Pro-poor water tariff under uncertain socio-economic conditions: a study of Palestine

This item was submitted to Loughborough University's Institutional Repository by the/an author.

Additional Information:

- A Doctoral Thesis. Submitted in partial fulfillment of the requirements for the award of Doctor of Philosophy of Loughborough University.

Metadata Record: https://dspace.lboro.ac.uk/2134/6352

Publisher: © Abdelrahman Alamarah

Please cite the published version.
This item was submitted to Loughborough’s Institutional Repository (https://dspace.lboro.ac.uk/) by the author and is made available under the following Creative Commons Licence conditions.

![Creative Commons Licence](https://creativecommons.org/licenses/by-nc-nd/2.5/)

You are free:

- to copy, distribute, display, and perform the work

Under the following conditions:

- **Attribution.** You must attribute the work in the manner specified by the author or licensor.
- **NonCommercial.** You may not use this work for commercial purposes.
- **No Derivative Works.** You may not alter, transform, or build upon this work.

- For any reuse or distribution, you must make clear to others the license terms of this work.
- Any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.

This is a human-readable summary of the [Legal Code (the full licence)](http://creativecommons.org/licenses/by-nc-nd/2.5/)

For the full text of this licence, please go to:
http://creativecommons.org/licenses/by-nc-nd/2.5/
Pro-Poor Water Tariff under Uncertain Socio-Economic Conditions

"A study of Palestine"

ATHESIS
Submitted by
Abdelrahman Alamarah
In partial fulfillment for the award of the Degree

Doctor of Philosophy

Under the Supervision of
Prof M.Sohail

Department of Civil and Building Engineering
Water and Engineering Development Center
WEDC
Loughborough University-UK
March, 2010
Table of Contents

List of Tables ........................................................................................................................................ VI
Abstract .................................................................................................................................................. IX
Declaration ............................................................................................................................................ X
Acknowledgement ............................................................................................................................... XI
Abbreviations ........................................................................................................................................ XII
Definitions ............................................................................................................................................ XIV

Chapter One: Introduction .................................................................................................................. 1
  1.1. Background ................................................................................................................................... 1
  1.2. Statement of the Problem .............................................................................................................. 4
  1.3. Aims and Objectives ..................................................................................................................... 7
  1.4. Conceptual Framework ............................................................................................................... 13
  1.5. Research Proposition and Questions .......................................................................................... 13
  1.6. Hypothesis ................................................................................................................................... 9
  1.7. Expected Outcome/Results ......................................................................................................... 10
  1.8. Importance and Impact of the Research (Innovation) ................................................................. 10
  1.9. Structure of the Report .............................................................................................................. 11
  1.10. Summary of the chapter .......................................................................................................... 12

Chapter Two: Literature Review ...................................................................................................... 13
  2.1. Introduction ................................................................................................................................ 13
  2.2. Integrated Water Resources Management (IWRM) .................................................................. 13
      2.2.1. International Vision .............................................................................................................. 14
      2.2.2. Future Challenges of IWRM ............................................................................................... 16
  2.3. Value of Water ............................................................................................................................. 17
      2.3.1. Value and charges .............................................................................................................. 17
  2.4. Water Policy and Reform ............................................................................................................ 20
  2.5. Good Governance ....................................................................................................................... 22
  2.6. Water and Poverty ....................................................................................................................... 23
      2.6.1. Water Poverty Index ........................................................................................................... 24
  2.7. Water Poverty and Scarcity of Water ......................................................................................... 27
  2.8. Basic Human Water Requirement ............................................................................................. 28
  2.9. Water Pricing and Tariff Structure .............................................................................................. 29
      2.9.1. Typology of Tariff Structure ............................................................................................... 29
          2.9.1. a. Non-volumetric tariffs .................................................................................................. 30
          2.9.1. b. Volumetric tariffs ......................................................................................................... 30
      2.9.2. Argument on IBT ............................................................................................................... 33
  2.10. Water Pricing and International Experience ............................................................................. 36
      2.10.1. Regional Experience ........................................................................................................ 37
          2.10.1. a. Jordan ......................................................................................................................... 37
          2.10.1. b. Israel .......................................................................................................................... 40
      2.11. Water Policy and Management in Palestine ........................................................................... 42
          2.11.1. Regional Plan for the West Bank Governorates: Water and Wastewater Existing Situation
                 (Ministry of Planning and International Cooperation, 1998) .................................................. 44
          3. Water Sector Strategic Planning Study (Carl Bro International, 2000) .................................... 45
      2.12. Willingness to Pay 48
          2.12.1. Arguments against Relying upon Willingness to Pay ..................................................... 49
          2.13. Affordability ....................................................................................................................... 51
          2.14. Comments on literature ...................................................................................................... 52
          2.15. Knowledge Gap .................................................................................................................. 53
          2.16. Summary of the Chapter ..................................................................................................... 55

Chapter Three: Methodology ............................................................................................................. 56
3.1. Introduction .......................................................................................................................... 56
3.2. Conceptual Framework ......................................................................................................... 56
3.3. Research Paradigm .............................................................................................................. 59
3.4. Research Proposition and Questions .................................................................................. 61
3.5. Research Process ................................................................................................................ 63
3.5.1. The Qualitative Research Process ................................................................. 65
3.5.2. The Quantitative Research Process ............................................................... 66
3.5.4. Case Study Methodology ..................................................................................... 68
3.5.2. The Quantitative Research Process ................................................................................ 66
3.6. Case Study Research design ............................................................................................. 69
3.6.1. Case study data collection procedures ............................................................ 69
3.6.2. Case study protocol ................................................................................................. 70
3.6.3. Case Study Strategy ............................................................................................... 71
3.7. Research Design ................................................................................................................ 73
3.7.1. Hypothesis ............................................................................................................... 76
3.7.2. Design ....................................................................................................................... 76
3.7.3. Data .......................................................................................................................... 76
3.7.4. Analysis .................................................................................................................... 77
3.8. Data Collection Methods and Techniques ...................................................................... 77
3.8.1. Interviews ............................................................................................................... 77
3.8.2. Focus Groups .......................................................................................................... 78
3.8.3. Meeting with Stakeholders .................................................................................... 78
3.8.4. Observations ............................................................................................................ 79
3.8.5. Other Sources of Data ........................................................................................... 80
3.8.5.a. Field Notes .......................................................................................................... 80
3.8.5.b. Secondary data review ....................................................................................... 81
3.9. Information Administration and Gained Knowledge Management .............................. 82
3.10. Research Techniques Applied ....................................................................................... 82
3.10.1. Data Gathering Vs Methods of Collection ....................................................... 85
3.10.1.a. Field survey ...................................................................................................... 86
3.10.1.b. Methods to Assess Willingness to Pay Data (WTP) ......................................... 91
3.11. Focus Group Meetings .................................................................................................. 93
3.12. Meeting with Stakeholders ............................................................................................ 94
3.13. Comparative Case studies ............................................................................................. 94
3.14.1. Falkenmark Method ............................................................................................. 95
3.14.2. Water availability index WAII ........................................................................... 95
3.14.3. Basic Human Needs Index ............................................................................... 95
3.14.4. Index of water scarcity ....................................................................................... 96
3.14.5. Water Poverty Index (WPI) ............................................................................... 97
3.15. Interviews ....................................................................................................................... 100
3.16. Focus Groups ................................................................................................................ 100
3.17. Observations .................................................................................................................. 101
3.18. Field Notes .................................................................................................................. 102
3.19. Application at Pilot Scale ............................................................................................. 102
3.20. Secondary data Review ................................................................................................. 103
3.21. Data Administration and gained knowledge management ........................................... 103
3.21.1. The data processing passed through the following steps ................................... 103
3.21.1.a. Data Reduction ............................................................................................... 104
3.21.1.b. Data Display ................................................................................................. 105
5.1. Introduction .................................................................................................................................149
5.2. Poverty and Households Economy Findings .............................................................................149
5.2.1. a. Family Size and Frequency ...............................................................................................152
5.2.1. b. Family Size and Average Monthly Income .......................................................................152
5.2.1. c. Family Size and Average Monthly Water Consumption ................................................153
5.2.1. d. Family Size and Average Monthly Water Cost ...............................................................156
5.2.1. e. Average Monthly Income Per Capita and Average Monthly per Capita Water Consumption ........................................................................................................158
5.2.1. f. Average Monthly Income Per Capita and Average Monthly Per Capita Water Cost 159
5.3. Finding and Analysis of Primary Data (Field Survey) ...............................................................151
5.3.1. Socioeconomic Findings ........................................................................................................152
5.3.1. a. Family Size and Frequency ...............................................................................................152
5.3.1. b. Family Size and Average Monthly Income .......................................................................152
5.3.1. c. Family Size and Average Monthly Water Consumption ................................................153
5.3.1. d. Family Size and Average Monthly Water Cost ...............................................................156
5.3.1. e. Average Monthly Income Per Capita and Average Monthly per Capita Water Consumption ........................................................................................................158
5.3.1. f. Average Monthly Income Per Capita and Average Monthly Per Capita Water Cost 159
5.4. Willingness to Pay (WTP) ..........................................................................................................161
5.5. Cost and Affordability ................................................................................................................165
5.6. Water Supply Findings ...............................................................................................................166
5.6.1. Water and Poverty Findings ................................................................................................193
5.6.1. a. Water and poverty Findings ............................................................................................196
5.6.1. b. Water and Poverty Findings ............................................................................................196
5.6.1. c. Water and Poverty Findings ............................................................................................196
5.6.1. d. Water and Poverty Findings ............................................................................................196
5.6.1. e. Water and Poverty Findings ............................................................................................196
5.6.1. f. Water and Poverty Findings ............................................................................................196
5.6.1. g. Water and Poverty Findings ............................................................................................196
5.7. Water Pricing in Palestine ..........................................................................................................169
5.7.1. Reasons for Discrepancy in Water Prices ..............................................................................169
5.7.1. a. Diversity of Water Sources ..............................................................................................169
5.7.1. b. Diverse Energy Sources Used in Water Production and Distribution ............................171
5.7.1. c. Disparity in the Efficiency of the Means of Production and Distribution .......................171
5.7.1. d. Disparity in the Accounting Systems ...............................................................................172
5.7.1. e. High Percentage of Lost Water .......................................................................................172
5.7.1. f. Absence of Sound Management in Some Water Service Facilities .................................173
5.7.1. g. Absence of Effective Awareness ......................................................................................173
5.8. Institutional Findings ..................................................................................................................173
5.8.1. Water Governance ................................................................................................................173
5.9. Uncertainties Findings ..............................................................................................................176
5.9.1. Uncertainties (Political, Socioeconomic and institutional Framework) ...............................176
5.10. Findings of Willingness to Reform and Good Governance ....................................................179
5.11. Findings of Application of Water Poverty Index ......................................................................181
5.11.1. Measurement of Water poverty .........................................................................................182
5.11.1. a. Falkenmark Method ......................................................................................................182
5.11.1. b. Water availability index WAI .......................................................................................183
5.11.1. c. Basic Human Needs Index ...........................................................................................183
5.11.1. d. Conventional composite index approach ....................................................................184
5.11.1. e. Water Poverty Index (WPI) ..........................................................................................188
5.12. Main Key Findings ....................................................................................................................193
5.12.1. Water and poverty Findings ............................................................................................193
5.13. Findings of Poverty Reduction and Water Subsidy in un-served (no water network) communities .........................................................................................................................196
5.13.1. Finding of Water supply and Consumption of the Target communities ............................196
5.13.2. Findings of Water Consumption Target communities ......................................................197
5.14. Findings of Governance and Water Management Level .........................................................203
5.15. Uncertainties Findings .............................................................................................................204
5.16. Water Pricing Policy and Tariff Findings ................................................................................204
5.17. Water and Poverty ....................................................................................................................205
5.18. Summary of The Chapter .........................................................................................................206

Chapter Six: Design of Water Tariff Structure .................................................................................207
Chapter Seven: Conclusion and Recommendations

7.1. Introduction ................................................................................................................. 243
7.2. Does the Proposed Tariff Structure Pro-Poor? ............................................................ 244
7.3. What are the factors should be considered to minimize the impact of uncertainties (Sub-Q2)? 245
7.4. What are the main steps which should be taken to reform the legal and institutional arrangement in order to enable the environment of the new tariff structure (Sub-Q3)? ....................... 245
7.5. What is the impact of proposed new model of tariff structure on utilities Performance (SUB Q4)? .................................................................................................................. 246
7.6. What lies beneath the unwillingness to pay and what are the measures should be applied? SubQ.5) ...................................................................................................................... 247
Table 23. Some Cities Performance Indicators
Table 22. Price and Tariff Structure Used During the Study Period
Table 20. Weighing Different Tariff Structures
Table 18. Available Average Quantity of Water
Table 17. Measurement of Water Poverty Index by Using Different Methods
Table 11. Current and Projected Population in West Bank
Table 10. Supply-Demand Gap Estimation in Domestic and Commercial Sectors
Table 9. Projection of Domestic and Commercial Demand
Table 8. Water Supply Per Governorate Year 2005
Table 7. Water Supply Per Governorate Year 2005
Table 6. Water Supply Per Governorate Year 2005
Table 5. Served and Un-served Population/Communities in the West Bank
Table 4. Water Resources Development Requirement in the West Bank
Table 3. Distribution of Employed Workers in Local Economy By Sector
Table 2. Land Use in West Bank
Table 1. Collected Data VS Methods and Objectives

List of Tables
Table 12. Typology of Uncertainties
Table 13: Water Consumption
Table 14: Actual Water Available
Table 15: The Water Poverty Index and Sub-index with Falkenmark and Human Development Indices of a few selected countries
Table 16: Syntheses Data (socioeconomic % of payment/income)
Table 17: Measurement of Water Poverty Index by Using Different Methods
Table 18: Available Average Quantity of Water
Table 20: Weighting Different Tariff Structures
Table 21: Main Socioeconomic Indicators in Comparison with The National Indicators
Table 22: Price and Tariff Structure Used During the Study Period
Table 23: Some Cities Performance Indicators
Table 24: Main Indicators for Monitoring the Performance
Table 25: Proposed Tariff
Table 26: The Impact of The New Tariff
Table 27: Increasing Revenue after the Implementation of The New Tariff

List of Figures
Figure 1. Palestinian and Israeli Ground Water Wells and Joint Supply System
Figure 2. Summary of The Problem
Figure 3. Study Hypotheses
Figure 4. Structure of the Research
Figure 5. Structure of Water Value
Figure 6. Conceptual Framework
Figure 7. Research Paradigm

VI
Figure 8. Research Logic ................................................................. 74
Figure 9. Research Flow Chart .......................................................... 84
Figure 10. Number of Questionnaires per Governorate .............................. 90
Figure 11. Data Management ................................................................ 106
Figure 12. Location of West Bank .......................................................... 112
Figure 13. GDP/person in West Bank (1997-2008) ................................. 117
Figure 14. Potentially Exploitable Ground Water Resources ...................... 122
Figure 15. Potentially Exploitable Surface Water Resources in the West Bank ... 122
Figure 16. The Existing Water Supply and the Projected Water Demand in the West Bank 124
Figure 17. Seved and Un-served Communities in West Bank .................... 126
Figure 18. Local Water Supply from Different Resources 2005 ................... 126
Figure 19. Purchases water supply per Governorate year 2005 ..................... 127
Figure 20. Purchases Water Supply Governorate year 2005 ......................... 128
Figure 21. Water Supply for Served Communities per Governorate year 2005 129
Figure 22. Representation of unaccounted for water, year 2005 ................. 131
Figure 23: Representation of commercial water use per governorate, year 2005 . 131
Figure 24: Domestic Water Consumption per Governorate, year 2005 ............ 132
Figure 25. Domestic Water Consumption per Governorate year 2005 .......... 133
Figure 26. Water Use per Governorate (2005) ........................................ 134
Figure 27: Domestic and commercial demand for the West Bank ............. 137
Figure 28. Political Uncertainty Effect on Availability of Water .................. 139
Figure 29. % of Economic Growth (1999-2007) ....................................... 147
Figure 30. Unemployment Rate (1999-2007) ........................................... 149
Figure 31. % of Families Receiving Assistance (Source: PCBS unpublished estimates based on 6th Palestinian Expenditure and Consumption Survey) ................................................................. 150
Figure 32: Distribution of surveyed families according to their sizes ............. 152
Figure 33: Family size and average monthly income per capita in West Bank .... 153
Figure 34: Family size and Average monthly water consumption in WB .......... 154
Figure 35: Family size and Average monthly water consumption in WB ........ 154
Figure 36: Family size and Average monthly per capita water consumption in the WB 155
Figure 37. The Relationship between family Size and Average Monthly Water Cost in WB 156
Figure 38. The Relationship Between Family Size and Average Monthly Water Cost from Local Network and Additional supply in summer ................. 157
Figure 39. The relationship between family size and average monthly water cost from local network and additional supplies in winter .................................................. 158
Figure 40. The relationship between average monthly income per capita and average monthly per capita water consumption in the WB ................................................................. 158
Figure 41. Average monthly income per capita and average monthly per capita water cost in summer ................................................................................................................................. 159
Figure 42. The Relationship between Average Monthly Income per capita and Average Monthly per capita Water Cost in Summer for both Local Network and additional Water Supply ......................... 160
Figure 43. The relationship between average monthly income per capita and average monthly per capita water cost in the winter for both local network and additional water supply ................................................. 160
Figure 44. Willingness to Pay to Get Connected to Water Supply .................. 163
Figure 45. The Relation between the Price of cubic meter and Willingness to Pay ................................................................. 163
Figure 46. Willingness to pay for different Categories .................................. 164
Figure 47. Willingness to Pay for the Different WTP in the Unconnected Areas ......................... 164
Figure 48. Comparison of WTP Variation between the Connected and unconnected areas ................. 165
Figure 49. % of Income for Water Payment per Social Group ...................... 166
Figure 50. Chronology of Water Management ........................................ 174
Figure 51. Water Institutional Structure .................................................. 175
Figure 52. Status of Governance ........................................................... 181
Figure 53. Social Groups % of Payment from Their Income ....................... 194
Figure 54. Water Availability of target Communities .................................. 194
Figure 55. Water Gap for the selected Families (2009, 2010, 2015) .............. 197
Figure 56. Decrease in Poverty Gap Due to Micro-Income Generation by water subsidy 200
Figure 57. Poverty Reduction Level .................................................. 201
Figure 58. Final Graduation from Extreme Poverty by End of 2015 ..........................................................202
Figure 59: The relationship between average monthly income per capita and average monthly water consumption for household in the summer. .................................................................................................213
Figure 60: The Structure of the New Proposed Tariff ...............................................................................216
Figure 61. Integration of Tariff Structure with Database .............................................................................217
Figure 62: Location map .............................................................................................................................225
Figure 63. Family Size Vs Water Consumption ..........................................................................................235
Figure 64. Family Size Vs Monthly Water Payment ..................................................................................236
Figure 65. Number and % of People Who Paid in The Old and New Tariff Systems ..............................237
Figure 66 Comparison of revenues between old and new tariff ...............................................................238
Figure 67. Summary of Research Flow ......................................................................................................253
ABSTRACT
Pro-Poor Water Tariff under Uncertain Socio-Economic Conditions
"A study of Palestine"

The availability and management of water resources is a global issue this is, particularly true in countries with limited water resources, such as Palestine, which falls under the Water Stress Line (1000 m³/person/year). Palestine has operated under an unstable political, economic and social conditions for more than six decades. This uncertainty has resulted in mismanagement, inefficient institutions and the over-exploitation of water resources. The main aim of this study was to produce socioeconomic indicators based on the water tariff structure in order to be pro-poor and to enable water utilities to cope with uncertainties. The study’s recommendation is for a flexible, pro-poor and socially acceptable tariff structure have been based on empirical work and socio-economic data which has been collected by rigorous research and reinforced with case studies.

Initial results based on a pilot survey showed that there was a 33% increase in the revenue of the water supplier equivalent to 13% of the total water costs and an increase in the number of beneficiaries that paid their bills ranging from 10.5% to 38.6%. If applied at national level, the model application based on current socioeconomic data would have a wide positive socio-economic impact in reducing poverty, financial equality, social security and reduction of the effect of uncertainties. The reform of the existing legal and institution framework are a prerequisite for the application of this kind of model. Institutional and legal reforms coupled with the application of this model, would produce a dynamic water pricing policy as part of the efforts to have an integrated water management and would serve as a tool for the national goal of poverty alleviation and food security.

Key Words: Water Tariff, Socio-economic Indicators, Pro-poor, Water Poverty Index, Uncertain Environment, Increasing Block Tariff (IBT), Integrated Water Resources management (IWRM).

¹ This line mentioned by several researcher e.g. Shuval Helill, Melin Falkenmark and Eran Feitelson.
DECLARATION
I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text
ACKNOWLEDGMENT

I am grateful to a number of people and organizations, which supported me to carry out this work. First and foremost, my heartily profound thanks gratitude and appreciation to my advisor Prof Muhammad Sohail for his encouragement, help and kind support. His invaluable technical advice, suggestions, discussions and guidance were a real support to complete this dissertation. Gratitude is also to my colleagues at the Palestinian Hydrology group (PHG) who provided me with required data. Also, thanks to the mayor of Beni Zaid municipality and the staff for the facilitation the field works during my research.

I am also indebted to Prof Eran Feitelson, department of Geography at Hebrew University, Prof Franklin Fisher from MIT-USA, Prof David Eaton university of Texas –Austin and Prof Amir Salman at University of Jordan and Eng. Ashraf Said for their continuous support and fruitful discussion during and after my research period,

A special appreciation is also expressed to my beloved family (Sura, Ebal, Adham, Dunya) who accepted with great patience and understanding my unbearable attitude and my regular absence from home.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIJ</td>
<td>Applied Research Institute-Jerusalem</td>
</tr>
<tr>
<td>BGS</td>
<td>British Geological Survey</td>
</tr>
<tr>
<td>BOD</td>
<td>Biological Oxygen Demand</td>
</tr>
<tr>
<td>CDM</td>
<td>Camp, Dresser, and McKee, INC</td>
</tr>
<tr>
<td>C/KWH</td>
<td>Cent per kilo/watt/hour</td>
</tr>
<tr>
<td>c/m³</td>
<td>Cent per cubic meter</td>
</tr>
<tr>
<td>CAS</td>
<td>Cost account system</td>
</tr>
<tr>
<td>CV</td>
<td>Contingent valuation</td>
</tr>
<tr>
<td>DESA</td>
<td>Department of Economic and Social Affairs</td>
</tr>
<tr>
<td>ESCWA</td>
<td>Economic and Social Commission for Western Asia</td>
</tr>
<tr>
<td>EXACT</td>
<td>Executive Action Team, Middle East Water Data Banks Project</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographical Information System</td>
</tr>
<tr>
<td>GWSP</td>
<td>the Global Water System Project</td>
</tr>
<tr>
<td>JWC</td>
<td>Joint Water Committee</td>
</tr>
<tr>
<td>JWU</td>
<td>Jerusalem Water Undertaking</td>
</tr>
<tr>
<td>JVA</td>
<td>Jordan Valley Authority</td>
</tr>
<tr>
<td>ICBS</td>
<td>Israeli Central Bureau of Statistics</td>
</tr>
<tr>
<td>GTZ</td>
<td>Dutsche Gesellschaft fur technische Zusammenarbeit</td>
</tr>
<tr>
<td>HIS</td>
<td>Israeli Hydrological Service</td>
</tr>
<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
</tr>
<tr>
<td>L/C/D</td>
<td>Liter per capita per day</td>
</tr>
<tr>
<td>MEG</td>
<td>Millennium Engineering Group</td>
</tr>
<tr>
<td>MEKAROUT</td>
<td>Israeli Water Company</td>
</tr>
<tr>
<td>MFA</td>
<td>Ministry of Foreign Affairs, Israel</td>
</tr>
<tr>
<td>MNIWC</td>
<td>Ministry of National Infrastructures Water Commission</td>
</tr>
<tr>
<td>MOPIC</td>
<td>Ministry of Planning and International Cooperation-Ramallah</td>
</tr>
<tr>
<td>MWI</td>
<td>Ministry of Water and Irrigation, Amman-Jo</td>
</tr>
<tr>
<td>MCM</td>
<td>Million Cubic Meter</td>
</tr>
<tr>
<td>M&amp;I</td>
<td>Municipal and Industrial</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>MU$</td>
<td>Million US dollar</td>
</tr>
<tr>
<td>mm</td>
<td>Millimeter</td>
</tr>
<tr>
<td>m³</td>
<td>Cubic meter</td>
</tr>
<tr>
<td>N.A</td>
<td>Not available</td>
</tr>
<tr>
<td>NCAR</td>
<td>American National Center for Atmospheric Research</td>
</tr>
<tr>
<td>NCEP</td>
<td>The National Centers for Environmental Prediction, US.</td>
</tr>
<tr>
<td>NIS</td>
<td>New Israeli Shekel</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operation and maintenance</td>
</tr>
<tr>
<td>NWC</td>
<td>National Water Council</td>
</tr>
<tr>
<td>PA</td>
<td>Palestinian Authority</td>
</tr>
<tr>
<td>PASSIA</td>
<td>Palestinian Academic Society for the Study of International Affairs</td>
</tr>
<tr>
<td>PCBS</td>
<td>Palestinian Central Bureau of Statistics</td>
</tr>
<tr>
<td>PHG</td>
<td>Palestinian Hydrology Group</td>
</tr>
<tr>
<td>PNA</td>
<td>Palestinian National Authority</td>
</tr>
<tr>
<td>PECDAR</td>
<td>Palestinian Economic Council for Development and Reconstruction</td>
</tr>
<tr>
<td>PGR</td>
<td>Population Growth Rate</td>
</tr>
<tr>
<td>PWA</td>
<td>Palestinian Water Authority</td>
</tr>
<tr>
<td>ppm</td>
<td>Parts per million</td>
</tr>
<tr>
<td>RO</td>
<td>Reverse Osmosis</td>
</tr>
<tr>
<td>SS</td>
<td>Suspended Solids</td>
</tr>
<tr>
<td>SUSMAQ</td>
<td>Sustainable Management of Aquifers (project name)</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>UNPD</td>
<td>United Nations Population Division</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>USGS</td>
<td>United States Geological Survey.</td>
</tr>
<tr>
<td>WAJ</td>
<td>Water Authority of Jordan</td>
</tr>
<tr>
<td>WBWD</td>
<td>West Bank Water Department-Ramallah</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WMO</td>
<td>World Meteorological Organization, Geneva</td>
</tr>
<tr>
<td>WQMP</td>
<td>Water Quality Monitoring Program</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nation Environmental Program</td>
</tr>
</tbody>
</table>

XIII
DEFINITIONS

Economic efficiency: Water resources are used in the most efficient way at the lowest possible social cost, from financial, resource, and environmental perspectives.

Cost-recovery: Tariffs produce revenue sufficient to meet the financial needs of the utility, including operations, maintenance, and administration of the water utility;

Equity & Equality: Equity usually means that everyone gets what's right for them, while equality implies that everyone gets the same thing.

Simplicity and understandability: tariffs have to avoid unnecessary complexity and be clear to utilities, water users and decision-makers.

Operation, Maintenance and Administration Cost. (O.M&A): Cost of sales, sales expense, and administrative fees less depreciation

Conventional water resources: Surface and groundwater resources

Donum/ Dunam: 1000m² = 0.1 ha

Fresh water: Water that can be used for household consumption

Investment cost per water unit: (US$/m³/unit) Total investment cost relative to the total annual production

New and additional water: Additional water resources from outside of the region

Net Water Gap: The differences between the volume of water that is produced from existing conventional water resources and the need for new and additional water resources

Unaccounted for water: The differences between the volumes of water delivered into a distribution system and the volume of water billed/recorded

Water security: ≥ 1,700 m³ per capita per year of renewable water²

Water stress: ≥ 1,000 and < 1,700 m³ per capita per year of renewable water.³

Water scarcity: ≥ 500 and < 1,000 m³ per capita per year of renewable water.⁴

Water absolute scarcity: < 500 m³ per capita per year of renewable water.⁵

² Source: adapted from World Bank (2007a).
³ ibid
⁴ ibid
⁵ ibid
Chapter One: Introduction

1.1. Background

Water is one of the most important natural resources, access to safe water is vital for survival. However, despite significant investment in the water sector in the last decade, the outlook on access to safe water remains grim at the global level (World Bank, 2002. IDRC, 2005. UNESCO, 2009 and UNWATER, 2008). In order to overcome this problem, many attempts and studies mention the importance of a comprehensive approach to manage water resources and to enhance water supply services. One of the important components of the comprehensive Integrated Water Resources Management (IWRM) is to use socioeconomic indicators to formulate policies and practices (Sulliven, 2003; Alamarah, 2007.), since the IWRM is not just about managing physical resources, but also to reform human systems to enable people to benefit from those resources. IWRM approach promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of the ecosystem (GWP, 2004). As demand increases, water resources are becoming increasingly scarce. The main driving forces behind that are population growth, economic development and changing trade policies. Water use has been growing at more than twice the rate of population increase during the century. By 2025, as much as two thirds of the world’s population could be living in countries in water stress a majority of them in developing countries (SIWI, 2001). The fulfillment of poor people water related needs is fundamental to the elimination of poverty. Access to water and sanitation is a fundamental need for the poor, vital for their health and dignity and a key factor in improving economic productivity. The poor are often the ones who pay the highest price for basic water needs.

---


The reference the UN water Publication : the human right to water ;current situation and future challenges.
for accessing water for lower quality. (SIWI.2001)\(^9\). The Mediterranean, a water scarce area, it is estimated that 7% of the entire Mediterranean population (28 million persons, in 2007) lies below the poverty line of 500 m\(^3\)/year per capita and another 29% (115 million person, in 2007) are below the threshold of 1000 m\(^3\)/year per capita. (EUWI MED .2007). The ESCWA region\(^10\) accounts for about 4.5% of the world’s population, but only 0.62% of world’s freshwater resources. Of the ten most water scarce countries in the world, eight ESCWA nations top of the list (Palestine one of them).

The per capita water availability in nine of thirteen countries falls below 500 cubic meters per year. The Palestinian Territories are among the most water-deprived countries in the world (Kawash, 2007.SUSMAQ\(^11\), 2005)\(^12\). This is mainly due to the arid climate conditions and the fluctuating political, social, and economic conditions which have resulted in weak institutional performance indicators. The actual available water is significantly lower than 80 m\(^3\)\(^13\) per person per year for all purposes,\(^14\) due to the lack of accessibility of both ground water and infrastructure needed to fully utilize the available resources (West Bank Water Department, 2007). The available water per capita differs considerably among West Bank governorates\(^15\), which ranges from 29 to 150 liters per capita per day (L/capita/day). Most of the water available per capita is below the average value stated by Howard and Bartram the 100 L/capita/day (Howard and Batram.2003)\(^16\). This can be attributed to a lack of accessibility to water resources, poor water supply management, and the increasing poverty in the region.

The unique historical water situation in West Bank has resulted in suppressed water demand and water supplies are generally constrained due to technical, political, and institutional limitations. Approximately 30% of Palestinian communities in West Bank,

---

\(^9\) SIWI : (The Stockholm International Water Institute)
\(^10\) ESCWA countries are: Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Saudi Arabia, Syria, United Arab Emirates, Yemen
\(^11\) SUSMAQ : Sustainable Management of Aquifers in Palestine : three years project Funded by DFID , Implemented by Palestinian Water Authority in cooperation with New Castle University Between 2003-2005
\(^12\) Speech of Fadle Kawash (the Ex-Director Of The Palestinian Water Authority and chief of Negotiation team ) in opening session of the General Meeting of Arab Water Council ,May 2007.Cairo.
\(^13\) This amount which is allocated by Israelis however the average renewable water per capita is 500m\(^3\)
\(^14\) This amount the available for Palestinians for all purposes
\(^15\) Administratively West Bank divided to 11 governorates.
\(^16\) Howard and Bartram argue that 7.5 l/c/d can be calculated as the basic minimum water requirement to meet direct human consumptive needs of which 21 l/c/d for food preparation and 50 l/c/d for hygiene and suggest 100 l/c/d as optimum access all requirement can be met.(domestic and health hygiene )
approximately 700,000 people, 25% of which are under 16 years old, are not served by any water network and approximately 15% of the population served less than one day a week. (National Water Council Report, 2007). Thus the current water demands cannot be used to predict future demand,\(^\text{17}\) (PWA, 2005)\(^\text{18}\). A recent study carried out by the Palestinian Water Authority in cooperation with the German Technical Assistance Unit (GTZ) indicated that the gap between supply and demand will increase dramatically in the coming years (PWA, 2007)\(^\text{19}\); therefore, the Palestinian Authority (PA) should develop new water resources and formulate new policies and management options to fill the gap.

The roles and responsibilities in the water sector in the West Bank are scattered and fragmented due to the lack of national coordination and the multiplicity of providers: municipalities, water utilities, private vendors. For the last 30 years of occupation, this continued situation of mixed roles and responsibilities in the water sector has led to inefficient management and uncoordinated investment and policies. There is an urgent need to restructure the water sector in order to regulate, monitor, and control the managerial, technical and financial performance of the national water suppliers\(^\text{20}\).

Socioeconomic development in Palestine is to a large extent dependent on an adequate water supply. However, the current prices in most utilities do not reflect their real values since they are not based on economic and social analysis\(^\text{21}\). This makes it difficult to estimate real values and to set a reasonable water tariff structure.

Water resources must be managed in terms of both quality and quantity in an economically effective manner. A tariff policy has to be adopted in order to ensure both the efficient use and conservation of water while achieving cost recovery at all levels in the water sector. In line with the national water policy\(^\text{22}\), this tariff should take into

---

\(^\text{17}\) Due to the Pressurized Water Consumption.
\(^\text{18}\) Due to the limited predefined water quota, The Palestinians have a limited water quota defined by Israelis, which means they use the available amount not the real need.
\(^\text{20}\) Several local and international agencies attempt to formulate policy documents and reform plans, however the political willingness to do that still so low.
\(^\text{21}\) Most of water municipalities and the basis for water pricing and tariff are to cover the cost of the entire municipality not the waterborne cost.
\(^\text{22}\) The Palestinian Water Authority in the process to formulate the national water policy; however the main constrain are the political conditions.
consideration the high social and economic value of water, the socioeconomic insecurity of beneficiaries and the flexibility to assure that the poor can afford to pay for it\textsuperscript{23}. The coverage and quality of water services are generally correlated with income and wealth. The poor adopt strategies, such as purchasing water from trucks and hauling water from standpipes or domestic faucets in neighboring communities, to compensate for the absence or inadequacy of the piped water supply. Such strategies are normally extremely expensive in terms of money and time. In contrast, piped water normally is priced well below the marginal cost of provision. Due to the uncertain political and socioeconomic conditions in Palestine, the water management policies and practices are not based on scientific approach or legal basis. There is also large scale mismanagement caused by the rapid changes of structure within the institutions of water sector. \textsuperscript{24} This study was done as part of the Integrated Water Resources Management approach to develop a financially sustainable water sector that maintains affordability and can upgrade the performance of water utilities.

\textbf{1.2. Statement of the Problem}

In recent years, water pricing has gained widespread acceptance as a valuable and versatile tool for municipalities and utilities to promote a number of goals. The most common goals associated with a sound water pricing policy, as specified by Boland and Whittington (2000), are identified as: economic efficiency, revenue stability, equity, income redistribution, and resource conservation. In addition to these five cardinal objectives, it is also important to consider the socioeconomic implications of the policy, and therefore policy makers must strive to formulate a policy that will be both publicly, socially, and politically acceptable. In order to reduce friction from the public as well as the governing body, a policy should be as simple and as transparent as possible, which will lead to greater ease in the implementation of any water rate structure. Any policy should take into consideration the local conditions and the specific conditions of the socioeconomic status of the communities. The majority of the attempts to apply the concept of IWRM didn’t count the importance of externalities and impact of different

\textsuperscript{23} Poor people pay between 10-16.5 % of the income however the recent increasing of unemployment expected to make this percentage higher than the research data.

\textsuperscript{24} Social and political powers are the main drivers of institutional arrangement not the needs or the sustainability.
powers such as donors and the entire economic approach that has been introduced by them. The Palestinian situation is a good example since external conditions such as military occupation, water conflict and donors are the main drivers of the mismanagement. Taking into consideration that Palestinian and Israelis depends on shared ground water and aquifers as described in the following map (figure 1)

![Figure 1](image_url)

Figure 1. Palestinian and Israeli ground water wells and joint supply system (Source: PHG, Data Base, PWA Data Base)

Much of the debate concerning the issue of water pricing has centered on the issue of decentralization of water management and the role local municipalities play in the
process of policy formulation and implementation. In most developing countries, there are ongoing discussions on the issue of management options for the supply of water. In the case of Palestine, the discussion is on how the local governments can provide their citizens with potable water at an affordable price the people which will create stable revenue for the municipality in charge of supply and distribution. What this demands is a pricing scheme that needs to be tailored to the social, economic, and political situation of the respective country. This task thus far has proved to be a formidable one for the Palestinian Water Authority in the West Bank. The consecutive political and administrative systems and the difference in the organizational structure in Palestine for more than 100 years have led to enormous problems in water management. The absence of a national water strategy makes it all the more timely to create a national tariff policy based on scientific fundamentals. In some areas Palestinians pay more than 16.5% (PHG, 2007) of their household's income to cover the water bill. The water utilities depend on water bills to cover most of its expenses and the municipalities use the revenue from water bills to cover part of its expenses which have no relation to water services. This practice is common and leads to the increase in water prices in rural areas reaching (3.7$/m^3) because of the gap between cost and revenue. (PWA, 2006.). The municipalities and water provider are doing this without any legal or political reference (interview with the head of pricing committee in PWA).

