will be affected. A decline in water available for irrigation without compensating investment and improvement in water management and water use efficiency – in both irrigated and rain-fed areas- will reduce production growth and increase prices, causing negative impacts on low- income consumers.

- Low water prices and subsidies for capital investment and operation and maintenance threaten the financial viability of irrigation and water supply.

- From the results of the interviews it was found that the main causes of inability to achieve cost recovery in Palestinian Water Authorities were:

1. The high percentage of unaccounted -for- water which reaches in certain cases 60%.
2. The small scale of the water networks.
3. The poor management and,
4. The inappropriate pricing policies are other main obstacles.

- There is no role for private sector in management or expansion of water sector services
- The existing water allocation mechanisms are characterized as inefficient and not clear as they are a continuation of the system practiced before peace negotiation.
- Clarifying and strengthening water rights can play an important role in improving water allocation equity and efficiency, while a lack of effective water rights systems creates major problems and inequities for managing increasingly scarce water.
- Reform of water allocation mechanisms and policy will be increasingly important for meeting new water demands by saving of water in existing uses, for increasing the water economy benefits from water use, and for improving the quality of water.
- Making the water rights tradable may have disadvantages more than benefits under the current situations.
- Access to safe water is crucial for poor residents. Often women, the poor, and disadvantaged groups, including minorities and indigenous peoples, have unequal access to water, which can lead to even greater increases in poverty.

- Privatization of water sector could help in improving access to water for the poor if privatization is done in a studied way.
- Trade-off among multiple uses of water is possible if practiced under complete control.
- Under the current situation, no real control over the complete system can be practiced, so policies and action regarding water pollution and quality are difficult to implement.

6.2 Recommendations

- It is recommended that more effort should be directed to enhance the situation of females from the aspect of water services.
- It is recommended that the government should support and enhance the role of village councils.
- It is recommended that there is a need for a policy to consider that class of people who cannot afford to pay for water in order to provide their needs of water with an affordable price.
- It is recommended that the main objectives of water pricing should include:
    1- Creation of incentives for efficient water use.
    2- Cost recovery in the water sector and,
    3- Financial sustainable for urban water supply systems and irrigation, including the ability to raise capital for expansion of services to meet future demand.
- It is recommended that the future tariff structure (developed by PWA) should be improved more to reach an integrated tariff policy.
- It is recommended that PWA institutional capacity should be enhanced.
- It is recommended that laws and legislations should be developed to help in solving the problem of poor, women, and disadvantaged peoples. Also media must talk about their water problems to help them to give their opinion.
- It is recommended that coordination between the Authority, the Associations, The NGO's and the water private company will be helpful in covering water problems of the poor.

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Appendices

Appendix A
Questionnaire

تأثير السياسات الإدارية المائية على فقر المياه في فلسطين

مقدمة

هذه الاستبانة هدفها علمي بحت، وهي تفيد بحث رسالة الماجستير لطالبة في كلية الدراسات العليا –قسم هندسة المياه والبيئة في جامعة النجاح الوطنية وتهدف لدراسة السياسات الادارية المائية في فلسطين وتأثيرها على فقر المياه. شاكرين لكم تعاونكم البناء.

المعلومات العامة:

1- اسم المدينة، القرية، المخيم:.....

2- النظام الإداري: بلدية، مجلس قروي

3- الجنس: ذكر ☐ أنثى ☐

4- العمر: 1- 20 سنة فأقل 2- 21 –35 سنة 3- 36 – 50 سنة 4- 51 فأكثر

5- المسؤولية الإجتماعية: 1- أعزب 2- رب أسرة 3- ربة بيت.

6- عدد الأسر في المسكن:1- أسرة واحدة 2- أسرتان 3- 3 أسر فأكثر

7- عدد أفراد الأسرة الكلي:1 :2- 3 أفراد 2 : 4-7 أفراد 3: 8 أفراد فأكثر

8- عدد العاملين في الأسرة:.....

9- مجموع دخل الأسرة الشهري: 1- أقل من 1000شيكل 2- 1001-2500شيكل

3- 2501-5000شيكل 4- 5001 شيكل فأكثر.

10- كيف يتم توزيع الدخل على الإحتياجات الأساسية(النسبة المئوية من الدخل):

مياه	كهرباء	ملبس	المسكن	التنقل	التعليم	التدفئة	هاتف	غذاء	توفير	ترفيه

11- جدول بيانات أفراد الأسرة:

ملاحظة: عند تعبئة الأعمدة في الجدول التالي (الصفحة التالية)نرجو استخدام الأرقام للدلالة على المعلومة المختارة وحسب الشرح التالي:

- العمر: (العمود **2**)

  1: 20 سنة فأقل 2: 21 –35 سنة 3 :36 – 50 سنة 4: 51 فأكثر

- الجنس: (العمود 3)

  1- ذكر 2- انثى

- مستوى التعليم: (العمود **4**)

  1- أقل من توجيهي 2- توجيهي

  3- جامعي بكالوريوس 40- جامعي (ماجستير أو دكتوراه).