1.2.1. Summary of the problem at National Level.

The deteriorating social and economic situation in Palestine during the last ten years led to an increase in water prices. Since there is no coherent water policy or national strategy, the rise in water prices hindered people’s abilities to pay the bills. For example, only 48% of customers in rural areas are able to pay their bills. In the case of Hebron, the largest governorate in the West Bank, 75% of customers did not pay their water bills between 2003 and 2007 (PWA, 2007). This trend has subsequently led to a

\[25\] The debate about the type of needed reform is divided into two schools: the political driven school which focus to concentrate all powers and institution in hands of single political party, and the second school which focus on creating institutions and policies enabling Palestinian people to coop with political, socioeconomic and environmental problems and to help to end the occupation claims which focus on the Palestinians are not qualified to manage shared water resources.

\[26\] This percentage is changing to be higher due to rapid increasing of unemployment and poverty rates

\[27\] PHG Database

\[28\] This price is an average one for connected areas

\[29\] 1 US$= 4.5 NIS (2008 Average Price)

\[30\] Despite the documents are ready no possibility to be implemented under the current political and socioeconomic conditions and the political level hesitate to endorse it.
decrease in water utilities’ income, resulting in the accumulation of debts and deteriorating services. Consequently, those utilities have faced financial and administrative problems. (figure.2)
As the problem increased, many economic problems at those municipalities or water utilities emerged in addition to the social problems and the reduction in the water services or totally collapsed. The existing data illustrates the decrease of the income of water utilities in spite of the rise in water prices more than once due to the decreasing number of customers that are able to afford paying their water bills. In case of the largest governorate Hebron about 75% of the consumers did not pay during the years 2003-2007 (PWA, 2007). As of yet currently, at national level no unified tariff system has been adopted. Each governorate follows its own system set by the municipalities or the water utility in charge. The current tariff systems do not take into consideration important socioeconomic dimensions. Because of this, the internationally recognized benefits of a good tariff structure, such as environmental sustainability, cost recovery, and equity, are not being realized in Palestine.

Figure 2. Summary of The Problem

1.3. Aims and Objectives
The main purpose of this study is to set a model for a tariff system for poor rural areas within a sustainable water resources management framework and to overcome the problems borne due to uncertain socioeconomic and political conditions.

The secondary aims and objectives of this study are:
• to propose an organizational and legal framework for the tariff system;
• to reveal the significance of the tariff system within the changing socio-economic conditions;
• to study the influence and impact of the tariff regarding the efficiency of the water service utilities;
• To build a tariff system model that achieves social justice and sustainable water resources management.

1.4. Conceptual Framework

In this research the main conceptual framework is the concept of integrated water resources management, which promotes the coordinated development of water, land and related resources, in order to optimize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP, 2000). In practice, this means giving water an appropriate place on the national agenda; creating greater water awareness and knowledge among decision makers responsible for economic and social policies related to water sector. In order to achieve this approach the concept focuses on preconditions which are essential: an enabling environment, the reform of institutions and current management instruments. Based on the above mentioned conceptual frame a theoretical road map has been formulated to investigate the linkages between different concepts and need variables. However the implementation of the map requires full understanding of the relationships between different drivers and the main pillars of the process to formulate an efficient tariff structure. A strong framework of concept and ideas is needed to understand the relationship between poverty reduction and water management. The theoretical framework used in this report is based on the international consensus (PEP, 200231 .UN, 2005) that poverty is about more than material health, it needs to be understood as a complex and multi-dimensional process in which different aspects of water management can contribute to reducing different dimensions of poverty. The process of ensuring water is not marginalized and becomes an integral part of the socioeconomic agenda of the developing countries should be based on closer

31 The Poverty Environment Partnership (PEP) is an informal network of development agencies, which seeks to improve the coordination of work on poverty reduction and the environment within the framework of internationally agreed principles and processes for sustainable development.
relations between water managers and political decision makers. There are tools to link the decisions with socio economic such as development of Decision support systems (DSS) and Models for stakeholders’ dialogue. (*More details in the Methodology Chapter*)

**1.5. Research Proposition and Questions**

In this study the main problem was defined by analysis of the impact of a lack of adequate water policies and vision in water services and performance of water utilities, Due to the absent of this vision, a history of ineffective management and several structural uncertainties (mainly political and socioeconomic) water supply services and policies become a burden on poor people. Under the prevailing security, economic, water resources and institutional constraints, the performance of the utilities is deteriorating. Utilities performance is typically poor, with unaccounted for water averaging 34% and bill collection rates averaging only 50% (World Bank ,2009), for most of the utilities a lack of institutional capacity, resentful customer base, bad or sometimes absent tariff structure and policy led to very poor services and to financial difficulties (*more details will be given in the methodology chapter*)

**1.6. Hypothesis**

Based on several interviews with the Palestinian Water Authority, water utilities, and several stakeholders and the experience of the researcher, the following hypotheses were developed. (Figure .3).
1.7 Expected Outcome/Results
The following results will be gained from the study and its objectives:

- A generic method of setting water tariffs in an uncertain context.
- The best or most appropriate tariff system set under changing and uncertain socioeconomic conditions;
- A tariff system that achieves social justice and sustainable water resources management;
- The results of testing the new tariff in reality.
- Recommendations for Policy and legal framework for the proposed tariff system.

1.8 Importance and Impact of the Research (Innovation)
Much of the research in this study was conducted in the field and will shed much needed light on an important policy issue neglected in the literature, that of water pricing under uncertain political and socioeconomic conditions. Most of the literature dealt with water tariff as a static model but in this research the dynamic and rapid changes of the uncertainties were structurally part of the proposed model. Furthermore, the research is innovative because it uses socioeconomic tools to produce a tariff structure to meet uncertain conditions as part of coping mechanisms add the context of uncertain condition
or violent context. This is the first time that Palestinians attempt to set up a tariff structure as a policy tool to manage their water supply. Although it is too early to judge the impact of the research will have on decision makers, it is unique because it combines the aspects of water management and policy issues in Palestine. Therefore, it has a good potential to be used by decision makers when formulating pricing policies in the future. However, the current research needs to be followed by organized lobbying and awareness-raising to enable the decision makers to understand the structural relationship between water management and poverty.

1.9 Structure of the Report
The current report is divided into seven chapters as follows:

- Chapter One is a brief introduction and highlights the conceptual framework, as a statement of the problem. Based on the problem analysis, a set of hypothesis have been mentioned in this chapter. Also, the chapter includes the objectives and expected results of the research.
- Chapter Two looks at previous studies and related literature in order to establish a platform of knowledge and to explore the gaps where the research aimed to cover.
- Chapter Three describes the methodology used in the study such as literature review and field survey; additionally in this chapter the use of water poverty index is described as part of the methodology.
- Chapter Four focuses on the historical and political background of the water sector, water resources and the institutional arrangement in Palestine, while also looking at governance and policy instruments that might influence the implementation of sound pricing policies. The chapter highlights the supply–demand status in the study area.
- Chapter five mentions the findings of the survey.
- Chapter Six presents the suggested water tariff structure and its application in the pilot project based on the results.
- Chapter Seven lists the conclusions and recommendations (Figure 4)
1.10. Summary of the chapter
This chapter is designed to give a brief description on the historical background of water policy and management in the Palestinian territories, it describes the impact of the uncertain political situation on the socio-economic conditions and water management. In addition, this chapter has discussed the water shortage, the institutional arrangement, and the fragmented inefficient water policy. Accordingly, this introduction chapter shows the problem of the water tariff and pricing policy and the lack of tariff criteria and policy guidelines. This chapter adopts the conceptual framework to reveal the relationship between the socioeconomic conditions and water management and tariff concepts such as: fairness, economic efficiency and poverty. Also, the chapter includes the formulated research main question and sub questions, and related hypotheses, finally the chapter gives the entire structure of the research report.
Chapter Two: Literature Review

2.1. Introduction
The main concept of this research is based on a comprehensive vision and in order to establish a platform of this vision, a comprehensive literature review has been carried out on: integrated water resources management, water policy, water governance, water and poverty, water poverty index, water pricing and water tariff structure. The international and regional experience towards the water tariff has been reviewed, also the literature review included several international and national reports concerning Palestinian water sector.

2.2. Integrated Water Resources Management. (IWRM)
The concept of the integrated water resources management has been around for nearly 60 years. It was rediscovered in the 1990s in order to try to give specific references. While at a first glance, the concept of IWRM looks very attractive, a deeper analysis brings out many problems both in concept and implementation (Biswas, 2004). Each country however, has created its own model which takes into consideration all socio-economic, political and environmental dimensions. The IWRM concept should be a continuous process and a part of the general policies trends in each country.

The Technical Advisory Committee of the Global Water Partnership defined Integrated Water Resources Management (IWRM) “as a process, which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems,” and emphasized that water should be managed in a basin-wide context, under the principles of good governance and public participation (GWP, 2000. GWP, 2003).

IWRM is not a new idea. In a number of countries, water management has been institutionalized in an advanced and integrated way over centuries. Embid writes that Spain was probably the first country to organize water management on the basis of river basins, as it adopted the system of “confederaciones hidrográficas” in 1926. (Embid,
Over the last several decades, there have been serious attempts to implement IWRM in different global regions. In the 1940s, an early version of IWRM occurred when the Tennessee Valley Authority began to develop the water resources for that region (Barkin and King, 1986). Several international events recommended or mentioned IWRM as the most acceptable approach in order to achieve a holistic management of water resources.

2.2.1. International Vision

At the United Nations Conference on Water in the Mar del Plata (1977), IWRM was the recommended approach to incorporate multiple competing uses of water resources. Although in the 1980s water disappeared, for the most part, from the political agenda; the situation changed in the 1990s thanks to the efforts of a number of conferences and international organizations. Efforts such as the International Conference on Water and Environment (1992), Second World Water Forum (2000), International Conference on Freshwater (2001), World Summit on Sustainable Development (2002) and Third World Water Forum (2003) collectively led to breakthroughs that thrust IWRM onto the political agenda. The most important international events where IWRM was mentioned are as following:

Dublin 1992: International Conference on Water and Environment

In January 1992 International Conference on Water and Environment Issues for the 21st Century, held in Dublin, Ireland. Current thinking on the crucial issues in water resources is heavily influenced by the Dublin Principles, which are (ICWE, 1992):

- Fresh water is a finite, vulnerable and essential resource, which should be managed in an integrated manner;
- Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels;
- Women play a central role in the provision, management and safeguarding of water; and
- Water has an economic value and should be recognized as an economic good, taking into account affordability and equity criteria.

---

32 Statement of International Conference on Water and Environment(1992)

The key issue raised in the Second World Water Forum related to IWRM is the importance of efficient management through public participation, recognizing the right to access and to make water ‘everybody’s business’. (WWC, 2000)

Johannesburg 2002: The World Summit on Sustainable Development (WSSD)

In the end of August -September 2002, The World Summit on Sustainable Development was held in Johannesburg, South Africa. The summit endorsed several concepts of IWRM through integration the policies and strategies, the concept of Public Private Partnership (PPP) and the stakeholders’ active participation. (WSSD, 2002).

The Third World Water Forum - Kyoto 2003

The ministerial declaration vowed support to enable developing countries to achieve the UN Millennium Development Goals, and for developing IWRM and water efficiency plans in all river basins worldwide by 2005, the target set at the World Summit on Sustainable Development (TWWF, 2003).

The 4th world water forum 2006 ,March

The ministerial declaration reaffirms the past forums and focused on IWRM Concept in the following article:

“Reaffirm our commitment to achieve the internationally agreed goals on Integrated water resources management (IWRM), access to safe drinking water and basic sanitation, agreed upon in Agenda 21, the Millennium Declaration and the Johannesburg Plan of Implementation (JPOI). We reiterate the continued and urgent need to achieve these goals and to keep track of progress towards their implementation, including the goal to reduce by half, by the year 2015, the proportion of people unable to reach or afford safe drinking water.”33

The 5th World Water Forum 2009, March

The main issue raised in this forum was how the acceptance of the privatization as a management style will protect the rights of the consumers and deals with affordability problem, this hot issue shifted the attention to the importance of stakeholders’ participation and listening to the voice of poor and civil society.

33 Article 2 of the ministerial declaration of 4rh world water forum
2. 2.2. Future Challenges of IWRM

The international community now recognizes IWRM as the most efficient and effective water resources management mechanism to enhance economic well-being, social-equity, and environmental sustainability. But current IWRM principles are often overlooked due the reality on the ground. The integration of different sectors related to water management is a difficult and challenging task. In addition, the problems and solutions associated with IWRM implementation in different regions are not universal. Overly general or universal policies and guidelines for implementing IWRM may become counterproductive. Integrated water resources management (IWRM) is nowadays regarded as the vehicle that makes the "integrated view" of sustainable development operational for the management of water resources, since the interests of people, society, economy, and environment are seen as an interconnected whole (and where tradeoffs concerning all interests need to be taken into account). The holistic approach adopted in IWRM implies that information is needed on the state economy, society, and water resources. The most widely adopted indicator framework is the Drivers-Pressure-State-Impact-Response (DPSIR) Framework developed by the Organization of Economic Cooperation and Development (OECD) in 2003. According to the DPSIR, social and economic changes, such as population growth, agricultural policies, food demand and uncertainties potentially cause different kinds of pressures on the environment. The DPSIR Approach is widely used in order to understand what kind of policies should be implemented in order to achieve IWRM. This approach heavily depends on the major functions of indicators and the trends of the indicator overtime. However one of the shortcomings of this approach is that the accuracy of the indicators affects the overall conclusions.

The UN–Economic and Social Commission for West Asia (UN-ESCWA) has two sets of indicators for the water sector, the first one related directly to water aspects (environmental sustainability and water supply data), while the second is related to socioeconomic aspects (equity, affordability...etc). The main targets of the two sets are: an enabling environment (policies and regulation); institutional roles (performance indicators of utilities) and management instruments (economic, social instruments). Many academic studies query how to achieve the optimal benefits of IWRM and how to use it
to achieve a combination of social, economic, and environmental results. What kind of policies should be taken by decision makers to achieve an efficient system that takes into consideration the socioeconomic uncertainties of each country?

2.3. Value of Water

Many past failures in water resources management are attributable to the fact that water has been – and is still – viewed as a free good (based on religion or culture), or at least that the full value of water has not been recognized. In a situation of competition for scarce water resources such a notion may lead to water being allocated to low-value uses and provides no incentives to treat water as a limited asset. In order to extract the maximum benefits from the available water resources there is a need to change perceptions about water values and to recognize the opportunity costs involved in current locative patterns.

2.3.1. Value and charges

Concern has been voiced over the social consequences of “the economic good” concept: (While the Dublin principles refer to water as an economic good, water is referred to as an economic and social good in Chapter 18 of Agenda 21). The concept of water as an economic good (cost-benefit based management) will impact the sustainable livelihood of the poor people since their affordability to secure water for drinking and food production very low, the social fairness requires associating this concept with basic human and water rights, and this should be reflected at policy and management levels. To avoid confusion over this concept there is a need to distinguish clearly between valuing and charging for water. The value of water in alternative uses is important for the rational allocation of water as a scarce resource (using the “opportunity cost” concept), whether by regulatory or economic means. Charging for water is applying an economic instrument to affect behavior towards conservation and efficient water usage, to provide incentives for demand management, ensure cost recovery and to signal consumers’ willingness to pay for additional investments in water services.

Useful water value concepts: The following concepts of water value have been found useful within IWRM. The full value of water consists of its use value – or economic value – and the intrinsic value. The economic value depends on the user and the way it is
used, include: value to direct users of water, net benefits from water that is lost through Evapo-transpiration or other sinks (e.g. return flows) and the contribution of water towards the attainment of social objectives. The intrinsic value includes non-use values such as bequest or Existence values.

**Useful water cost concepts:** The full cost of providing water includes the full economic cost and the environmental externalities associated with public health and ecosystem maintenance. The full economic cost consists of: the full supply cost due to resource management, operating and maintenance expenditures and capital charges, the opportunity costs from alternative water uses, and the economic externalities arising from changes in economic activities of indirectly affected sectors.

**The goal of full cost recovery:** The recovery of full cost should be the goal for all water uses unless there are compelling reasons for not doing so. While, in principle, the full cost needs to be estimated and made known for purposes of rational allocation and management decisions, it need not necessarily be charged to the users. The cost, however, will have to be borne by someone. Estimation of full cost may be very difficult in situations involving conflict over water. (In conflict area where water is part of it water cost use to achieve political interest)

**Financial self-sufficiency versus water as a social good**

In order for water resources management agencies and water utilities to be effective there is a need to ensure that they have adequate resources to be financially independent of general revenues. Thus, as a minimum, full supply costs should generally be recovered in order to ensure sustainability of investments. But high supply costs and social concerns may require direct subsidies to specific disadvantaged groups. While subsidies “across the board” generally distort water markets and should be discouraged, direct subsidies for

---

34 A **non-use value** (feel good or warm glow) is a value associated that does not concern our use, either direct or indirect, of the environment, its resources or services. **Bequest value:** The current generation places value on ensuring the availability of biodiversity and ecosystem functioning to future generations. This is determined by a person’s concern that future generations should have access to resources and opportunities. It indicates a perception of benefit from the knowledge that resources and opportunities are being passed to descendants. (Beaumont, N.J, et.al 2007). **Existence value:** This is the benefit, often reflected as a sense of well being, of simply knowing marine biodiversity exists, even if it is never utilized or experienced, people simply derive benefit from the knowledge of its existence (Hageman, 1985, Loomis and White, 1996 )
targeted groups may be relevant, but they need to be transparent. There are, however, several institutional prerequisites for the successful implementation of targeted subsidies; these include adequate taxation or general revenue collection systems, mechanisms to identify the target groups and the capacity to monitor and follow up on fund utilization. Transparent financial linkages among different organizations and between users and management agencies are fundamental to the successful implementation of water policies. The principle “subsidize the good, tax the bad” has considerable merit when exercised in a transparent manner, although it has to be recognized that all subsidies have to be paid for by someone. In general, subsidies paid for from taxation will be less distorting than systems which rely on cross-subsidies between different groups of consumers; however, it is acknowledged that in many administrations cross-subsidies are easier to implement. ((Global Water Partnership Technical Assistance Committee (GWPTAC, 2000))

The cost of water: there are three different types of cost incurred in providing water to a household. 1) Supply cost: full supply cost is composed of two separate items: operation and maintenance (O & M) and capital cost (Rogers, 1997). 2) Opportunity cost (in economics, opportunity cost is defined as the value of the best available alternative (Roger, 1997) Externalities: water resources exhibit externalities in the sense that they have the property of "mutually interfering usage". Individuals take the valuable commodity of clean water from the same environment that they then use to dump wastes (Briscoe, 1997). Full cost: the overall cost of water is the sum of supply cost, opportunity cost, and externalities. (Figure 5) There is a common and reasonable concern that treating water as an economic good will inevitably be damaging to the poor, in terms of supplying "basic human needs"; in fact, most interventions to keep tariff low are defended in the name of the poor.
2.4. Water Policy and Reform

The objective of a water policy is to serve as a set of standards for judging the effectiveness of institutions for allocating and managing water (Porter, 1996) Seppa'la analyzed the trends in policy development, he mentioned that the early water development tended to be project specific and fragmented with little exchange of information and experiences between countries and among agencies (Seppa'la’, 2002). Towards the end of the 20th century, international agencies and countries have begun to have much more interaction and cooperation with regard to development of water policies and strategies. His paper mentioned difficulties in convincing most of the governments to reform their policies because many of them assume that their water policy are appropriate and justified. Seppa'la' in his detailed paper summarized the pre-conditions and key requirement and approaches for success in water policy and its reform implementation are: "the Institutional change and the factors affecting it, Institutional Incentives (staff, organization), integrated, comprehensive and systematic approach, effective stakeholder participation at all levels effective dissemination and development of adequate capacity for implementation at all levels."

However one of the important preconditions is highlighted by Dinar (1998); the importance of integrated and adequate information in order to create effective water
resources development and management policy, additionally his emphasis, on the relationship between water sector policy and other sectors. "New policies should develop a water resources, framework that account for the future needs of all water use sectors, including the environment, it should be recognized that any sector policy affects".( Dinar, 1998)

However the most important driver for any policy reform is the willingness of politicians. Although the literature contains a rich set of studies on the political economy of institutional and policy reforms, generally speaking very few studies exist addressing figuring out the political circles in bringing out of reforms, additional to that the socioeconomic impact of any accepted option of the reform is highly sensitive for them. (Paul,1990;Azis,1997;Bromly 1989;Nelson,1992). Despite all the above mentioned references constrains to adopt a comprehensive implementable water policy reform, there would be widespread consensus on the following principles to govern the formulation of national policy; Water is a holistic resource, a scarce commodity and an environmental asset. Basic human right, many stakeholders’ involvement, and economic efficiency. (DFID, 1997, Molle and Mollinge, 2003.Poverty –Environment Partnership, 2004.Gray at el, 2006)

The best of our knowledge, the literature does not provide information how to measure the political influence and political risk of policy reform. However no pre-fabricated model for integrated water management or policy reform, the socio economic and political context of each country is determining the guidelines and main components of water policy. Moreover, it is pre-condition to have a proper institutions and legal system to formulate and implement the policy reform, as well as the literature is lacking the information and tools how to deal with continuation of reform process during the uncertainties. Politically; the instability of government or internal violence; socioeconomic and financial issues (in particular in the countries are highly depend on international aid). Yet, the literature is very limited in describing how to keep the utilities performances at acceptable level without more burden on the people who suffer from instability, also the literature rarely mentioned the importance of transiently reform in particular in the new born countries where the central government very weak and vulnerable for influence by several political and social powers.
2.5. Good Governance

Implementing an IWRM process requires implementing three pillars correctly:

1. Moving towards an enabling environment of appropriate policies, strategies and legislation for sustainable water resources management and development.

2. Putting in the place the institutional framework through which the strategies and policies can be implemented.

3. Setting up the management instrument required by these institutions to do their job. (Clausen, 2004)

In the case of Palestine, the most important player in the institutional building processes are the donors, however the fragmented, scattered uncoordinated agendas of the donors impacted very negatively on the integrated water sector management. The reform process suggested by different donors is not efficient because of the above mentioned reasons and the different approaches to achieve the reform. The global report on corruption mentioned clearly that a transparent and a good governance water institution helps in fighting corruption and empowering poor (International Transparency, 2008).

“A variety of innovative initiatives show how empowerment can translate into greater participation and a more powerful voice for the poor. At the same time, special efforts are needed to overcome the traditional exclusion of women and other vulnerable citizens from participatory processes. Their inclusion in activities needs to be targeted and a common respect created for their contributions.

Setting water policy and budget priorities are one area for a more inclusive approach. Greater public participation and transparency in budget-setting activities can contribute to a more equitable distribution of resources for the poor.” (Sohail and Cavill, 2008), that explains that some political and social circles refuse the reform process and want to maintain the existing structures.
2.6. Water and Poverty

The application of IWRM concept may be harder in developing countries, giving rise to researchers and international organizations linking water and poverty: 'for humanity, the poverty of a large percentage of the world's population is a both a symptom and a cause of the water crises. Giving the poor better access to better managed water can make a big contribution to poverty eradication (Ojen et al. 2005). Among international organizations (IOs), the United Nations Development Program (UNDP) and the World Bank have influenced the poverty research agenda worldwide, through their yearly reports and extensive lobbying (Human Development Reports, 1999-2006, and World Development Reports, 1978-2004). UNICEF has its own research centre which produces a rich literature on the conditions of children (including access to clean water) deprived of care (UNICEF Reports, 1989-2005).

The most notable recent international event to draw attention to these issues was the UN World Summit on Sustainable Development in Johannesburg in 2002. An important outcome of the summit was the reaffirmation of the UN Millennium Development Goals (MDGs), including goal number seven, which is to “Ensure environmental sustainability.” Especially relevant to the water sector is target 7c, which aims to reduce the proportion of people without sustainable access to safe drinking water by half by 2015. Equally important and, in many cases dependent on safe access to water, is goal number one: "Eradicate extreme poverty and hunger".

In addition to poverty-related research of international organizations (IOs), national poverty reports or plans of action for poverty reduction are in progress or being initiated in many countries (For example, in Palestine, three poverty reports have been published)35. Also water is seen as one of the most critically-stressed resources, and much attention has focused on global water stress and the water needs of the poorest (Sullivan et al. 2003). The awareness of water and poverty-related issues as fundamental to sustainable human development, through the MDGs and national poverty reports, has spurred many researchers to focus on the best approaches and representative indicators in

35 The ministry of planning and national poverty reduction committee published three reports between 2002-2005, All reports done by stakeholders consultations and field surveys
order to formulate policies to achieve such goals as poverty reduction and integrated water resource management. An important issue has been the relationship between poverty as a socioeconomic term and water scarcity as a water management term. The past decade has seen much progress in the conceptualization of the link between poverty and water. This progress has also been given impetus by the development in the global water sector itself, which has mostly agreed that water, in addition to being an environmental resource, is an economic and social good, as well as a basic human right. (UNESCO, 2003). At the conceptual level, the link between water and poverty still needs to be further refined. Characterizing poverty through water needs further work on development of a conceptual link and analytical framework of water to poverty to include different relevant facts.

2.6.1 Water Poverty Index

The water poverty index (WPI) was designed to contribute to the global effort to tackle water problems, particularly as they relate to the poor. One of the main objectives of the WPI is to provide assistance with the challenges of local water management (Sullivan, 2001). While it provides a useful tool to monitor progress, it is equally important as a means of identifying those areas of greatest need. The main objectives of the WPI:

- Ease of understanding for policymakers
- Transparency of the process
- Empowerment of local community and adaptability to a variety of local situations and scales.

The more holistic approach of the WPI takes into account a number of factors influencing the effectiveness of water provision, thereby providing a more meaningful assessment of water access impacts at the household level. Sullivan presents the WPI as an interdisciplinary approach for an integrated assessment of water stress and scarcity by linking physical estimates of water availability with socioeconomic variables that reflect poverty. Another main objective of the index is to point out the link between access to water and the poverty incidence. It has been established that poor households suffer from
a lack of water provision, which results in significant loss of time and efforts, particularly for women in the developing countries. It has been established that the relationship between water use and economic development is positive (Sullivan, 2002 and Madulu, 2003). The link between water and poverty has also been looked at in terms of water supply and provision for domestic use (Kulinda 2002, Bond 2003, Feitelson and Chenoweth 2002, Mwandodosya and Meena, 1998, Whittington et al 2002, Katukatua 2002).

The WPI has broad characteristics, with the distinctive difference that most indices, such as the human development index (HDI) are generally applied only nationwide, whereas the WPI focuses on more local scales). The WPI fits well into a framework that focuses on sustainable livelihoods, which is widely used by donor agencies to assess development effectiveness (Scoones, 1998). The water poverty index is closely linked to these ideas it is a way of measuring water states focusing on poverty and the livelihood assets of the poor. The link between water and poverty is emerging through the human poverty index (HPI) by its consideration of access to an improved water source. Further development in this poverty–water nexus is the development of the water poverty index (WPI), explained in the methodology chapter (Sullivan 2002, Lawrence et al 2002; Feitelson and Chenoweth 2002; Salameh (2002). Generally, 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. 37

Agenda 21 and the Dublin principles placed the concept of water as an economic and social good on the global agenda, and they have received wide acceptance by water professionals. However, it is not clear to many non-economists what is implied by the statement that water is an "economic and social" (Rogers et al, 2004. Feitelson , 2002), one of the few researchers in the region focusing on the main elements required for a structural water poverty index, has set up an estimate of the cost of developing effective

---

36 More information about WPI will be given in the next chapters
37 The idea of a WPI is to combine measures of water availability and access with Measures of people’s capacity to access water. 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 also be ‘water poor’ because they are ‘income poor’; although water is available, they cannot afford to pay for it. The Water Poverty Index: An International Comparison Peter Lawrence (Keele University), Jeremy Meigh (CEH, Wallingford), Caroline Sullivan (CEH, Wallingford)
water and sanitation services. Moreover, Feitelson mentions the relationship between the water poverty index (WPI) and a country’s GNP, since the costs of water supply for a country would be made in absolute terms (rather than per capita terms) at prevailing exchange rates. The numerator of the water poverty ratio would be the total GNP for a nation and he suggests that the question of water sufficiency should be addressed in monetary terms as both the environmental and social dimensions of the sustainability discourse can conceptually be internalized in such terms. In light of this, a useful indicator relating water poverty could serve as a tool for communicating key information about national water systems in a simplified form to policymakers. Such an indicator could be used to show the trend over time and reveal whether providing adequate water services for the global human population is becoming more or less obtainable as both economic development and population growth continues in most regions of the world.

The Global Poverty Report of 2002 predicts a scenario in which most countries, especially low income countries, will not be able to achieve the set target of 90% water coverage by 2015 due to the serious resource and policy constraints. Due to this situation, (Gleick, 1999) argues that access to the basic water requirement is a fundamental human right implicitly and explicitly supported by international law. Privatization of water utilities is happening all over the world as a way to solve the resources constraints on the part of national governments and increase efficiency of supply. This move has resulted in increased prices, increasing hardships and instigating unrest and protest from the poor sections of society (Mehta and Madison 2003). Falkenmark (1998) considers the low coping capabilities that affect many developing countries and accounts for the dismal implementation record of policies and planned strategic activities. The African Development Bank, in collaboration with the World Bank, points to serious financial and other resource constraints in implementing national policy objectives and in achieving MDG targets. Due to this understanding of institutional inadequacies in the water sector, a huge effort is being made worldwide to make changes to water institutions in order to improve their performance.
2.7. Water Poverty and Scarcity of Water

In order to develop conceptual clarity, it is useful to define what is meant by each concept. "Water scarcity" is a decrease in the volume available per capita over time. "Water poverty" is a set of combinations between the water resources that is becoming either scarce with the set of potential adaptive assets of socioeconomic components. (GWP, 2003) One of the measures that can be taken to meet water demand management and the pro-poor socioeconomic objectives important for poverty eradication is a good tariff policy and structure. However, water tariffs have come into being in various ways. Sometimes, the tariff is simply inherited from a prior time, is not a subject of public debate, and/or is in no need to change. However, in many cases, particularly in developing countries where there is little socioeconomic sustainability, the need to revisit and to reform the tariff structures and policies is necessary. Water agencies must, from time to time, consider the proper design for the tariff. The process is often complex and can involve, in addition to the water agency itself, various stakeholders. Much of the complexity derives from conflict about different objectives and considerations that different parties bring to the discussion (Boland, 1997).

Based on the above mentioned debate, it is very clear that the water sector development remains at the heart of struggle for poverty reduction, sustainable development. In some developing countries (e.g. Palestine) the challenge of managing water legacy is almost without precedent. Yet, if these challenges are not met, sustainable growth and poverty eradication cannot be achieved. There is a re-emerging consensus that water sector development is essential to generate wealth, mitigate risks, cope with uncertainties and alleviate poverty; that poverty demand that Palestine will need to make large investment in water sector at all levels; and that development must be undertaken building on the lessons of experience, with much greater attention to institutional development and policy formulation.
2.8. Basic Human Water Requirement

The right to water is mentioned more or less explicitly in a number of international legal
documents such as: in the Action Plan adopted by the UN water conference in Mar del
Plata (1977), in the convention on the Elimination of all forms of Discrimination against
Women(1979), in the Convention of the rights of the child (1989), in the Dublin
Statement on water and sustainable development, as well as in many national laws.
Nevertheless, there is no international instrument to guarantee every person the right to
economically affordable drinking water, oblige national authorities to respect this right. A
range of estimates per capita water requirements have been developed, ranging from 20
liters per capita per day l/c/d through 4,654 l/c/d . The WHO and UNICEF in their global
assessment of water supply adopted the figure of 20 l/c/d for domestic hygiene purposes
from a source located within one kilometer of a person’s dwelling and coming from one a
range technologies generally considered capable of supplying safe water. No clarification
was given, however about their estimates of 20l/c/d was derived. (WHO, 2000.
UNICEF 2000)

Gleick (1996) argues that at least 50 l/c/d are required to meet human and ecological
needs. 5 l/c/d for drinking in tropical climates . 2 l/c/d for bathing and food. Falkenmark
(1986) argues that 1369 l/capita /year (500m3) is the minimum required to run a modern
society living in semi arid conditions. Shuval (1992) suggests that a figure of 247
l/capita/year is adequate to meet non agriculture water requirements. In most cases,
different estimates of minimum water requirements are developed with a range of
political or social purposes. However the capacity of each country (resources,
infrastructure, national economy, affordability and social structure) is the major
parameter for defining the basic need, recently at a seminar designed in Geneva, more
than 20 Middle East and international experts attempted to define the proper basic need
for the region and the conclusion was 35 cubic meter per capita a year for domestic and
ecological needs (International Workshop Statement, 2008)38

38 International workshop “defining water needs for fully exploited resources in The Middle East’ 2-4 May
2008 Plaise de Nations –Geneva
2.9. Water Pricing and Tariff Structure

It becomes clear that efficient water management and policy reform are required for the integration of socioeconomic indicators and understanding the entire social process. (Sohail and Cavill 2001). Taking into consideration the specific conditions of the country, in particular the nature of its economy and social structure will help in minimize the negative impact of desired reform process. Saleth and Dinar (2000) see these reforms as having common patterns and clear trends, suggesting that reforms are enacted due to both endogenous factors (scarcity, performance detriments, and financial non-viability) as well as exogenous factors (political reform, macroeconomic crises, etc.). Despite efforts at institutional reform, there is still a lot of room for improvement. Many researchers,(Homer-Dixon, 1996. Allan and Karsheanas, 1995) present economic tools as part of policies that can be taken to achieve the following objectives: management efficiency, social fairness, and improvement of performance indicators of utilities. The major debate on which application works best continues to focus on water pricing and tariff structures.

In practice, water policy and tariff structure may be designed to meet many objectives, including political ones (Dinar and Subramanian, 1998). After reviewing water experiences across 22 countries in various sectors and over time, experience shows that countries have different reasons for charging for water, including cost recovery, redistribution of income, improvement of water allocation, and water conservation. The willingness of countries to undertake water pricing reforms and successfully implement them cannot be solely explained by their water scarcity levels or by the size of their budget deficit, since high income countries have been relatively more open to reforming water pricing policies (Dinar et al 1998). An important question in the field is which pricing and tariff structure should be applied under diverse socioeconomic and political conditions.

2.9.1. Typology of Tariff Structure

Tariffs are charges for water and/or sanitation services but the "Effective Tariff Rate" that is, the net amount households will actually pay. This is a function not only of the amount households are charged also the extent to which tariff will be pursued and collected and
the participation rate for subsidies. (DFID)\textsuperscript{39}. The literature and practice shows different types of tariff structures are in practice. In Guidance notes “water and sanitation tariffs for the poor” Sohail (2004) mentioned two main categories of tariff structures: metered (measured) and unmetered (unmeasured). Also, the metered category has seven different types of tariffs: 1) simple volumetric rates.2) rising block with "lifeline"3) rising block with strong conservation signal .4) fixed minimum charges .5) higher non domestic charges.6) different charges for water and sewage 7) differentiation by level services. (Sohail, 2004. editor). However the different tariff structures have different impacts on suitability for poor people. (Sohail, 2004. editor)

\textbf{2.9.1. a. Non-volumetric tariffs.}

These are tariffs which do not require actual usage to be assessed. Such structures are appropriate where it is not practical or not cost effective to assess usage levels (e.g. because of the costs of installing meters and collecting usage information relative to the value of that information). Common examples of non-volumetric tariffs are flat fees per resident, or per household (for example for community latrines), or per sewerage connection, or fees based on the diameter of the household water connection, or irrigation fees per area of irrigated land, or per volume of crop grown. (DFID, BN.3)

\textbf{2.9.1. b. Volumetric tariffs.} Here, actual volume is measured. Common examples include flat rate, rising block and seasonal tariffs.

\textit{The ‘lifeline block’}

Many tariff regimes incorporate the concept of a minimum amount of water necessary for basic human needs such as drinking, washing and cooking. Often this ‘basic needs’ level of water is reflected in the tariff regime in the form of a \textit{lifeline block} which provides the basic needs level of water either for free or at a low rate to those eligible to receive it.

\textit{Flat rate’ or ‘linear’}. This is the simplest form of volumetric tariff. As the name suggests, a single rate is charged per unit of usage (e.g. per cubic meter of water used). This structure has the advantages of being easily understandable, generally perceived to be fair, and is simple to administer. However, a flat rate means that households using water for basic needs pay at the same rate as heavier users, and also that poor households

\textsuperscript{39} Briefing note No.7. Pro-Poor Approaches in Water Resources Management-no date
have incentives to restrict their usage below levels considered to be necessary to meet basic needs (though both effects may be offset through subsidies as well as through different tariff structures).

(ii) Increasing Block Tariffs. This is where there are increasing tariffs per unit of water for higher levels of consumption. Rising block structures can be used to signal the true cost of water to customers using large volumes of water, while allowing subsidized prices for “essential use”. Thus the charge applied to the top block of consumption could reflect the marginal cost of water. The lower blocks provide an element of subsidy and hence protection for low income households. A common difficulty with rising block structures arises in determining the appropriate cut-offs for the blocks. Unless the cut-offs are related to numbers in the household (which is administratively expensive) large households will be penalized. In contrast, if the cut-off is set at a generous level, it risks leaving relatively few customers facing a true marginal cost tariff, and hence will have little advantage in terms of demand management.

(iii) Seasonal Tariffs are tariffs which change depending on the time of year. They are appropriate where the demand/supply balance differs significantly by season. Examples include areas where there are marked differences in water supply between seasons. For instance, summers may be characterized by lower availability of water, or there may be alternative water sources (which may be free and without water tariff) which are seasonal; and/or water demand between seasons. For example, areas may attract large numbers of seasonal residents, or per head consumption may rise in the dry season due to plot watering etc.

Foster (2006) argues that the IBT structures are the most prevalent form for social tariff in the Latin America. Also, claims that a number of more sophisticated social tariff schemes are also being applied that combine consumptions criteria with some of socioeconomic screening.

John. J. Boland and Dale Whittington (1993) discuss in details the most common tariff structure, an Increasing Block Tariff (IBT), Whittington in his review of water policy in developing countries he stated that" The political economy of IBTs in developing continue Five problems and limitations of IBTs that have not been sufficiently appreciated by practitioners
“(1) The inability of water utilities to limit the size of the initial block for residential users due to political and other pressures; (2) The difficulty of confronting users with the proper economic incentives without large departures from marginal cost pricing for some users; (3) The difficulty in raising revenues to meet a financial (cost recovery) constraint without large departures from marginal cost pricing due to lack of knowledge of household demand; (4) Lack of transparency and difficulty of administration; and (5) Problem posed when a household with a metered connection supplies unconnected neighbors or vendors. The fifth section compares a simple IBT Structure with a tariff based on a single volumetric price coupled with a fixed credit, and illustrates an important advantage of the latter. Finally, we offer some concluding observations".

The use of such IBTs is widespread. In a survey of water utilities in cities in Asia, the Asian Development bank (1993) found that the majority of utilities in their sample (twenty of the thirty two) used an IBT structure. The global movement to privatization in the municipal water sector has not decreased the popularity of IBTs, despite strong reasons to expect that profit-seeking purveyors would prefer other structures. In bidding documents and requests for proposals, government often requires the private concessionaire to use an IBT.

However, Briscoe (1997) mentioned that most of developing countries aiming for economic perfection is neither practical nor helpful, and he touched the important issue which similar to Palestinian condition, that is the role of scarcity in developing informal water market and pricing system which create a black market (more burden on poor). The application of pro-poor IBT might be will minimize the effect of black market by encouraging people to control their consumption as an instrument for demand management under water scarcity management.
2.9.2. Argument on IBT

There are several arguments commonly made in support of IBT structure. First, it is claimed that IBTs promote equity because they force rich households to cross-subsidize poor household. The argument is that if all household have private, metered connections, wealthy household will use more water than poor household because water is a normal good and use increase with income. For example, rich household use more water in part because they may have gardens, more water- using appliances, and cars to wash. The low price for the initial block means that the poor can obtain a sufficient quantity of water for their essential needs at a low monthly cost. Rich households pay a higher average price for water because a greater percentage of their water use occurs in the higher priced blocks.

Second, it is also commonly thought that high rates charged industrial and commercial customers relative to most residential customers promote" equity " by allowing the water utility to cross-subsidize poor residential customers with revenues from rich industrial firms. Third, the argument is made that IBTs are desirable because the price associated with the highest block can be made punishing high and thus discourage or stop "extravagant" or "wasteful" water use. It is thus felt that IBTs promote water conservation and sustainable water use. Fourth, it is sometimes argued that IBTs are needed to implement marginal cost pricing principles. Assuming the marginal costs of municipal water supply are rising ( due perhaps to increasing raw water prices or opportunity costs), presumably the rationale here is that if the price of water use in the most expensive block is set equal to marginal cost. Then marginal cost pricing has been accomplished ( Hall and Hanemann ,1996) A more elaborate version of this argument is that an IBT is an optimal means of second best pricing, i.e., pursuing an economic efficiency objective subject to a cost recovery constraint ( Porter, 1996. Bakker, 2000, Chattila, 2004).

In different papers (Whittington, 1992, 2003) supported the IBT as a powerful and versatile management tool. It is capable of promoting a number of objectives:

1. Revenue sufficiency: the utilities have to introduce a good collection system and efficient accounting procedures to be able to collect enough revenue to cover the
Expenses.

2. Economic efficiency through incentives: all measures to increase the willingness to pay should be taken into consideration in particular where the WTP is so low, additional to that by efficient management of all resources.

3. Equity and fairness: The water prices should be reasonable and fair, the people have to feel comfortable with pricing system and treated equitable.

4. Income distribution: The level of the income of the people and the rural, marginalized areas should be taken into consideration at all levels of the policies.

5. Resources conservation: All measure and policy should be aware enough for resources sustainable and the right of future generations.

But Whittington mentioned several pre conditions in order to be realistic approach to achieve the above mentioned objectives:

- Public Acceptability: the social acceptance of any tariff system is an essential need and can be achieved through active involvement and consultation.

- Simplicity and transparency: the tariff system should be very practical and transparent in order to produce information or reports.

- Net Revenue stability: this net revenue should be secured in order to guarantee the level of services and the sustainability of the utility.

- Ease of implementation describe and not just list.

However the above mentioned is the description of the ideal situation, but no enough clarity how the system will work under the instable conditions, in other words how the system can be able to remain working under uncertain conditions such as war or internal social conflict and collapsing the institutions.

Accordingly, Whittington mentioned two commonly accepted justifications for using IBTs. The first, based on a rationale of equity, is that IBTs should assist the low-income households and ensure an equitable allocation of the costs of water production and distribution, the argument in this case is that the low income households use less than high income households. In this case the price in the initial block may be set very low, usually at a subsidized rate, to insure that the poor are not discouraged from using the amount of water considered essential for human needs. The second justification for IBT
structures are that the higher prices charged beyond the initial block discourages "extravagant" water use and promotes water consumption.

However the possibility of adverse effects of increasing water tariffs in developing countries is valid. Since, in many poor countries including Palestine the extended family, Poor families often live in more densely crowded housing and sharing buildings with many more households than do higher income families the other impact of an IBT structure because many households do not have private water connections and purchase water from neighbors.

Some researchers mentioned the practical problems of the IBT for example Jones reviewed the experience of 29 member countries in the Organization of Economic Cooperation and Development (OECD) he found the following practical problems (Jones, 1999):

1. The various political and other influences on selling the size of initial block.
2. Mismatch between IBT and managerial cost
3. The conflict between revenue and economic efficiency
4. Meaning of simplicity and transparency
5. Reality of shared connections

Also he mentioned the problem of the concept of cost recovery The principle of full cost Recovering is becoming more wide spread in the provision of both water supply and sewage disposal services, However, actual practice does not yet fully conform with this principle water supply subsidies also remain significant in OECD countries despite the good socio-economic conditions (Jones, 1999). Additionally, the design of the IBT; highly depends on socio-economy conditions of each country or community. Water tariffs come into being in various ways. Sometimes the tariff is simply inherited from a prior period. If the existing tariff has not been controversial, and if no outside lending agency is pressing for change, water manager may choose to deal with current needs by marking the smallest possible changes in the existing structure. In other cases, the tariff may be determined by a formula embodied in national legislation (e.g., Ukraine) which may also be administered and regulated by a national body (e.g., Colombia). Theses constraints reflect a social concern over the fairness of water tariffs, buy they are rarely
revised to account for changing circumstances. Whatever the motivation, legislative and regulatory constraints often leave little opportunity for an individual water supplier to consider the broader issues of tariff design, at least in the short run.

Expect for these special cases, water agencies must, from time to time, consider the proper design for the tariff. The process is often complex and can involve, in addition to the water agency itself, outside consulting firms, donors, political leaders, various stakeholder from the user population, and sometimes local and/or national legislature. Much of the complexity derives from conflicts among the various objective and consideration that different parties bring to the discussion. The most common objectives and considerations are listed below. The role of stakeholders and community participants is very important in the process of selecting the tariff structure or the management body (private, public, or joint). The Karachi city experience showed the importance of consensus-building during the reform process, in which participation by the stakeholders led to positive social and economic impacts (Ahmad and Sohail, 2003).

The other options of tariff structure discussed by different researchers and the conclusion was: Some characteristics of water pricing that researchers have taken into account and should be considered when thinking about a tariff structure are: minimum charges, flat fees tariffs, and prices below cost recovery, which may prevent users from appreciating the value of water. It is acknowledged that the attempt to create a cost covering water price might raise equity problems, since it would be a heavy burden on the economically disadvantaged (Hamdy and Casimo, 1999).

2.10. Water Pricing and International Experience

The discussion about the best economic tools and tariff structure is relatively new in Middle Eastern countries, where most of them living under water scarcity condition and poor management of water resources. Also because water is part of the political conflict and each country has a hidden agenda for water management. However the concept of integrated water resources management (IWRM) and tariff structure started to appear clearly in conferences and literature in the region. In December 2003, the UN–Economic and Social Commission for West Asia (UN-ESCWA) organized a workshop for its members (all of them in the Middle East) in order to promote IWRM. Among the
recommendations of the conference was a need for "restructuring the water tariff structures to cover at least operation and maintenance costs," also setting up a cost recovery and socially fair system highly recommended.

Abu Qdais and Al Anassay (2003) evaluated the effects of introducing new pricing mechanisms in Abu Dhabi city and compared it with the old flat tariff rate; they randomly selected 90 households with different socioeconomic levels and were analyzed before and after introducing the new pricing system. As a result of the new pricing policy, 73% of the households reduced their consumption by an average 29%; based on the paper, the new tariff system had a positive impact on demand management despite the fact that the people are relatively wealthy. Recent changes, in particular after pressure from donors, imply the scarcity of the resources and the environmental aspects are taken into account when using economic tools. This means setting up new institutions (i.e. in Morocco, Palestine, and Jordan) or technical and economic instruments in countries going through transitional arrangements (i.e. in Israel and Tunisia). Tariff and pricing experiences in Mediterranean countries are in general oriented towards cost recovery objectives and have contributed to the reduction of public financing at least with respect to operation and maintenance costs of water supply. More rarely, a part of capital cost is charged to consumers which lead to better durability of water infrastructures (Cohin-Kuper et al., 2004). However, the reform process has a different socioeconomic and institutional context; in Palestinian case the reform definition is to strength the Palestinian legislation and the capacity in order to use it as a step towards qualified institution towards independent state. But uncertainties and external political agenda force it to go in a different agenda.40

2.10.1. Regional Experience

2.10.1. a. Jordan

In order to learn lessons from the experience water management and policy of different countries, case studies in Jordan, and Israel, have been studied in detail. An example that resembles the Palestinian situation is a study in the City of Amman in 2004. Amman, the

40( the people last three months protest to pay the water bills as an action against the donors reform plan
capital of Jordan, has a population of close to 2.0 million. In 2004, the country’s average Gross National Income (GNI) was estimated at US$2,140 per capita, with income levels in Amman slightly higher. The country has managed a skillful balancing act in a volatile region and has increasingly diversified its economy. Recently, Amman has attracted both capital and people from neighboring countries suffering from political unrest. The physical characteristic of the country is arid and water is scarce and expensive; for example, raw water is pumped up about 1,200 meters from the Jordan Valley to Amman. Water resources development and management are vested with the Water Authority of Jordan (WAJ) established in 1988 as a statutory body with financial and administrative autonomy. Agricultural and municipal water has long been priced below cost. Investments have been funded by capital grants, many of which are provided by aid agencies. The major lessons from the Amman case involve the relationship between management capacity and performance of the tariff structure. Arguably any water supply and sewerage operator should be evaluated on its success in providing "efficient, sustainable service for all." By this token, the score card of the Amman management contractor is cautiously positive as the improving trend of the performance ratios indicates. Also, the Government is actively considering alternatives to the option of extending the contract period. Three lessons can be derived:

(i) The sustainability of a private operator contract is contingent first on the political support that it enjoys and second on the factual results of the contract. WAJ does not expect further rapid improvements from continued private management and will therefore attempt an alternative public management model.

(ii) The fixing of targets under a private management contract is delicate. There could be a temptation to set unrealistically rapid improvements in key performance indicators in order to facilitate the public acceptance of private management. In particular, forecasting rapid reductions of the percentage of non-revenue water NRW reduces the pressure for tariff increases. However, unrealistic improvements build up expectations that may then be dashed and create a backlash against the private management model.

(iii) Management contracts are constrained in what they can reasonably achieve by the investments that will be publicly funded. In particular, they cannot be expected to
mitigate deep-seated risks such as the raw water supply risk in Amman, due to the country’s precarious water balance and the deficient state of the distribution system that contributes to the continued high levels of NRW through physical leakage. Neither the raw water supply nor the state of disrepair of the distribution system will be improved without substantial investments. These investments will have to be funded by domestic or foreign tax payers through development subsidies since the Government has not so far allowed tariff to be set at levels sufficient to generate operating surpluses. The financing of these investments has been further constrained by the fact that the operator collects revenue on behalf of WAJ, which can decide to use them to fund investments in Amman or in other cities. Indeed, there is a strong competition for the scarce financial resources available to WAJ to fund extension and rehabilitation programs elsewhere (UN published Documents of Jordan Ministry of Water and Irrigation, 2004).

Jordan is highly vulnerable to external shocks and regional fluctuations. Moreover, it suffers from limited financial and natural resources. Policy reform programs have been initiated for the transformation from an inward oriented economy, with extensive government intervention, into a more market based economy that targets an outward oriented growth. High levels of unemployment usually intensify the problems of poverty; Therefore, one of the main goals of the reform programs adopted by the government since the beginning of the 1990s has been to reduce the unemployment rate. (Al-Zu’bi, 2008). The government of Jordan took several measures in the water sector to reduce the anticipated deficit of capital expenditure allocation for the Water Authority in the budget, to rationalize the uses of water and to cover economic cost of water services. In this regard, the government revised and raised the prices of water and replaced the previous favorable rate with progressive rates. In a step to reduce the public sector role and increase the productivity and efficiency in the water sector, the government privatized the Water Authority of Jordan by signing a management contract in the Greater Amman Area with Suez Loynnaise des Eaux (French)/Arabtech Jardaneh, LEMA. The initial benefits

41 Management contract won by LEMA consortium that comprised the French operator lyonnaise des Eaux and Montgomery Watson.
of the new management contracts for water distribution in Greater Amman are summarized by Al-zu’bi as follows:

i) water is now flowing again on a more regular basis,
ii) outstanding leaks reduced from 35% to 13%
iii) 68 percent of leaks repaired in less than 24 hours,
iv) 30,804 water meters realigned and rewired or renewed
v) US$ 1.7 million extra revenues from sewage were invoiced
vi) Water maintenance management system (GIS). (Al-Zu’bi, 2008)

The Jordanian experience showed four major lessons: 1) the importance of reform and revisiting the policies based on the changes of socioeconomic conditions. 2) the efficiency of the applied model (public - private partnership) at management level. 3) The impact of new tariff policies on supply demand management 4) efficient management leads to cost recovery and extra revenues can be used for investment.

2.10.1. b. Israel
The water sector in Israel is standing now at a crossroads. While for more than three decades it has relied on supply management, fixed quota regimes and policy makers now feel that some changes are necessary. Degrading water quality and several consecutive drought years are only part of the reason behind a re-evaluation of water policy and the role prices have to play here. It is worth noting that at the present time nothing has changed (Becker, 2003). The water law in Israel (1959) determines that the nation owns the water and Water Commission Agency controls its use. The technical aspects of water supply are handled by the national water company (Mekarout)\(^{42}\), which is responsible of two thirds of the nation’s supply, while the rest is handled by private sector. The economic vision behind this structure: Water sources are common property and thus should be controlled by government and water supply characterized by economic of scale; thus most of the water should be supplied by a” natural monopoly” Mikarout. (Becker and Doron, 2002).

\(^{42}\) The Israeli company responsible for management water resources in Palestine by military order no 92/1967
Water in Israel is metered and charged according to volume use. The pricing structure changed in the late 1980’s as part of a new water demand policy to an increasing block tariff that is intended to achieve efficient patterns of water-use. Currently, water prices for users vary widely across and sectors and regions in three ways: 1) agricultural users pay lower prices than industrial users who pay lower prices than households; 2) prices differ among regions in ways that are not always consistent with water transportation costs; and 3) consumers face an increasing block-rate pricing structure whereby higher prices are paid for higher levels of consumption. Beginning in 2007, as part of a new arrangement of the water sector, the national water regulator Water Authority was established, with expanded responsibilities including control over tariffs. One of the key demand-management tools is the Extraction Levy on water producers. The extraction levy reflects scarcity in water resources and together with the production and distribution costs, it is possible to set water prices such that they reflect the true value of water. (Zaide, 2007). Simon Klawitter (2005) analyzed the case of Israel and conducted a case study of Tel Aviv in order to see how specific water policies, especially a water tariff, affected the socioeconomic and political conditions. Since all freshwater served in Israel is paid by increasing block rates that charge increasing volumetric rates for increasing consumption. Increasing block rates require metering. By law all water served in Israel is metered. Increasing block rates need to define consumption blocks over which rates increase. The rates usually are designed by customer classes. Theoretically, properly designed increasing block rates recover class specific cost of service while sending a more conservation-oriented price signal to the classes. Therefore, increasing block rates (IBR) have been favored in relatively water scarce region. But the price signal of IBR will only be sent if the water price calculated is in economic terms, not by administrative policy decisions as the situation in Israel.43

Lessons obtained from the Israeli experience are that the policies were affected by the water and agriculture lobby. Israel was managed by a labor movement based on the “kibbutzim” or socialist movement, additionally Israel used a water pricing system for

---

43 Israel is not a good case since the average income per capita 16 times more than Palestinian territories and the economy and the society structure fully different.
long time as a tool to encourage and support rural areas to be attractive areas for new immigrants. Recently however Israel is looking for a new water pricing policy as part of the policy of demand management, to summarize the Israeli experience: The water policy in general and water pricing in particular always have been part of the social and economic agenda of the political levels more than as part of a technical vision of water management.

2.11. Water Policy and Management in Palestine
Due to the historical and political problems in Palestine, very limited efforts have been attempted towards water resources management. Until the establishment of the Palestinian Authority (PA), all water supply and resource management was under Israeli control. The Palestinian Water Authority (PWA), since its establishment in 1995 under Presidential Resolution Number 5, was given the mandate as the main regulatory and policymaking body for water resource management and development in both the West Bank and Gaza. The deteriorating condition of the water sector infrastructure and the increasing need for water are driving infrastructural, legislative, and institutional development in the water sector. The main elements of the Palestinian Water Policy have been established in Water Law No 3 (2002) and are the basis for decisions on the structure and tasks of water sector institutions and water sector legislation. This Law is based on 15 principles and 8 strategic priorities, including securing Palestinian water rights and regulating and coordinating integrated water and wastewater investments and operations.

Due to the fact that PWA is established as a project organization seven years before the Water Law was passed. The ambiguity of the mandate and heritage from that period still strongly affecting PWA’s performance. New infrastructure projects and studies from a variety of donors on water supply and sanitation have taken precedence since the creating of the PWA, leading to a dilution of the regulatory focus, loss of identity as a regulator, and reduced capacity for regulatory work.

---

44 After signing the interim agreement (Oslo Accord) in September 1993 the Israelis agreed to establish PWA as a mechanism to implement the projects approved by donors to encourage the peace process.
The Water Law is still only six years old and it may take some time before the regulatory functions become embedded in the “culture” of the water sector, in regards to the PA, PWA, the utilities, and the end users. A regulator needs utilities in place and in operation in order to execute meaningful regulatory functions. Such utilities are in short supply in the West Bank at present. A final obstacle facing the PWA as a sector regulator is the tremendous difficulty of law enforcement in severe conflict areas where frustrated users whose desperate short term concern is access to water, regardless of whether this is done in a sustainable manner. In summary, there is an immediate need to create a more favorable environment for PWA as a regulator to gain the trust and confidence of the water users of the West Bank, and thereby also to benefit from capacity building to this effect.

According to the Water Law, the National Water Council (NWC) is the high level cross-ministerial and stakeholder forum charged with sanctioning the general water policy, ratification of water use plans and programs, including tariff policy (which is under construction and in the consultation process), confirmation of the allocation of funds for water sector investments, and approval of the work and activities of the PWA and its annual budget. Although the PWA has a mandated responsibility as the secretariat of the NWC, the activation of the NWC is repeatedly described as a long overdue task (the NWC only met once since its creation in 2003). Until the PWA can execute its regulatory functions fully in accordance with the Water Law, and to the satisfaction of the sector stakeholders, the efforts of mobilizing the NWC should be put on hold. For as long as this transition period lasts, the powers of the PWA should be upgraded to authorize, sanction and approve all issues mentioned in Article 9 of the Water Law, subject to stakeholder impact assessment and stakeholder consultations in the preparatory work. Several donors recommend that all efforts should be focused on continuing the various capacities building project in place at the moment (Budget Support Program, Project Management Unit, German technical assistance (GTZ) Water Sector Cooperation). These institutional support programs should balance capacity and institution building technical assistance (TA) and training tasks with the aim of having a fully fledged regulatory water
sector body in place and accepted by its clients in both West Bank, and Gaza once the utilities that are to be subject to regulation are established (PWA, 2005).

The principles of sustainable development of water resources have been very difficult to implement in practice since the Oslo Accord.

In order to formulate a general framework for sustainable water management and policy guidelines, several studies were conducted by different donors:

1. **A comprehensive Planning Framework for Palestinian Water Resources Development (Camp, Dresser and McKee, Inc. [CDM]/ Morganti, 1997)**
   This report provides a framework for the development and utilization of water resources in West Bank and Gaza Strip through the year 2040. The study presents “the rationale and details of alternative plans relating to several possible scenarios for meeting water demands of the years 2000, 2020, and 2040.” Information and data discussed in this study include estimates of the total water supply, the baseline and projected water demand, and the quantities of renewable water resources available for development.

   This study, developed by the Ministry of Planning and International Cooperation, provides descriptive and quantitative information concerning the existing (1998) situation of water resources, water supply, water quality, wastewater collection, and wastewater treatment in the governorates (administrative districts) of the West Bank. The comprehensive evaluation of resource information at the governorate level makes this an

---

45 (Palestinian Water Sector Strategy Documents (DRAFT))

46 Article 40 (Water Resources) of the Oslo Accords

The Declaration of Principles signed on September 13, 1993 (Oslo 1) is the first bilateral agreement between the Palestinians and Israelis. According to this agreement, water resource issues would be discussed by the Permanent Palestinian-Israeli Committee for Economic Cooperation. The parties agreed to prepare plans for water rights and equitable use of water resources. However, the agreement did not identify or establish any explicit water rights for the parties.

Article 40 of the Oslo 2 Agreement, signed on September 18, 1995, is the basis for water sector planning and project implementation. This binding agreement regarding water and wastewater became the basis for water sector planning during the “interim period” and until the final agreement was reached. The original plan states that the interim period should not exceed 5 years from the date of the signing of Oslo 2, or September 2000.

Principle one of the water section of Oslo 2 is the most significant element of the agreement. It states “Israel recognizes the Palestinian water rights in the West Bank.” These rights will be settled in the permanent status agreement after the final negotiations. This was the first time the Israeli government explicitly acknowledged the Palestinians’ sovereign right to water on the West Bank.

47 American companies
important document supporting baseline water resource, and supply and demand analysis for the West Bank.


This comprehensive study conducted by Carl Bro International and associated firms was similar in scope to the 1996-1997 study completed by CDM/Morganti. The study builds upon the resource analysis and supply and demand estimations presented by CDM/Morganti provides a comprehensive database of projects to be implemented in order to meet anticipated water demand through 2020. In addition, this study asserts specific goals, objectives, policies, and priorities recommended for adoption by the Palestinian water sector.

However the above mentioned studies ignored the uncertain political and socioeconomic condition in Palestine and of all of the studies assumed one scenario which is the continuation of the peace process and positive development of the socioeconomic situation, since the facts on the ground were not as ideal as assumed, these studies remain aspiration.


The National Water Plan (NWP) is a strategic document developed to provide guidance for development of the Palestinian water sector. The document awaits final endorsement by the National Water Council; however, it provides an important insight to the Palestinian vision for water sector growth. Important elements of this document include descriptions of the legal and institutional framework, the tariff structure, the basis for water rights, and general management strategies. Perhaps most importantly to the planning process, the NWP presents objective criteria to guide the development of water supply for the West Bank and Gaza Strip from 2000 through 2020. A detailed investment plan is also included in the NWP.

This document, prepared under Phase II of the USAID-supported West Bank Water Resources Program, is an update of previous studies and provides projected water requirements for the planning years 2000, 2010, 2020 and 2040 for the West Bank and the Gaza Strip. The planning framework developed in this document provides an updated inventory of existing water resources and describes potential alternative sources that may be available within the region. In addition, this document provides a comprehensive discussion of the legal and political framework for current and future water allocation in the West Bank and the Gaza Strip.

One of the most fundamental challenges facing the Middle East is ensuring sufficient water for future prosperity. Water security is especially critical for a future Palestinian state: water resources are scarce in the West Bank and Gaza, and supplies must increase to accommodate development. Current consumption from most groundwater sources exceeds the rate of recharge and is unsustainable. According to recent estimates, Israelis and Palestinians are overdraining from the aquifers underlying the West Bank by more than 170 million cubic meters per year (MCM/yr) (CH2M HILL, 2002a). Overdraft from the Gaza Aquifer exceeds recharge by about 65 MCM/yr (PASSIA, 2003). Water quality, inadequate water distribution, and sewage infrastructure are also major issues. Water problems in the West Bank and Gaza have already led to significant health problems and hinder efforts to alleviate poverty and to encourage development. The uncertain political environment has significant implications for the water infrastructure.

The PWA argues that the following should be the four major planning goals for 2015:

1. Increase water availability to meet minimum per-capita consumption while managing demand through efficiency and reuse.
2. Reduce utilization of groundwater resources to sustainable levels.

---

48 A study funded by USAID in order to assess the potential of the ground water in Palestine; however the main difficult was the dispute between Palestinian and Israel on water rights since the ground water is a trans-boundary water resources.

49 Unpublished document (draft plan submitted to the national water council 25th October 2006)
3. Upgrade and improve the efficiency of the existing water supply and sewage infrastructure.
4. Expand water supply and sewage infrastructure to serve at least 90 percent of the population.

There are many policies that could be implemented to achieve these goals. A prudent planning approach will consider the costs of candidate policies under a wide range of possible water demand and supply scenarios. As we show in this chapter, some policies perform better under uncertainty than others. Meeting these goals will require overcoming many hurdles, the first of which is negotiating an agreement between the Israelis and Palestinians on the use of shared aquifers. Any proposed water-sharing solution will need to address significant equity issues. However, regarding the tariff policy and structure, very limited work has been done, which will make this study of great importance. In the last meeting of the NWC, the necessity of a good water tariff is mentioned and an evaluation study for all existing tariff structures will be conducted.\textsuperscript{50}

The head of the water tariff unit in PWA Kamal Issa summarized the financial problems of the water suppliers as follows:\textsuperscript{51}

- The cost is high and the ways for reducing it are limited.
- Water suppliers apply different prices and tariff system.
- The applied prices are not justly distributed.
- All the service accounts are mixed together and not separate that some provides other service than water. The accounts of these services are mixed and use for each other.
- Most of the municipalities and utilities suffer from arbitrary fee collection.
- Consumers are not able to pay their bills, mostly due to the bad economic situation, with some estimates placing 50% of people under the poverty line. The efforts to encourage consumers to pay are not sufficient.
- Some of the municipalities and utilities are not covering their operating (O&M) costs.

\textsuperscript{50} Informal meeting in 8 February 2008
\textsuperscript{51} Presentation during the meeting of the national water council/ expert meeting dated 31 October 2007
• Municipalities still used old accounting systems.
• The financial data available is limited and sometimes inaccurate.

All these conditions affect the value of water. These conditions must be reformed in order to continue offering the service at good quality and suitable prices with sufficient quantities. As is clear from the above mentioned problems in the Palestinian water sector, good governance and reforming the institutionalization process is a pre-condition to apply an efficient socioeconomic-based tariff structure.

2.12. Willingness to Pay
Willingness to pay is a dynamic parameter resulting from the combination of affordability and willingness to use. The latter is a relatively new concept which can be defined as the maximum amount of desire one can willingly express for a certain commodity or service. It is a function of many technical, institutional, financial, and legal factors. It may also include factors such as the scarcity and value of the resource. Meanwhile, affordability is the expression of ability to pay for a service or commodity and is a function of the price of the service or commodity and the income of the user. It has been stated that the cost of water supply should not exceed 5% of family income (Katko, 1990. Awad, 2009) However, this rule of thumb is questionable; in fact, the ability to pay criterion can at best be only a broad guideline and represents an external assessment (WHO, 1989). Accordingly, determining willingness to pay by users is not an easy process, simply because some users may value a service more than others and therefore, they may be willing to pay a higher price than others. However, careful measurements of willingness to pay will provide an insight into public opinion regarding the value of water and will allow for the inclusion of public concerns regarding water prices into any future water pricing policy.

Low reliability, poor service, institutional obstacles, managerial problems and lack of awareness are among the compelling causes for low willingness to use. When this is combined with high costs for services, low willingness to pay is inevitable. This, in turn, results in poor service quality. This vicious circle should be broken with an affordable amount of money. For that, efforts should be taken to improve willingness to pay/ use by
some socio-cultural activities. (Islam and Vincent, 1999). Three sets of characteristics jointly influence a household’s willingness to pay for improved water supply (World Bank Water Demand Research Team, 1993):

- Socioeconomic and demographic characteristics: education, occupation, size and composition of family, income, expenditure and assets;
- The nature of existing (traditional) water systems versus those of improved supply systems on offer: cost (both financial and time required to collect water), quality and reliability of supply;
- Household attitudes toward government water policies and their sense of entitlement to government services.

2.12.1. Arguments against Relying upon Willingness to Pay
Meier (1983) writes that there are a number of arguments against relying entirely upon the willingness of consumers to pay as a criterion for supplying them with water. These include consideration of external benefits, the extent of consumer knowledge, and the ability to pay. Given the difficulties described, there are particular doubts as to the practical relevance of the concept of ability to pay in arriving at a judgment about willingness to do so. There is much evidence that even where consumers are wealthy, they often refuse to pay or otherwise cause difficulties for a water authority which is attempting to introduce or increase water charges. This leads us to suggest that the only way in practice to address this issue is, rather than to conduct elaborate, assumptive socioeconomic surveys, to “test the market” by the gradual introduction of new tariff policies, and then to observe consumer reaction before deciding to increase those charges or to expand capacity. (Meier, 1983)

Webb and Iskandarani (1998) share the opinion that household response to a new, possibly ‘improved’ water supply is not due to one set of determinants alone, but to their joint effect. This suggest a need for careful consideration of the potential correspondence between public sector concerns for an appropriate water supply policy and local peoples’ wishes as reflected in their willingness-to-pay. It has been suggested that households usually pay, or are willing to pay, 3 to 5 percent of their income for an improved water
supply (World Bank Water Demand Research Team, 1993). Yet since income is not the only or even principal determinant of water demand, the share of income that a household is willing to pay varies widely according to local context. Furthermore, the reliability of water supply, one of the elements influencing people’s willingness to pay for improved water supply service, should not be underestimated. Unreliable service can discourage people from having their household connected to a piped water system. At the same time, one should keep in mind that the willingness to pay may differ from the ability to pay. It cannot always be assumed that individuals who are willing to pay for a basic service will be able to do so (Webb and Iskandarani, 1998).

Meier mentions also the following: "Experience suggests that in the public utilities field in general, the only way in which the minimum economic worth of investments can be determined is by giving consumers themselves the chance to let authorities know how much they value the service”. (Meier, 1983, PHG, 2003). However the method to estimate the willingness to way is also controversial. Pearce (1998) stated that "The aim of the Contingent Valuation Method (CVM) is to elicit valuations- or "bids" – which are close to those that, would be revealed if an actual market existed. The hypothetical market- the questioner, questionnaire and respondent – must therefore be as close as possible to a real market .The respondent must, for example. Be familiar with the good in question. If the good is improved scenic visibility, this might be achieved by showing the respondent photographs of the view with and without particular levels of pollution. The respondent must also be familiar with the hypothetical means of payment vehicle. The questioner suggests the first bid (the "starting – point bid (price)") and the respondent agrees or denies that he/ she would be willing to pay it. An iterative procedure follows: the starting – point price is increased to see if the respondent would still be willing to pay it. And so on until the respondent declares he/ she is not willing to pay the extra increment in the bid. The last accepted bid, then, is the maximum willingness to pay (MWTP). The process works in reverse if the aim is to elicit willingness to accept (WTA) bids are systematically lowered until the respondent's minimum WTA is reached. A very large part of the literature on CVM is taken up with discussion about the "accuracy" of CVM .Accuracy is not easy to define. But since the basic aim of CVM is to elicit "real" values. A very large part of the literature on CVM is taken up with discussion about the accuracy
of CVM. Accuracy is not easy to define. But since the basic aim CVM is to elicit "real" values. (Pearce, 1998). A bid will be accurate if it coincides (within reason) with one that would result if an actual market exist. Merit (2005) in his critical review the willingness to pay concepts uses in the 11 studies from Caribbean Africa, and Asia concludes as: "The importance to understand of the Existing local market for the services mentioned the water demand school, particularly Dale Whittington, have made a great contribution have to our comprehension of these hydro social process from the point of Abstraction to the moment of water purchase by the household. This now needs to be complemented by an attempt to grasp how much water is used by the family by whom and to what purpose without this baseline behavioral ground work, projects are exposed to a greater risk of failure". (Merit, 2005)

Also merit added our understanding of future household Behavior requires semi structural interviews primarily with families female adults. (Merit, 2005)

**The sensitivity of the application of willingness to pay in Palestine**

The application of willingness to pay in Palestine is more sensitive than any place else. since the ownership of the water is in dispute between Palestinians and Israelis, additionally the physiological dimension (Palestinians think they shouldn’t pay to water managed and controlled by enemy). Taking into consideration the above mentioned measure the CVM should be applied very carefully and the number of sample size should be large enough in terms of number and the coverage of geographical areas in order to avoid the effect of political and physiological effect.

**2.13. Affordability**

A critical distinction when considering affordability is the difference between willingness-to-pay and ability-to-pay. Willingness-to-pay reflects consumer preference about purchasing a quantity of goods or services relative to prices. As prices rise, particularly for essential goods and services, consumers may demonstrate a reluctance or unwillingness to pay (EPA, 1997). Ability-to-pay raises another host of issues. Ability-to-pay focuses not on whether consumers will pay for water service, but whether consumers can pay for water service. Ability-to-pay is primarily a function of income related to the cost of living, which in turn is primarily a function of employment. Income (weighted by
the cost of living) and employment measures often are used in estimating a community’s socioeconomic conditions and the related ability of consumers to support utility costs (EPA, 1997). The affordability assessment framework recognizes the flow of resources that affect water systems and the different resources available to different types of water systems. The framework can be used not only to understand affordability issues but also to explore options for addressing affordability concerns.

### 2.14. Comments on literature

Based on the review of the international and national literature related the subject the author comments described as following:

- The interdisciplinary approach is the most correct one to manage the water resources and supply. The IWRM is a dynamic process and the proposed toolkits by international bodies are road maps rather than an action plans.
- Although the literature recognizes the importance of the socioeconomic and political conditions to implement integrated water resources management there is little attention paid to un-certainties in these conditions.
- Despite the fact that some literature focus on the importance of water poverty index (WPI) it is not comprehensive enough to link water with poverty or to give a clear vision of the issues.
- The literature is lacking a full description on how to deal with political concerns of the decision makes during the process of the policy formulation towards water tariff or other policies.
- Based on the work done on literature review, the author defined the importance of the local conditions to be fully into consideration to formulate water tariff and to suggest the needed reform plans to make this structure workable in order to achieve the predefined objectives.
- Most of the literature considered the water tariff as a static structure, however in order to be efficient the structure should be a dynamic process, without losing the focus and the objectives and flexible enough to deal with uncertainties such as a rapid changes and reforms of institutional arrangements done by political level.
Despite the fact that water is a necessity for life under all political and socioeconomic conditions, the literature gave very little information and experience on how the decision makers should act under abnormal conditions (civil war, occupation, long term emergencies). Also, the experience of developing countries in water pricing showed the importance of dealing with social and political issues. However the literature rarely mentioned how to deal with this issue during policy formulation and reform process.

Despite this fact, the literature explained several experience of developing countries for IWRM application, however all these experiences showed that the application should not be as prefabricated model, in other word each country has to choose its own model and the model has to be as part of the entire country socioeconomic model.

The literature gave several criteria about the methods to define the Basic Human Needs (BHN) for water, however the discussion on the relationship between BHN and the ongoing water scarcity and the deterioration of water services was very shallow.

The literature explained the importance of the stakeholders involvement in the process of water management but the experiences have been mentioned how to deal with various interest and the process to facilitate the dialogue among different stakeholders so limited.

2.15. Knowledge Gap
During the course of the research it was found that there were significant knowledge gaps in the literature dealing with water management in general and water tariff in particular. Most of the literature and experiences in the study were reviewed in ordinary conditions and illustrated the commonly recognized guidelines and principals for water pricing and tariff structure without taking into consideration specific local conditions. The following are the significant gaps as well as the research attempts to overcome them.
1. Lack of guidelines to deal with political and socioeconomic uncertainties

Despite the fact that there is a large amount of literature on theoretical explanations of integrated water management, there is still insufficient guidance on how to be flexible enough to deal with external uncertainties such as political conflict. While there are many models to deal with the socio economic dimensions of water management models in the literature which could be easily adapted these do not deal with local specific conditions. This research attempts to fill this gap by developing multidimensional frameworks to deal with uncertainties.

2. Lack of multi-dimensional empirical studies in water tariffs

The reviewed literature shows the absence of a multi dimensional approach to dealing with water tariffs. Most of the studies ignore the importance of a holistic approach. Water tariffs should be dealt with as a dynamic process. The reform of water institutions, good governance, macroeconomic issues, politics, cultural norms, conflict development, disputes over resource ownership and the capacity of the society to develop its own model without the interference of external political agendas are the main drivers for efficient water tariff. This research attempts to understand all these components in order to produce a comprehensive model. Only under this holistic multidimensional vision can the literature gap be filled and an efficient and sustainable water tariff structure designed.

3. Innovation of Assessment of Willingness to Pay

In order to assess the willingness to pay (WTP), a common and well known technique called contingent valuation method was used. This is not a new technique but it has not been applied before on a national wide survey. The innovative aspect of this approach is to use the holistic approach in order to understand the political and psychological influences behind the answers given to the researchers. It is also different in that it uses the collected data (primary and secondary) for purposes other than the willingness to pay, which allows a deeper understanding and analysis of the survey results. The analysis focused in
understanding why and when during a political and socioeconomic period the public responds positive or negatively.

4. Integration between the units of analysis (household) with National Performance Indicators (NPI)
The research attempted to use and understand the data collected by the field survey in the context of National Performance Indicators (NPI). These indicators were: good governance, national income, political agenda and future trends of national socioeconomic conditions.

5. Introducing the WPI at a national level
Despite the fact that WPI is a controversial issue the research used it as an indicator for the performance of the water sector in Palestine. This indicator helped in justifying the needs for reform of the water tariff system. This usage was innovative but uniquely suited to formulate a sustainable tariff structure in uncertain conditions.

6. Despite the fact, improving services delivery in fragile states (like Palestine is a difficult task due to the delicate contents, and challenging operational environment, however this research attempts to prove in such exceptionally difficult circumstances, potential opportunities and levers for change within service delivery and governance can be done.

2.16. Summary of the Chapter
The chapter aims to set out a theoretical knowledge which is derived from existing literature on integrated water resources management, water and poverty, water pricing, different tariff structures and the review have done for the published documents by international organizations such as World Bank, UNDP, FAO, ESCWA…etc, and the local national official documents in Palestinian Territories Include Water Policy Documents, Management Plans…etc. The author explores the international experience (under diversity of socioeconomic conditions) by reviewing of several papers regarding water management and the importance of socioeconomic dimension. The chapter highlights the knowledge gaps have been targeted by research to be filled.
Chapter Three: Methodology

3.1. Introduction
The design of methodology discusses the research methods and described in details the techniques chosen for the research, also it provides the research design and the conceptual framework of the research suggests and formulizes the proper model of the case study design. The chapter describes the collection methods and the typology of the data (Qualitative and Quantitative with its primary and Secondary resources). The chapter goes further to discuss sampling techniques, data administration and response. The Chapter aims to illustrate the methods used to help filling the knowledge gap (Inter-disciplinary vision to deal with uncertainties) and to answer the research question (how the water tariff structure can serve to main objectives under a local uncertainties). The researcher attempts to define the proper methods to help in replying the research questions by using the techniques for analyzing and interlinking the collected data.