- الحالة المهنية: (العمود **5**)

1- يعمل 2- لا يعمل.

- نوع المهنة: (العمود **6**)

1-لا يوجد مهنة 2- صناعة 3- زراعة 4- تجارة 5- سياحة
6- أمن أو جيش 7- موظف حكومة 8- خدمات (طب، هندسة، محاماة، .....)

- الحالة الصحي(العمود **7**)

1-ممتازة 2- اعاقة منذ الولادة 3- سكري 4- ضغط دم
5- كلى 6- كبد 7- سرطان 8- قرحة

- دخل الفرد الشهري (العمود **8**)

1- أقل من 1000شيكل 2- 1001-2500شيكل
3- 2501-5000شيكل 4- 5001 شيكل فأكثر.

الرقم	الفرد	العمر	الجنس	مستوى التعليم	الحالة المهنية	نوع المهنة	الحالة الصحية	الدخل بشيكل/الشهري	ملاحظات
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

معلومات حول المسكن:

12-نوع المسكن: 1- بيت مستقل 2- شقة
☐ ملك ☐ أجرة

13- ما هي مساحة المسكن الإجمالي:
1- أقل أو يساوي 60 م2 2- 61 -100 م2
3- 101-140 م2 4- 141م2 – 200م2 5- 201م2 فأكثر.

14- هل يوجد حديقة للمنزل: 1- نعم 2- لا

15- هل يوجد خزان مياه: 1- نعم 2- لا

16- ما هو عدد الغرف باستثناء المطبخ والحمامات:

1- غرفة 2- غرفتان

3- 3 غرف 4- 4 غرف فأكثر

17- هل هناك مطبخ مستقل في المسكن: 1- نعم 2- لا

18-نوع الحمام في المسكن:

1- مرحاض خارجي 2- مرحاض داخلي

3- مرحاض داخلي بدون مضخة ماء(نيغارا) 4- مرحاض + حمام داخلي مع مضخة ماء

5-مرحاض + حمام داخلي بدون مضخة ماء

المعلومات حول خدمة تزويد المياه، خدمة الصرف الصحي، الاستهلاك، والوضع الصحي:

19-ما هو مصدر المياه الرئيسية في مسكنك:

1- شبكة مياه رئيسية 2- بئر جمع مياه المطر 3- من الينابيع المحيطة

4-شراء من الصهاريج 5- غيره، حدد .....

20-ما هو معدل كمية المياه المشتراه في الشهر (صيفا) م.3

21-ما هو معدل كمية المياه المشتراه في الشهر (شتاءا) م.3

22-ما هو معدل سعر المياه المشتراه صيفا لكل متر مكعب.....شيكل.

23-ما هو معدل سعر المياه المشتراه شتاءا لكل متر مكعب.....شيكل.

24-كيف يتم تخزين المياه في حال عدم كفاية المياه المزودة للمسكن بواسطة الشبكة أو عدم اتصال المسكن بالشبكة:

1- من خلال بئر جمع 2- براميل مياه بلاستيكية

3- براميل مياه حديدية (تنكات) 4- غيره، حدد:.....

25- اذا كانت كميات المياه في منزلك غير كافية، في أي جوانب يتم الاقتصاد في الصرف:

1-الاستحمام 2- غسيل الملابس 3- تنظيف المنزل 4- غيره، حدد:.....

26- هل يوجد شبكة صرف صحي:1- نعم 2- لا

27- إذا كان الجواب لا فإن عملية جمع المياه العادمة تتم من خلال:

1- حفر صماء 2- حفر امتصاص 3- قنوات سطحية

28- ما معدل استهلاك الأسرة الكلي (من الشبكة /الخزان أو غيره) من المياه في الشهر:...م.3

29- هل راجعت أنت أو أحد أفراد أسرتك العيادة الصحية لأمراض مرتبطة بتلوث المياه مثل الحمى، الأميبا، الإسهال وغيرها: 1- نعم 2- لا

30- هل المراجعة كانت للأطفال فقط: 1- نعم 2- لا

31- هل المراجعة كانت لكبار السن فقط: 1- نعم 2- لا

32- هل المراجعة كانت للبالغين فقط:1 - نعم 2- لا

33- إذا تمت المراجعة لأي من أفراد الأسرة للمراكز الصحية، فكم عدد المرات الإجمالية التي تمت ولكافة أفراد الأسرة خلال التسعة شهور الماضية:

1- 3 مرات فأقل 2- 4-8 مرات

3- 9-13 مرة 4- 14 مرة فأكثر

34-- ما هو مصروف الأسرة الشهري على المياه: .....شيكل.