3.2. Conceptual Framework
A conceptual framework is described as a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Reichel & Ramey, 1987). When clearly articulated, a conceptual framework has potential usefulness as a tool to scaffold research and, therefore, to assist a researcher to make meaning of subsequent findings. Such a framework should be intended as a starting point for reflection about the research and its context. The framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and to communicate this. As with all investigation in the social world, the framework itself forms part of the agenda for negotiation to be scrutinized and tested, reviewed and reformed as a result of investigation (Guba & Lincoln, 1989). The conceptual framework becomes the heart of the study as the research gains momentum. The importance of the conceptual frame is to keep the research on track by providing clear links from the literature to the research goals and questions (Goetz & Le Compte, 1984). The research benefited from a large body of literature on various aspects related water-poverty and IWRM, but no prefabricated model exists for how this should be done.
Establishing any component of water policy will always be tolerated to the specific national conditions, however when the specific conditions are so complicated and uncertain as in Palestine, the key step of policy formulation process is to develop an integrated analysis based on several clusters of indicators such as socioeconomic, poverty, institutional performance, political interests etc.). The Water Poverty Index (WPI) can be used as a supplementary comprehensive indicator giving a theoretical indication about the status of water management. Based on the Palestinian context, one issue is worthy for consideration - that efficient water management can and does make a major impact on poverty reduction, improving the performance of water utilities, reducing the high risk of collapsing the water utilities. A proper tariff structure can be a catalyst for effective water policy by reducing the effect and threats from environmental, economic and political factors including sudden impact and shocks and long term trends. In other words efficient, proper water policy will reduce the vulnerability of the public. Taking into consideration the research objectives and questions which are to create a good practical and pro poor water tariff structure able to overcome the socioeconomic (poverty, unemployment, social divisions) political difficulties (high polarization and political tensions among different political groups, confrontation with occupation and donor political agendas), and uncertainties (rapid changes of institutional arrangement, different reform and proposals and process, as well as long term drought. The following diagram shows the conceptual frame to achieve the main goal of the research (figure.6)
Main focus of the study

Explanatory information for data interpretation and policy implication

Figure 6. Conceptual Framework
3.3. Research Paradigm

A paradigm provides a theoretical framework for seeing and making sense of the real world. According to Burrell and Morgan (1979), "To be located in a particular paradigm is to view the world in a particular way." And indeed paradigm has been termed a "World View". However it was Kuhn (1970) who introduced the term as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners", and suspected that (Khun, 1970) "something like a paradigm is a prerequisite to perception itself". In the postscript to his second edition, Khun (1970) provides a useful definition; "it stands for the entire constellation of beliefs, values and techniques, and so on shared by the members of a community." The significance of paradigms is that they shape how we perceive the world and are reinforced by those around us, the community of practitioners. Within the research process the beliefs a researcher holds will reflect in the way the research is designed, how data is both collected and analyzed and how research results are presented. For the researcher it is important to recognize their paradigm, it allows them to identify their role in the research process, determine the course of any research project and distinguish other perspectives. Literature on research paradigm and methodology suggests that the research approach can be selected without restrictions while other practitioners assert that the decisions for paradigm and methodology selection are influenced by research aim, research questions and research resources (Patton, 1990). In this research the following paradigm was selected. (Figure.7).
Figure 7. Research Paradigm

Shortage of water, high Poverty, Socioeconomic conditions, Political constrains to reform, Poor institutional arrangements, lack of vision, mismanagement, Poor services, water bills burden on poor

Problem

Analysis and Conclusion

Research Questions

Data

Hypothese

Main Question

What are the pro-poor and most efficient water tariff structure can be implementable under several uncertainties?

Sub Questions

What lies beneath the unwillingness to pay and what are the measures should be applied?

What is the impact of proposed new model of tariff structure on utilities performance?

What are the main factors will make the tariff structure pro poor and efficient?

What are the factors should be considered to minimize the impact of uncertainties?

Basic hypothesis

In the context of water as an element for socioeconomic stability, it is hypothesized that the current water tariff structure is not proper to meet the basic elements of the efficient water tariff structure (socially not fair, economically inefficient and lacking sustainability dimension)

Methodology

Qualitative, quantitative and case study data collection methods

SH1. The current poor tariff structure caused by lack integrated vision, proper policies and governance

SH2. the current water tariff structure is not proper to several uncertainties (socio-economic, environment and

SH3. A new model of water tariff structure will relive both the poor and the utilities?
3.4. Research Proposition and Questions

A problem with the research study problem is that they have determined within their broad area of interest. This could be along the lines of:

- Indication of something hidden that might be revealed by the study
- The occurrence of an event for which there is no adequate explanation
- An apparent relationship between items which is not explained by current theories

Deep research requires a lot of work and patience; this usually requires that the researcher is strongly motivated to stay the course. The problem must also at least appear to be soluble by the researcher, in the time available, with the skills and resources they have.

**Problem:** In this study the main problem was defined by analysis the impact of lack adequate water policies and vision on water services and performance of water utilities, due the absent of vision, historical management deformations, and several structural uncertainties (mainly political and socioeconomic) water supply services and policies becomes a burden on poor people under the prevailing security, economic, water resources and institutional constrains, the performance of the utilities is deteriorating. Utilities performance is typically poor, with unaccounted for water averaging 34% and bill collection rates averaging only 50% (World Bank, 2009), for most of the utilities lack of institutional capacity, resentful customer base, bad (sometimes absent) tariff structure and policy led to very poor services and to financial difficulties. The detailed statement of the problem was described in chapter one.

The study is based on the proposition that water management is a dynamic process and this process is strongly linked with several factors. A comprehensive planning and integrated vision (taking into consideration threads and opportunities, strengths and weakness factors) is the optimal way to have a sustainable, socially acceptable and economically efficient water management. Based on this proposition and vision, the main purpose of this study was developed as following: based on the current conditions, how can new water tariff structure and its related interventions, such as policies and institutional restructuring, contribute to help create sustainable water supply
management? Taking into consideration the nature of above mentioned water problem and the main purpose of the study the main research question and sub question were formulated as following the main research question: **What is the pro-poor and most efficient water tariff structure can be implementable under several uncertainties?**

**Sub question 1:** what are the main factors that will make the tariff structure pro poor and efficient

**Sub question 2:** what are the factors that should be considered to minimize the impact of uncertainties?

**Sub questions 3:** what are the main steps that should be taken to reform the legal and institutional arrangement in order to create an enabling environment for the new tariff structure?

**Sub question 4:** what is the impact of the proposed new model of tariff structure on utilities performance?

**Sub question 5.** What lies beneath the unwillingness to pay and what are the measures that should be applied?

**Sub question 6.** What is the added value that can be used to engage the stakeholders and community?

The design of any study begins with the selection of a topic and a research methodology. These initial decisions reflect assumptions about the social world, how science should be conducted, and what constitutes legitimate problems, solutions, and criteria of "proof." Different approaches to research encompass both theory and method. Two general approaches are widely recognized: quantitative research and qualitative research. (Creswell, 2003). **Quantitative research** is an inquiry into an identified problem, based on testing a theory, measured with numbers, and analyzing that theory using statistical techniques. The goal of quantitative methods is to determine whether the predictive generalizations of a theory hold true. By contrast, a study based upon a **qualitative** process of inquiry has the goal of understanding a social or human problem from multiple perspectives. Qualitative research is conducted in a natural setting and involves a process
of building a complex and holistic picture of the phenomenon of interest (Creswell, 2003).

The selection of which research approach is appropriate in a given study should be based upon the problem of interest, resources available, the skills and training of the researcher, and the audience for the research. Although some research may incorporate both quantitative and qualitative methodologies, in their ‘pure’ form there are significant differences in the assumptions underlying these approaches, as well as in the data collection and analysis procedures used.

### Why is the distinction between quantitative and qualitative research important?

It is important to be able to identify and understand the research approach underlying any given study because the selection of a research approach influences the questions asked, the methods chosen, the methods of analyses used, the inferences made, and the ultimate goal of the research. When critically reviewing scientific research, the questions asked, and the answers given, will differ depending upon whether the research is quantitative or qualitative.

### 3.5. Research Process

The actual research process is approximately six steps; **Identifying the research topic, Defining the research problem, Determining how to conduct the research or the method, Collecting research data before analyzing and interpreting this data and finally presenting the results (Zikmund, 1991).** Within these steps operates the researcher and the quantitative and qualitative research approaches. In identifying a research topic the researcher sorts through a broad research topic to clarify a precise set of ideas or concepts. Examination of any area for research can yield an infinite variety of questions, however; there are constraints in resources and the requirements of future users. Therefore it is essential to identify those questions which can be addressed within the constraints imposed, and the questions that match the needs of those using the research results (Davis et al., 1989). To further clarify the research topic and define the research problem a review of existing literature is undertaken.
A review of existing literature identifies what researchers have found to be important and provides a basis for the researcher to work from (Davis et al., 1989). It is literally looking again at prior research. It further provides the researchers with a degree of competence within their research area which assists in developing the researcher’s knowledge and identifies the boundaries of previous research, therefore focusing and justifying the research problem. A sound literature review, "gives a good basic framework to proceed further with the investigation." by clarifying the research problem and identifying likely variables. (Sekaran, 1992.)

Research design is used to determine how to conduct the research and which methods are used. The research topic has been refined into a problem statement or tentative question, the researcher is ready to compose a proposal. Research design has been referred to as (Zikmund, 1991), "a master plan specifying the methods and procedures", and the (Hussey & Hussey, 1997) "detailed plan which you will use to guide and focus your research.” Here the researcher is concerned with why they collect certain data, what data they will collect, where and how they will collect it, and how they will analyze the data in order to answer the research question. The research purpose is defined as exploratory, descriptive or causal. A theoretical framework is developed. This framework is a conceptual model of the relationships among the factors identified as important to the research problem (Sekaran, 1992). From this the research question is refined and the research strategy introduced.

The research strategy, a subset of research design, includes elements of data collection and interpretation and emerges from both the research purpose and question. In research design causality is vital for a functionalist researcher to predict patterns of behavior (Putnam, 1983). Therefore, the research purpose is causal or predictive and the research strategy would typically involve using secondary data, survey techniques and classic experiments. In contrast an exploratory research purpose would tend to favor as a strategy a case study involving participant observation or a field study with in-depth interviewing. A certain rationale emerges in research design that suggests a particular data collection method or methods, a particular unit of analysis and sample selection. Sampling is the
process of selecting a sufficient number of elements from a population to represent the properties or characteristics of that population (Sekaran, 1992).

After data has been collected from a representative sample the next step is to analyze and interpret the data. The objective at this stage in the research process is dependent on prior selections. For example a researcher with a predictive research purpose using a classic experiment or survey approach will typically be trying to prove or disprove their original hypothesis or research question. Variations throughout the research process including research purpose (Patton, 1990) "have a major effect" on how data is analyzed. Finally in presenting the results a quantitative approach, through the research design, would result in data being discussed as to the extent to which it either proves or disproves the research question. On the other hand data analysis and interpretation is an ongoing concern with the qualitative researcher. According to Schultz et al. (1996), "In contrast to the causal mode of functionalist analysis, interpretive analysis is associative.” For the interpretive what is meaningful emerges from the data, therefore the process is inductive. In presenting results it is the narrative of the participants that speaks.

3.5.1. The Quantitative Research Process
The first step of the research process is identifying the research topic. The researcher then sifts through a broad research area to clarify a precise set of ideas or concepts. At the completion of this the researcher should be able to write their research topic in the form of a question or a problem. The researcher then proceeds with their literature review. During this process the research topic is further refined and a clearer understanding of the research question or problem is obtained. The researcher can begin to design their research.

The basic beliefs of a positivist or quantitative researcher lead them to perceive the world as external and objective, and science as value free. As an observer they are independent and values can be suspended in order to understand. Reality is seen as one and therefore by dividing and studying its parts the whole can be understood. Therefore in their general approach to research design the quantitative researcher is seeking to deduce cause and affect relationships to predict patterns of behavior. Therefore the research purpose is
likely to be causal or predictive rather than exploratory. The quantitative researcher then
develops theory and uses this to explore the world. This theoretical framework identifies
key variables and their relationships and associations. It allows initial design clarity but
the result may not necessarily contribute to existing knowledge.

The research sample size in a quantitative approach would be reasonably large, a sub set
of a larger population and random sample with the same characteristics as that
population. There are time economies gained in this approach with documented and
tested methods to generate data, while data analysis is of a low complexity through
accepted statistical analysis methods. Typically a quantitative researcher will use
secondary data, survey techniques and classic experiments when collecting data, whereas
an interpretive will focus on fieldwork to facilitate the emergence of knowledge. This
difference has been termed inquiry from the outside versus inquiry from the inside
(Evered & Louis, 1981). Researcher involvement in this stage of the research process is
low with the researcher acting as an independent observer.

The stages in data analysis and interpretation are completed after data collection.
Statistical measures of association and the development of measurement models are
significant at this stage, the language used (Lee, 1992) "becomes the language of
variables." Quantitative data analysis and interpretation is primarily deductive, a matter
of proving or disproving the hypothesis or an assertion developed from a general
statement. Indeed in any causal or predictive study when the cause and effect relationship
has been demonstrated, or not, then the researcher has done their duty (Westmeyer,
1994). Therefore reporting research results the findings are discussed, in a recognized
format, as to the extent to which the data collected either confirms or dis-confirms the
research question.

3.5.2. The Qualitative Research Process

The initial steps in the qualitative research process are similar to that used by a positivist
researcher. The research topic is identified, refined and clarified. A literature review is
undertaken and the research problem takes form. However, interpretive research is
primarily exploratory and descriptive in purpose designed to discover what can be
learned about the area of interest. The interpretive researcher views the world as a socio-psychological construct where there are multiple realities forming an interconnected whole that can only be understood as these multiple realities. According to Schultz et al. (1996), in organizational culture studies, "functionalism and interpretive differ in the extent to which they define an analytical framework prior to entering the organization to be studied". What this means is that interpretive research design evolves over time as features emerge from the research that the initial design did not cover. The design steps essential remain the same, however, they are not as rigid as the quantitative approach. The researcher is guided by their research not the framework.

The qualitative approach to research strategy is characterized by lower sample numbers, than quantitative research, and participants selected to expand variability and represent the natural population. Normally forms of non-probability sampling such as accidental or purposive are used (Sarantakos, 1993). This approach is often time consuming as patterns slowly emerge. Also what is true in one context may not be true for another therefore data may need to be gathered in a variety of contexts, which takes both time and effort (Tucker et al., 1995). The interpretive also explores first and then develops theory thus allowing deeper explanations and insights. However, some uncertainty exists as it is possible that nothing of value may emerge.

High researcher involvement in data collection characterizes this approach. The researcher is an active participant often immersing themselves in a setting, becoming part of the group under study in order to understand meaning and significance. Typical techniques include participant observation, in depth interviews, group interviews and documentation collection with an emphasis on fieldwork. Data analysis and interpretation is an ongoing activity for the interpretive researcher. (Schultz et al., 1996) "In contrast to the causal mode of functionalist analysis, interpretive analysis is associative.” for the interpretive what is meaningful emerges from the data, therefore the process is inductive.
3.5. 3. Mixed Research

Mixed methods research offers great promise for practicing researchers who would like to see methodologists describe and develop techniques that is closer to what researchers actually use in practice. Mixed methods research as the third research paradigm can also help bridge the schism between quantitative and qualitative research (Onwuegbuzie & Leech, 2004a). Methodological work on the mixed methods research paradigm can be seen in several recent books (Brewer & Hunter, 1989; Creswell, 2003. Greene, Caracelli, & Graham, 1989; Johnson & Christensen, 2004; Newman & Benz, 1998; Reichardt & Rallis, 1994. Tashakkori & Teddlie, 1998, 2003). Much work remains to be undertaken in the area of mixed methods research regarding its philosophical positions, designs, data analysis, validity strategies, mixing and integration procedures, and rationales, among other things.

3.5.4. Case Study Methodology

In explaining what a case is?. Yin (1993) suggests that the term refers to an event, an entity, an individual or even a unit of analysis. It is an empirical inquiry that investigates a contemporary phenomenon within its real life context using multiple sources of evidence. Anderson (1993) sees case studies as being concerned with how and why things happen, allowing the investigation of contextual realities and the differences between what was planned and what actually occurred. Case study is not intended as a study of the entire organization. Rather is intended to focus on a particular issue, feature or unit of analysis. In order to understand and examine the processes of training activities in organizations, case study method was chosen. This method enables the researcher to understand the complex real-life activities in which multiple sources of evidence were used. The used of case study to probe an area of interest in depth is particularly appropriate as described by Patton(1987) Case studies become particularly useful where one needs to understand some particular problem or situation in great-depth, and where one can identify cases rich in information.
According to Yin (1993) there are three types of case study research exploratory, descriptive and explanatory. Researchers in business related subjects sometimes limit case studies to the exploratory use. For example, pilot case study can be used as a basis for formulating questions or hypothesis testing. Descriptive case study is an attempt to describe, like what happen to a product when it is launched. Explanatory research can be useful for example to study processes in companies.

3.6. Case Study Research design
Well-known case study researchers such as Robert E. Stake, Helen Simons, and Robert K. Yin have written about case study research and suggested techniques for organizing and conducting the research successfully. This introduction to case study research draws upon their work and proposes six steps that should be used:

- Determine and define the research questions
- Select the cases and determine data gathering and analysis techniques
- Prepare to collect the data
- Collect data in the field
- Evaluate and analyze the data
- Prepare the report

3.6.1. Case study data collection procedures
Case studies are complex because they generally involve multiple sources of data, may include multiple cases within a study, and produce large amounts of data for analysis. Researchers from many disciplines use the Case study method to build upon theory, to produce new theory, to dispute or challenge theory, to explain a situation, to provide a basis to apply solutions to situations, to explore, or to describe an object or phenomenon. In order to collect a good quality data, the collection procedures should be well designed, the main stages of the procedure are: designing the protocol, conducting pilot case study (testing the questionnaires and the data collection forms) and collection of data from the field.
3.6.2. Case study protocol

Yin (1994) Asserted that the development of the rules and procedures contained in the protocol enhance the reliability of case study research. While it is desirable to have a protocol for all studies, Yin (1994) stated that it is essential in a multiple-case study. The protocol should include the following sections:

- **An overview of the case study project** - this will include project objectives, case study issues, and presentations about the topic under study
- **Field procedures** - reminders about procedures, credentials for access to data sources, location of those sources
- **Case study questions** - the questions that the investigator must keep in mind during data collection
- **A guide for the case study report** - the outline and format for the report.

The discipline imposed on the investigator by the protocol is important to the overall progress and reliability of the study. It helps keep the investigator's focus on the main tasks and goals, while the process of development brings out problems that would only be faced during the actual investigation. The overview of the project is a useful way to communicate with the investigator, while the field procedures are indispensable during data collection. The case study questions are those under study, not those contained in the survey instrument. Each question should also have a list of probable sources.

The guide for the case study report is often omitted from case study plans, since investigators view the reporting phase as being far in the future. Yin (1994) proposed that the report be planned at the start. Case studies do not have a widely accepted reporting format - hence the experience of the investigator is a key factor. Some researchers have used a journal format (Feagin, Orum, Sjoberg, 1991) which was suitable for their work, but not necessarily for other studies. Indeed the case study at Fairfield University is not served by such a format, nor was the Levy (1988) study before it. The reason for the absence of a fixed reporting format is that each case study is unique. The data collection, research questions and indeed the unit of analysis cannot be placed into a fixed mold as in experimental research.
3.6.3. Case Study Strategy

As mentioned above, research design requires a choice of research strategy, a decision to use experimentation, survey methods, archival analysis, histories or case studies. Are all strategies equal, or is there is a hierarchy of methods?

The relative usefulness and application of case studies, indeed any type of 'qualitative' research is subject to interpretation. As mentioned earlier, critics of case research such as Miles (1979) suggested that the case study's usefulness is limited to an exploratory phase in a hierarchically arranged research program. Proponents of wider application of case studies, such as Yin (1981) claim that the use of case studies is only limited by lack of understanding of the types of applications, the types of research questions best addressed (as opposed to other strategies) and the type of case study design. (Subsequent sections will discuss all of these issues).

Yin (1984) suggested that the three conditions could determine the type of research Program indicated: First, the type of research question; secondly, the degree of Investigator control possible; and finally, the degree of focus on contemporary events desired.

'What' questions usually suggest that exploratory research is indicated, or may actually be rephrased as 'how many' or 'how much' questions? 'Who' and 'where' questions (or the derivative 'how many', 'how much') favor survey or archival research, and tend to describe incidents or phenomena with the goal of predicting outcomes.' How’ and 'why' questions are more explanatory by nature, and are likely to lead to the use of experiments, histories and case studies. These questions tend to deal with operational links which occur during a span of time, rather than the incidents or phenomena which occur at intervals over time. Defining the research question is the most important step in a research programmed, especially since this indicates the likely type of research programmed. The second criterion is the extent of control over behavioral events which the researcher can exercise. Assuming that the 'how' and 'why' or 'who' and 'what' form has been determined, the degree of required control is the next most important variable. Histories are the preferred strategy when there is no practical form of control and the event or phenomenon occurred in the past:(since historians deal in the 'dead' past) If there
is a high likelihood of focus on contemporary events, the case study is preferred. The researcher using case studies not only has the historian's primary and secondary documentation as resources, but can add direct observation and systematic interviewing: The case study's strength is thus its ability to deal with a full range of evidence - documentation, artifacts, interviews and observations. (Schell, 1992, Yin, 1984).

Bryman (1974) suggested that like most epistemological positions, most research strategies are hybrids or intermediate positions. He discounted the relevance of an epistemological basis for methodological decision criteria by pointing out that there was unlikely to be any clear symmetry between epistemological positions and associated techniques of social research, citing three conditions where discussion of methodological and epistemological distinction become unclear.

(a) Technique and sensitivity - Qualitative research offers flexibility in design and application which are more sensitive to the complexities of social phenomena than quantitative methods, which offer clearer, directly observable indicators. If research must be suited to the problem at hand, then the choice of research strategy should be the one which yields the appropriate combination of observation and sensitivity. Unfortunately, if a qualitative research design is chosen, it may be difficult to verify the correctness of the choice in retrospect:
It seems that the application of the methodology is as likely (perhaps inherently) at fault as the methodology itself.
(b) Qualitative research as preparation - As mentioned above, qualitative research has a long standing history as an exploratory strategy. Comments of researchers that qualitative research is best suited as reconnaissance for quantitative work suggests that there is an inherent superiority of quantitative research over qualitative: If the two are epistemologically as well as methodologically distinct, as we have proposed above, then can one be used to verify the other? Indeed, can structured research be used to verify unstructured research? Obviously, this is a second instance where the Methodological and epistemological positions are inconsistent.
(c) Combining methods - The methodological literature suggests that combined
Or triangulated strategies offer the best of both quantitative and qualitative research possibilities.

### 3.7. Research Design

As described in the previous sections of this chapter, the main research question, sub questions, and the nature of the problem are the main drivers of the research design. The research problem *how* the decisions can be made to improve the water policy (inadequate water tariff) and its impact on poor people and water utilities performance. The research question *What Is* the proper and reasonable water tariff should be apply in Palestinian context in order to be pro-poor and applicable under uncertain conditions (political, socioeconomic, institutional arrangement).

The study was designed to gain in depth knowledge about the main factors causing the problem by collecting needed data and variables in order to answer the above mentioned research question. Defining the drivers of the problem needs clear qualitative and quantitative data in order to help building the platform of knowledge. (Figure .8).

The mixed research methods will be used to facilitate and control the process of the research. The case study approach will be used as a vehicle to understand the relationship between different variable and will help to understand the cause effect relationship in particular. Based on the literature, the experience showed that mixed research method and different resources data is the most used method to produce water policy or its related applications.
Figure 8. Research Logic

The clarity of the relationship between different variables within the studies conditions will be presented as statistical and narrative forms.

The application of the design will be applied on West Bank as a case study; case study research excels at bringing us to an understanding of a complex issue or object and can extend experience or add strength to what is already known through previous research. Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. Researchers have used the case study research method for many years across a variety of disciplines. Social scientists, in particular, have made wide use of this qualitative research method to examine contemporary real-life situations and provide the basis for the application of ideas and extension of methods. Researcher Robert K. Yin (1984) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the
boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used (Yin, 1984). The single case design implies the use of one case study that is a holistic when it involves one unit of analysis or the case itself. A single case design that integrates more complex sub-units of analysis, is referred to as an embedded case design. The single case design is suitable when the case a) provides a vital test for established theory; b) embodies an exceptional or a unique event; c) is distinguished or typical case or d) provides revelatory aim (Yin 2003a). Based on the above mentioned criteria and taking into consideration the research question West bank could provide evidence to answer the research questions in Palestinian context. During the design phase of case study research, the researcher determines what approaches to use in selecting single or multiple real-life cases to examine in depth and which instruments and data gathering approaches to use. When using multiple cases, each case is treated as a single case. Each case conclusions can then be used as information contributing to the whole study, but each case remains a single case. Exemplary case studies carefully select cases and carefully examine the choices available from among many research tools available in order to increase the validity of the study. Careful discrimination at the point of selection also helps erect boundaries around the case. The researcher must determine whether to study cases which are unique in some way or cases which are considered typical and may also select cases to represent a variety of geographic regions, a variety of size parameters, or other parameters. A useful step in the selection process is to repeatedly refer back to the purpose of the study in order to focus attention on where to look for cases and evidence that will satisfy the purpose of the study and answer the research questions posed. Selecting multiple or single cases is a key element, but a case study can include more than one unit of embedded analysis. For example, a case study may involve study of a single industry and a firm participating in that industry. This type of case study involves two levels of analysis and increases the complexity and amount of data to be gathered and analyzed. (Soy, 1997). A key strength of the case study method involves using multiple sources and techniques in the data gathering process. The researcher determines in advance what evidence to gather and what analysis techniques to use with the data to answer the research questions. Data gathered is normally largely qualitative, but it may also be quantitative. Tools to collect data can include surveys,
interviews, documentation review, observation, and even the collection of physical artifacts (Soy, 1997)

There are some common elements to research projects which can be used to shape the whole activity. Here's a general approach.

3.7.1. Hypothesis
Developing the hypothesis involves converting the question into a predictive form and also creating a null hypothesis by which falsification may be achieved.

3.7.2. Design
Design of the experiment can be a critical stage as an incorrect design will produce invalid and useless data from which false conclusions may be drawn. The purpose of the design is thus to determine a method which creates accurate and unbiased data from which valid conclusions may be drawn. This includes determining how experimental closure will be achieved?. A big problem in social study is that when people know they are being observed they tend to act differently. This requires careful design to eliminate this bias. An important part of experimental design is to ensure that all variables other than those of interest are held stable and do not distort the results. One way of doing this is to include a control group, in which the experiment is repeated under the same conditions but without manipulating the independent variable. The results of the two studies may then be compared with the assumption that differences are due only to manipulation of the independent variable. Where traditional experimental control and management of variables is not possible or not desirable, other methods such as surveys, interviews or more distant observation may be used.

3.7.3. Data
Data design not only includes identification of what data is needed - it also includes design of how the data will be collected. Measurement of data typically involves manipulating independent variables and measuring dependent variables. Data may also be gained by observation of naturally occurring events. In such situations the researcher will try not to let their observation affect the data. Two opposing ways of doing this is first to be so separated from the people being studied that you are not noticed (such as
using one-way mirrors or hidden cameras). Secondly, you can be so obviously present that people eventually ignore you and revert to natural behavior (such as in reality TV shows). Choosing the data you will gather has a very significant effect on the analysis and conclusions you will be able to draw. If you want significant and credible results, then data design is a critical activity. Gathering data is often the most time-consuming and expensive part of the experiment. Designing data to collect thus needs a pragmatic approach that will enable you to conclude useful results without breaking the bank or taking forever. Where everyone cannot be accessed, careful sampling is used to enable accurate analysis and valid results.

3.7.4. Analysis
After gathering of data, the next stage is to analyze it, effectively turning data into useful information. Where there is sufficient data, statistical analysis may be used, where tools such as SPSS and SAS may help (although a simple spreadsheet may also be adequate). Analysis can be quite sophisticated and there are many tripwires where information derived is not as significant as might be supposed. Considerations about analysis should not be left until after the data has been collected. Deciding what analysis you will do is a part of the design process. This also includes consideration of what conclusions you may wish to draw.

3.8. Data Collection Methods and Techniques
The research attempts to establish strong linkages between research questions and hypotheses with the data collections, in order to achieve this goal the types of data and collection methods are described below.

3.8.1. Interviews
Qualitative interviews may be used either as the primary strategy for data collection, or in conjunction with observation, document analysis, or other techniques (Bogdan and Biklen, 1982). Qualitative interviewing utilizes open-ended questions that allow for individual variations. Patton (1990) writes about three types of qualitative interviewing:
1) informal, conversational interviews; 2) semi-structured interviews; and 3) standardized, open-ended interviews.

An interview guide or "schedule" is a list of questions or general topics that the interviewer wants to explore during each interview. Although it is prepared to insure that basically the same information is obtained from each person, there are no predetermined responses, and in semi-structured interviews the interviewer is free to probe and explore within these predetermined inquiry areas. Interview guides ensure good use of limited interview time; they make interviewing multiple subjects more systematic and comprehensive; and they help to keep interactions focused. In keeping with the flexible nature of qualitative research designs, interview guides can be modified over time to focus attention on areas of particular importance, or to exclude questions the researcher has found to be unproductive for the goals of the research (Lofland, 1984).

The main objectives of the interviews will be to have a feedback from the experts and the main stakeholders to modify the research process or to enhance the quality of the research.

3.8.2. Focus Groups
The focus group is a qualitative research method for eliciting descriptive data from population subgroups. Usually, a group of eight to twelve persons are gathered together for a group interview or discussion on a focused topic. The technique is often used to explore them that are not well known to the researcher, (Bender, 1994). Focus groups are widely used in the investigation of applied research problems and are recognized as a distinct research method. The method enables researcher to generate new hypotheses; to explore intermediate variables as a means of explaining certain relationships found in survey data; to validate finding gathered through other methods (Bender and Doglas, 1994).

3.8.3. Meeting with Stakeholders
Stakeholders are individuals, groups or organizations who, directly or indirectly, stand to gain or lose from a given development activity or policy. Distinction is drawn between:
• **Primary stakeholders** who are directly affected and would include the principal project beneficiaries such as ministries, farmers, consumers, water utilities

• **Secondary stakeholders** who are indirectly affected such as women, local associations, planners, etc.

• **Key stakeholders** who are the agents of change. These are often also “primary” stakeholders.

We undertake stakeholder analysis to:

• identify stakeholders’ interests in, importance to, and influence over the intervention

• identify local institutions and processes upon which to build, and

• provide a foundation and strategy for participation

**Methods of stakeholder analysis:**

• Collaboration with key stakeholder groups: this close collaboration will help to understand what is the interest of each stakeholder and the influential weight of each

• Participatory methods such as stakeholder workshops and local consultations, facilitating the dialogue among them will help to explore

  Something can’t be done by bilateral discussion

• Using secondary data wherever available and reliable to reduce costs

**3.8.4. Observations**

The classic form of data collection in naturalistic or field research is observation of participants in the context of a natural scene. Observational data are used for the purpose of description—of settings, activities, people, and the meanings of what is observed from the perspective of the participants. Observation can lead to deeper understandings than interviews alone, because it provides knowledge of the context in which events occur, and may enable the researcher to see things that participants themselves are not aware of, or that they are unwilling to discuss (Patton, 1990). A skilled observer is one who is trained in the process of monitoring both verbal and nonverbal cues, and in the use of concrete, unambiguous, descriptive language. Sours’ (1997) there are several observation strategies available. In some cases it may be possible and desirable for the researcher to watch from outside, without being observed. Another option is to maintain a passive presence, being as unobtrusive as possible and not interacting with participants. A third
strategy is to engage in limited interaction, intervening only when further clarification of actions is needed. Or the researcher may exercise more active control over the observation, as in the case of a formal interview, to elicit specific types of information. Finally, the researcher may act as a full participant in the situation, with either a hidden or known identity. Each of these strategies has specific advantages, disadvantages and concerns which must be carefully examined by the researcher (Schatzman and Strauss, 1973).

3.8.5. Other Sources of Data

Another source of information that can be valuable to qualitative researchers is analysis of documents. Such documents might include official records, letters, newspaper accounts, diaries, and reports, as well as the published data used in a review of literature. In his study of technology teachers in training, Hansen (1995) analyzed journal entries and memos written by participants, in addition to interviews. Hoepfl (1994), in her study of closure of technology teacher education programs, used newspaper reports, university policy documents, and department self-evaluation data, where available, to supplement data gained through interviews. There are some specialized forms of qualitative research which rely solely on analysis of documents. For example, Gagel (1997) used a process known as *hermeneutic inquiry* to investigate the literature on both literacy and technology. Patton (1990) provides a good overview of the various theoretical orientations that inform the "rich menu of alternative possibilities within qualitative research.

3.8.5. a. Field Notes

Field notes are a hybrid of research ideas, research observations, general thoughts, and even a diary. They are works in progress and are often incomplete notations meant not only to clarify thoughts on situations but also to provide mental stimulation to help recall peripheral aspects of situations. To view them outside of the context of such is to view them in an incorrect light and distorts their true nature and utility. It is extremely important for researchers to be able to maintain the security of their thoughts and ideas,
as well as the material gained through the confidence of the people studied or with whom they work.

Field notes refer to transcribed notes or the written account derived from data collected during observations and interviews. There are many styles of field notes, but all field notes generally consist of two parts: descriptive in which the observer attempts to capture a word-picture of the setting, actions and conversations; and reflective in which the observer records thoughts, ideas, questions and concerns based on the observations and interviews.

Field notes should be written as soon as possible after the observation and/or interviews. The original data may be recorded in cryptic form, and unless they are fleshed out as soon as possible after the observation, important details may be forgotten and not appear in the field notes. Field notes are used to "broaden your range of vision" and produce data that will be of use in later stages of the system design.

### 3.8.5. b. Secondary data review

Secondary data are all information or data sources that are available and useful for planning and implementing the research or extension project. Appropriate utilization of secondary data will ease the access to a research and extension problem and economize the research and extension processes. Secondary data are the references for formulating hypothesis or hypotheses that are useful for setting problems, issues and work plan in the research. Secondary data help the research to roughly understand the situation of the study area. We must review the secondary data before start working in the field and prepare in the form of diagrams, tables and lists, brief summary paragraphs, copies of maps and photographs.

Secondary data are available in published or unpublished form such as books, reports (meeting, annual, etc) statistics (rainfall, temperature, population, etc) maps (administrative area, road, public building, etc) films (culture, village activities, etc) aerial photos (topography, land use, etc). The secondary data can be from the related government offices, non-governmental, organization, donors and documentation departments.
3.9. **Information Administration and Gained information Management**

One of the major components of the research how to deal with collected data and information, data validation and processing is a key issue for a successful research. Additional to that producing format, guidelines and protocols will help in clustering the data and organizing the information to produce knowledge based analysis and conclusion. In multi disciplinary studies, data integration, exploring linkages among data are the main drivers to enhance the knowledge and to extract the final findings.

3.10. **Research Techniques Applied**

The design of this research consists of the following three phases: (figure .9)

**Phase I: Preparatory Phase**

Activities in this phase included the following:

1. Identifying potential drivers influencing water policy in general and water tariff in particular. Also, to identify these factors, international, regional, and local literature were collected and reviewed. Qualitative and quantitative research literature was reviewed to identify the methodology of the study.
2. After identifying the potential drivers, a tentative conceptual framework, emerge theory and model of research design were all written.
3. Based on the conceptual framework, 25 informal interviews were conducted with senior staff of water utilities identify potential case-specific drivers influencing both utilities and consumers. Conceptual framework was modified based on the preliminary results of decision makers’ interviews.
4. On site visits were conducted in the study area (Major water suppliers were visited)
5. A tentative theoretical framework was adopted based on the identified factors.
   1. In-depth interviews were carried out with water utilities and 18 interviews were conducted with Experts and decision makers
   2. Observations of the utilities performance and the process of water bill collection were conducted in the pilot project area.
   3. Household full survey to identify water consumption, socioeconomic parameters was conducted. In 10 districts 1250 questionnaires were distributed and 1196 were collected and 1075 considered valid questionnaires. 60
Questionnaires were distributed at pilot level. 57 of them were monitored in order to see their reaction towards new tariff structure; all questionnaires at national level include questions to serve the measurement of willingness to pay.

4. Focus group discussion: Six focus group sessions were conducted and two of them were for women. Two of the focus group was after the formulation of new tariff.

5. Stakeholders meetings; Two stakeholders meetings were conducted one was for pilot project area,

6. A comprehensive triangulation analysis of all the collected data

7. Performed and the conceptual framework of the study modified continuously while doing the analysis process.

Phase III: Data Analysis and Conclusions

Activities in this phase are iterative and should be ongoing activities throughout the whole work. These activities include:

1. Literature review which should be conducted along the whole process of the research, data collection and analysis. The conceptual framework of the study should be modified continuously along the whole process of data collection and analysis and throughout building the theory.

2. Iterative data collection, coding and analysis performed based on the literature review and identifying missed or contradictory information throughout the process of data collection.

3. Data administration and processing

4. Proposing the tariff model which aims to meet the objectives and answering the research questions

5. Application the proposed tariff structure and monitoring the impact at household level and utility level

6. Discuss the results with stake holders and water utility

7. Finalization the conclusions and recommendations
Figure 9. Research Flow Chart

This research has adopted various multi-sources (triangulation) techniques for obtaining good quality reliable data. The sources of data were field surveys by multipurpose questionnaires, in depth interviews with key stakeholders, decision makers and regional and international experts. Also secondary data from official documents, utilities files, donor’s policies and strategies reports were used. Additional to these sources the researcher attended several international and local workshops which are the source of personal notes. In order to have a feed back on the methodology and the primary results focus groups, stakeholders and official political levels interests have been used. In order to apply the methodology and the data collected the case study approach was used. To investigate the efficiency and impact of proposed tariff model at pilot level was applied.
In conclusion, structured and semi-structured interviews, participant observation, focus groups, workshops, field data and stakeholders analysis increase the prospect of getting valuable, insights about the possible formulation of tariff model can be applied and answer the research questions.

The following is a detailed description of methodology used to collect the needed data to check the main hypotheses and to answer the research questions.

In the following table a full description of the collected data, source of data and the objective was given.

3.10.1 Data Gathering Vs Methods of Collection

The following (table.1) Explains data and methods of collections and collection objectives.

Table 1.collected data VS methods and objectives

<table>
<thead>
<tr>
<th>Category</th>
<th>Variables</th>
<th>Method of collection</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socioeconomic</td>
<td>Income</td>
<td>Survey Literature</td>
<td>1.To understand the socioeconomic drivers of</td>
</tr>
<tr>
<td></td>
<td>Family size</td>
<td></td>
<td>2.the tariff and performance of the water providers</td>
</tr>
<tr>
<td></td>
<td>Water cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poverty rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unemployment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water supply and consumption</td>
<td>Water consumption per capita</td>
<td>Survey Literature</td>
<td>1.To understand the rate of average consumption</td>
</tr>
<tr>
<td></td>
<td>Family consumptions</td>
<td></td>
<td>2.To use the data for tariff structure design</td>
</tr>
<tr>
<td>Uncertainties</td>
<td>At political level</td>
<td>Interviews Focus groups</td>
<td>To understand the socioeconomic and</td>
</tr>
<tr>
<td></td>
<td>At social level</td>
<td>Literature and secondary data</td>
<td>the political environment which is very important for policy formulation</td>
</tr>
<tr>
<td></td>
<td>At economic level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At institutional level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact of uncertainties</td>
<td>At water management level</td>
<td>Literature and secondary data</td>
<td>1.To understand the relation between</td>
</tr>
<tr>
<td></td>
<td>At policy level</td>
<td>Interviews Observations</td>
<td>uncertainties and proposed tariff model model</td>
</tr>
<tr>
<td></td>
<td>Utilities performance</td>
<td></td>
<td>2.To investigate the impact of uncertainties on applicability of the model</td>
</tr>
<tr>
<td>Institutional arrangements</td>
<td>Existing institution and</td>
<td>Interviews and Secondary data</td>
<td>1.To understand the existing institutional</td>
</tr>
<tr>
<td></td>
<td>performance</td>
<td></td>
<td>arrangements and its shortcoming</td>
</tr>
</tbody>
</table>
3.10.1. a. Field survey

A multi-disciplinary research approach is applied through revising literature in economic theories, policy-setting methodologies, and the social dimensions for tariffs. Therefore, the decision theory and bidding game was considered in order to see the people’s opinion and whether it would, in turn, correlate with their income. Also, similar social and economic circumstances, such as Jordan and Tunisia, were studied. After studying the literature and theories related to it, a conceptual framework was set up to illustrate the relationship and effectiveness of the tariff with the social and economic factors such as poverty, unemployment and others. This framework will be measured through three different questionnaires, which will consider the following:

<table>
<thead>
<tr>
<th>and performance</th>
<th>Observations</th>
<th>To propose some policy reform measures to improve the performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks and assumptions</td>
<td>Expected risk and assumption of tariff models</td>
<td>Interviews Analysis of existing documents and reports Personal judgment</td>
</tr>
<tr>
<td>Applicability of the proposed mode</td>
<td>Data from pilot project</td>
<td>Stakeholders responses Personal judgment and analysis the field data Pilot data analysis</td>
</tr>
</tbody>
</table>

52 In order to overcome the problem of the restriction of movement part of field survey were done by help of Palestinian hydrology Staff after they received a specific training, also the questionnaires quality checked by the specialist of statistic to assure will be match with the requirement of the software(SPSS)
1. A sample representing the Palestinian rural areas with some differences such as the number of population in the village and different social and economic circumstances.
2. The questionnaires are designed to be close ended and open ended in order to ensure accuracy in data.
3. The questionnaires are designed to be in a way that reflects all factors that affect the social and economic situations.
4. Some data might be difficult to collect through questionnaires; therefore, focus groups, meetings, and interviews will be conducted. (Qualitative)

A special design and methodology was set up for the study in order to achieve its goal (a tariff system that depends on social equality and cost recovery and resources sustainability within the complex social, economic and political circumstances. Goal oriented methodology was designed based on the following tools: literature review, field survey (questionnaires), focus groups, case studies stakeholders analysis, testing the data, water poverty index and the DPSIR approach. The main purpose of the field data collection is to update the water related socioeconomic indicators; the questionnaire was designed to collect the following data (see annex VI)\(^{53}\)

**Social Data:** family size, family structure, willingness to pay…etc

**Economic Data:** Income, rate of poverty, rate of unemployment, cost of water, water bills per household, affordability …etc

**Water Data:** Water consumption, regularity of access, availability, source of water…..etc

**Survey**

The survey system applied theoretical and analytic methods such as:

Questionnaire development and testing:

Approximately 100 households were visited primarily to adjust the questionnaires and study the reaction of people concerning the questions and to what extent they were able to comprehend the questions.

\(^{53}\) Annex VI “Questionnaires for household”
As already known in statistics, the results greatly depend on the size of sample taken which is usually measured according to the following equation:

\[ n = \frac{4(p)(q)}{E^2} \]

\( p \) = percentage of any category to be estimated
\( q = 1 - p \)

Since we aim at estimating different percentages for different social levels, we will use \( p = q = 0.5 \)

\( E \): margin error

This assumption will reduce the percentage or margin of error
\[ N = \frac{1}{E^2} \]

Data will be entered and analyzed through the statistical program SPSS and by focus group meetings and stakeholders discussion which will give a feedback and help in validating the collected data. Then, according to the interviews and meetings that will be conducted with the decision makers, options for a tariff will be set and a logical methodology will be defined to be compared.

**Sample selection**

It is well known from statistical theory that the accuracy of the results of any sample survey is dependent on the sample size selected from the target population. The relationship is summarized as follows:

\[ n = \frac{4(p)(q)}{E^2} \]

\( P \) = the percentage of any category to be estimated. And \( q = 1 - p \).

Since we are interested in estimating several percentages of different attributes of the target population at the same survey, we consider the sample size when \( p = q = 0.5 \).

This assumption will reduce the formula for the margin of error to:
\[ n= \frac{1}{E^2} \].
Therefore, if we are interested in obtaining estimates at the district level that suffer from a maximum margin of error $E=\pm 4\%$. This will entail a sample size of:

\[ n = \frac{1}{(0.04)^2} = 625 \text{ households} \]

The above calculation of the margin of error assumes that the sample of households is being selected using simple random sampling. In our survey the sampling process was multistage stratified cluster sampling and done in four stages:

a) Selecting a population location using probability proportional to size Sampling (PPS)

b) Selecting a cluster or census track from the population location. The cluster or the census track contains approximately 100 to 150 households.

c) Selecting 1:1 households from the cluster using systematic sampling.

d) Selecting an adult from the people living in the selected household using simple random sampling

*Full Survey*\textsuperscript{54}

Despite the fact that the recommended sample size for this study is 1250 households, it was adjusted when the population number in each category of connected and not connected areas was considered at the different districts. It was realized that there is some areas that were classified as not connected it was connected and therefore some areas were eliminated from this category. For this reason, the suggested final sample size was nearly 1190 questionnaires ($\pm 10\%$). The distribution of the questionnaire in the West Bank districts can be seen in Figure 10.

\textsuperscript{54} In 2001 and 2002, the Palestinian Hydrology Group (PHG), a Palestinian non-profit, non-governmental organization, conducted a research survey within ten of the eleven districts in the occupied West Bank, the aim of the survey to assess the Palestinian water perception, the researcher used the same administrative areas which will help to understand the impact of uncertainties on water issues. (see PHG water pricing report 2003-unpublished)
The questionnaires were then classified into clusters and distributed in the different parts of West Bank.

The researcher was able to obtain 1075 questionnaires. However, because of the political situation and the strict closure on most cities and towns the researcher was not able to continue the data collection process. Since the remaining number of unfilled questionnaires is within the acceptable 10% limit it was decided to stop the data collection process and to gather the questionnaires for processing and analysis. After that all the data entered were fed into a specialized statistical package (SPSS). Results were then analyzed by help from the statistician and the results obtained were evaluated by researcher.

The information gathered was then used to test the different hypothesis established at the beginning of the research and to define the impact and relation of various social and
economic variables on establishing a tariff the affordability and willingness to pay for water. The main hypothetical model was set to study the relation between the water consumption and the % of payment with:

- Income level
- The current price paid for water
- The current water quantity used
- Family size

It was thought that other sub models might also be useful to be tested including willingness to pay versus cultural values, water conservation practices and income.

3.10.1. b. Methods to Assess Willingness to Pay Data (WTP)

In the situations involving existence of externalities, WTP is an empirically estimable figure which is a stated preference not a revealed preference as is the case with most economic data. This is the main drawback of WTP. Many do not trust WTP for policy recommendation because it is hypothetical data and not market data. To measure WTP, one of five methods can be used:

1) The Contingent Valuation Method (CVM) relies on hypothetical assessment. For example, the respondent is asked to value the good in question by expressing his/her WTP for an improved quantity or quality. The positive feature of this method is that it is utility based but the drawback is that it is hypothetical. McFaden and Leonard (1993) assert that two conditions must be met for the CVM to be valid: (1) there must be reliable survey methods for eliciting stated consumer preferences, and (2) the consumer’s stated preferences are the same as his/her true preferences. Because of these issues, the following biases may arise:

- Strategic bias: this refers to the free riding behavior, which refers to respondent’s strategic behavior of under stating his/her true WTP, thinking that it might lead to actual lower tariffs.
- Starting point bias: the starting point can potentially influence the respondents’ WTP if taken as a reference point.
• Vehicle bias: this occurs if the respondent misperceives the payment vehicle (method of finance).
• Information or questions order bias: the order in which questions are asked could lead to bias in WTP.
• Hypothetical bias: this is due to the nature of CVM as the respondent is not making real payments.
• Interviewer bias: in this case the respondent does not reveal his/her true response to please the interviewer.
• The existence of most of these biases is testable; in case they exist, remedial measures can be devised to correct the problem.

2) Hedonic pricing method: although rarely used for estimating WTP for water. It can be used for other environmental issues such as clean air. For example, this method compares market value of land or homes in two areas (say the difference is due to clean air) and assumes the difference is an estimate for WTP for clean air.

3) The travel cost method or benefit transfer method: here the demand for a particular site is estimated with travel cost serving as WTP. The estimate is then applied to other sites with similar characteristics. The problem with this method is the preferences are not the same in both locations.

4) The averting behavior method: this method considers the behavior of individuals who pay certain amounts to avoid (avert) the consumption of poor quality goods. For example, consumers would purchase water filters to avert the consumption of poor quality water. That expenditure is looked at as an estimate of WTP.

5.) Cost of illness method: this method is not very popular because it does not account for the disutility of illness. It does account for direct costs (hospital care, medicine, etc) and indirect costs such as lost productivity.

The discussion will now focus on the CV method as it is the most used for evaluating the WTP for water. However, this should not be done in isolation of the averting behavior method. It is, therefore, recommended to take full account of water vending activities in
rural areas and water purification expenditures in the urban areas that have piped water connections.

It was mentioned earlier that market forces because of the free riding behavior couldn’t value public goods. This motivated environmental economists to think of alternatives such as the CV method. Randall, Ives, and Eastman (1974) introduced a bidding game for survey respondents to reduce strategic bias. Using open-ended WTP question was still susceptible to other biases other than strategic biases. In a major contribution by Hanemann (1984), followed the double referendum questionnaire which then became standard in conducting CV applications reduced such biases. The double referendum method for eliciting responses typically offers a second bid conditional on the answer to the first bid. Further studies that enhanced and simplified this method were Cameron and James (1987). Carson, Hanemann, and Mitchell (1986). Carson (1991) shows that such methods reduce the biases more considerably than a single response.

It was argued by Cummings, Brookshire, and Schulze (1986) that for the CV method to work the subjects interviewed must be familiar with the good being evaluated. It is also required that the subjects have prior experience of choice in consumption and valuing of the good.

3.11. Focus Group Meetings
The methodology used in the meetings was the participatory rapid appraisal (PRA). The PRA method allows people to go beyond the quantitative aspects that are covered by the questionnaire. It also attempted to promote open group discussion on the value placed on water. In addition, different tools such as the matrix mapping and pie chart were used during the meetings. The meetings were organized in Nablus, Hebron and Ramallah areas.

Four meetings were held in each of Ramallah and Hebron for women and two held in Nablus area, one for women and one for men (Head of village councils – stakeholders). The purpose of the meetings that targeted women was to get a clear perception of women on water issues. However, the purpose of the meeting that targeted men was to define the stakeholder perception about water and to assess their water related gender perception
especially their perception on women involvement in the management of water resources at the village council and at centralized levels.

The results obtained on willingness to pay and affordability, public perception, the type and efficiency of water pricing schemes in place and the gender perception of water issues in conjunction with the information collected through focus group meetings together with the Findings of the theoretical research conducted on the water sources, the theoretical background of economic theories and the actual socio-economic conditions in the West Bank as well as the implications of policy as well environmental situations on the proposed pricing policy, were key determinants in the type of water pricing policy this research may suggests: (see annex 8)

3.12. Meeting with Stakeholders
Several meetings, consisting of oral discussions and questionnaires, were held in order to have an idea about the future vision of the water policy in general and the approach of water pricing. The main stakeholders of the water sector are the donors, ministries, NGOs, local governments, municipalities, water administration authority (the PWA, and the National Water Council). It is important to see the vision of main donors such as the World Bank and GTZ, since these donors are the main drivers of the water sector in Palestine and work closely with decision makers. (See annex 8)

3.13. Comparative Case studies
In order to learn lessons from the experience water management and policy of different countries, case studies in Jordan, Israel, have been studied in details. The reasons for this selection are that Jordan has a similar social structure to Palestine, Israel shares and controls the same water resources, based on the two case studies the learned lessons will be taken into consideration during the design of the tariff structure.

Several methods were found in literature for calculating water poverty index (WPI); the following discussion includes several methods for calculating WPI

55 The researcher is a member of NWC
3.14.1. Falkenmark Method

The Falkenmark Water Stress Indicator, which was developed by the Swedish water expert Falkenmark in 1989, is one of the most commonly used indicators for describing water availability in a country. Originally, the indicator based on the estimation that a flow unit of one million cubic meters of water can support 2,000 people in a society with a high level of development. Water availability of more than 1,700 m³/capita/year is defined as the threshold above which water shortage occurs only irregularly or locally. Below this level, water scarcity arises in different levels of severity. Below 1,700 m³/capita/year water stress appears regularly. However, below 1,000 m³/capita/year water scarcity is a limitation to economic development and human health and well-being. Finally, below 500 m³/capita/year water availability is a main constraint to life.

3.14.2. Water availability index WAI

This index includes surface water as well as groundwater resources, and compares the total amount to the demands of all sectors, i.e. domestic, industrial and agricultural demands. The month with the maximum deficit or minimum surplus respectively is decisive. The index is normalized to the range $-1$ to $+1$. When the index is zero, availability and demands are equal.

$$WAI = \frac{R + G - D}{R + G + D}$$  \hspace{1cm} (1)

Where: $R =$ surface runoff, $G =$ groundwater resources and $D =$ sum of demands of all sectors. In calculating WAI, the following issues have to be taken into consideration:

a. The surface water availability is calculated as the 90% reliable runoff.

b. The groundwater availability is estimated either as the potential recharge that is calculated from the monthly surface water balance, or as the potential aquifer yield, and the lower figure is considered in the calculation.

3.14.3. Basic Human Needs Index

This approach is based on the use of water instead of water availability. Gleick (1996) quantified the amount of water that a person needs for basic water requirements (BWR), such as drinking, cooking, bathing, sanitation and hygiene, as **50 liters per person per**
day. This indicator is only calculated on country-level so that regional water scarcity is not depicted.

### 3.14.4. Index of water scarcity

An indicator that combines information about water abstractions and water availability is the index of water scarcity. It is defined by the intensity of use of water resources, i.e. the gross freshwater abstractions as percentage of the total renewable water resources or as percentage of internal water resources. This indicator is defined by the ratio

$$R_{WS} = \frac{W - S}{Q}$$

Where, $R_{WS}$ is the water scarcity index, $W$ are the annual freshwater abstractions, $S$ are the desalinated water resources and $Q$ is the annual available water which is calculated by

$$Q = R + \alpha \sum D_{up}$$

where $R$ are the internal water resources in the country, $D_{up}$ is the amount of external water resources and $\alpha$ is the ratio of the external water resources that can be used. The factor $\alpha$ is influenced by the quality of the trans-boundary water, the real consumption of water resources in the upstream region and the accessibility of water.

The severity of water stress is classified by

- $R_{WS} < 0.1$  
  no water stress
- $0.1 < R_{WS} < 0.2$  
  low water stress
- $0.2 < R_{WS} < 0.4$  
  moderate water stress
- $0.4 < R_{WS}$  
  high water stress

Again, this indicator neglects temporal and spatial variations as well as water quality data.

#### Vulnerability of Water Systems

This index has been developed by Gleick (1990), it describes the vulnerability of water resources systems based on the following five criteria and corresponding thresholds that are briefly described below.
• Storage volume relative to total renewable water resources
• A basin is defined as **vulnerable** if the storage capacity is less than 60 % of the total renewable water resources.
• The threshold for vulnerability is a ratio of 0.2 (the ratio of consumptive use relative to total renewable water resources.).
• Groundwater overdraft relative to total groundwater withdrawals. Regions with a ratio above 0.25 are defined as vulnerable.
• Variability of flow, this indicator is **calculated by dividing the surface runoff exceeded only 5 % of the time by the quantity exceeded 95 % of the time.** A low ratio indicates a low variability of runoff and by that a low risk of both floods and droughts.

The aforementioned methods are useful in determining the situation of water situation for a country. However, these methods are not holistic. In other words, basic related aspects were not taken into account. For example, water quality and other water users, rather than domestic use, such as the industry, agriculture and nature (environment) itself, were not included at all in these approaches. Moreover, the socio-economic dimension for water scarcity/availability was not included in these approaches.

### 3.14.5. Water Poverty Index (WPI)
Recently, the water poverty index (WPI) was developed by (Sullivan, 2002; Lawrence *et al.*, 2002), via the Centre for Ecology and Hydrology (CEH) in Wallingford. This index tries to show the connection between water scarcity issues and socio-economic aspects. It ranks countries according to the provision of water, combining five components which are:

#### 3.16.5. A Structure of Index and Data Used

**WPI Component**

<table>
<thead>
<tr>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>• internal Freshwater Flows</td>
</tr>
<tr>
<td>• external Inflows</td>
</tr>
</tbody>
</table>
- population

**Access**
- % population with access to clean water
- % population with access to sanitation
- % population with access to irrigation adjusted by per capita

**Capacity**
- ppp per capita income (GDP per person)
- 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
- biodiversity based on threatened species

Each of these components is derived from two to five sub-indicators which are normalized to a scale from 0 to 1. In case of an equal weighting, the sub-index and component values are then calculated as a simple average of the corresponding indicators, and this value is multiplied by 20. The overall index is generated as a sum of the component values so that the value is between 0 and 100. A value of 100 is only possible if a country ranks best in all of the five components. WPI can be calculated according to equation (2)

\[
WPI = wrR + waA + wuU + wcC + weE
\]  \hspace{1cm} (2)

In case of equal weighting, the equation (3)
\[ w_r = w_a = w_u = w_c = w_e = 20 \] (3)

there are several ready-made tables shows the aforementioned sub-indices with main
guidelines for using them properly (Shah, 2007).
3.15. Interviews
Interviews can be used as a main component for qualitative research or as integral part with other techniques such as documents analysis, observation and field notes, many authors classify interviews into three categories; structured interviews (preset format for questions and the people asked to answer it), the second category is unstructured interviews (no preset format) and it is like a conversation and the process of discussion leads to answers, this kind of interviews need a professional method in order to keep the conversation on the required track. The third category of interviews is the semi structured interviews which is mixed between the first two categories. The literature has shown no rules to define the number and length of interviews; however these techniques highly depend on the nature of the research and the experience of the researcher. A general rule can be used which is conduction interview until the satisfaction point where the researcher feels he has the all needed data and feedback from the interviewed people. The most important dimension that the level of trustworthiness and validity of the data and information. In this research the three categories have been used, the selection of each category depends on the position and technical background of interviewed person. According the research protocols the interviews, several people from different departments and organizations working on water (Utilities, Donors, Experts, NGOs, Consumers from different classes). The interviews have been done by three methods: i) face to face interviews ; ii) by email and iii) as open discussion (see annex III)

3.16. Focus Groups
Focus group is a tool generally used to have a feedback on the discussed subject focus groups are fundamentally a way of listening to people and learning from them. Focus groups create line of communication. This is most obvious within the group itself, where there is continual communication between the moderator and the participants, as well as among the participants as well. Moderators should be motivated to listen and learn from the participants. It is not a passive process. The researcher is responsible for deciding which topics they want to hear and to focus the discussion on the things that they want to learn. At the same time, Morgan states (1998) that they must not be too controlling.
Every group has its own *dynamics*; therefore they need to acknowledge the participants’ priorities if they want to hear their thoughts and ideas.

As an initial step, small group meetings were organized in order to have the first impression about the problems and people perception. Part of the methodology used in the meetings with people was the participatory rapid appraisal (PRA). The PRA method allows people to go beyond the quantitative aspects that are covered by the questionnaire. It also attempts to promote open group discussion on the value placed on water. In addition, different tools such as matrix mapping and pie charts were used during the meetings. The meetings were organized in the Nablus, Hebron and Ramallah areas.

Four meetings were done in Ramallah and Hebron for women and two in Nablus, one for women and one for men (head of village councils – stakeholders). The purpose of the meetings that targeted women was to get a clear perception of women on water issues. However, the purpose of the meeting that targeted men was to define the stakeholder perception about water and to assess their water related tariff perception, especially on community involvement in the management of water resources at the village council and at centralized levels. The meetings also are intended to paint a clear picture of how the socioeconomic factors of the families impact water needs and consumption.

### 3.17. Observations

Participant Observation is usually just one part of a cluster of other non-experimental, inductive, field-based research strategies. These guidelines refer only to the Participant Observation component.

In Participant Observation the researcher is, to a greater or lesser extent, immersed in the day-to-day activities of the people being studied. The objective is usually to record conduct under the widest range of possible settings.

While there are a vast range of informal interactions, encounters, observations and ‘participations’ involved in this form of research, with the various ethical issues that thereby arise, it is to be noted that more ‘technical’ practices produce their own particular ethical concerns. These include mapping, filming, video-taping, photographing and tape-recording.
Since this research has been conducted by a practitioner researcher working in the field at daily bases, observations focused on people behaviors and attitudes, social complexity of the social relations among the communities, uncertainties impact mainly the rapid changes at political level.

### 3.18. Field Notes
The main important part of the field notes to be used as a controller of what is the progress of the research and to review it. Field notes are useful in identifying important issues or conflicting answers that can be revisited and clarified through further questions or for gathering additional information that was missing, additionally the field note were used to clarify the differences between what the people say and what they are in real life practicing.

### 3.19. Application at Pilot Scale
The pilot project was used to validate and refine the data were obtained from the field and to test the theoretical model. also to see the impact and applicability of the model. The selection of the pilot study was based on several criteria:

- Accessibility to the field (movement is restricted in several areas for security measures)
- The community and water utility willing to cooperate and facilitate the research
- Availability and accessibility of data recorded by water utility
- Quality of data
- Maximum representation of the entire community with regard to socioeconomic conditions and water problems
- The area covered by water utility includes connected and unconnected people

In addition to the field data, the pilot study included focus group, interviews and stakeholders discussion at the pilot level.
3.20. Secondary data Review
Secondary data is data which has been collected by individuals or agencies for purposes other than those of our particular research study. Secondary data may be available which is entirely appropriate and wholly adequate to draw conclusions and answer the question or solve the problem. Since this research deals with historic records of utilities, performance indicators, policy and strategy documents, files of water authority, donors policy reports secondary data is very important and necessary. In this research, official departments, water utilities, donors and technical reports are the secondary data main sources.

3.21. Data Administration and gained knowledge management
Since the research is based on the multidisciplinary approach, several tools and methods have been used to collect the needed data. The data collected by interviews, focus groups and meetings of stakeholders were used in designing the questionnaires, in depth interviews and the consultation with experts. The qualitative data and secondary qualitative and quantitative data were analyzed. In order to use the outcome for consultation and designing the process of the case study research. A comparative analysis with different cases from similar countries was carried out.

The case study research was implemented by long well prepared, reviewed questionnaires. In order to have a good sampling system and quality of data collection a statistical tools and procedures were used. A ready-made statistical software SPSS was used for data entry and analysis of the questionnaires. Pilot project was used to validate the proposed model. Clustering, interpretation and integration the data and information used to produce a deep of understanding several dimensions of the research: water poverty linkage, status of water poverty, the impact of socioeconomic conditions on water tariff. The final understanding was used to check the hypotheses and the research questions

3.21.1. The data processing passed through the following steps
As described in figure 11 the data processing and display will pass through the following processes.
3.21.1. a. Data Reduction

Large qualitative data sets generally encompass multiple research questions. Hence, very few, if any, analyses of such data sets simultaneously involve all of the data that have been collected. From the outset, researchers need to delineate the boundaries of a given analysis with a comprehensive analysis plan. This plan can include guidelines for data set reduction, including whether all the data will first be coded in an exploratory analysis, whether they will be partitioned in a way appropriate for theoretical analysis and hypothesis testing, or whether some data will simply not be included in specific analyses. Eliminating data not relevant to the analysis at hand or extracting the data that are relevant—is usually the first, and arguably the simplest, form of data reduction. As (Miles and Huberman 1994) explain, Data reduction is not something separate from analysis. It is part of analysis. The researcher’s decisions—which data chunks to code and which to pull out, which evolving story to tell—are all analytic choices. Data reduction is a form of analysis that sharpens sorts, focuses, discards, and organizes data in such a way that “final” conclusions can be drawn and verified. In cases where the larger data set was compiled from more than one type of data collection instrument (e.g., semi structured in-depth interviews, structured focus groups, and pile-sorting activities), the researcher needs to make a decision about the type of data she or he will select from the larger data set. She or he may choose to analyze data from only one type of instrument, or from several different instruments. As described by Patton (1990), this form of “triangulation” across different data collection strategies during data analysis can be particularly helpful when dealing with large data sets. The researcher may also need to frame the analysis in terms of the sources of data or the categories of participants from whom the data were collected (Mac Queen and Milstein 1999). This may require limiting the analysis to one or two sites of a multisite project, or limiting the number of subgroups included in the analysis (e.g., including only data relevant in terms of select participant characteristics regardless of site). The researcher’s primary guide in all of these data reduction decisions is a clearly defined analysis objective, accompanied by an analysis plan. The objective may be based on the research questions addressed in the project or it may be determined on the basis of specific reporting or publishing goals. In the analysis plan, the researcher also defines the level of the analysis—whether exploratory,
descriptive, hypothesis testing, or comparative in nature—and chooses data accordingly. These initial data reduction decisions are critical to choosing an appropriate strategy for the one effective method for making large qualitative data sets more manageable, for either content or thematic analysis, is to develop and apply a series of “structural” codes to the data. This approach works for data collected using structured or semi structured interview or focus group guides that have discrete questions and probes that are repeated across multiple files in a data set. Each discrete question and its associated probes are assigned a code that is then applied or linked to the question and subsequent response text in each data file. Sets of questions that comprise a conceptual domain of inquiry can also be given a structural code (Emily and Namely et.al ,2007) While traditional thematic or structured coding can be a first step in ordering large data sets, the richness of the various codes applied to the data, coupled with the possibility of having multiple salient themes, requires additional consideration. In particular, as summarized by Miles and Huberman (1994), analysts are often faced with the following questions: “How do all the codes and themes relate to each other? What is the complete picture, and how does it relate to each theme or code? Where does one begin to tell the story?” To answer some of these questions, graph-theoretic techniques, also referred to as semantic network analyses, may be used to identify complex semantic relationships in bodies of text (Barnett and Danowski 1992).

Hierarchical cluster analysis is an agglomerative methodology that identifies clusters of observations in a data set. As described by Anderberg (1973), at its most elementary level, cluster analysis “sorts data into groups,” In other words, a cluster analysis is a statistical method for grouping “like” things together. Before performing a cluster analysis, the analyst first needs to display qualitative data using similarity matrices.

3.21.1.b. Data Display
Data display refers to ways of displaying the data, which include matrices, graphs, and charts illustrating the patterns and findings from the data. According to Miles and
Huberman, the use of data display is an essential part of the qualitative data analysis process, particularly in assisting with interpretation of interviews data and codes. They suggest various types of matrix formats displaying data and the results of data analysis in ways that allow the complexity of a mass of qualitative data in wide range circumstances, to be captured. Miles and Huberman (1994) describe data display as a visual format that present information systematically, so that the user can draw valid conclusions. In the case of the quantitative data, the presentation is easier, it can take different shapes such as tables, graphs, charts, and the analysis of the shapes will lead to the conclusions.

**Conclusion drawing and verification:** conclusion is the final analytical activity for the qualitative and quantitative researcher. It is here that the researcher begins to decide what things mean. They do this by noting regularities, patterns (differences/similarities), explanations, possible configurations, causal flows, and propositions. However, Miles and Huberman (1994) also add that the competent researcher should hold such conclusions lightly, while maintaining both openness and a degree of skepticism.

---

**Figure 11. Data Management**

- **Data Collection**
  - field survey
  - Interviews
  - Observation
  - Secondary data
  - Focus Groups
  - Stakeholders consultation
  - Pilot project
  - Documents review

- **Data Management**
  - Data Reduction
    - transcription of interviews notes
    - revisiting notes and interviews
    - cluster data into themes
    - identification of themes organised around research question
    - categorising data
    - data codes
  - Data Display
    - SUMMARIES OF FINDING
    - MATCHING AND CHECKING AGAINST PROPOSITION
    - FINAL SYNTHESSES OF DATA DISPLAY
  - Data Verification
    - DISCUSSION FINDINGS
    - CONCLUSIONS
    - RECOMMENDATIONS
    - recommendation for further research
3.22. Quality of case study research design

Despite the advantages of the case study method, its reliability and validity remain in doubt. Tests to establish the validity and reliability of qualitative data are important to determine the stability and quality of the data obtained. However, up to researcher’s knowledge, there is no single, coherent set of validity and reliability tests for each research phase in case study research available in the literature.

3.22.1. Validity

In order to be convincing and credible, a researcher must follow certain requirements. Yin (2003) and Siggelkow (2007) give an overview of the most important what makes a good case study.

*Construct validity* describes whether the case study gives support to the intended interpretation of the variables. In order to increase construct validity multiple sources of evidence should be used. Key informants should review the draft of the written case study in order to avoid misunderstandings. Through maintaining a chain of evidence an external observer can follow the steps from the initial research question to the case study results. In this research multi resources and triangulation analysis approach was used to minimize any invalidity of data.

*Internal validity* is especially important for explanatory or causal case studies; it has no relevance for exploratory or descriptive case studies. When establishing a causal relationship between *event x* and *event y*, you should be sure that the cause for *event y* is the *event x* and there is no alternative explanation or other possible cause. Analytic tactics like pattern matching and explanation building, addressing rival explanations and the use of logic models help defining causal relationships.

*External Validity* describes to which extent the findings of the case study can be generalized to an entity (population, organization, group, country, industry…). In order to establish external validity in a case study research, theory can be used in a single case study design. In multiple-case study designs "replication logic" is a way to establish external validity. This means that every case study can be considered as an experiment by itself and should be used to replicate previous cases or to expand emergent theory. In this
case study the specific conditions have been taken into considerations to avoid any misunderstanding for generalization the results.

3.22.2. Reliability
Data reliability is an internal requirement of case study. Exactly as if you repeat the same experiments there is the expectation that a second analysis of the same case would bring similar results. A good documentation of case study research (trough protocols or a database) helps to demonstrate that your case study meets the reliability requirements.

The researcher took all measures to assure the protocol of the case study and collected data are reliable to be applied in similar conditions, the documentation was enough for trustworthiness of the data. The questionnaires reliability and quality checked by selecting random sample and refilling the questionnaires.

3.23. Strengths and Weaknesses
One of the strengths of the research methodology is that the multi-stakeholders consultation process, since part of the targeted stakeholders are very important to give part of the answers of the research questions, by the understanding the reaction and perceptions of the stakeholders towards the research problem, engaging the stakeholders before and during the research process has a practical and constructive added value. The second strength of the methodology is the implementation of the pilot project, the output of the application at pilot scale will allow to modify the model and conclusions if it is needed.

The weaknesses of the methodology that the conditions of the case study are to some extent specific (due to the unique of political conditions) so the application of the comprehensive methodology proposed was time consuming and very complicated (for example the methodology proposed a pilot project implementation, however during the implementation the administration of the water supplier changed three times by political circles. That caused a lot of difficulties to convince them each time to apply the experiment of new tariff system.
3.24. Ethical considerations

The most important issues and concerns that a researcher has to consider and to respect are:

a) Transparency and openness towards all people engaged in the research
b) Confidentiality of the data in particular the data obtained from the interviews. Since some of the people have been interviewed ask the researcher to use the information only for the purpose of the research not for any other political interest

c) Privacy: some participants declared data might be considered a private and can be misused, that why to protect the privacy is very important ethical issue.

One ethical issue was faced during the stakeholder’s consultation, some of them have relations with water utilities and they were very hesitant to talk freely especially when the issue of utilities performance was raised. During the focus groups, the issue of corruption and mismanagement in water utilities was raised without any evident or documentation, the researcher kept his ethical consideration not to use that perceptions or claims. In general the researcher took all ethical issues into his consideration at all steps of the research.

3.25. Summary of the Chapter

In this chapter, the appropriate research framework, design and methodology setting undertaken to conduct the research has been explained and justified. The selection of the research paradigm, mixed research and case study strategy was explained in addition to the data collection, analysis methods and processes the issue of quality case study and its design research was taken into consideration. Also data validity, reliability and display methods were justified. Ethical issues were also considered.
Chapter Four: Background of the Study Area

4.1 Introduction

Between the two world wars Britain ruled Palestine under a League of Nations mandate, which ended with a UN decision in November 1947 to partition the territory of Mandate Palestine into two states, Israel and Palestine – 53 and 47 percent of the territory, respectively. The State of Israel was established in May 1948 amid Arab protests and a war broke out between Arab and Israeli forces from which Israel emerged victorious. More than 800,000 Palestinians were either expelled or fled from Israel and became refugees in the Gaza Strip, the West Bank and neighboring countries. The war ended in 1949, with Israel having conquered additional territory and the State of Israel having been enlarged to comprise 78 percent of Mandate Palestine. The remaining 22 percent, the West Bank and the Gaza Strip, remained under the control of Jordan and Egypt, respectively. Hostilities between Israel and Egypt, Syria and Jordan in June 1967 ended in Israel’s occupation of the West Bank (including East Jerusalem, which Israel later annexed in violation of international law) and the Gaza Strip. These areas became known as the Occupied Palestinian Territories (OPT). Negotiations between Israel and the Palestine Liberation Organization (PLO) in the early 1990s led to the Oslo Accords and to the establishment of the Palestinian Authority (PA) in 1994, with jurisdiction in parts of the West Bank and the Gaza Strip. Negotiations on a permanent status agreement on Jerusalem, settlements established in the OPT), the delineation of borders, allocation of water resources, and Palestinian refugees were deferred, but were to be concluded by 1999. However, by 2000 no progress had been achieved on any of these issues. The stark reality of this inequitable system is that, today, more than 40 years after Israel occupied the West Bank, some 180,000 – 200,000 Palestinians living in rural communities there have no access to running water and even in towns and villages which are connected to the water network, the taps often run dry. Water rationing is common, especially but not only in the summer months, with residents of different neighborhoods and villages receiving piped water only one day every week or every few weeks. Consequently, many Palestinians have no choice but to purchase additional supplies from mobile water tankers which deliver water at a much higher price and of often dubious quality. As unemployment and poverty have increased in recent
years and disposable income has fallen, Palestinian families in the OPT must spend an increasingly high percentage of their income (AMNESTY, 2009)

4.2. General Information

The study area a unique geographical and historic specifications, in terms of elevations (it has the lowest place and the oldest city in the world), diversity of climate, severe water scarcity. Additionally it is one of the good examples of the impact of uncertainties (political, socioeconomic on water management), the following chapter explains the main components of the study area which will help to understand the dimensions of the research problem and the solutions by full knowledge of the local context.

4.2.1. Location

The West Bank and the Gaza Strip are parts of historic Palestine, which were occupied by the Israeli army during the June 1967 war. Palestine is bound by the Mediterranean Sea in the west, by Jordan and Syria in the east, by Lebanon in the north and by the Sinai Peninsula in the south. The total area of historic Palestine is 27,024 km² extending for approximately 400 km in length and 80 km in width. (Abed and Wishahi, 1999).

The West Bank with an area of 5655 km², (approximately 155 km in length and 60 km in width) is mainly a mountainous region, but it contains the western bank of the Jordan River between the Bisan Valley in the north and the Dead Sea in the south, as well as small areas in the semi coastal plain in Tulkarem and Qalqilia (Figure 12).
Much of Palestinian life and society revolves around an agricultural economy. Rural areas are regarded as an important component of the land and this should be taken into account when talking about the conditions and characteristics of Palestinian society. This is especially true when dealing with information regarding the percentage of people in agriculture and what proportion of water is used for irrigation. Moreover, the economic situation in the West Bank varies suddenly and sharply, due to unstable political conditions. The standard of living of many Palestinians has worsened over the last five years. (Abed and Wishahi, 1999), (World Bank, 2008).

4.2.2 Land Use

Land use statistics, especially in Palestine, are crucial for planning policies, natural resource management, and law enacting of land use organization (Table 2).
Table 2. Land Use in West Bank (Source: The status of the environment in the West Bank, ARIJ, Jerusalem, 2004)

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>AREA (HECTARE)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palestinian built – up areas</td>
<td>21345.3</td>
<td>3.67</td>
</tr>
<tr>
<td>Israeli settlements(^{57})</td>
<td>7778.8</td>
<td>1.34</td>
</tr>
<tr>
<td>Closed military areas</td>
<td>117754</td>
<td>20.23</td>
</tr>
<tr>
<td>Military areas</td>
<td>1652.37</td>
<td>0.28</td>
</tr>
<tr>
<td>Left as state land</td>
<td>141088.46</td>
<td>24.23</td>
</tr>
<tr>
<td>Nature reserves</td>
<td>33070.15</td>
<td>5.68</td>
</tr>
<tr>
<td>Forests</td>
<td>6391</td>
<td>1.1</td>
</tr>
<tr>
<td>Dead Sea</td>
<td>17741</td>
<td>3.05</td>
</tr>
<tr>
<td>Israeli cultivated areas</td>
<td>6362.9</td>
<td>1.09</td>
</tr>
<tr>
<td>Palestinian cultivated areas</td>
<td>168200</td>
<td>28.9</td>
</tr>
<tr>
<td>Others*</td>
<td>60815.9</td>
<td>10.44</td>
</tr>
</tbody>
</table>

*: Other represents either: sites, industrial zones, unused land or grazing

4.2.3. Climate
The West Bank has a Mediterranean climate, with two distinct climate seasons, a wet season and a dry, hot one. The wet, rainy season starts in October and extends till the end of April with the lowest temperatures occurring in January and February; the maximum rainfall is in January. There is an abundance of sunshine in Palestine with an average radiation of 5000-7500 kcal/m\(^2\) per day in the summer (PBCS, 2001).