35- في حال عدم تزويد المياه عن طريق شبكة مياه فإن الوقت اللازم لجمع أو شراء –احضار للبيت كمية من المياه تعادل .....م3 هو.....ساعة.

36- ما هو مجموع مصروف الأسرة الشهري على تفريغ المياه العادمة:.....شيكل.

37- ما هو مجموع انفاق الأسرة على علاج الأمراض الناتجة عن تلوث المياه خلال العام:...شيكل

38- في حال توفر المياه بإستمرار وبكميات كافية فإن معدل إستهلاك العائلة للمياه يتوقع أن:

1- يزداد 2- يبقى كما هو 3- يقل

39-في حال دعم الحكومة فاتورة المياه بنسبة 30% فإن معدل إستهلاك العائلة للمياه يتوقع أن:

1- يزداد 2- يبقى كما هو 3- يقل

Appendix B
Interviews Questions

أسئلة المقابلات

1-من يدفع المصاريف الادارية للمؤسسة؟

2- هل تستطع بلدية /مجلس قروي / مخيم بيع المياه بدون التنسيق واخذ موافقة من السلطة وبالعكس؟

3-هل تستطع بلدية /مجلس قروي / مخيم تحديد تسعيرة بدون التنسيق واخذ موافقة من السلطة وبالعكس؟

4-هل تستطع بلدية /مجلس قروي / مخيم الحصول على دعم مالي من جهات خارجية بدون التنسيق واخذ موافقة من السلطة ؟

5-على أي أساس يتم تحديد الضرائب والرسوم والتسعيرة ومن يحددها؟

6-على أي أساس يتم تحديد الاعفاءات ومن يحددها ومن هو المستفيد منها؟

7-هل هنالك دعم اجباري لفاتورة المياه لبعض المناطق وتحت أي ظروف؟

8-ماذا يحصل (من الناحية العملية-على الواقع) لو حفر بعضهم بئرا وباع الماء بدون ترخيص؟

9-ماذا يحصل اذا تعدى صاحب بئر ماء أو بلدية الحد المسموح به من البئر؟

10- ماذا يحصل عند استعمال المياه لغرض غير محدد بالرخصة؟

11- ماذا يحصل اذا لم يتم دفع فاتورة المياه من قبل بلدية/ مجلس قروي/ مخيم؟

12- ما عدد العاملين في القسم المعني بالخطط التطويرية؟

13- هل أعداد العاملين في قسم التخطيط ملائم وكاف؟

14- هل تخصصات العاملين في قسم التخطيط ملائمة وما هي النواقص؟

15- هل الوسائل والبيانات اللازمة للتخطيط متوفرة للعاملين في القسم وبأي شكل (مكتوبة أو دسكات)؟

16- هل هناك ميزانية للخطط التطويرية وكم هي؟

17- هل هناك ميزانية للتطوير ذاته، وكم هي، وماهو مصدرها؟

18- من أين ميزانية سلطة المياه؟(السلطة ....%، جهات أخرى ....%)

19- ماذا عن الخطط التطويرية المستقبلية بالنسبة ل

أ- تحسين الشبكات

ب- للخزانات

ت- محطات الضخ

ث- عدد وطاقة الابار

ج-الفاقد

ح-تطبيق القانون

خ-جمع ومعالجة المياه العادمة واعادة استعمالها

20- مشاركة الجمهور: كيف ولأي مدى (إن وجدت)، وما خطط السلطة في هذا الاتجاه؟

21- كيف تعرف السلطة وجهة نظر الجمهور بها؟

22- هل يتم اغناء معرفة الجمهور؟

23- إذا كان الجواب نعم فإن ذلك يتم عن طريق الراديو، الجريدة، التلفزيون، نشرات؟

24- هل هناك حاجة أو خطط لتفعيل مساهمة الجمهور ماليا في مشاريع المياه؟

25- هل هناك حاجة أو خطط لتفعيل مشاركة الجمهور في اختيار المشاريع وتوجيهها؟

26- هل هناك حاجة لتفعيل مشاركة الجمهور في إدارة المؤسسة؟

27- هل هناك حاجة لنقل ملكية قسم من أنظمة المياه للجمهور (الخصخصة)؟

28- هل يتم استعمال المياه العادمة في ري المزروعات؟

1- نعم 2- لا

29- اذا كان الجواب نعم :

- في أي المناطق يتم ذلك؟
- نسبة الأراضي المروية بهذه المياه هي.....%
- كمية المياه المستغلة .....م3؟

30- هل تم تسجيل شكوى من قبل سكان منطقة ما بالنسبة لنوعية المياه؟

31- ما نسبة وأسباب الفاقد في الشبكات؟

32- من الجهة المسؤولة قانونيا عن مصادر المياه (سلطة المياه الفلسطينية، وزارة الزراعة، وزارة الحكم المحلي)؟