4.2.3. a. Temperature
The average annual temperature for the western plains of the West Bank is 19° C, while it is 17° C for the mountainous region and 25° C for the Jordan Valley. The average annual temperature in the Gaza Strip is about 21° C.

\(^{57}\) Settlements inside the West Bank
4.2.3. b. Humidity
The average relative humidity in the West Bank varies from 50% to 70% in the seasons. The minimum humidity occurs in June, while the maximum occurs in January. Because of its proximity to the Mediterranean Sea, the relative humidity in the Gaza Strip is higher than that in the West Bank, ranging from 70% to 85%.

4.2.3. c. Evapo-transpiration
No direct evapo-transpiration measurements are available for Palestine. Annual pan evaporation rates for the western parts of the West Bank are 1,900 mm/yr, while for the Jordan Valley around Jericho pan evaporation rates reach 2,600 mm/yr. Typical pan evaporation rates for the Gaza Strip range from 2.1 mm/day in winter to 6.3 mm/day in summer, which equals an annual pan evaporation rate of about 1,900 mm/yr. Throughout the warm season, there is a soil moisture deficit which requires irrigation for cultivating crops. Only a few crop varieties that can withstand water stress conditions are able to survive the summer in the Gaza Strip. (Abed and Wishahi, 1999).

4.3. Socio-Economic Conditions in the West Bank

4.3.1. Population
According to the last census conducted by the Palestinian Central Bureau of Statistics in 2007, the population of the West Bank, including East Jerusalem, is estimated at approximately 2,355,589.58 The population growth rate in the West Bank is known to be one of the highest in the world, estimated at 3% (PCBS.2008). Demographic trends in Palestine have been closely related to the political developments in the region. The population is generally young. Approximately 80% of the West Bank population is younger than 35 years. The Israeli authorities have imposed restrictions on economic developments as well as land and water use during the last 28 years. This, coupled with the absence of major local investment, has resulted in a misbalance between population and resources, particularly water resources. (High population growth with limited water resources and misdistribution of the available resources due to the Israeli-Palestinian conflict)59.

58 This is the census done 2007
59 80% of water resources in West Bank still under Israeli Control
4.3.2. Population projections
When considering future population estimates for Palestine, many factors have been taken into consideration, such as future population policies, population growth rates, immigration and the density of settlements in Palestine. Population density in the West Bank ranges from 71 to 609 persons/km$^2$ with an overall average of 250 persons/km$^2$. There is a geographic trend in the distribution of population density, decreasing from west to the east (e.g. Tulkarm 367/km$^2$ in the west, to Nablus 187/km$^2$ in the center and to Jericho 71 persons/km$^2$ in the east). The population density is highest in the Jerusalem district. Another characteristic of the population distribution in West Bank is that the population residing in the northern districts of Nablus, Jenin, and Tulkarm represent about 45% of the total population of the West Bank.

4.3.3. Economy
The Occupied Palestinian Territories (OPT) are subject to exceptional political and economic conditions, having been under military rule for decades. In a situation characterized by legal restrictions, strikes and curfews, the local economy is consequently constrained. (World Bank, 2009). Further, the integration into the Israeli economy and infrastructure which has taken place during the occupation has profoundly changed the labor markets in the OPT.

4.3.3. a. Labor Market
The participation rate in the Palestinian labor force in 2005 was around 40.4%, with the West Bank rate at 41.9% and the Gaza Strip at 37.6%. Female participation rate was 12.8% (MAS, 2004). (Table 3).

---

$^{60}$ More details was given in the data analysis section, this section just general information

$^{61}$ The Palestinian economy is usually calculated for the West Bank and the Gaza Strip
Table 3. Distribution of Employed Workers in Local Economy by Sector (Source: PBCS, labour force survey, 2005)

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>PERCENT OF TOTAL EMPLOYED WORKERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002</td>
</tr>
<tr>
<td>Services</td>
<td>n.a</td>
</tr>
<tr>
<td>Trade and hotel</td>
<td>20.1</td>
</tr>
<tr>
<td>Agriculture</td>
<td>15.6</td>
</tr>
<tr>
<td>Industry</td>
<td>12.4</td>
</tr>
<tr>
<td>Construction</td>
<td>7.6</td>
</tr>
<tr>
<td>Storage, transportation, and telecommunication</td>
<td>6.0</td>
</tr>
</tbody>
</table>

4.3.3. b. Macro Economic Status
The macroeconomic environment in the Occupied Palestinian Territories (OPT) had been more difficult than anticipated in the Palestinian Reform and Development Plan (PRDP) for 2008-10. Restrictions in the OPT continued during 2008, while Gaza’s isolation increased. Moreover, inflation was much higher than anticipated; further eroding real wealth and incomes. Nevertheless, in the West Bank the adverse impact of the above factors on private sector confidence and growth has been tempered by the redeployment of security forces in several cities, as well as prudent expenditure policy that minimized new arrears accumulation. Overall, real GDP growth in 2008 in the OPT is estimated at about 2 percent, which translates to a decline of almost 1 percent in real per capita terms, resulting in a per capita income of just over US$1,000 in 2008 (Figure 13). The Gaza economy, already devastated from years of Israeli blockade, was further ravaged by the recent military operation. Consequently, what little growth has occurred, has taken place in the West Bank. On the other hand, the global financial crisis has thus far not had a significant impact on the Palestinian economy (IMF 2009).
Unexpectedly high inflation and fluctuations in the exchange rate has shocked the Palestinian economy. The Consumer Price Index (CPI) increased by 7 percent in the year to December 2008 (from around 1 percent in mid-2007)\(^62\). The rise was far more pronounced in Gaza (10 percent) than in the West Bank (4.5 percent) and East Jerusalem (6.5 percent) as a result of the blockade on Gaza. The IMF Staff Report of February 25, 2009, Macroeconomic and Fiscal Framework for the West Bank and Gaza: Third Review of Progress, reports income-based poverty rates from the UNRWA July 2008 report Prolonged Crisis in the Occupied Palestinian Territory: Socio-economic Developments in 2007. These rates are far higher, with 80 percent of households in Gaza living below the poverty line and 45 percent in the West. Unemployment and poverty rate are high, with a marked deterioration in Gaza. The 2008 unemployment rate was estimated at an average of about 40 percent in Gaza and 19% in the West Bank, up from an average of 30 and 18 percent, respectively, in 2007. The sharp rise in unemployment in Gaza resulted from the tighter blockade on it when compared to 2007. Poverty levels, based on data from a 2007 household survey, are estimated to be much higher in Gaza than in the West Bank\(^63\), with

\(^62\) Above the expected 3-4 percent rate projected in the PRDP

a poverty rate of 30 percent in Gaza compared to 19 percent in the West Bank. While
data on poverty levels in 2008 are not yet available, Gaza’s humanitarian situation has
worsened, especially during the last quarter of 2008, with more severe restrictions on the
entry of essential items, including cash

4.3 .3.c. Women in the Labor Market
Labor force participation is influenced by political and socio-cultural factors. There are
relatively strong cultural norms governing the places and types of work that can be
considered "acceptable" according to gender, age, and social status. The cultural
dimension is particularly important when explaining Palestinian women's lack of (formal)
labor activity. Women in the OPT generally have a very low labor participation ratio
compared to men; this ratio is even lower in Gaza because of the strong cultural
inhibitions against female employment and the lack of employment opportunities.
Women in Palestine usually work inside the house as part of the housewife's tasks; other
work done in a domestic setting may be contract or piece work, particularly sewing
clothes, working in a family business, gardening plot or farming, or food processing. Out-
of-house employment can be found among women who are highly educated, young and
unmarried, widowed, divorced or those who do not have children. Male labor force
participation is especially low for young and old men because of education and age
inhibitors.

4.3.3 .d. Household Income
The outbreak of the second Intifada in 2000, characterized by frequent strikes and
curfews, has initiated a period of declining household income in the OPT. Restrictions on
employment in Israel have deprived many households- in the West Bank and especially
in Gaza and refugee camps- of their main source of income. Household income types in
the OPT can be divided into two main categories: the first and more important type is
labor activity and the second is private and public transfers and capital income.

2008 report Prolonged Crisis in the Occupied Palestinian Territory: Socio-economic
Developments in 2007. These rates are far higher, with 80 percent of households in Gaza living
below the poverty line and 45 percent in the West Bank.

64 The main force in agricultural sector is women.
4.3.3. e. Income from labor activity
Income from labor activity is the most important type of household income. It is comprised of wages and salaries, business income, and income from land cultivation and animal husbandry. Wages are the most frequent type of household income. The household share of wage income increases with the number of adult males residing in the household. Statistics shows that Gaza has a lower share of households receiving wage income than the West Bank and east Jerusalem. Also in Gaza, only one out of every twenty people has full-time employment, compared with one out of five people in the West Bank. According to FAFO\textsuperscript{65}, income from labor activity is rendered unstable by curfews, strikes and restrictions on employment in Israel. The lack of state-directed economic security arrangements as well as prevailing political uncertainties, have thus increased the importance of the family economic network.

4.4. Water Resources and Supply
Understanding the status of water resources and supply is an important component of the research, since the management of water resources, water availability and accessibility are part of the uncertainties as well as acting as a major constraint for socioeconomic development. The background will enable the research reader to understand the reasons for lower consumption and water scarcity and the link between scarcity and poverty, and also the effect of uncertainties in the political situation on water tariffs and utility performances.

4.4.1. Historical and Political Background of the Water Sector in Palestine
Palestine is located in a semi-arid region with limited water resources that are already under strain due to the overall demand in the region exceeding the available water supply and the deterioration of the quality of the natural water resources (Barghothy, 2004). The current gap between water supply and demand in West Bank (WB) is around 45 Million Cubic Meter (MCM)/year (Tamimi \textit{et al}, 2005). “It is expected to increase considerably by the high population growth (3.0%) supplied by constant or even decreasing resources” (Tamimi \textit{et al}, 2005). In addition to the natural constraints, the political constraints have

\textsuperscript{65} a Norwegian social science research institute, Report 151,
resulted in the lack of accessibility to these resources. Tightened “Israeli” measures to fully control Palestinian water resources since 1967 (Tamimi et al, 2005). In 1967, “Israel” declared all water resources in the region as state property. Moreover, 42 wells were drilled in West Bank by the “Israeli” Water Company “Mekorot” (Tamimi et al, 2005). Most of them were drilled in the eastern aquifer with an overall abstraction of 91 MCM/year supplied to the “Israeli” settlements inside the West Bank with an average consumption of 400 L/capita/day (Tamimi et al, 2005). In the last decade, water quality and accessibility have grown far worse. “And now “Israel” uses approximately 85% of the Palestinian groundwater resources generated from four aquifers located in West Bank and Gaza Strip (GS), to meet 40% of its total water needs. This leaves 15% of Palestinian water for Palestinian use” (Bashir and Winkelstein, 2004.)

The advantage of the peace process “Oslo II” in 1995, as perceived by many Palestinians, was an opportunity for greater use of water inside Palestinian territory (Rabi et al, 2002). However, this has adversely affected the overall performance of the water sector and resulted in creating a large gap between the services provided and the ones demanded (Rabi et al, 2002). The lack of investments in improving the infrastructure 66 (the need estimated around 5 billion US$ and the existing infrastructure very old and most of it out of order mainly the ground water wells) 67, the scattered nature of water supply and management utilities, and the absence of adequate rules and regulations have resulted in the deterioration of the entire water system (Rabi et al, 2002). In reality, the peace process caused the formation of new, responsive public institutions to govern water usage (Rabi et al, 2002). This is how the Palestinian Water Authority (PWA) was established in 1995 and was assigned the task of formulating and implementing a comprehensive Water Law. These laws were to entail setting up adequate rules and regulations including a proper water pricing system both in WB and GS (Rabi et al, 2002). However, as the Palestinians do not yet have full control over their water resources, they are facing many constraints to develop and implement a Water Law, and no final uniform water pricing policy has been formulated (Rabi et al, 2002).

---

66 The Palestinian Water sector have been neglected about 50 years due to absent of national public sector
67 The estimation bases on the need assessment done by Palestinian Water Authority 2008
4. 4.2. Water Resources in the West Bank

The characterization of current water resources in the West Bank as listed in this section is based on review of data and baseline studies produced by the Water Resources and Strategic Planning Directorate (WRD) of the PWA and specific water resources studies developed by USAID under the Water Resources Program (West Bank, from 1996 to 2004). The WRD project identified the maximum potential resources, regardless of technical, political or socio-economic constraints. It is important to emphasize that these resources are classified only as potentially exploitable. In most cases, significant technical and political obstacles must be overcome, and development of the water resources will be relatively expensive. Specific feasibility issues associated with development of these resources categories will be examined in future phases of Integrated Water Resources Management plans. The following is a summary of the conclusions of the baseline analysis carried out under the WRP study.

4.4.2. a. Groundwater Resources: Three groundwater basins lie under the West Bank: the Eastern Basin, the Western Basin, and the Northern Basin. Groundwater resources in each basin are presently shared by Palestinians and Israelis. Analysis of all currently available data on the groundwater in the basins (including spring flow) summarizes the potentially exploitable groundwater resources for Palestinian use as follows (Figure 14).

---

68 The final status of available water resources to the Palestinians is still the main issue in the final status negotiations between them and Israel.
The baseline groundwater analysis indicates that the Eastern and Northeastern Basins are currently developed to their approximate sustainable yield, while the Western Basin is being exploited beyond its sustainable yield. The identified potentially exploitable groundwater resources for Palestinian use (approximately 273 MCM/year) consist exclusively of groundwater that is currently being utilized by the Israelis. In other words, further Palestinian development of groundwater resources must be balanced by a decline in Israeli use.

4.4.2. b. Surface Water Resources: Surface water resources considered by the Water resources national plan (WRP) include wadi flow, the Jordan River, and rainwater for harvesting. The potentially exploitable surface water resources are summarized as follows in Figure 15. (Abusaada, 2004).
The baseline surface water analysis indicates that there is a maximum potential of approximately 400 MCM/year which could be exploited from these various surface water resources. Of the three surface water resource categories, the Jordan River is currently fully utilized by the Israelis, while rainwater harvesting represent the resources used by Palestinian in winter season. These latter two may be technically difficult to develop and are remotely located in relation to demand centers.

4.4.2. c. Waste water Resources:
Wastewater resources consist of wastewater that can be put to use for domestic, industrial, or other beneficial uses. Available wastewater resources are dependent on the available water supply, and consequently will vary over time. The estimated potentially exploitable wastewater resources, based on the projected domestic supply within the West Bank, are 65 million m³. To develop wastewater as a resource, a collection system and a treatment plant are required. Presently, only limited quantities of treated wastewater are produced in the West Bank and there are no significant, active reuse projects.

4.4.3. Comparison of Existing Supply, Projected Demand, and Available Resources
Existing & Projected Demand: Table 4 below illustrates the existing water supply and the projected water demand in the West Bank. Also shown on the graph is the total supply potential (total potentially exploitable groundwater, surface water, and wastewater resources plus existing supply) through the planning period 2001-2025. As demand increases, an increasing percentage of the potentially-available resources will need to be developed (figure 16). As an example, to fill the gap between supply and demand in 2015, approximately 31% of potentially exploitable water resources must be developed. This is illustrated in Table 4 below.
4.5. The Status of Supply And Demand

4.5.1. Introduction

Water is one of the most essential elements vital for human well-being. It is a main component in most domestic, industrial, and agricultural activities. Unfortunately, water resources in Palestine, as in most of the other countries in the Middle East, are scarce. This makes the careful management of these resources and their use essential, especially in view of the rapid population growth rates and socio-economic development potential. This chapter aims to highlight the supply and demand in the West Bank and Gaza Strip based on available secondary source information (e.g. well abstractions, spring
discharges, population, etc.). The assessment of supply/demand was undertaken for the year 2005 according to the availability of data in the PHG Database.

4.5.1. a. Water Supply – Demand in the West Bank

**DOMESTIC AND COMMERCIAL SECTORS**

The domestic and commercial water systems are mixed in many places in the West Bank; therefore, it is very difficult to distinguish between these two systems. At the same time, the supplied water for these two sectors is divided into two parts; served and un-served areas. The served area includes all population connected to the public water network, while populations not connected to the network are defined as living in un-served. An un-served area relies on non-conventional water sources (e.g. water harvesting and tanker supply). Which reach 30 % of the population mainly rural areas in the northern and southern part of West Bank. Geographically, the West Bank is divided into 11 governorates. According to estimates of the Palestinian Central Bureau of Statistics (PCBS), the population of the West Bank in 2003 was estimated to be 2.06 million inhabitants, living in 642 communities. From the total population, 1.83 million inhabitants (89.1%) live in 385 communities (60%) that are served or partially served by a public water network (see Table 5 and Figures 17)

**Table 5.** Served and Un-served Population /Communities in the West Bank (PWA, 2005, Abusaada, 2004)

<table>
<thead>
<tr>
<th>Governorate</th>
<th>Total</th>
<th>Served or Partially Served</th>
<th>Unserved</th>
<th>Total</th>
<th>Served or partially served</th>
<th>unserved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>Inhabitant</td>
<td>%</td>
</tr>
<tr>
<td>Bethlehem</td>
<td>71</td>
<td>81.7</td>
<td>13</td>
<td>18.3</td>
<td>169962</td>
<td>99.2</td>
</tr>
<tr>
<td>Hebron</td>
<td>153</td>
<td>39.9</td>
<td>92</td>
<td>60.1</td>
<td>507621</td>
<td>99.7</td>
</tr>
<tr>
<td>Jericho</td>
<td>56</td>
<td>64.2</td>
<td>44</td>
<td>35.8</td>
<td>243248</td>
<td>82.3</td>
</tr>
<tr>
<td>Jericho</td>
<td>16</td>
<td>87.5</td>
<td>2</td>
<td>12.5</td>
<td>41050</td>
<td>99.9</td>
</tr>
<tr>
<td>Jerusalem</td>
<td>31</td>
<td>90.3</td>
<td>3</td>
<td>9.7</td>
<td>145387</td>
<td>99.1</td>
</tr>
<tr>
<td>Nablus</td>
<td>72</td>
<td>50.0</td>
<td>36</td>
<td>50.0</td>
<td>219453</td>
<td>78.4</td>
</tr>
<tr>
<td>Qalqilya</td>
<td>35</td>
<td>51.4</td>
<td>17</td>
<td>48.6</td>
<td>91075</td>
<td>84.1</td>
</tr>
<tr>
<td>Ramallah</td>
<td>80</td>
<td>90.0</td>
<td>8</td>
<td>10.0</td>
<td>270865</td>
<td>97.2</td>
</tr>
<tr>
<td>Safta</td>
<td>23</td>
<td>65.2</td>
<td>8</td>
<td>34.8</td>
<td>80369</td>
<td>82.0</td>
</tr>
<tr>
<td>Tubas</td>
<td>23</td>
<td>26.1</td>
<td>17</td>
<td>73.9</td>
<td>45369</td>
<td>63.9</td>
</tr>
<tr>
<td>Tulkarem</td>
<td>42</td>
<td>59.5</td>
<td>17</td>
<td>40.5</td>
<td>160200</td>
<td>87.4</td>
</tr>
<tr>
<td>Total</td>
<td>642</td>
<td>66.0</td>
<td>257</td>
<td>40.0</td>
<td>2063999</td>
<td>89.1</td>
</tr>
</tbody>
</table>

125
4.5. 1. b. Water Supply for Served Population

The domestic water supply for the served population is divided into two types of water resources: local and purchased resources.

Local Sources:

The local water supply originates from wells and springs owned by Palestinian municipalities, the Palestinian Water Authority, or water distribution institutions. The total water supply from local sources is estimated to be 28.711 MCM in year 2005. Figure 18 shows the quantities of water supply per governorate and also the spatial distribution of the local water resources.

Figure 18. Local Water Supply from Different Resources 2005
**Purchased Sources**

The purchased source comes from the Israeli water company, Mekorot, and is distributed through the West Bank Water Department, WBWD. The total amount of water purchased in year 2005 was 36 MCM. Figures 19 and 20 shows the quantities of water supply per governorate and also the spatial distribution of the purchased water resources.

![Figure 19. Purchases water supply per Governorate year 2005 (PWA, 2006)](image)
Figure 20. Purchases Water Supply Governorate year 2005

The total water supplied to the served and partially served population from the two different sources in year 2005 was estimated to be 64.75 MCM while the need estimated around 155 Mm$^3$ Table 6 and Figures 21 will show the total quantities of water supply per governorate and also the spatial distribution for the West Bank governorates.
Table 6. Water Supply per Governorate year 2005 (PWA, 2006)

<table>
<thead>
<tr>
<th>Governorate</th>
<th>Local Water Sources</th>
<th>Purchased Resources</th>
<th>Total Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mcm/yr   %</td>
<td>Mcm/yr   %</td>
<td>Mcm/yr % from Total</td>
</tr>
<tr>
<td>Jenin</td>
<td>2.181    51.524</td>
<td>2.062    48.48</td>
<td>4.233          6.54</td>
</tr>
<tr>
<td>Tubas</td>
<td>0.596    83.240</td>
<td>0.12     18.76</td>
<td>0.716          1.11</td>
</tr>
<tr>
<td>Tulkarem</td>
<td>5.031    94.996</td>
<td>0.265    5.00</td>
<td>5.296          8.18</td>
</tr>
<tr>
<td>Nablus</td>
<td>7.195    76.226</td>
<td>2.244    23.77</td>
<td>9.439          14.58</td>
</tr>
<tr>
<td>Galileiya</td>
<td>3.658    91.610</td>
<td>0.335    8.39</td>
<td>3.993          6.17</td>
</tr>
<tr>
<td>Saltit</td>
<td>0.228    14.931</td>
<td>1.299    85.07</td>
<td>1.527          2.36</td>
</tr>
<tr>
<td>Jericho</td>
<td>1.398    55.680</td>
<td>1.042    44.34</td>
<td>2.350          3.63</td>
</tr>
<tr>
<td>Ramallah</td>
<td>2.192    20.184</td>
<td>8.686    79.82</td>
<td>10.872         16.77</td>
</tr>
<tr>
<td>Jerusalem</td>
<td>0.062    0.875</td>
<td>7.025    99.13</td>
<td>7.087          10.94</td>
</tr>
<tr>
<td>Bethlehem</td>
<td>2.599    33.498</td>
<td>5.162    66.51</td>
<td>7.761          11.99</td>
</tr>
<tr>
<td>Hebron</td>
<td>3.661    31.657</td>
<td>7.831    68.14</td>
<td>11.492         17.75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>28.711</strong></td>
<td><strong>36.043</strong></td>
<td><strong>64.754</strong></td>
</tr>
</tbody>
</table>

Figure 21. Water Supply for Served Communities per Governorate year 2005 (PWA, 2006)
4.5.1. c. Water Supply for the Un-Served Area

Unfortunately, there is no field data concerning the water supplied to the un-served population. In general, they rely on water harvesting during winter periods and some agriculture wells and small springs during the summer periods (Figure 21). Calculating the amount of water supplied to the un-served populations is based on the assumption that the amount of water that a person needs for basic water requirements, such as drinking, cooking, bathing, sanitation and hygiene is 50 l/c/d, Gleick (1996). In addition to the above assumption, two assumptions are introduced to help estimate the water supplied to the un-served population:

1. The unaccounted for water for the un-served system is 5% (losses during filling and transportation) of the total supply; these losses comprise water transport and storage processes.
2. Commercial consumption is 7% of the total supplied water for domestic use (CH2MHILL, 2001).

By applying the above approach, the water supplied to the un-served population is estimated to 4.6 MCM in year 2005.

Unaccounted for Water

The overall loss or unaccounted-for-water rate in the served area was estimated to vary between 25 percent (in Ramallah) and 65 percent (in Jericho), with an average of 44 percent of the total supply (SUSMAQ, 2005) for the served areas. The loss rate in this study in the served areas was assumed to be 40% from the total supplied water. The unaccounted for water in served areas comprises:

- Physical losses at the source, in the main transmission systems and distribution network as most of the infrastructure is more than 50 years old
- Unregistered connections
- Meter losses
The overall unaccounted for water in the served and un-served populations are shown in Figure 22.69

![Figure 22: Representation of unaccounted for water, year 2005 (PWA, 2006)](image)

4.6. Water Consumption

4.6.1. Commercial Consumption
The commercial use is defined as the use of water for industry, tourism, livestock, and other commercial activities. Based on the literature, the commercial water consumption is estimated to be 7% from the total water supply (CH2MILL, 2001). As a result, the water consumed by the commercial sector is estimated to be 3.03 MCM in the year 2005 (Figure 23).

![Figure 23: Representation of commercial water use per governorate, year 2005 (PWA, 2006)](image)

---

69 The % of the unaccounted water at governorate level of the national level
4.6.2 Domestic Consumption

The domestic water consumption is equal to the remaining water from the supply water after subtracting the unaccounted for water and the water which is used for commercial purposes. For the served population, the net water for domestic consumption is divided between the total served population and the number of days in the year. The result is the domestic water consumption per capita per day. For the governorates that do not meet the minimum domestic water requirements, 50 L/c/d, supplementary water will be provided from local water sources (e.g. harvested water). The additional water will be added to the supplied water for the served population to achieve the total water supply. The total amount of water consumed by the domestic sector was 44.26 MCM in year 2005. 

Figures 24 and 25 show distribution of water supply and consumption for each governorate in the West Bank.

Figure 24: Domestic Water consumption per governorate, year 2005

---

70 After reduction of the losses
4.6.3. Summary of Supply-Consumption and Demand

The water supply, losses, and consumption for the domestic and commercial sectors in the West Bank are summarized in illustrated in Figure 26.
4.6.3.a. Domestic and Commercial Demand

The historic water demand in the West Bank has been artificially constrained by non-market forces. As a result, historical demand figures cannot be used to forecast future demand (PWA, 2001). Population increase is the fundamental parameter affecting future water needs. This determines not only domestic demand, but also agricultural and commercial demand. Population projections have been based only on natural growth of the base populations.

Estimation of domestic and commercial demand is based on three basic assumptions:

- Projection of the West Bank population is based on the Dalton formula ref:

  \[ P_i = P_o \left(1 + C_r \right)^n \]

  Where:

  \( P_o \) = actual population based on succeeding census (Year 2007)
  \( C_r \) = population growth (0.03)
  \( n \) = time interval in years between succeeding census and estimation year.

- Minimum water required for domestic use is 150 L/c/d as supplied water from source; this means that the 150 L/c/d will include the losses and not the net water reaching the users. Based on the previous estimation, the net water consumption will be around 90-110 L/c/d.

- Commercial growth is 8% from the domestic water supply.
The projected population and demand for domestic and commercial sectors for years 2006, 2010, 2015, 2020 and 2025 are shown in Table 7, 8 and 9 and Figure 27.

Table 7. Projection of Domestic Demand

<table>
<thead>
<tr>
<th>Governorate</th>
<th>Population</th>
<th>Domestic Demand (Mcm/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betlehem</td>
<td>169962</td>
<td>221762</td>
</tr>
<tr>
<td>Hebron</td>
<td>507621</td>
<td>662330</td>
</tr>
<tr>
<td>Jenin</td>
<td>248248</td>
<td>323907</td>
</tr>
<tr>
<td>Jericho</td>
<td>41050</td>
<td>53551</td>
</tr>
<tr>
<td>Jerusalem</td>
<td>145387</td>
<td>198697</td>
</tr>
<tr>
<td>Nablus</td>
<td>319453</td>
<td>416814</td>
</tr>
<tr>
<td>Qalqilya</td>
<td>91075</td>
<td>118832</td>
</tr>
<tr>
<td>Ramallah</td>
<td>270856</td>
<td>353484</td>
</tr>
<tr>
<td>Salfit</td>
<td>63059</td>
<td>79755</td>
</tr>
<tr>
<td>Tubas</td>
<td>45359</td>
<td>59183</td>
</tr>
<tr>
<td>Tuikarem</td>
<td>154020</td>
<td>214099</td>
</tr>
<tr>
<td>Total</td>
<td>2053389</td>
<td>2692255</td>
</tr>
</tbody>
</table>

Table 8. Projection of Commercial Demand
### Table 8. Projection of Commercial Demand

<table>
<thead>
<tr>
<th>Governorate</th>
<th>Population</th>
<th>Domestic and Commercial Demand (Mcm/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bethlehem</td>
<td>169962</td>
<td>221762</td>
</tr>
<tr>
<td>Hebron</td>
<td>507621</td>
<td>662330</td>
</tr>
<tr>
<td>Jenin</td>
<td>248248</td>
<td>323907</td>
</tr>
<tr>
<td>Jericho</td>
<td>41050</td>
<td>53661</td>
</tr>
<tr>
<td>Jerusalem</td>
<td>145367</td>
<td>189979</td>
</tr>
<tr>
<td>Nablus</td>
<td>319465</td>
<td>416144</td>
</tr>
<tr>
<td>Qalqiliya</td>
<td>91076</td>
<td>118832</td>
</tr>
<tr>
<td>Ramallah</td>
<td>270865</td>
<td>353404</td>
</tr>
<tr>
<td>Salfit</td>
<td>60369</td>
<td>76766</td>
</tr>
<tr>
<td>Tubas</td>
<td>45369</td>
<td>61913</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,063,389</td>
<td>2,602,266</td>
</tr>
</tbody>
</table>

### Table 9. Projection of Domestic and Commercial Demand
Figure 27: Domestic and commercial demand for the West Bank (PHG, 2007)
4.6.3.b. Future Water Deficit

Based on the previous demand projections, Tables 10 shows the future water deficit in domestic, commercial and agriculture sectors, assuming that the supply will be constant.

Table 10 .Supply-Demand Gap Estimation in Domestic and Commercial Sector

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jerusalem</td>
<td>7.114</td>
<td>8.65</td>
<td>11.29</td>
<td>12.71</td>
<td>14.73</td>
<td>17.08</td>
</tr>
<tr>
<td>Betlehem</td>
<td>7.824</td>
<td>10.11</td>
<td>13.20</td>
<td>14.66</td>
<td>17.22</td>
<td>19.96</td>
</tr>
<tr>
<td>Hebron</td>
<td>14.433</td>
<td>30.21</td>
<td>39.42</td>
<td>44.36</td>
<td>51.43</td>
<td>59.62</td>
</tr>
<tr>
<td>Nablus</td>
<td>10.065</td>
<td>19.01</td>
<td>24.80</td>
<td>27.52</td>
<td>32.36</td>
<td>37.52</td>
</tr>
<tr>
<td>Galilee</td>
<td>4.292</td>
<td>5.42</td>
<td>7.07</td>
<td>7.96</td>
<td>9.23</td>
<td>10.70</td>
</tr>
<tr>
<td>Ramallah</td>
<td>11.016</td>
<td>16.12</td>
<td>21.03</td>
<td>23.67</td>
<td>27.44</td>
<td>31.61</td>
</tr>
<tr>
<td>Safat</td>
<td>1.803</td>
<td>3.59</td>
<td>4.69</td>
<td>6.27</td>
<td>6.12</td>
<td>7.09</td>
</tr>
<tr>
<td>Tubas</td>
<td>1.184</td>
<td>2.70</td>
<td>3.52</td>
<td>3.96</td>
<td>4.60</td>
<td>5.33</td>
</tr>
<tr>
<td>Tulkarem</td>
<td>5.724</td>
<td>9.75</td>
<td>12.74</td>
<td>14.33</td>
<td>16.52</td>
<td>19.26</td>
</tr>
<tr>
<td>Total</td>
<td>73.11</td>
<td>122.79</td>
<td>160.22</td>
<td>180.33</td>
<td>209.05</td>
<td>242.34</td>
</tr>
</tbody>
</table>

The numbers and data available in this report indicate that Palestinians are facing increasingly difficult water conditions. The demand is continually increasing as a result of a corresponding increase in population numbers, the expansion of commercial

---

71 The control over water resources in the West Bank continues to be un-balanced in recent years:

- The Israeli side controls and operates 38 Muskroot wells (40.0 MCM/year) for water supply to settlements alone.
- It also controls and operates the group of 13 WBWD wells, of which 10 wells are operated to supply the Palestinian communities at a level of 7.7 MCM/yr for Palestinians.
- The Israeli side also limits politically the development of Palestinian water resources in critically-needed well fields in the Northeastern and Western aquifers.
- The Palestinian side owns only 11 production wells at the moment (PWA wells - 7.7 MCM/year) and 6 wells operated by JWU (2.7 MCM/year) in addition to 29 municipal wells (17.2 MCM)
- The Palestinian side also operates several springs (4.6 MCM/year) and agricultural wells (3.9 MCM/year) for domestic water supply to Palestinian communities

In parallel, the gap between the available quantities of water and the increasing demand on water due to natural demographic increases, building expansion and urban development all over the West Bank increases under the prevailing climatic changes, repeatedly dry seasons, and the decrease of replenishable water quantities. The summer season witnesses a real suffering for Palestinians in many towns and villages, especially in areas not connected to water networks, therefore depending on expensive water purchased from mobile water tankers.
activities and industrial development. It is thus necessary to seek additional water resources and introduce non-conventional water provision methods. But all of these methods require political endorsement from the Israeli government which is highly depends on political situation and the status of the conflict.(Figure 28).

Figure 28. Political Uncertainty Effect on Availability of Water

4.7. Legislations and Regulations in the West Bank

The history of legislation in the West Bank is complicated. Current laws concerning the management of water resources were introduced by outside governments and occupation forces. The use of the natural resources was derived from the plans, interests, and goals of

---

72 This table produced by the author (merging several secondary data)
73 For example, in 1967, all water resources in the OPT came under Israeli ownership. Israeli water companies were given a key role in the planning, implementation, and operation of water projects to the degree that an Israeli company Mekorot took control in 1982 of all the water resources and supply. The Government of Israel explicitly acknowledged for the first time in Article 40 of Oslo II agreement the Palestinians’ sovereign right to water in the West Bank.
the occupying powers, and the written laws therefore often contradict the interests of the indigenous people. As a result, the roles and responsibilities in the water sector in the West Bank were scattered (the tasks for each organization are unclear) and fragmented (no coordination at national level). Before the establishment of the Palestinian Water Authority (PWA) in 1995, the water resources in the West Bank were controlled by strict Israeli military orders. These orders did not permit any Palestinian water institutions to develop their water resources. Moreover, the existing Palestinian institutions were restricted to operating and participating in an extremely limited range of activities regarding water supply administration, including operation and maintenance. Therefore, there has been no chance to promote a new water institution or to strengthen the existing ones involved in formulating water plans and strategies for sustainable management of the water resources. When the Palestinian Water Authority (PWA) was established, it took the responsibility of restructuring the water sector in order to regulate, monitor, and control the managerial, technical, and financial performance at the national, regional, and local levels. But unfortunately, the PWA and the other stakeholders are still influenced by Israeli policy since Israel still controls the main water resources in the West Bank.

Although the Palestinians have no full control over their water resources, they have introduced legislation to regulate the water resources development and to constrain activities that might compromise water availability and quality. This trend reflects increasing competition and conflict between water users and the increasing threat of water resources pollution. The legislations and regulations for maintaining and protecting the water resources in the West Bank are shared between different stakeholders within the Palestinian territories. Understanding the processes of how these legislations and regulations are produced is crucial for understanding the stakeholders of the water sector and their role for sustainable management of these resources.

4.10. The Institutional Framework in the Water Sector in the West Bank

The Palestinian institutional and regulatory framework for water resources management in the West Bank will have to cope with a situation of growing water demand, deteriorating quality, conflict between different user categories, and issues of water rights between
themselves and Israel. The roles and responsibilities in the water sector are carried out by many Palestinian institutions. The institutional framework is divided into four levels:

1. Policy and Decision Making Level.
2. Regulator Level.
3. Service Delivery Level.
4. Supporting and Advisory Level.

4.7.1. Policy and Decision Making Level

This level is represented by the National Water Council (NWC), which consists of five ministers, six other members representing government and non-government organizations, union of local authorities and universities, and the head of the PWA as the secretary of the Council. The members of the NWC gather to review and approve national water policy, review and approve quotas, reconsider the issue of private ownership of water, examine the central water projects, approve their implementation, and enhance regional and international co-operation in water.

4.7.2. Regulatory Level

The Palestinian Water Authority (PWA) is the regulatory body in the Palestinian territories. In addition to the main challenge of securing the future water rights of the Palestinian society, the overall development goal of PWA includes achieving economic growth through securing the water rights of the Palestinians and enforcement of equitable allocation of water resources among sectors and achieving environmental aims through the effective conservation and protection of these same scarce resources.

The PWA’s primary objectives are as follows:

- Execute the National Water Policy as approved by the National Water Council;
- Ensure the most efficient management of available water resources in the West Bank;
• 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;
• Set standards and establish technical guidelines and specifications to ensure quality control of water works.
• License the exploitation of water resources including the construction of water projects.
• Seek to achieve strong co-operation between itself and other relevant parties.

4.7.3. Service Delivery Level

The main elements of the water and the wastewater sector policy are based upon the principles of sustainable development. The Service Delivery Level is responsible for:

• Adoption and implementation of discreet national water policy endeavored to insure that domestic, industrial, and agricultural capital investments are compatible with the availability, development, and conservation of the Nation’s water resources.
• Operate water production facilities, purchase drinkable water from national and international suppliers, and deliver the water to local Municipal and Industrial water distribution systems.
• Operate and maintain the water systems within their service areas.

4.7.4. Supporting and Advisory Level

Universities

Palestinian universities provide support to the water sector research activities, training, and experience to Palestinians working in the water sector.
Non-Governmental Organizations (NGOs)

NGOs have played a unique role in the water sector; before the establishment of the PWA, the role of NGOs was:

1. Building up a water professional team which has been involved in monitoring and developing the available water resources.
2. Developing the base of the water information system.
3. Highlighting the seriousness of the water problems locally and internationally.
4. Working with the national and international bodies for developing and protecting the water resources in the West Bank.
5. Public awareness: working with the public to teach them the importance of water and environment in order to maintain the water quantity and quality.
6. Develop methods to increase the water availability for the public (e.g. water harvesting, rehabilitation of wells and spring, etc.).
7. Provide financial and technical support to the public and local organizations.