33- ما هي التجاوزات وعقوباتها حتى الان، ولماذا؟

34- هل هناك علاقة أو تخطيط لاقامة علاقة بين الماء المخصص للزراعة و الانتاج الغذائي؟

35- هل السياسات المائية تحدد من سلطة المياه وتعتمد من السلطة الوطنية (الحكومة) أم العكس؟ وكيف يتم ادماجها بالسياسات الوطنية؟

36- هل هنالك تأثير من زيادة أو نقصان استيراد المواد الغذائية بما فيها الفواكه والخضار من الخارج (اسرائيل) على الوضع والامان المائي، وماذا تعمل سلطة المياه في هذا أو ضبط هذا الموضوع؟

37- كيف نحسب تسعيرة المياه وما هي نسبة استعادة التكلفة؟

38- ما هو دور القطاع الخاص في ادارة خدمات المياه أكانت للري أو للشرب أو للصناعة؟

39- هل توزيع المياه الحالي للزراعة والصناعة والسياحة والشرب سيتغير بالمستقبل، وكيف؟

40- ماهي محددات/ سلبيات نظام وحصص توزيع المياه بين القطاعات المختلفة (صناعة / زراعة/شرب)؟

41- كيف ترون العلاقة بين حقوق المياه واحتياجات المياه؟

42- هل يمكن السماح بتغيير حقوق المياه مثل أن يبيع صاحب بئر زراعية (للأغراض الزراعية) حقوقه المائية لبلدية مجاورة؟

43- ما هي الاجراءات الممكن اتخاذها على مستوى المؤسسة (سلطة المياه/ أقسام المياه بالبلديات ومصالح المياه) لتخفيض كلفة وبالتالي تسعيرة المياه؟

44- كيف يمكن تأمين الحد الأدنى من المياه للجميع ضمن التغيرات السياسية والاقتصادية والاجتماعية؟

45- كيف يمكن للطبقة الفقيرة أن تسمع رأيها لخدمات المياه (للمؤسسات المائية كسلطة المياه) – و تؤثر على السياسات المائية المتبعة؟

46- ما هي التغيرات الواجب عملها على مستوى المؤسسة لتمكين الطبقة الفقيرة من اسماع رأيها؟

47- هل خصخصة قطاع المياه يمكن أن تساعد في هذا المجال؟ وهل النقابات والمؤسسات غير الحكومية يمكن أن تساعد في ذلك؟

48- ما هي الوسائل المؤسساتية/القانونية التي يمكن اتباعها لتمكين تبديل المياه من قطاع الزراعة لمياه الشرب أو غيره أو بالعكس؟

Appendix C

Water Poverty Index Calculations

Calculating Water Poverty Index
Conventional composite index approach:

$WPI=W_aA+W_sS+W_t(100-T)$
Where:
A: Adjusted water availability.(AWA)
S: Population with access to safe water and sanitation.
T: Time and effort taken to collect water for the household (proportion of population having access in or near the home).

W_a, W_s, W_t: Weights given to each component of the index.
$(W_a+W_s+W_t=1)$
A=(Total ground and surface water availability)/(Total basic human requirement [domestic demand + agricultural demand + industrial demand)
Total available water=130.24 Mcm/year
Domestic Water Demand=100L/C/d= 86Mcm/year
Agricultural Water Demand=200Mcm
Commercial and Industrial Water Demand = 9% of total consumption
=11.7Mcm/year

Therefore A= (130.24)/(86+200+11.7)

A= 44 percent

S: Population with access to safe water and sanitation.
% population with access to safe water=94.9
% population with safe sanitation=36.5
Therefore S= (94.9+36.5)/2

S=65.7 percent

(100-T): Proportion of population having access or near the home
Percent of population connected with the network = 79.06%
Collection well with connections = 11.9%
Collection well with without connections inside house=3%
Therefore (100-T) = 79.6+11.9+3=94.5 percent (T=5.5 percent)
Assume: W_a =0.5, Ws=0.4, Wt=0.1
Therefore WPI = (0.5*44) + (0.4*65.7) + (0.1*94.5)=57.73≈ 58

WPI=58 index points

WPI calculated using the composite index approach

	Water Availability %	Access to **Water %**	**Index of time spent in water collection**	WPI
Weights	0.5	0.4	0.1	
	44	65.7	5.5	58

Holistic Water Poverty Index Calculation Approach:

$WPI= (W_rR+W_aA+W_cC+W_uU+W_eE)/(W_r+W_a+W_c+W_u+W_e)$

R: Resources

A: Access

C: Capacity

U: Use

E: Envirunment

W_i: Weight applied to that component.

We will assume equal weights, that:

$W_r=W_a=W_c=W_u=W_e=0.2$

Components of the WPI:

(1) Resources (R):

R= Assessment of service water and ground water availability.