Nowadays, the role of NGOs is similar to their role before the establishment of PWA, but with full coordination between them and the governmental organizations.

External Funders

Many international organizations (governmental and non-governmental) have played and still play a very important role on the sustainability of water resources. They introduced the financial support to many water projects as well as expertise and training support. However, it is important to mention that the donors are the main drivers of water sector in

---

74 NGOs in Palestine are playing a very important role since most of them were active before the establishment of the Palestinian Authority (PA).
75 The Palestinian Authority depends heavily on external funding.
Palestine, the regional and global changes influences donor behavior towards water sector in Palestine. However this mentioned role is highly politicized

4.8. Summary of the Chapter
This chapter uses a descriptive approach, providing detailed information on the geography, demography, climate, land use, socio-economic conditions and poverty in the West Bank. It gives the general background of the study area and the context of uncertainties (political, social, economic...etc). The study gave detailed descriptions of water resources availability and the current status of supply demand and the future of water gap. Furthermore the chapter has mapped the institutional arrangement that control the water resources and management of supply. This chapter also includes the main stakeholders, the decision making process and the relationships between the different layer of water institutions.
Chapter Five: Data Analysis and Findings

5.1. Introduction
Following the selected methodology requirements, data reduction, validation and clustering have been done. The objectives of the following data categories are: helping to establish relations between socioeconomic variables, to explore the impact of uncertainties on water management, to understand the relations between poverty and water cost, to assess the status of willingness to pay and to understand the impact of poverty on water utilities performance. The data analysis focuses around the research main question; the best tariff structure can help the poor people and applicable under uncertain conditions. National level related data was obtained from secondary sources (data related national indicators of socioeconomic, good governance, water supply ...etc) , the household related data was obtained from the field survey and interviews (Primary Sources ) the household data contains socioeconomic parameters and water consumption data. Based on Primary and secondary data the researcher calculated the Water Poverty Index (WPI), which also used to highlight the general status of water sector in Palestine.

5.2. Finding and Data Analysis
The main objective of this chapter is to present the main findings and proper data in order to find answers of the research questions: What is the proper water tariff for poor under uncertainties?, the data will serve the objective of defining the gaps of the current institutional arrangement and legal framework, For the sake of clarity the chapter is divided into two sections: the first section presents the main secondary and primary data of socioeconomic status at national level while the second section presents the findings of the water related at household level, institutional arrangement, governance and uncertainties and water poverty index.  

Section one:

5.2.1. Socioeconomic Findings
This section gives information about demographic, macro and micro economic Parameters, and the future trend of socioeconomic indicators. 

---

76 This Water Poverty Index applied for the first time in Palestine and the Author published the findings in a separate paper. "Using socioeconomic indicators for demand management: as a case study. Palestine “in Shaval, H. Dwaik, H. (editors) “water resources in the Middle East. Springer (2007)
5.2.1. a. Population Trends
Demographic statistics are considered as one of the important topics especially in the development and planning process of political, social, and economic aspect. In the Palestinian territories issue the demographic is considered to be a vital topic since the demographic dimension represents one of the major Palestinian choices of comprehensive development in the light of limited water resources. One of the major problems facing the Palestinian planners is rapid population growth (3.0%) and the social status of the households. The size of the nuclear family in the West Bank is 7.71 and the average size of extended families 12.8, the extended family percentage is around 21.7 % (PCBS, 2008). The pressures its population will pose for a new Palestinian state will depend not only on the population’s current size and structure but also on how these features change in the future. As in all populations, such changes are produced in two ways: through natural increase and net migration which will depend on future political development). (Table.11)

The size and characteristics of the population in a new Palestinian state (entity) will affect the policy formulation process by determining the natural and physical resources needed to sustain the population; by influencing the demand for services and the ability to support those service level and by shaping the demands placed on the economy (RAND,2005)

Table 11 Current and projected population in West Bank (PCBS (2008):Statistical abstract of Palestine)

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>2.35</td>
</tr>
<tr>
<td>2010</td>
<td>2.48</td>
</tr>
<tr>
<td>2020</td>
<td>2.96</td>
</tr>
<tr>
<td>2030</td>
<td>3.42</td>
</tr>
</tbody>
</table>

5.2.1. b. Macroeconomic Trends
The overall macroeconomic picture in the period 2000-2007 was a clear reflection of the dominated political conditions. The economic performance was strongly affected by
several factors, first and foremost of which was the Gulf war (2004), internal violence, Israeli sanctions and the postponed international funding after the last elections in Palestine in January 2006. The decline of the Palestinian economy, triggered by the Second Intifada in 2000 and compounded by recent events, has left per capita GDP at $1,129 by the end of 2006, about a third less than it is level of $1,612 in 1999. The emerging recovery in 2003-2005 was again reversed in 2006 as a result of the fiscal crisis, as well as movement and access restrictions, following the Hamas victory in the PLC elections (Figure 29). GDP contracted by nearly 8.8% in 2006, and by a further 4.2% in the first quarter of 2007. This trend appears to be continuing in the second half of 2007.

![Economic Growth Rate](image)

**Figure 29.** % of Economic Growth (1999-2007)


Due to declines in the national and per capita income, real household spending declined rapidly during this period. The cumulative effect of the economic depression seems to

---

77 The Palestinian used to receive fund from Gulf Countries and United states
have produced economic hardship at the household level. This is evident in the higher average levels of poverty. The Palestine Poverty National Commission for Poverty Alleviation (PPNC) stated that nearly 40% of the West Bank population lives below the poverty line. In light of the above, it is clear that the Palestinian economy is not operating according to its potential level. In addition to the political constrain the situation is further aggravated by the legacy of inhospitable environment featuring a poor infrastructure and weak public services, obsolete legal and institutional frameworks, heavy dependency on international aid and vulnerability to external and internal political instability. (World Bank, 2007).

5.2.1. c. Unemployment
The unemployment in West Bank actually fell from 20.3 to 18.6 % in the first half of 2007, but these figures are misleading. Due to the fiscal crisis and its impacts on both public sector employees and private sector contractors, employment did not always translate into a regular salary payment. Also, official unemployment data excludes workers who turn to unpaid family labor or seasonal agriculture to make up for lost jobs (figure 30). Thirdly, the figures do not include many discouraged workers who have left the labor market because they cannot find employment. PCBS estimates that adding discouraged and underemployed workers would raise the 2006 unemployment rate in the West Bank to 28 % (PCBS, 2007)
5.2.1. d. Poverty and Households Economy Findings

Despite large inflows of aid in 2008 the percentage of severe poverty has been steadily increasing to nearly 35% with the continued economic decline in 2008 (PCBS, 2008)\(^78\). The Palestinian Central Bureau of Statistics announced the preliminary findings of the Socio-Economic Conditions of the Palestinian Households Survey. The survey was conducted in January and February 2009 on a sample of 4,960 households in the West Bank. This Survey was conducted in cooperation with and contribution from FAO and World Food Program (WFP). The Survey aimed to provide key and comprehensive indicators about the socio-economic characteristics of Palestinian households, including households’ income and expenditures levels, coping strategies employed by these households, and the changes in the general living conditions of the households during the past six months. The Survey also included questions about assistance received by households by type and source and the households’ perceptions on the satisfaction levels of the assistance received. The survey results show that 32.9% of West Bank households received assistance; the rest of the households (67.1%) did not receive any kind of assistance (figure 31). The findings also showed that the less fortunate households in receiving assistance are those living in the central of the West Bank (26.5%)\(^79\) in comparison with the northern of the West Bank (36.0%), and the southern of the West Bank (35.9%). 96% of households in the West Bank suffered from the increase in the prices of food products during the six months preceding the survey(UNSCOM, 2008). There was significant variation in this regard among different regions of the West Bank. Moreover, 26.9% of the households pointed out a loss in assets, assistance, or salaries during the same period. In addition 19.8% of the households stated that they had difficulties or problems in accessing workplace or market or farmlands. To cope with the economic crisis, 41.6% of households in the West Bank said that they resorted to shopping on credit during the week preceding the survey; the highest was in Southern

---

\(^{78}\) PCBS constructed the deep poverty line to reflect a budget for food, clothing and housing. For a family of six the deep poverty line in 2006 was NIS 1,837.

\(^{79}\) The assistance providers are UN agencies local or international NGOs and ministry of social affairs. The assistance includes water, food and other basic needs.
West Bank (55.8%). In addition, 31.2% of the West Bank households faced the crisis through the reduction of the amounts of food the household consumed during the same period and 28.4% of the households purchased food products of lower quality during the week that preceded the Survey. The Survey’s results showed that 47.8% of the households in the West Bank (52.7% in South West Bank, 48.7% in North, and 42.9% in the Center) faced the crises through reducing cash expenditure on clothing during the six months before the Survey in order to adapt to the economic hardships of the household (WFP, 2009)

**Percentage of people who receiving assistance**

32.9% of the households in the West Bank received assistance during the second half of last year, of which 63.1% received in-kind assistance while 36.9% received cash assistance.

96.0% of the households in the West Bank suffered due to the increase in the prices of food products during the past six months

41.6% of the households in the West Bank had to buy their daily basic needs on credit.

---

**Figure 31.** % of Families Receiving Assistance (Source: PCBS unpublished estimates based on 6th Palestinian Expenditure and Consumption Survey)
5.2.1. e. Water and Socioeconomic Indicators

The following sections present the primary data (obtained by survey have been conducted in the frame of this research) and secondary data to serve the process of checking the hypotheses and answering the research question and sub questions;

**What is**” the proper and reasonable water tariff should be apply in Palestinian context in order to be pro-poor and applicable under uncertain conditions (political, socioeconomic, institutional arrangement.

The nature of the IWRM and the water tariff structure and policy calls for a multi method and trans-disciplinary approach to research because understanding complex socioeconomic problems requires information from several resources and the production of new knowledge from both qualitative and quantitative paradigms (chalmers, 1999). The methodology deployed in the research is a flexible design qualitative and quantitative data and based on the principles of case study design. The quantitative and qualitative data were categorized into several thematic topics: socioeconomic and poverty, water poverty index, water supply, tariff policy, uncertainties (socioeconomic and political), institutional performance, and national water strategies and policies trends.

5.3. Finding and Analysis of Primary Data (Field Survey)

The ambition of this research to understand the drivers (socio-economic, political, water policy) of water policy in general and water tariff structure in order to propose a proper tariff structure which can meet the objectives of being: pro-poor, can cope with uncertainties and meet with the regular objectives (social fairness, economic efficiency and sustainability, understanding well established data and the interactions among different variables will contribute to achieve the ambition.

However, it is important to take into consideration the household definition in a Palestinian context is the family members who live together which can be a small family or extended family (three generation or three and more relatives living in the same house)
5.3.1. Socioeconomic Findings

5.3.1.a. Family Size and Frequency

It was found that the average family size for the surveyed households is 7.71, with 7.5 having the highest frequency. Also, 73.73% of the surveyed households have family size ranges between 4-10 members. Within this interval, 57.80% of the families are between 7-10 members. Figure 32 shows the distribution of surveyed families according to their sizes in WB.

![Frequency of family size](image)

**Figure 32**: Distribution of surveyed families according to their sizes

5.3.1.b. Family Size and Average Monthly Income

Generally, direct relation was found between family size and average monthly income. Based on the average monthly income, the surveyed families can be classified into three groups. The first group of families consists of less than 4 members, the average monthly income of this group ranges between 1,933-2,167 NIS/month (429.5-481.5 $). The second group of families consists of 4-10 members; with an average monthly income ranging between 2,544 – 2,771 NIS. In this group, families between 7-10 members (almost above the average family size) have an average monthly income range of between 2,644-2,771 NIS/month with a mean of 2,680 NIS/month. The third group of families consists of 11–37 members with average monthly income ranges of between 2,917–5,600 NIS/month. The percentages of the three groups are 21.18%, 73.73% and 5.6% around 565.3-615.7 US$. 

---

80 Around 565.3-615.7 US$

81 So-called extended family means more than three families living together (grand father and father with his sons).

82 AROUND 595 US$
5.09% respectively. Figure 33 shows the relationship between family size and average monthly income.

![Family size and average monthly income](image_url)

**Figure 33**: Family size and average monthly income per capita in West bank.

A strong inverse relationship was noticed between family size and average monthly income (based on reliability of the data and also the observation of the family status) this is also true as most of them may be unemployed or informally employed. Per capita; as family size increases, average monthly income per capita decreases. Based on the previous classification of family size (<4, 4-10 and 11-37 members), the average monthly income per capita in (NIS) ranges between 722-1933, 277-636 and 155-286 respectively, and between 277-378 NIS for families between 7-10 members (almost above the average family size). Also, it is interesting to notice that the differences in the average monthly income per capita between the three groups are high; the differences among the largest and smallest families in each of the three groups are 1211 NIS/capita/month, 359NIS/capita/month and 114 NIS/capita/month, respectively. The aforementioned numbers reveal that more than 50% of the surveyed families are below or very close to the poverty line (205NIS/capita/month), reflecting the deteriorating economic situation of many Palestinian families.

### 5.3.1. c. Family Size and Average Monthly Water Consumption

It was found that there is a direct relation between family size and the quantity of monthly water consumption both in winter and summertime. The amount of water consumed
increases with increased family size. However, it is a poor correlation both in summer and winter ($R^2 = 0.42$ and $0.35$, respectively). This could be attributed to the upper and lower extreme values that do not obey the general trend of water consumption. When these values were excluded, stronger correlations were obtained both in summer and winter ($R^2 = 0.67$ and 0.57 respectively), as shown in Figures 34 and 35.

![Graph showing family size vs average monthly water consumption in WB, with $R^2$ values for winter and summer](image)

**Figure 34**: Family size and Average monthly water consumption in WB

![Graph showing family size vs average monthly water consumption in WB, with $R^2$ values for winter and summer](image)

**Figure 35**: Family size and Average monthly water consumption in WB

But still, the increase in water consumption is insignificant compared to increase in family size. This can be justified by the fact that families in most of the West Bank localities and districts do not receive the minimum water quantity essential for covering their basic needs. In addition, data shows that family ranges between 4-6, 10-12, and 16-18 members have very poor correlations between the two variables, particularly in the summer ($R^2 = 0.09$, 0.20, and 0.03, respectively). The reason behind these values is that most of these families are
located in districts with low water availability such as Hebron, Nablus, Junin, and Ramallah. Therefore, each family consumes almost all of the quantity of water received by the network through direct consumption and/or water storage for the water cut periods particularly in summertime. At the same time, data shows that the cubic meter prices in the above mentioned districts are higher compared to other districts in the West Bank (4.5, 4.5, 4.5 and 4.2 NIS/m³, respectively). On the other hand, both additional water supply and connection to the local network have no impact on water consumption. As for average monthly per capita water consumption, it was found that there is a strong inverse relationship between the two variables both in summer and winter ($R^2 = 0.65$ and $0.73$, respectively). As family size increases, monthly per capita water consumption decreases, as shown in Figure 36.

![Family size Vs average monthly per capita water consumption](image)

**Figure 36**: Family size and Average monthly per capita water consumption in the WB

This could be attributed to the fact that the increase in family size is accompanied with a decrease in monthly income per capita, thus a decreased amount of consumed water. However, the reason behind the small differences between per capita water consumptions, regardless of family size, for some groups could be the inelastic amount of basic water demand (water consumed for basic needs such as home cleaning, cooking, and washing) which is almost the same for all households regardless of family size. Given that most families in the West Bank receive almost constant or even decreasing amount of
water to cover their basic needs, this water quantity becomes smaller when divided by a higher number of family members.

5.3.1. d. Family Size and Average Monthly Water Cost

Generally, a direct relationship was found between family size and average monthly water cost, particularly in the summertime. Figure 37 shows this relationship:

![Figure 37. The Relationship between family Size and Average Monthly Water Cost in WB](image)

Generally, these figures indicate a direct relationship between family size and both monthly water consumption and monthly water cost for most of the surveyed families. Thus, a direct proportionality can be concluded between monthly water consumption and monthly water cost. However, this relationship is weaker in summer than it is in winter for reasons related to the use of additional water supply, which will be clarified below. Additionally, it can be noticed that water cost in the summer is higher than it is in the winter, due to the higher water consumption in the summer. Also, the figures reveal that as average monthly per capita water consumption decreases, average monthly water cost increases for most of the surveyed families, particularly in summertime. In summer, families with 13-18 members pay almost the maximum water cost for lower water consumption compared to other families. This could be attributed to the fact that most of these large size families live either in rural areas with poor local network services or in districts with low water availability, thus higher water cut frequencies such as Jenin, Hebron, and Ramallah (20, 11 and 15 families, respectively). Therefore, those families consume the highest amount of additional water supplies, such as tank-provided and
bottled water (which are normally more expensive than water from the local network), compared to the other families. Consequently, they consume less water and pay higher prices, as shown in Figure 38

![Figure 38. The Relationship between Family Size and Average Monthly Water Cost from Local Network and Additional supply in summer](image)

However, families from Tulkarem, Qalqilya, and Jericho are excluded from this situation because more water wells (legal and illegal) are available in these districts, where additional water supplies becomes less important.

Moreover, it was found that the exponential trend line for water costs in summer has higher correlation value with family size ($R^2=0.61$) than that it does in winter ($R^2=0.33$). This is due to the higher water consumption from additional water supplies in summertime compared to wintertime. Figure 39 shows the relationship between family size and average monthly water cost in winter from both local network and additional water supplies.

![Figure 39. The Relationship between Family Size and Average Monthly Water Cost from Local Network and Additional water supply in winter](image)
And since additional water supplies are expensive, buying higher amounts in the summer would strengthen the relationship between family size and monthly water cost more than it does in the winter. Families of different sizes are obliged to buy water amounts according to their sizes at higher prices to cover their basic needs regardless of their monthly income.

5.3.1. e. Average Monthly Income Per Capita and Average Monthly per Capita Water Consumption

Figure 40 shows the direct proportionality between average monthly income per capita and average monthly per capita water consumption, both in winter and summertime ($R^2= 0.51$ and $0.66$, respectively), with 72.4% of the surveyed families having an average monthly income per capita that falls between 255-547 NIS. In addition, we notice that families with average monthly income per capita of 450 NIS and above, constituted of 1-12 members, consume higher quantities of water than families with average monthly income per capita less than 450 NIS and constitute between 13-37 members. In other words, the average monthly per capita water consumption of high income smaller families is higher than that of large poor ones.

Figure 40: The relationship between average monthly income per capita and average monthly per capita water consumption in the WB.
5.3.1. f. Average Monthly Income Per Capita and Average Monthly Per Capita Water Cost

In summer, a very weak relationship was found between average monthly income per capita and average monthly per capita water cost ($R^2 = 0.05$). Figure 41 shows the relationship between average monthly income per capita and average monthly per capita water cost in summer.

For example, the first group of poor families (132 NIS/capita/month)\(^{84}\), consumes 3.2 m\(^3\)/capita/month, as shown in Figure 41, and pays 21.9 NIS/capita/month. In contrast the group of rich families (797 NIS/capita/month), consumes 4.1 m\(^3\)/capita/month and pays 20.5 NIS/capita/month. The reason behind these results is that the poor who normally live in rural areas with low connection to local networks consume more expensive water supplies and pay 13.4 NIS/capita/month for these supplies. Whereas, the rich who normally live in urban areas with better water services, pay only 4.6 NIS/capita/month for additional water supplies. In other words, the poorest families pay 16.5\(\%\)\(^*\) of their income for water, while the rich pay 2.6\(\%\) of their income for water in summertime. Figure 42 clarifies the relationship between the two variables for both types of water services.

Figure 41: Average monthly income per capita and average monthly per capita water cost in summer

For example, the first group of poor families (132 NIS/capita/month)\(^{84}\), consumes 3.2 m\(^3\)/capita/month, as shown in Figure 41, and pays 21.9 NIS/capita/month. In contrast the group of rich families (797 NIS/capita/month), consumes 4.1 m\(^3\)/capita/month and pays 20.5 NIS/capita/month. The reason behind these results is that the poor who normally live in rural areas with low connection to local networks consume more expensive water supplies and pay 13.4 NIS/capita/month for these supplies. Whereas, the rich who normally live in urban areas with better water services, pay only 4.6 NIS/capita/month for additional water supplies. In other words, the poorest families pay 16.5\(\%\)\(^*\) of their income for water, while the rich pay 2.6\(\%\) of their income for water in summertime. Figure 42 clarifies the relationship between the two variables for both types of water services.

---

\(^{83}\) data was output of a merging between two field survey one done by this research and one by PHG at different dates

\(^{84}\) Poor or rich is the term expressing the value of unit in

\(^*\) It has been stated that the cost of water supply should not exceed 5\(\%\) of family income (Katko,1990) cited in (Tamimi et al.,2005).
Figure 42. The Relationship between Average Monthly Income per capita and Average Monthly per capita Water Cost in summer for both Local Network and additional Water Supply

As mentioned earlier, in spite of the proportional relationship between average monthly income per capita and monthly water consumption in the summer as shown in Figure 41, this relationship disappears with the average monthly per capita water cost as shown in Figure 43. This result highlights the fact that money paid for a specific amount of consumed water does not necessarily represent that amount, which reveals the inequity of the water pricing system among West Bank districts. As for winter, the proportional relationship between average monthly income per capita and both monthly water consumption and monthly per capita water cost was found to be strong ($R^2 = 0.66, 0.85$ respectively), as shown previously in Figure 42.

Figure 43: The relationship between average monthly income per capita and average monthly per capita water cost in the winter for both local network and additional water supply
Such results reflect the lower amount of consumed water from additional supplies in the winter compared to the summer (1.5 and 13.4 NIS/capita/month, respectively, for the poorest families). The percentage of monthly income paid for water in the winter for the lowest and highest per capita income groups are 4.8% and 1.4%, respectively.

5.4. Willingness to Pay (WTP)
Willingness to pay is an economic indicator used to delineate an individual’s opportunity cost for water. Opportunity cost is the cost of not being able to use the resources for another purpose, be it economic, social, environmental or generational85. Willingness to pay is a dynamic parameter resulting from the combination of affordability and willingness to use. The latter is a relatively new concept which can be defined as the maximum amount of desire one can willingly express for a certain commodity or service. It is a function of many technical, institutional, financial and legal factors. It may also include factors such as the scarcity and value of the resource. Meanwhile, affordability is the expression of ability to pay for a service or commodity and is a function of the price of the service or commodity and the income of the user. Accordingly, determining willingness to pay by users is not an easy process, simply because some users may value a service much higher than others and therefore, they may be willing to pay a higher price than others. However, careful measurements of willingness to pay will provide an insight into public opinion regarding the value of water and will allow for the inclusion of public concerns regarding water prices into any future water pricing policy. Willingness to Pay (WTP) can be measured by several methods. Despite all its drawbacks the most commonly used method is the Contingent Valuation Method (CVM). However, many techniques were introduced to reduce the problems encountered with this method. For example, bidding game was introduced for survey respondents to reduce strategic bias. Another major contribution to reduce the CVM biases was the double referendum method. It simply aimed at eliciting responses by introducing a second bid conditional on the answer of the first bid.

85 The right of future generations to have water
The current research has tried to adopt the CV method to measure the willingness to pay. In the meantime, it differentiated three categories of willingness to pay as follows:

1. Willingness to pay to recover cost.
2. Willingness to pay to develop water resources
3. Willingness to pay for sustainability of resources and supply

The reason behind this differentiation is to enable the researcher to draw limits for maximum and minimum willingness to pay levels and to reveal its purpose. In addition, it is used to be able to compare such levels with the existing tariff structures in the various areas and to try to conclude an average water price that may be recommended at national level. Yet, to be able to draw a reliable conclusion, it was important to determine the independent variables that influence the various categories of willingness to pay for water in the West Bank and check the interrelation among these variables. Accordingly, two levels of analysis were performed, bi-variate and multivariate analysis. The results obtained from the bi-variate analysis can be summarized as follows:

1. People in the areas not connected to water are all willing to get connected to water supply. They are also willing to pay fees to get connected. The weighted average of the fees that people are willing to pay is 672 NIS while the largest percentage (nearly 71.9%) indicated that they could pay 250 NIS only to get connected. Figure 44 shows this variation. The reason behind this variation is most likely due to the variation in income levels.

---

86 some data obtained from PHG files
2. It was difficult to define the exact amount that people are willing to pay for the cubic meter. However, the results obtained from the bidding game showed that the weighted average that people are willing to pay is 6.7 NIS/m³ while the largest percentage (nearly 62.5%) indicates that they are willing to pay 3 NIS/m³. This percentage decreased with the increase in the water price. Figure 45 shows the relation between the price of cubic meter and the willingness to pay percentage.

![The willingness to pay percentage compared with the price of cubic meter](image)

3. The average willingness to pay varies from one district to another and between the connected and not connected communities within the district itself. It was noticed that willingness to pay to cover the cost of water and to insure its sustainability is higher at the area which is not connected than it is in the connected areas. The average willingness to pay to cover cost and to insure sustainability is 5.5 NIS/m³ and 12.33NIS/month respectively in the non-connected areas while they are 1.41 NIS/m³ and 10.01 NIS/month respectively in the connected areas. Figures 46 and 47 shows the variation in the willingness to pay for water across districts. Figure 46 shows the variation in the connected areas and figure 47 shows the variation in the areas not connected.
As can be noticed from figure 45 that the lowest rate that people are willing to pay to cover the cost is at Bethlehem, 0.13NIS/m³. The highest rate however is recorded at Qalqilia and Salfeet area at 4NIS/m³. In the mean time the lowest rates for developing water resources and for sustainability cost was recorded at Jenin at 5.4 NIS/month and 6.3 NIS/month respectively while the heights was recorded at Hebron at 15.23 NIS/month and 14.08 NIS/month respectively.

4. The variation of willingness to pay within the same district between connected areas and non-connected areas to water supply system was also substantial except in Qalqilia and Salfeet and Tulkarm districts. In the time that people in the connected areas in Hebron are willing to pay 2.35 NIS/m³ to cover cost, the people in the non-connected

---

87
areas are willing to pay 8.44NIS /m³ to cover cost, almost four times more. This also applies for Jenin and Nablus. Figure 48 shows the variation between connected and non-connected areas across districts.

Figure 48. Comparison of WTP Variation between the Connected and unconnected areas

5.5. Cost and Affordability

Generally, water supplied through the domestic network costs consumers approximately NIS 4/m³, and people find this fair. However, given the very low income levels, the PCBS 2007 survey found that average expenditure on water from all sources was about 8% of household income – and much more again for low income households. This level of water expenditure is double the standard of 3.5% of household expenditure (World Bank, 2009) recommended by UNICEF & WHO. High costs and poor service contribute to low payment rates, which may lead to increased dependence on Israel. This high cost of water in relation to income is one reason why the cost recovery rate for network supply averages 45% nationwide (Interview with PWA). The government ends up footing the bill. It is the poor unconnected consumers who pay the highest costs – up to nearly half of their household budget – and run the biggest health risks. The poorest and most
vulnerable communities are those in Area C\textsuperscript{88}. They are vulnerable to both access controls and to the high cost and poor quality of water. The summer months of June-October are when these communities are most vulnerable. The PCBS 2003 survey was used to compare average water expenditure share of income for each income group. The poor who are dependent on tankers may pay out almost half their income on water, five times more than the poor who are connected figure 49.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure49.png}
\caption{\% of Income for Water Payment per Social Group (Source: PCBS, 2003. MAS, 2009, PHG, 2009)}
\end{figure}

5.6. Water Supply Findings
Most of the Palestinians towns and villages live under severe and detrimental water shortage started with the beginning of the Israeli occupation to the Palestinians lands in 1967. Israel immediately issued many military orders accompanied with on ground actions to fully control the ground, and surface, Palestinian water resources including the water of the Jordan River. According to these military orders, the Palestinians were not allowed to do any activity relating to water, including; water abstraction, hauling or using springs water, or doing any activity relating to water measurements and tests. These were conditional to prior approval from the Israeli military governor through what was called, the water officer, who was in charge of supervision and control on the water sector in the occupied Palestinians lands. From one side, and in parallel with the tightening of its

\textsuperscript{88} The Palestinian areas under full Israeli control
measures on the Palestinians in the water sector, the occupation authority granted the Israeli water company, Mekeroth, the full authority to drill wells, build reservoirs, and construct the net works to supply water to the Israeli colonies that the Israeli occupation started constructing in all over West Bank.

Historically it is well known that most of the Palestinian towns and villages were built on near the springs and seeps, and most of these towns and villages were named after the names of these springs and seeps. The Palestinians were totally dependent on these sources of fertile and fresh water for their domestic and agricultural uses. Most of these sources dried and ended, no further alternative water sources are present for the Palestinians to depend on for their needs especially in the presence of the Israeli water policy and its military measures and actions concerning the prevention of the Palestinians from drilling new wells or even rehabilitating the existing ones. Because of this, still there are more than 250 Palestinian communities, in all over West Bank that have no access to water and do not have networks. The populations of these UN served communities are around 450 thousands; these depend on the collection of the rain in limited underground reservoirs, known as collecting cisterns. The water of these cisterns is usually not suitable for drinking. In addition to this, most of these villages buy their water for domestic use from the shallow agricultural wells, if these wells are present. Or they are forced to buy some of their waters from the water tankers at very high prices that reach 20 NIS per meter cube, these waters are not monitored, and sometimes are not healthy but they are forced to do so. For other Palestinian communities that are around 385 with population of around 1.4 millions, the services such as net works, main pipelines, of water are available. These communities get their waters from their own water resources or they purchase it from Meerut at a cost of 2.2 NIS per meter cube. The average per capita of supply to these communities does not exceed 90 l/c/d, taking into consideration the average loss which exceeds 40%, due to the old age of the networks and the high leakage rate, this indicates that the true average of the consumed water by the Palestinians for both the domestic and industrial purposes, does not exceed 55 l/c/d, which is six to seven times less to what is available to the Israeli capita inside Israel, and
twelve times less to what is available to the Israeli capita living in the colonies inside West Bank.

Comparing the average international per capita minimum need according to the WHO standards which is around 150 l/c/d, and what Palestinians in these governorates are getting, the amount supplied is less than 20% of the recommendations of WHO, and as we noted, a high proportion of the available water sources are not healthy (PHG WASH Program).89 This difficult and dangerous water situation affects the lives of the population of Tubas governorate and serves as an example that can be applied on many other governorates in West Bank, such as Hebron and Bethlehem and many other villages in Tulkarem, Qalqilia, Nablus, and Salfit. The problem of water shortage and sometimes unavailability is one of the biggest problems. Severe sufferings are facing most of the Palestinian families in many of the unserved villages and communities. The population growth coupled with the increasing water shortage problems will, with time, have a dangerous impact that threatens the health, social, and economical environment of most areas of West Bank. This leads to the conclusion that if this problem continues and the suffering of the Palestinians increases and continues this will lead the region to instability. The average water supplied for Palestinians, in the West Bank, for the domestic and industrial purposes are around 61mc m/y. 52% of this quantity is purchased from Meerut, a big proportion of it comes from Israeli wells drilled in West Bank, and the rest comes from Israeli wells drilled in the Western Basin inside Israel and near to the green line. This means that most of the purchased waters are originally from the Palestinians water sources. In the same time, especially in summer, Meerut reduces the supplied quantities to the Palestinians to more than 40% in order to increases the quantity of water supply to the Israeli settlements inside West Bank to water their gardens and fill their swimming pools. According to the available statistics in the Palestinian Water Authority, the losses percentage in the networks ranges between 30-50% at most. This high percentage is due to its long period in service and the bad condition of the networks, in addition to the other physical reasons such as the length, diameters, coverage area, and the difference in elevations and pressure.

89 WASH : Water and Sanitation monitoring program funded by UNICEF between 2006-2010)
5.7. Water Pricing in Palestine
In 1996, the Palestinian Authority (PA) passed Law No. 2, which provided for the formation of the Palestinian Water Authority and delineated its powers. The law also provided for the establishment of the National Water Council, the higher authority charged with setting water policies in the PA areas. This law was abrogated in 2002, and replaced by Water Law No. 3 of 2002, which reaffirmed the formation of the Water Authority and the High Water Council. Article 20 of the law stipulates that: “a unified tariff system for water shall be set, which may be amended from time to time, with the aim of encouraging the water users to conserve the available water resources and to ensure its optimal usage.” Article 25 sets down the legal basis for the administrative authorities that provide water to citizens in the various geographical regions, stipulating that: “regional water utilities will be established based on the needs of local authorities and water user associations, to provide water and wastewater services, and will set their tasks, responsibilities, and composition in accordance with regulations that will be issued for this purpose.” Article 26 stipulates that: “Regional utilities and water user associations shall set the prices of water for different usage, in accordance with the tariff system.” As of yet no unified tariff system has been adopted. Each Governorate follows its own system set by the municipalities or the water utility in charge. (See annex V and IV)90

5.7.1. Reasons for Discrepancy in Water Prices
A number of reasons are behind the discrepancy in water prices between the West Bank and Gaza Strip, as well as between West Bank governorates. These reasons may be summarized as follows:

5.7.1. a. Diversity of Water Sources
There are multiple sources of water in the PA areas. Some water is purchased from the Israeli company Mekorot, and some is extracted from artesian wells to meet the needs of a governorate or city. Some is generated from shallow wells or springs and surface water. This diversity of water sources affects price determination:

90 Annex V and IV “Questionnaires for interviews water utilities and municipalities)
Water purchased from the Israeli company (Mekorot): The Palestinian Water Authority’s West Bank Water Department purchases a large quantity of water from the Israeli company (Mekorot). The percentage of water purchased from this company comprises more than 50% of all water consumed in the West Bank and Gaza Strip. The local authorities that rely on purchasing from Mekorot include: the Hebron Municipality, most local councils of villages and townships in the Hebron Governorate, the Jerusalem Water Utility (JWU) for the Ramallah and Al-Bireh area (where the amount of water purchased in 2000 was approximately 83 percent of water consumed), Salfit, Jenin, and Bethlehem.

Water generated from artesian wells: Some potable water is extracted from a limited number of artesian wells. The cost of generating a cubic meter from artesian wells is usually less than the cost of purchasing a cubic meter from the Israeli company. The cost of generating water from an artesian well depends on its depth: the deeper the well, the higher the cost of production. For example, the cost of generating one cubic meter from the artesian wells managed by the water utility in Ramallah is approximately 3.5NIS/m³ (i.e. higher than the cost of purchasing water from the Israeli company at 2.38 NIS/m³), whereas the cost of generating one cubic meter in the Tulkarem governorate does not exceed 1 NIS.

Water generated from shallow wells: A small quantity of potable water is generated from shallow wells, especially in some villages in Jenin as well as in some areas in Gaza Strip. The cost of generating water from such wells fluctuates between 1 and 1.5 NIS per cubic meter, (i.e. less than the cost of water generated from deep wells and less than the cost of water purchased from the Israeli company). However, the quantity of water generated from these wells is much less than that of water generated from deep wells.

Water generated from springs (surface water): There are many springs that provide potable water, such as Al-Sultan spring in Jericho and Al-Matwi spring in the Salfit governorate. The cost of water generated from springs is less than that of water generated from the sources mentioned above. The cost of generating one cubic meter from a spring does not exceed 0.70NIS in Jericho; this is attributed to the small amount of energy used in production.
5.7.1.b. Diverse Energy Sources Used in Water Production and Distribution

The type of energy used in water production and distribution significantly affects costs, particularly since the majority of wells in the West Bank are deep wells and thus require a large amount of energy to extract water from the ground, pump it into the main storage tanks, and then pump it through the water systems (i.e. the deeper the well, the higher the energy consumption and thus, the higher the costs). Costs also depend on the elevation to which the water is being pumped: the higher the elevation of the receiver, the higher the costs. On average, the cost of generating one cubic meter using electricity is less (by approximately 0.40 NIS) than the cost of generating one cubic meter using diesel fuel. It is noteworthy that most municipalities still use diesel motors and aging generators in water production, wherein a number of obstacles arise because wells are not connected to the electric grid.

5.7.1.c. Disparity in the Efficiency of the Means of Production and Distribution

Disparity in the quality of the means of water production and distribution results in price discrepancies. The use of more efficient means of production (and the use of modern technology) lowers the costs of generating water. Conversely, the use of unsuitable, non-uniform technology complicates maintenance and operation and results in higher costs. The use of aging machinery (including generators, motors, pumps, etc.), increases maintenance costs and requires continual repair. This is reflected in the price of the water provided. Although some wells use modern equipment, their spare parts are unavailable locally or their repair requires foreign expertise that cannot be garnered quickly. For example, some of the Water Authority’s wells in Ramallah and the Hebron municipal well in the Batan Al-Ghoul area of the Bethlehem governarate ceased pumping water for more than three months during 2006, when their pumps broke down and the necessary spare parts were unavailable locally. The parts had to be brought in from abroad, along with a specialized expert to install them. This is in addition to the Israeli-erected obstacles related to obtaining the permits required to undertake such work.
5.7.1.d. Disparity in the Accounting Systems
Standardization of the accounting systems that the authorities use to manage water provision would, in and of itself, help to narrow the discrepancy in the tariffs between the various governorates. Currently, more than one system is used to calculate the cost of one cubic meter of water. Moreover, most water facilities operating in the various governorates do not rely on scientific, modern accounting systems. In calculating the cost of one cubic meter of water, some facilities do not take into account depreciation of the value of water systems, maintenance costs, employee wages, or interest on loans. They likewise do not take into account the costs of immovable assets, such as wells, storage tanks, waterlines, water networks and equipment used in water production and distribution—a primary source of the actual overall cost. This means that the calculated costs do not, in reality, reflect the actual costs of providing water to the consumer. Moreover, the absence of a unified accounting system among all water sector facilities thwarts efforts to cover production and distribution costs, which causes overall financial losses (Alamarah, 2009).

5.7.1.e. High Percentage of Lost Water
‘Lost water’ refers to the quantities of water that are unmeasured or unaccounted for, when the quantity of water sold to consumers according to their bills is less than the quantity pumped from the water system. To cover the costs of lost water, local authorities and water sector facilities usually pass them on to the consumer: an increase in lost water means an increase in price. There are two main types of ‘lost water’:

i) Technical or physical loss: This type includes water lost through pipe breakage, especially in aging water systems; leakage from service connections; faulty construction or installation of water systems, service connections, or water meters; and meter imprecision in measuring the actual quantity of water consumed.

ii) Commercial loss: This type includes water lost through theft, illegal service connections, and unrecorded quantities of water.

In the West Bank and Gaza Strip, lost water is a significant problem. In some municipalities, such as Tubas and Jenin, total lost water reaches 40 percent or more, and in some areas, such as Hebron and Bethlehem, commercial lost water reaches 30 percent. Water loss has increased perceptibly during the Intifada, as the occupation authorities
have damaged water systems and storage tanks and created obstacles for the parties responsible for their repair.