As calculated in the first approach

R=44 percent

(2) Access (A):

$A= (A_1+A_2+A_3)/3$

A_1: Percentage of the population with access to save water.(A_1=94.9%)

A_2: Percentage of population with access to sanitation. (36.5%)

A_3: An index which relates irrigated land, as a proportion of arable land, to internal water resources.

A_3= (Agricultural water use)/(Total available water)=(95Mcm)/(130.24Mcm)100%= 72.9%

A= (94.9+36.5+72.9)/3

A=68.1 percent

(3) Capacity (C):

$C= (C_1+C_2+C_3+C_4)/4$

C_1: PPP (log GDP per capita)

GDP=76958.5*1000 US$

GDP per capita= (76958.5*1000)/(2313609)=33.26

Log (33.26) = 1.522

C_1=1.522 %

C_2: under-five mortality rate. (C2=27.2%) [45]

C_3: Education enrolment rates. (C3=83%) [44]

C_4: Gini coefficient of income distribution. (C4=37.8%)[35]

C= (1.522+27.2+83+37.8)/4

C= 37.38 percent

(4) Use (U):

$U= (U_1+U_2+U_3)/3$

U_1: Domestic water consumption rate.

Domestic water consumption = 34.435Mcm/year

Total water consumption= 130.5Mcm/year

U_1= (34.435/130.5)*100%=26.4 %

U_2: Agricultural water use.

Agricultural water use= (The proportion of GDP derived from agriculture)/ (the proportion of water used in Agricultural)

The proportion of GDP derived from agriculture= 30% [40]

Agricultural water consumption=95Mcm/year

Agricultural water consumption=95Mcm/year

Proportion of water used in agriculture = (agricultural water consumption)/(Total Consumption)

= (95/130.5)*100%=72.8%

Agricultural water use (U2) = (30%/72.8%)*100%= 41.2%

U_2= 41.2%

U_3: Industrial water use

Industrial water consumption=1.065Mcm/year

The proportion of water used by industry= (1.065/130.50)*100%=0.82%

U_3=0.82%

$U= (U_1+U_2+U_3)/3$= (26.4+41.2+0.82)/3=22.81%

U=22.8percent

(5) Environment (E):

$E= (E_1+E_2+E_3)/3$

E_1: An index of water quality

E_2: An index of water stress.

E_3: An index of biodiversity.

E_1=Avg. (Dissolved O_2 concentration, Nitrate concentration, Turbidity, Electrical conductivity)

D.O = 5.84%

Nitrate concentration=23.17%

Turbidity=1.03%

Electrical Conductivity=86.4%

E_1=29.11%

E_2=Avg.(Pesticide use in West Bank, Fertilizer use in West Bank, Percentage o Country's territory under severe water stress (Pollution))

Pesticide use in West Bank: Lands using pesticides with respect to total cultivated land.

Total cultivated land= 2 Million Dunums.

100000 Dunums are under irrigation

1.6 Million Dunums are rain fed

300000 Dunums are fallow land.

96.6% of irrigated land using pesticides

87% of rain fed land using pesticides.

Percent pesticides use = ((0.966*100000) + (0.87*1.6Million))/(2Million)=74.43%

Fertilizer use in West Bank= (Lands using fertilizers)/(Total cultivated in West bank)=(243100)/(2Milions)=12.16%

Percentage of countries territory under severe water stress (pollution) = 20-30%

Take=25%

E_2=37.2Percent

E_3: An index of biodiversity based on the percentage of threatened mammals and birds.

Percentage of threatened mammals = 12.1%

Percentage of threatened birds=7.4%

E_3= (12.1+7.4)/2 = 9.75%

$E= (E_1+E_2+E_3)/3$

= (29.11+37.2+9.75)/3

=25.35%

E=25.35 Percent

$WPI= (W_rR+W_aA+W_cC+W_uU+W_eE)/(W_r+W_a+W_c+W_u+W_e)$

$W_r=W_a=W_c=W_u=W_c=0.2$

WPI = (0.2*44) + (0.2*68.1)+(0.2*37.38)+(0.2*22.81)+(0.2*25.35)

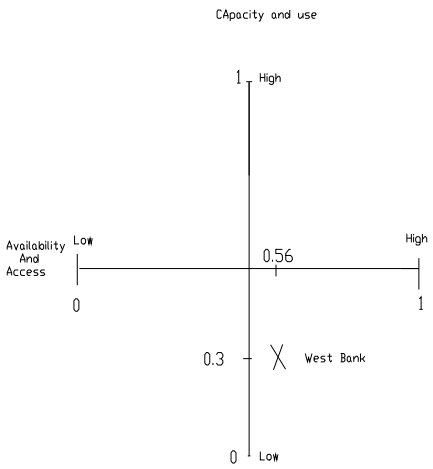
=39.5%

WPI=39.5 Percent

WPI Calculated Using the Holistic Approach

	Resources	**Access**	**Capacity**	**Use**	**Environment**	***WPI***
Weights	0.2	0.2	0.2	0.2	0.2	
	44	68.1	37.4	22.8	25.4	39.5

Matrix Approach and WPI Pentagram:



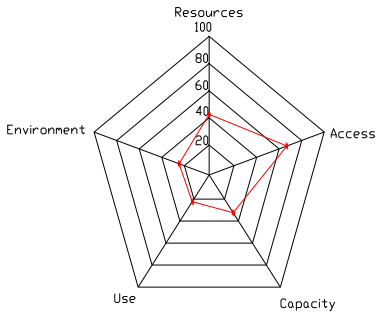


Figure 4.2
WPI Pentegram For West Bank

Simple Time – Analysis Approach

WPI= T/ (a quantity of water)

In rural Areas:

T= Time required per person to collect a quantity of water (i.e. 100m^3)

From the results of the questionnaire T=20 hours for quantity= 100m^3

WPI= (20/100)*100%= 20%

WPI=20 percent

Falkenmark Water Stress Index:

Falkmark index=Water Resources per Capita per Year.

= (23.6*$10^6$$m^3$/year)/(2313609)

=53m^3 per capita per year

Appendix D

Interviews Results

لا% No%	نعم% Yes%	السؤال Questions
100	-	• هل هنالك دعم اجباري لفاتورة المياه لبعض المناطق؟ Is there an obligatory support for the invoice of water at some areas?
75	25	• هل تستطيع بلدية/ مجلس قروي/ مخيم بيع المياه بدون التنسيق وأخذ موافقة السلطة وبالعكس؟ Can municipality, village, camp sell water without coordination and take agreement from authority and vice versa?
100	-	• هل تستطيع بلدية/ مجلس قروي/ مخيم تحديد تسعيرة بدون التنسيق و أخذ موافقة من السلطة و بالعكس؟ Can municipality/ village council/ camp determine a quotation "price" without coordination and taking agreement from authority and vice versa?
25	75	• هل تستطيع بلدية/ مجلس قروي/ مخيم الحصول على دعم مالي من جهات خارجية دون التنسيق وأخذ موافقة السلطة ؟ Can municipality/ village council/ camp obtain financial support from an external side without coordinating and taking agreement from authority?
75	25	هل توجد اعفاءات؟ Are there exemptions?
67	33	• هل أعداد العاملين في قسم التخطيط ملائم و كاف؟ Is the number of workers at the division of planning adequate and satisfactory?
–	100	• هل تخصصات العاملين قي قسم التخطيط ملائمة و ما هي النواقص Are the specializations of workers at the division of planning adequate?
–	100	• هل الوسائل والبيانات اللازمة للتخطيط متوفرة للعاملين في القسم و بأي شكل (دسكات، مكتوبة)؟ Are the means and statements necessary for planning available for workers in division; and in which form are they (disks or writings)?
50	50	• هل هناك ميزانية للخطط التطويرية و كم هي؟ Is there a budget for development plans?
	−100	• هل هناك ميزانية للتطوير ذاته، و كم هي، وما هو مصدرها؟ Is there a budget for development it self?
–	100	• هل يتم اغناء معرفة الجمهور؟ Is there enhancement for the knowledge of people?

75	25	• هل هناك حاجة أو خطط لتفعيل مساهمة الجمهور ماليا في مشاريع المياه؟ Is there is a need or plans to activate the contribution of people financially in the project of water?
100	–	• هل هناك حاجة أو خطط لتفعيل مشاركة الجمهور في ادارة المؤسسة؟ Is there a need or plans to activate the participation of people in the administration of institution?
100	–	• هل هناك حاجة لنقل ملكية قسم من أنظمة المياه للجمهور (الخصخصة)؟ Is there a need to transfer the ownership of a section of the water systems to people (privatization)?
100	–	• هل يتم استعمال المياه العادمة في ري المزروعات؟ Is there a usage for waste water in the irrigation of plants?
25	75	• هل تم تسجيل شكوى من قبل سكان منطقة ما بالنسبة لنوعية المياه؟ Has there been a registration for a complaint by the population of an area pertaining to the quality of water?
–	100	• هل الجهة المسؤولة قانونيا عن المياه هي سلطة المياه الفلسطينية فقط؟ The side accountable legally for the sources of water, is it the Palestinian Water Authority only?
67	33	• هل هناك علاقة أو تخطيط لاقامة علاقة بين الماء المخصص للزراعة و الانتاج الغذائي؟ Is there a relation or planning to establish a relation between water assigned for agriculture and food production?
–	100	• هل السياسات المائية تحدد من سلطة المياه و تعتمد من السلطة الوطنية الحكومة أم بالعكس؟ و كيف يتم ادماجها بالسياسات الوطنية؟ Are the water policies being fixed by the Authority of water; and being accredited by the National Authority or vise versa?
–	100	• هل هنالك تأثير من زيادة أو نقصان استيراد المواد الغذائية بما فيها الفواكه و الخضار من الخارج (اسرائيل) على الوضع و الأمان المائي، و ماذا تعمل سلطة المياه في هذا أو ضبط هذا الموضوع؟ Is there an impact for the increase or decrease of importing food materials; such as, fruits and vegetables from abroad (Israel) on the situation and water security?
100	–	• هل هناك دور للقطاع الخاص في ادارة خدمات المياه أكانت للري أو الشرب أو الصناعة؟ Is there a role for the private sector in the administration of water services whether they were for irrigation or drinking or industry?
25	75	• هل توزيع المياه الحالي للزراعة والصناعة والسياحة والشرب سيتغير بالمستقبل، و كيف؟ The current distribution of water for agriculture industry tourism and drinking, will it change in future?
–	100	• هل يمكن السماح بتغيير حقوق المياه مثل أن يبيع صاحب بئر زراعية

		(للأغراض الزراعية) حقوقه المائية لبلدية مجاورة؟ Is it allowed to change the rights of water; such as the selling of an agricultural well (for agricultural purposes) owner to his water rights for an adjacent municipality?
75 بدون جواب	25	• هل يمكن للطبقة الفقيرة أن تسمع رأيها لخدمات المياه (للمؤسسات المائية كسلطة المياه)– و تؤثر على السياسات المائية المتبعة؟ Can poor class make hear of its view point to the services of water (the water institutions as a Water Authority) and affect the followed water policies?
75 بدون جواب	25	• هل حصخصة قطاع المياه يمكن أن تساعد في هذا المجال؟ وهل النقابات و المؤسسات غير الحكومية يمكن أن تساعد في ذلك؟ The privatization of water sector, may it help in this respect? Can trade unions and nongovernmental organizations (NGO's) help in that?

جامعة النجاح الوطنية

كلية الدراسات العليا

تأثير السياسات الادارية المائية على فقر المياه في فلسطين

اعداد

روند بسام عثمان بشناق

اشراف

ألأستاذ الدكتور مروان حداد

قدمت هذه الأطروحة استكمالا لمتطلبات درجة الماجستير في هندسة المياه و البيئة بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين

2004

تأثير السياسات الإدارية المائية على
فقر المياه في فلسطين

اعداد
روند بسام عثمان بشناق
اشراف
أ.د. مروان حداد

الملخص

يهدف هذا البحث الى فهم وتحديد تأثيرات السياسة الحكومية المختلفة على تزويد المياه و الطلب عليها، الفقر والدخل، نوعية المياه، الانتاج و الأمان الغذائي و انعكاس هذه التأثيرات على الناس. تم حساب مؤشر فقر المياه باستخدام طرق مختلفة. و بناء على نتائج البحث فقد وجد أن الطريقة الشاملة لحساب المؤشر هي أفضل طريقة، و كانت نتيجتها أن مؤشر فقر المياه يساوي 39.5% وهذا يدل على أن المنطقة تواجه مشكلة جادة في فقر المياه.

كما يهدف هذا البحث الى تقدير و تحليل مؤشر فقر المياه و ذلك باستخدام طرق مختلفة.لتحقيق هذه الأهداف تم تطوير الاستبانة و المقابلات. بالنسبة للمقابلات تم تطبيقها ةعلى عينة مجمعية من سكان الضفة الغربية. أما بالنسبة للمقابلات فقد تم اجراؤها مع أشخاص من دائرة مياه الضفة الغربية و سلطة المياه الفلسطينية و البلديات. و قد قمنا بتحليل نتائج الاستبانة (الدراسة الميدانية) باستخدام طرق احصائية مختلفة منها الأوساط الحسابية و النسب المئوية و التباين الأحادي و فحص شيفي بوست هوك.

وقد تمثلت النتائج الرئيسية للبحث فيما يلي:

1. يوجد هناك ثمة فروق مميزة (ذات دلالة خاصة) فيما بين الذكور و الاناث في مجال استهلاك المياه لمصلحة الذكور.

2. يوجد هناك ثمة فروق مميزة (ذات دلالة خاصة) بصدد فروق المسكن في مجال استهلاك المياه و الوضع الصحي و خدمات الصرف الصحي لمصلحة السكان القاطنين بالمدينة. و ربما يعود هذا الى كون هناك بعض القرى لاتزال غير مربوطة بالشبكة و كذلك الوضع الاقتصادي لسكان القرى و المخيمات.
3. يوجد هناك ثمة فروق مميزة (ذات دلالة خاصة) في عدد العائلات التي تقطن المبنى السكني في مجالات استهلاك المياه و خدمات الصرف الصحي. و ليس هناك اختلافات في المجالات الأخرى. و قد وجد أن بيوت العائلة الواحدة تستهلك ماء أقل من بيوت العائلتين أو الثلاثة. و حول خدمات الصرف الصحي، تبين أن بيوت عائلة واحدة تستحصل على خدمات أفضل من بيوت عائلتين أو ثلاثة.
4. يوجد هناك ثمة فروق مميزة (ذات دلالة خاصة) في عدد أفراد العائلة الواحدة حول: تزويد المياه و استهلاك المياه و الوضع الصحي و نوعية المياه لمصلحة العائلات قليلة الأفراد.
5. يوجد هناك ثمة فروق مميزة (ذات دلالة خاصة) في الدخل الشهري حول تزويد المياه و خدمات الصرف الصحي من نوعية المياه لمصلحة الدخل الشهري المرتفع.
6. لا يوجد هناك ثمة فروق مميزة (ذات دلالة خاصة) ترجع الى النسبة المئوية للمياه من الدخل الشهري لكافة المجالات، فقد تبين أن 15.4% من العينة السكانية تدفع ما بين21% 40% من دخلها الشهري نظير خدمات المياه التي هي نسبة مئوية عالية.
7. و حسب العينة المسحية، تبين أن مستوى المعيشة قد توزع بناء على الفئات التالية: 46.3% من العينة كانت موسرة، 50.4% كانت متوسطة، وان 3.2% كانت معسرة.
8. هناك كانت فروق مميزة (ذات دلالة خاصة) بين وجود صهاريج ماء أو عدمه لكافة المجالات تتجه لمصلحة البيت المزود بصهريج ماء.

9. كما أنه لا تزال هناك بعض المناطق غير المربوطة مع مياه و خدمات صحية امنـــة. و نتيجة هو أن المياه وكذلك الصرف الصحي التي تتعلق بالأمراض- تنتشر هناك خاصة و أن حوالي 20%من أفراد العينة تأثروا بأمراض لها علاقة بالمياه.

10. ومن نتائج المقابلات، تبين أن رسوم التعرفة القائمة حايا لا تشجع على الاحتفاظ بالمياه و هي عموما لا تلائم التكاليف العملية و الصيانة.

11. كما تبين من نتائج المقابلات أن تركيب التعرفة المستقبلية (الذي تم تطويره علـــى يـــد سلطة المياه الفلسطينية) لم يأخذ باعتباره تلك الفئة من الناس الذين لم يسددوا أثمان مياههم.

12. ان استيراد المياه من ناحية ليس من شأنه أن يقلل (يخفض) مياه الزراعة ونتيجة أن من شأنه أن يساعد و أن يقلل من ندرة وشح المياه (عن طريق تخزينها لأغـــراض أخـــرى). و لكنها من ناحية أخرى بقدورها أن يكون لها اثار سلبية على الموقف الاقتصادي الفلسطيني.

13. ان أثمان المياه و المساعدات المقدمة لاستثمار رأس المال و العمليـــة و الصـــيانة تهـــدد الحيوية المالية للري و تزويد المياه.

14. ليس هناك دور للقطاع الخاص في ادارة و ارشاد خدمات قطاع المياه.

15. ان اليات توزيع حصص المياه القائمة تتميز بانها غير فاعلة و يكتنفها الغمـــوض كونهـــا حالة تواصل للنظام الذي كان يمارس قبل مفاوضات السلام.

16. ان توضيح و تشجيع حقوق المياه يمكن أن يلعب دورا هاما فـــي تحســـين المســـاواة و الفاعلية في حصة المياه في حين أن النقص في أنظمة حقوق المياه من سأنه أن يخلق مشاكل كبرى وحالات عدم مساواة لادارة نقص المياه المتزايد.

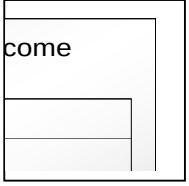
17. ان اتاحة المجال لحقوق المياه بجعلها عرضة للمتاجرة أمر له مسوىء تزيد عن الحسنات في ظل الأوضاع السائدة.

18. الوصول الى المياه الامن هو أمر حاسم للمواطنين الفقراء. ذلك أن النساء و الفقراء المعدمين و المجموعات المهمشة غير المنتفعة بما فيهم الأقليات و سكان البلاد الأصليين ليس لهم مجالات وصول متساوية نحو المياه، الأمر الذي قد يؤدي في نهاية المطاف الى حالات فقر أفدح.

19. الخصخصة في قطاع المياه يمكن أن يساعد في تحسين الوصول الى المياه للفقراء المعدمين اذا ما تم عمل ذلك و فق طريقة مدروسة.

20. الاستخدام المتبادل للمياه ضمن استعمالاته المتعددة يمكن عمله اذا ما تم تحت رقابة كاملة.

21. في ظل الوضع الاقتصادي الحالي ليس هناك امكانية ممارسة رقابة حقيقية على النظام الكلي و عليه فان السياسات و العمل بخصوص تلوث المياه و نوعيتها امران يصعب تنفيذهما.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