5.7.1. f. Absence of Sound Management in Some Water Service Facilities
There are scores of local authorities and public facilities that supply water to Palestinian citizens and that are also responsible for managing water service provision and determining costs. The role of a single entity to overseeing water service provision to citizens should involve a number of monitoring measures, especially the following:
A. Putting in place a unified tariff system for water and overseeing its application.
B. Adhering to modern accounting methods and relying on a unified system for calculating charges.
C. Determining the sources of costs for service and yields.
D. Setting criteria with which water facilities must comply.
E. Setting prices for various usages, in accordance with priorities that should be determined.

5.7.1.g. Absence of Effective Awareness
Raising the level of awareness among citizens about water consumption and utilization holds tremendous importance of reducing water consumption and costs. In this regard, the bodies managing the water sector must work to raise the level of consumer awareness on the importance of lowering consumption by installing regulators for faucets, showers, and toilets; using methods to collect excess water (cisterns); and using modern irrigation methods, such as drip irrigation. Furthermore, devices for rationing and conserving water should be distributed to participants free of charge or for a nominal fee.

5.8. Institutional findings

5.8.1. Water Governance
Before describing the status of the governance in WB, it is important to give a brief chronology of the history of water status and development of the institutions
The following diagram illustrated the timeline of the governance and institutional development along the modern history (figure 50)
It is clear that the Palestinians inherited a fragmented and inefficient water institution, and the water governance has been reformatted for political interest throughout its history. Despite the water scarcity and emerging water needs the Palestinian water sector in the WB features a fragmented and heterogeneous makeup. As illustrated below, the policy, planning and regulatory roles belong to an inter-ministerial body that has met once during 1997-2008, the National Water Council (NWC). And to the Palestinian Water Authority (PWA), along with the Ministry of Agriculture for matters relating to irrigation. On the service side, water production is carried out by the West Bank Water Department (WBWD)-, PWA, as well as through municipal or private well operators. Depending on the community, water distribution is ensured by regional utilities (JWU, WSSA) and municipal utilities in urban areas, or by Village Council water departments and Joint Service Councils (JSCs), in rural areas. To varying degrees the bulk water supply of these fragmented, often low capacity operators, is dependent on a single high capacity Israeli water company (Mekorot) managing the scarcity through interconnected systems. However the double level of policy making and management (Israeli and

---

**Figure 50. Chronology of Water Management**
Palestinian) Complicated and enhance the fragmentation of the sector, the following
diagram shows the degree of the lack of integration at all levels. (figure 51)

**Figure 51. Water Institutional Structure**

The institutional framework of the sector is not fully functioning. The Water Law
provided for sector governance, including separation of resources management and
regulation from resources use. However this vision is not reflected in the present
governance framework, the national water council has never functioned as intended.
PWA failed to fulfill its commitment to be a pure regulator. The water suppliers remain
scattered, there are no unified policies and no reasonable guidelines there is a major
differences between the governance envisaged under the law and the current set up. The
sectors governance concerns require technical assistance and a cluster of policies. (World
Bank, 2009). There is no strategic focus and certainly no strategy for the future that takes
account the possible outcomes of the political settlement of dispute. The PWA has been
managed in a largely autocratic fashion over the last 10 years in particular, with *ad hoc*
decision making being the norm and very little transparency, donor coordination has been
insufficient, leading to undesirable overlaps between projects and confused responsibilities. In part as a result of this, the PWA has received conflicting advice on important issues, and does not possess the capacity to distinguish a preferred route forwards. (Audit Project Report\textsuperscript{91}, not published)

The well known internal divisions within the Palestinian water sector include resentment of the traditional or existing municipal water suppliers of the approach imposed by the “PWA new comers” and the radically different approaches in sector development in sector development styles existing between the “top down PWA” and the “bottom –up NGOs”. The almost complete lack of any coherent separation of powers amongst the various institutions ensures that many sector tasks are duplicated (e.g. project implementation, research assessment) while others are essentially neglected. The institutional are exacerbated by competition for donor funds, which often ends up pitting Palestinian institutions against each other. There have been many attempts at improving governance of the water sector\textsuperscript{92}, most notably those by AFD, Finland, GTZ, USAID and the World Bank (NSU, 2009). The most recent initiative, a 2008 PWA water governance program in the water sector. This program seeks to prioritize internal sector governance as a standalone issue and seeks separate funds to continue to address the topic.

5.9. Uncertainties Findings
The main uncertainties are political, socioeconomic, institutional and environmental.

Table 12 .Typology of Uncertainties

\textsuperscript{91}Several donors request to have an overall audit for PWA and the final report not published yet
\textsuperscript{92} The Problems noted include strong fragmentation in the water sector; inherent problems with the institutional arrangement in the sector; a lack of any coherent enforcement of the water law; a strong emphasis on crises management rather than mid to long-term planning ; in adequate data And information.
<table>
<thead>
<tr>
<th>Item</th>
<th>Components</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Political Uncertainties</strong></td>
<td>1. Internal and external violence</td>
<td>1. Poor utilities</td>
</tr>
<tr>
<td><strong>Instability of security</strong></td>
<td>2. Social polarisation</td>
<td>2. Lack of transparancy</td>
</tr>
<tr>
<td></td>
<td>3. Weak law enforcement</td>
<td>3. Disability of policy implementation</td>
</tr>
<tr>
<td><strong>War and violence</strong></td>
<td>4. Political interest high priority</td>
<td>4. Bad governance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Weak public sector monitoring and control on utilities</td>
</tr>
<tr>
<td><strong>B. Socioeconomic uncertainties</strong></td>
<td>1. Increasing poverty rate</td>
<td>1. Poor affordability</td>
</tr>
<tr>
<td>(fluctuation of the socioeconomic conditions)</td>
<td>2. Increasing unemployment</td>
<td>2. Poor utilities revenues</td>
</tr>
<tr>
<td></td>
<td>3. Increasing social conflicts</td>
<td>3. Social conflicts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Poor services and lack of customer satisfaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Collapsing some of water supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Increasing illegal connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Lack of transparancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. Poor infrastructure</td>
</tr>
<tr>
<td><strong>C. Institutional uncertainties</strong></td>
<td>1. Instable Institutions</td>
<td>1. Poor performance</td>
</tr>
<tr>
<td></td>
<td>2. Overlap responsibilities</td>
<td>2. Lack of policies</td>
</tr>
<tr>
<td></td>
<td>3. Contradictory and scattered policies</td>
<td>3. High corruption</td>
</tr>
<tr>
<td><strong>D. High dependency on International aid 60-80% of the public budget</strong></td>
<td>1. No long term commitment from the donors</td>
<td>1. Weak public sector</td>
</tr>
<tr>
<td></td>
<td>2. Fund highly politicized</td>
<td>2. Scattered un-coordinated Policies</td>
</tr>
<tr>
<td></td>
<td>3. Hidden agenda of some donors</td>
<td>3. Relief Projects more than development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. No linkage between short and long term plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Posing important project due political dispute with israelis</td>
</tr>
<tr>
<td><strong>E. Environmental Uncertainties</strong></td>
<td>1. Long term drought</td>
<td>1. No experience in mitigation measures</td>
</tr>
<tr>
<td></td>
<td>2. High water pollution</td>
<td>2. Reduction of availability of good water quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Lack of preparedness</td>
</tr>
</tbody>
</table>
5.9.1. Uncertainties (Political, Socioeconomic and institutional Framework)

More than seven years (2000-2007) of political violence and instability have plunged the Palestinian economy into a deep crisis, causing dramatic declines in living standards. Donors and policy makers are naturally concerned that the resources available reach those who are most depend on emergency assistance. Their concern is reinforced by two perceptions: due to the deterioration of the socioeconomic condition, the poorest people have exhausted their saving and are increasingly vulnerable to permanent poverty traps should they face the further economic shock, and the poorest will be unable to benefit from economic recovery because they tend to be unskilled or unable to find new jobs. The uncertainties have a negative impact on the water security at household level and water utilities level, the above table shows the main uncertainties and related impact on water sector (table .12)

<table>
<thead>
<tr>
<th>The impact of the uncertainties on utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to the above mentioned uncertainties, most of the utilities revenue decreased between 20-60 % which leads to increase the water price by utilities as attempt to cover the deficit. The price increase occurred without any legal or technical references. This kind of action lacks transparency and legality. The absence of water tariff structure and the weak public sector have created decentralized policies and mistrust between people and utilities. The limited water supply to Palestinians has shaped the development of the country. This situation had resulted in poor capacity building in water sector, limited rural development, poor and negative economic growth, an increase in poverty. As a result, the Palestinian authority exists in a complex environment over which it has no control, not least of all, because it is not officially recognized as the government of a state or country. The implication by the PA of basic and essential projects and plans will take many years to achieve. Quick results should not be expected unless the political and economic status of the country changes dramatically in a stable direction</td>
</tr>
</tbody>
</table>

Palestine is unique in that three factors are present in combination at the current time: a deep uncertainty over its political future; a volatile environment controlled by an
occupying force and a strong desire by external parties to provide assistance in improving the available infrastructure and the living conditions of Palestinians. In combination, these factors have tended to give rise to deep inertia in the Palestinian Authority, and great difficulty in attaining lasting improvement in Palestine. This is exacerbated on a regular basis by Israelis multiple methods of control and by in-fighting among Palestinians. The donor community has experienced major problems in providing coherent and meaningful assistance under the prevailing circumstances, but retains a strong presence and interest in the region. The interplay of political, practical and cultural issues has led to greatly reduced efficiencies within Palestinian Authority. Corruption, mismanagement, and in some cases autocratic leadership are problematic in many parts of the Government system. The division responsibilities are also confused, with major challenges for the creation of consensus on any issue. For its part, the Palestinian Authority suffers from many of the usual problems encountered amongst government organizations. (Interview with Negotiation Support Unit staff and Minister of Planning 93 ) Under such circumstances, the development of a consensual strategy for the water sector is highly challenging. Progress in this respect throughout the last decade has been exceptionally slow. (Interview with Head of Water Authority 94 and the coordinators of water sector working group 95 ). Previous attempts to undertake such strategy on the basis of the above mentioned circumstances on the basis of sweeping assumptions concerning the outcome of such political conditions render the preexisting plans of almost zero utility. This is deeply important in, but has not been recognized sufficiently by, any of the planning documents produces to date for the water sector 96 (Interview with policy advisor to PWA)

5.10. Findings of Willingness to Reform and Good Governance
Reform and development in West Bank is an integral part of our plan for bringing stability and prosperity for all Palestinians in the occupied territory. "We are committed to restoring the rule of law, good governance and respect for human rights in the West Bank. If the isolation of Gaza continues, we will work to maintain the supply of

93 Dr Samir Abdallah: Minister of Planning (2006-april 2009)
94 Dr Shadad Attilli : chairman of water authority
95 Eng Nadeem Melhem- Manager of water program GTZ
96 Fuad Bateh : Policy advisor for water authority
humanitarian assistance, the continued payment of public sector salaries and social transfers, and the provision of critical basic services - including electricity, water and sanitation, and health and education." (Palestinian Prime Minister Speech addressed to the Donors Meeting in Paris December, 2007)

Since June 2007, mindful of the need to restore the trust of citizens in its capacity to govern, the PNA has redoubled its efforts to bring safety, security and good governance to the occupied territory.

"By delivering on a challenging reform agenda, we intend to create a secure and stable internal environment in which social and economic development can take place and which, ultimately, will create the institutional infrastructure of the Palestinian state. This must go hand in hand with sustained and serious political dialogue, and concrete steps and commitments by all parties, towards a lasting peace. We have made significant progress in building institutions, including the passage of some of the most progressive laws in the Arab world and the peaceful conduct of free and fair elections. A series of public financial management reforms – including the establishment of the single treasury account, the formation of an internal audit function and the timely publication of public financial information – put the PNA ahead of many countries in the region. However, progress has been frustrated, and sometimes reversed, by insecurity and political and economic instability" Personal interview with minister of planning Ghassan khatteeb)⁹⁷.

The last two years have witnessed an unprecedented political and fiscal crisis that threatened to bring the PNA to the brink of collapse. The public sector strike during 2006 and early 2007 created great social distress, particularly as water and health services almost ground to a halt. (UNSCOM, December Report, 2007)⁹⁸

Enabling Environment: There is a commitment and remarkable process show that the political level is committed to reform, and to take actions to support the poor and vulnerable group, through a set of laws and regulations including water sector and tariff policy, and this will be a great help to enable the environment for an efficient water tariff structure. However the general environment is still under the expectation and still needs remarkable efforts to enhance the environment (figure .52)

⁹⁷ The interview held on 20th September 2007
⁹⁸ UNSCOM is The United Nations Special Commission to the OPT
In order to have a comprehensive picture about the water sector, the researcher used the water poverty index as a holistic tool to measure water stress at the household level and national level, designed to aid the national; decision makers, as well as donor’s to determine the status of the sector and possible interventions. The WPI fills the need for a simple, open and transparent tool, one that appeals to the decision maker and at the same time can empower poor people to participate in the better targeting of water policy interventions. Several researchers are claiming that WPI was designed as a composite, interdisciplinary tool, linking indicators of water and human welfare to indicate the degree to which water scarcity impacts on human population. In this research the idea behind using this tool is to see where Palestine stands in comparison with similar countries and what is the status of each component (resources, access, capacity, use and environment) of the water sector. One more added value is the ability to integrate the physical, social, economic and environmental aspects and to link water issues with poverty. Since the main research question related to the poverty and the linkage of tariff with socioeconomic indicator, Water Poverty Index is a good vehicle to see to what extent the water sector main components (capacity, resources, water availability, national...
GDP …etc) affect the water policy and will help to come with a conclusion where are the main interventions most needed.

5.11.1 Measurement of Water poverty

Several methods were found in the literature for calculating water poverty index (WPI). The following discussion includes several methods for calculating WPI in the water situation. As described in the chapter of literature review section (2.6.1) the main objective to use these indicators to produce a comprehensive indicator based on several parameters and sub indices (water and socioeconomic related indices) can help to understand the overall picture of water sector.

5.10.1. a. Falkenmark Method

The Falkenmark Water Stress Indicator, which was developed by the Swedish water expert Malin Falkenmark in 1989, is one of the most commonly used indicators for describing water availability in a country. The indicator is based on the estimation that a flow unit of one million cubic meters (MCM) of water can support 2,000 people in a society with a high level of development. Water availability of more than 1,700m³/capita/year is defined as the threshold above which water shortage occurs only irregularly or locally. Below this level, water scarcity arises in different levels of severity. Below 1,700m³/capita/year water stress appears regularly. However, below 1,000m³/capita/year water scarcity is a limitation to economic development and human health and well-being. Finally, below 500m³/capita/year water availability is a main constraint to life.

The current population of the West Bank is 2,372,216 (PCBS, 2005), and the overall water quantity is 551 MCM/yr. Therefore the annual per capita water availability is 229.95m³/yr. Therefore, according to the Falkenmark approach, water availability in the West Bank is a main constraint to life.

99 This attempt is the first time done in Palestine in order to see the inter-parameters effect on water management
5.10.1. b. Water availability index WAI

This index includes surface water as well as groundwater resources, and compares the total amount to the demands of all sectors, i.e. domestic, industrial, and agricultural demands. The month with the maximum deficit or minimum surplus respectively is decisive. The index is normalized to the range \([-1 \text{ to } +1]\). When the index is zero, availability and demands are equal.

\[
WAI = \frac{R + G - D}{R + G + D}
\]

(Laurence, et al. 2002) \hspace{1cm} (1)

Where, \(R\) = surface runoff, \(G\) = groundwater resources and \(D\) = sum of demands of all sectors. In calculating WAI, the following issues have to be taken into consideration:

c. The surface water availability is calculated as the 90% of the reliable runoff.
d. The groundwater availability is estimated either as the potential recharge that is calculated from the monthly surface water balance, or as the potential aquifer yield, and the lower figure is considered in the calculation.

According to the WAI approach,

\[
WAI = \frac{(0.9 \times (70 + 14 + 99) + 55) - 359.91}{(0.9 \times (70 + 14 + 99) + 55) + 359.91} = -0.242
\]

According to the WAI approach, water availability in the West Bank is not sufficient to satisfy water demand. Moreover, the value -0.242 means that the gap is large and new water sources and alternatives have to be introduced to reduce this gap. However this measurement is very general and only deals with water availability, since in the case of Palestine the water accessibility is a problem too.

5.10.1. c. Basic Human Needs Index

This approach is based on the use of water instead of water availability. Gleick (1996) quantified the amount of water that a person needs for basic water requirements (BWR), such as drinking, cooking, bathing, sanitation and hygiene, as 100 liters per person per
day. This indicator is only calculated on a country-level; therefore, regional water scarcity is not depicted.

<table>
<thead>
<tr>
<th>Connected areas</th>
<th>Unconnected areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average family size - 7.71 persons</td>
<td>Average family size - 8.36 persons</td>
</tr>
<tr>
<td>Average monthly water use in summertime - 26.06 m³</td>
<td>Average monthly water use in summertime - 18 m³</td>
</tr>
<tr>
<td>Average monthly water use in wintertime - 20 m³</td>
<td>Average monthly water use in wintertime - 13 m³</td>
</tr>
</tbody>
</table>

Table 13: Water Consumption *(Source: PHG 2005.)*

**Average water consumptions per capita in summer and winter**

Average water consumption for the connected areas in the summertime and wintertime is 115 and 89 L/capita/day, respectively. However, unconnected areas in the summertime and wintertime are 71.7 and 51.8 L/capita/day, respectively. Therefore, water availability for domestic use is insufficient and below the level for basic human needs. The Indicator has three shortcomings: first it is only applicable at country level; secondly, it deals with different social groups as if their situation was equal and thirdly, it is misleading. When the water used also for household economy, however this the consumption is not a real number *(Table.13).* however the actual average water consumption is about 40 L/C/D *(Which includes household agriculture)*

### 5.10.1. d. Conventional composite index approach.

One way of monitoring the link between water and poverty can be by a water poverty index (WPI). Such an index is currently being developed. This is a potentially useful index if data for its computation is made available. As Sullivan (2002) argues, “where there is water poverty, any measures to reduce income poverty are unlikely to be successful at national level, higher levels of income tend to have higher level of water

---

100 since this consumption includes leakage for connected areas and household economy for unconnected areas (livestock and home gardens)
Therefore identifying water poverty is a first and important step in the process of poverty eradication. In order to enrich the poverty dimension variables in the suggested conventional composite index approach, production and productivity, education for girls and leisure variables could be added. The conventional composite (WPI) approach better reflects water poverty for a community because it compromises various elements, such as:

1. Water availability.
2. Access to safe water.
3. Clean sanitation.
4. Time taken to collect domestic water.

The formula that gathers these elements is

\[ WPI = wa A + ws S + wt (100-T) \]  

Where:

A: Adjusted water availability (AWA) assessment (%) is calculated on the basis of ground and surface water availability related to ecological factors, human requirements, domestic demand, agricultural demand and industrial demand. A should also take into consideration seasonal variability of water availability.

S: Population with access to safe water and sanitation.

T: This index represents time and effort taken to collect water for household. (100-T) is the structure used to take into account the negative relationship between time taken to get water and final level of WPI.

\( wa, ws \) and \( wt \): These are the weights given to each component of the index \((wa+ws+wt = 1)\). The research assumed the three items have the same weight.

\( A, S, \) and \( T \) are between 0 and 100, so in order to have a number between 0 and 100, the total is divided by 3. Therefore

\[ WPI = \frac{1}{3} (wa A + ws S + wt (100-T)) \]

According to the conventional composite index,
Total available water is shown in the table 14:

The actual available water is significantly lower than 551 MCM/year (PWA, 2007). So, as the conventional approach doesn’t take into consideration the accessibility of water, then the value of actual water available was calculated as follows:

<table>
<thead>
<tr>
<th>Water Source type</th>
<th>Quantity (MCM/year)</th>
<th>Percentage of available water (%)</th>
<th>Actual water available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water</td>
<td>257</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>99</td>
<td>30</td>
<td>29.7</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>Flood water</td>
<td>14</td>
<td>30</td>
<td>4.2</td>
</tr>
<tr>
<td>Springs</td>
<td>56</td>
<td>60</td>
<td>33.6</td>
</tr>
<tr>
<td>Ground water</td>
<td>55</td>
<td>100</td>
<td>55</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td>143.5</td>
</tr>
</tbody>
</table>

Table 14: Actual Water Available

Domestic, agricultural and industrial water demands are respectively 71.41, 261 and 27.5 MCM/year. Therefore the total water demand for the three sectors is 359.91 MCM/year. Therefore,

Access (S)

Percentage of population with access to safe water is 70% (PHG, 2005).

---

103 Palestinians are prohibited by Israel from utilizing their right to water from the Jordan River.

104 Wadi water harvesting in large scale (e.g. dams) is prohibited by Israelis; moreover, this source of water is only available for 4 months.

105 A large number of springs need to be rehabilitated in order to be fully utilized.
Percentage of population with access to safe sanitation is 36.5% ( 
Therefore, \( S = \frac{70 + 36.5}{2} = 53.25\% \)

70% of the Palestinians are connected to water networks. The median monthly income is 1,600 NIS (PCBS, 2005). In the connected areas, the average monthly water bill in the summer is 121.55 NIS, while the average monthly water bill in the winter is 69.5 NIS. However, in the unconnected areas, the average monthly water bill in the summer is 194.64 NIS, while the average monthly water bill in the winter is 35 NIS (PHG, 2002). Accordingly, if the wintertime is considered as 4 months, then the mean monthly water bill is 104.03 and 141.42 NIS for the connected and unconnected areas, respectively. Therefore, 6.5 and 8.8% of monthly income, for connected and unconnected areas, respectively, is spent to cover the water bill. Therefore, the weighted average for the percentage of income paid for water is:

\[ 6.5 \times 0.7 + 8.8 \times 14\% = 5.38\% \]

Therefore, 100 - 5.38\% = 94.6\%\(^{105}\)

According to the water situation in the West Bank, availability of water is considered the main problem; therefore, the weighing is considered as follows:

\( wa = 0.5 \quad ws = 0.25 \quad wt = 0.25 \)

Therefore, the WPI according to conventional approach can be calculated as follows:

\( WPI = 58.56. \)

The above mentioned methods are useful in determining water situation for a country. However, these methods are not holistic. In other words, basic related aspects were not taken into account. For example, water quality and other water users, rather than domestic use, such as the industry, agriculture and nature (environment) itself, were not included at all in these approaches. Moreover, the socio-economic dimension for water scarcity/availability was not included in these approaches. Recently, the water poverty index (WPI) was developed by (Sullivan, 2002; Lawrence et al., 2002), via the Centre for Ecology and Hydrology (CEH) in Wallingford. This index tries to show the connection between water scarcity issues and socio-economic aspects. .

\(^{104}\) Some people connected but no water, the % here who has water more than three days/week

\(^{105}\) However this number changed dramatically by closure and restriction on movement
5.10.1. e. Water Poverty Index (WPI)

WPI ranks countries according to the provision of water, combining five components which are:

1) Resources  
2) Access  
3) Use  
4) Capacity  
5) Environment

Each of these components is derived from two to five sub-indicators which are normalized to a scale from 0 to 1. In the case of an equal weighting, the sub-index and component values are then calculated as a simple average of the corresponding indicators, and this value is multiplied by 20. The overall index is generated as a sum of the component values so that the value is between 0 and 100. A value of 100 is only possible if a country ranks best in all of the five components. WPI can be calculated according to equation (2)

\[
\text{WPI} = w_R R + w_A A + w_U U + w_C C + w_E E \quad (\text{Sullivan et al. (2002)}) 
\]  

In case of equal weighting, then equation (3) is:

\[
w_R = w_A = w_U = w_C = w_E = 20
\]  

Resources (R)

As discussed above, actual water resource availability is 143.5 MCM/year. Current water demand is predicted based on available data; water demand for the domestic, agricultural, and industrial sectors is 71.41, 261 and 27.5 MCM/year, respectively. Therefore, the summation for water demand by the three sectors is 359.91 MCM/year.

Therefore, \( R = \frac{143.5}{359.91} = 39.9 \)

Access (A)

% of population with access to safe water is 86% (UNDP, 2000).
% of population with access to safe sanitation is 36.5% (UNDP, 2000).
% of water demand by agriculture is 261/551 = 47.4%

**Therefore, A = 56.6**

**Capacity (C)**
- PPP per capita(GDP per person) = 1,051 (UNDP, 2004) → C1 = 1.051%.
Under-five mortality (per 1000) = 25 (UNDP, 2004) → C2 = 25%.
Education enrolment rate = 86% (UNDP, 2004) → C3 = 86%.
Gini coefficient = 0.32 → C4 = 32%.

**Therefore, C = 36%**

**Use (U)**
Domestic water consumption with total water quantity = 71.41/551 = 12.96%.
Agricultural water use adjusted by GDP derived from agriculture can be calculated as follows:
Proportion of GDP derived from agriculture = 9.6% .
Quantity of water consumption by agriculture = 261/551 = 47.4%.
→ U2 = 9.6/47.4 = 20.25%.
Proportion of GDP derived from industry = 14.7%.
Quantity of water consumption by industry = 27.5/551 = 5.0%.
→ U3 = 14.7/5 = 294%, → U3 = 100%.

**Therefore, U = (100 + 20.25 + 12.96)/3 = 44.4%.**

**Environment (E)**
**E1: Water quality**
Concerning water quality parameters, dissolved oxygen, turbidity, and Total Dissolved Solids (TDS) were in compliance with WHO guidelines for drinking water. However, significant differences were noticed between the concentrations of some parameters such as nitrate in the different wells. Therefore, it is more precise to consider this component at a smaller scale. However, the water quality index below is estimated based on the general data reported by PCBS (2005).

**Dissolved Oxygen (DO)**
The average DO in the West Bank is 5.84 mg/L, this number expressing the saturation concentration for oxygen. Therefore, water in Palestine doesn’t need further aeration before usage. According to Sullivan (2002), DO index is calculated as follows:

$$DO\ index = \left( \frac{DO}{1.2 \times DO} \right) = \left( \frac{5.84}{5.84 \times 1.2} \right) = 83.33\%$$

**Total Dissolved Solids (TDS)**

The maximum allowable TDS concentration according to WHO guidelines for drinking water is 1000 mg/L. As TDS concentration goes up, water quality deteriorates. The TDS index is calculated as follows, where the average TDS value in Palestine is 501.2:

$$1 - \frac{Average\ value\ for\ TDS}{1,000 \times 1.2} = 1 - \frac{501.2}{1200} = 58.2\%$$

**Nitrate (NO₃⁻)**

Nitrate concentration was used instead of phosphorus, since nitrate is one of the most dangerous compounds of consideration in Palestine, because of the increasing concentration of nitrate in the ground water as a result of pollution by wastewater from cesspits and cess pools, agricultural activities (such as fertilizers, pesticides, and herbicides), and industrial activities. Even though nitrate concentration differs considerably among the wells in the West Bank, an average for nitrate concentration of 42.1 mg/L was determined by PCBS, (2005). The highest concentration for nitrate according to WHO guidelines is 50 mg/L, and the nitrate index can be expressed as follows:

$$1 - \frac{Average\ value\ for\ NO₃⁻}{50 \times 1.2} = 1 - \frac{40.2}{60} = 29.5\%$$

**Turbidity**

According to WHO guidelines for drinking water, the maximum allowable concentration for turbidity is 5 NTU. In the West Bank, the average value for turbidity is 1.03 NTU, and the turbidity index is expressed as follows:

$$1 - \frac{Average\ value\ for\ Turbidity}{5 \times 1.2} = 1 - \frac{1.03}{6} = 82.83\%$$
Define $E_1$ as the water quality index, therefore:

$$E_1 = \frac{83.33 + 58.20 + 29.50 + 82.83}{4} = 63.47 \rightarrow E_1 = 63.47\%$$

$E_2$: Pesticide and fertilizer use in the West Bank.

Total cultivated land = 1,815 Million dunums (PCBS, 2003).

0.1 million donums $^{106}$ under irrigation.

1.6 million donums are rain fed.

0.115 donums are fallow lands.

96.6% of irrigated land use pesticides.

87% of cultivated land use pesticides.

Therefore, pesticides usage = \(\frac{(0.966*100,000) + (0.87*1,600,000)}{1,815,000}\) = 82.02%

Proportion of land using fertilizers/total cultivated land = 243,100/1,815,000 = 13.39%.

Percentage of the country under severe water stress = 25%.

$$\rightarrow E_2 = \frac{(82.02 + 25 + 13.39)}{3} = 40.14\%$$

$E_3$: Biodiversity (B)

% of threatened mammals = 5/94 = 5.3% (PCBS, 2003).

% of threatened birds = 12/378 = 3.2% (PCBS, 2003).

$$\rightarrow E_3 = \frac{(5.3 + 3.2)}{2} = 4.25\%$$

$$E_3 = \frac{(E_1 + E_2 + E_3)}{3} = \frac{(63.47 + 40.14 + 4.25)}{3} = 35.95\%$$

\(^{106}\) One donum = 1000m²
Therefore, the value of WPI according to the holistic approach can be calculated. The following table shows WPI values at different weightings.

<table>
<thead>
<tr>
<th>Country</th>
<th>R.</th>
<th>A</th>
<th>C</th>
<th>U</th>
<th>ENV.</th>
<th>WPI</th>
<th>HDI</th>
<th>Falkenmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>3.4</td>
<td>11.7</td>
<td>14.5</td>
<td>12.2</td>
<td>7.8</td>
<td>49.7</td>
<td>0.693</td>
<td>0.4</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>9</td>
<td>13.8</td>
<td>10.1</td>
<td>12.3</td>
<td>9.0</td>
<td>45.2</td>
<td>0.470</td>
<td>5.1</td>
</tr>
<tr>
<td>Egypt</td>
<td>3.4</td>
<td>18.3</td>
<td>13.3</td>
<td>12.5</td>
<td>10.5</td>
<td>58.0</td>
<td>0.63</td>
<td>0.4</td>
</tr>
<tr>
<td>Israel</td>
<td>0.8</td>
<td>16.7</td>
<td>16.8</td>
<td>10.9</td>
<td>8.6</td>
<td>53.9</td>
<td>0.89</td>
<td>0.1</td>
</tr>
<tr>
<td>Morocco</td>
<td>5.4</td>
<td>9.3</td>
<td>12.3</td>
<td>12.5</td>
<td>6.7</td>
<td>46.2</td>
<td>0.596</td>
<td>1.1</td>
</tr>
<tr>
<td>Palestine</td>
<td>11.97</td>
<td>14.15</td>
<td>9</td>
<td>6.6</td>
<td>1.79</td>
<td>43.51</td>
<td>-</td>
<td>&lt;.1</td>
</tr>
</tbody>
</table>

Table 15. The Water Poverty Index and Sub index with Falkenmark and Human development indices of a few selected countries

As described in the table 15, The Palestinian water sector has good resources in comparison with its neighbors; however the capacity to manage and use these resources is very low. As a result and as the calculated water poverty index indicates (43, 51), the general water availability is low.

**Benefits of WPI**

This water poverty index is a first attempt at trying to establish an international measure comparing performance in the water sector in the country in a holistic way that brings in the diverse aspects and issues that are relevant. It does seem to give some sensible results but it does not pretend to be definitive nor offer a totally accurate measure of the situation. No single figure or set of figures could do this, especially when they are meant to be representative of the progress or otherwise of a whole country. (Sullivan, 2003). In other words the WPI is not a tool to clarify the entire sector. Other methods and qualitative data can explain the situation better. This criticism focus on the fact that most of the sub-indices are not correlated with each other. The data itself needs more investigation, since there are sometimes differences between reputable estimates of the same variable, as in the case of water resources. Also some parameters depend highly on consultation and personal judgment. The other disadvantage is not cost effective if primary data needs to be collected.
5.12. Main Key Findings
Based on the data obtained from the multiple sources described in the methodology section a proper analysis was accomplished which took into consideration the main research questions and objectives. The main findings were categorized to serve the objectives of the research and to answers its questions.

5.12. 1. Water and poverty findings

<table>
<thead>
<tr>
<th>Average water consumption (l/capita/month)</th>
<th>% Water payment/income</th>
<th>weighted average payment per household</th>
<th>Average income household (NIS)</th>
<th>average income capita/month</th>
<th>%</th>
<th>Poverty degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.10</td>
<td>0.15</td>
<td>129.0</td>
<td>1010</td>
<td>152</td>
<td>12.3</td>
<td>Deep Poor</td>
</tr>
<tr>
<td>21.07</td>
<td>0.06</td>
<td>114.9</td>
<td>1966</td>
<td>255</td>
<td>27.1</td>
<td>Poor</td>
</tr>
<tr>
<td>29.55</td>
<td>0.04</td>
<td>137.5</td>
<td>3430</td>
<td>450</td>
<td>28.2</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>23.32</td>
<td>0.03</td>
<td>115.7</td>
<td>4212</td>
<td>547</td>
<td>17.9</td>
<td>Middle class</td>
</tr>
<tr>
<td>22.13</td>
<td>0.02</td>
<td>128.4</td>
<td>5212</td>
<td>676</td>
<td>7.1</td>
<td>Almost Rich</td>
</tr>
<tr>
<td>29.29</td>
<td>0.02</td>
<td>131.1</td>
<td>6145</td>
<td>797</td>
<td>7.4</td>
<td>Rich</td>
</tr>
</tbody>
</table>
Figure 53. Social Groups % of Payment from Their Income

- The above graph 53 and table 16 indicate that 12.3% of the people suffer from deep poverty while they pay about 13% of their income for water bills (this figure can reach 20% of the poor family’s income). And 27.1% of the people who are classified as poor pay about 6% of the income and 28.2% are vulnerable (during the last year 2008). The percentage of people who are classified as poor is more than 65% (due to the high rate of unemployment, internal violence and restrictions on movement imposed by Israelis).

- The other important key finding is that the poor communities are suffering from the lack of accessibility and availability of water. It should be taken into consideration that most of the poor families are extended families, 21.7% have a family size of above 12 members). The last political violence and Israeli restriction have driven up the cost of tanker water with an extra cost almost 1% of GDP and communities are reducing consumption by up to half.

- Taking into consideration the declining political process and socioeconomic conditions as well as the impact of the reduction of international aid (due to the global crises) the poverty rate will increase rapidly
• The high cost of water in relation to income
• The cost recovery rate for network supply averages 45% nationwide. The government ends up footing the bill – and even then the cost is deducted at source by the Israeli government. Several cases illustrate how this failure to pay is undermining the utilities and creating distorted incentives to use Mekorot water, which increases dependence on Israel, which means higher cost and less availability.
• Despite the high rate of willingness to pay, the economic burden on the poor reducing the affordability and revenues of water utilities.
• The Water Poverty Index in table 17 shows the Palestinian water sector suffering at all levels: capacity, use, access and environment, also the index clearly indicates that Palestinian water consumptions is below the recommended basic human needs

Table 16. Measurement of water poverty index by using different methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Falkenmark</th>
<th>Water Availability Index</th>
<th>Basic Human Needs Index</th>
<th>Conventional Composite Index</th>
<th>Water poverty index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indices</td>
<td>Population Water</td>
<td>Surface Water</td>
<td>Water Consumption l/cap/d</td>
<td>Water availability</td>
<td>Resources</td>
</tr>
<tr>
<td>water availability</td>
<td>Ground water</td>
<td></td>
<td>Access</td>
<td>Access</td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td></td>
<td>Resources</td>
<td>Use</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clean sanitation</td>
<td>Capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time to collect water</td>
<td>Environmental</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>232.7 m3/capita</td>
<td>71.7- 51.8 l/c/day</td>
<td>58.20%</td>
<td>43.1</td>
</tr>
</tbody>
</table>
5.13. Findings of Poverty Reduction and Water Subsidy in un-served (no water network) communities

In order to see the impact of the water subsidy on poverty alleviation, the research project was monitored\(^{107}\) by the Palestinian Hydrology Group\(^{108}\). This monitoring assessed to what extent the water subsidy improved social safety conditions for poor and hardly hit families in the marginalized areas in the West Bank. The subsidy was monitored to see if it created income provider families instead of recipients of assistance and so establish to what extent the use of subsidized water in household income generating projects will eradicate extreme poverty or improve food and water security.

5.13.1. Finding of Water supply and Consumption of the Target communities

The south of Hebron faces a difficult situation with regard to water supply. In most of the district locations, water is supplied 1 to 3 times a week with insufficient quantities for residents needs. As previously mentioned the World Health Organization (WHO) standards recommend a minimum of 100L/C/D (liter /capita/day). Locals in these villages fall under the water poverty index, which means that they suffer from lack of water availability for domestic and agriculture purposes. The water consumption rate in the study area was estimated at 36 L/C/D for domestic purposes and 31.2 L/C/D for agricultural consumption at house level which constituted 36% of the WHO standards. All four locations in the study area are not served by water supply networks. Residents mainly rely on two main sources: rainwater, in which the average rainfall in the area estimated at 507mm/year (Palestinian Metrological Department, 2007); and water supplied through water tankers. They mainly suffer from irregular water availability and high costs since locals are obliged to purchase water from expensive sources to cover their basic water needs. In our case the source is a three water fetches:\(^{109}\) Halhoul fetch, Keryat Arba’ fetch, and Al-fahs fetch in Hebron city. The cost per each cubic meter supplied was estimated at $4.8. It is noteworthy that covering the cost of water supply

\(^{107}\) The project funded by UNDP to help deprived families by water subsidy for drinking and home gardens to produce their food and improve income.

\(^{108}\) A Palestinian Large NGO working to develop water sector in Palestine and to help poor people by providing them water services

\(^{109}\) Public Filling Point
decreases the household purchasing power for other purposes. It was estimated that about 40% of the income of the 38 extreme poor families which were selected for this study was used to cover water costs. Taken this into consideration, that local residents, due to low income levels aren’t able to afford the water supply for consumption purposes and for agriculture. In regards to wastewater, all locations collect their wastewater in latrines and cesspits. Most of the families have no access to adequate sanitation facilities. The following table 18 and figure 54 show the average available amount of water for individual family from the study area on a monthly basis:

Table 17 Available Average quantity of water

<table>
<thead>
<tr>
<th>Source</th>
<th>Available average quantity (m3/capita/month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water tankers</td>
<td>1.5</td>
</tr>
<tr>
<td>Rainwater Harvesting</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 54. Water Availability of target Communities

5.13.2. Findings of Water Consumption Target communities:
Projected consumption was based on three scenarios: Low, medium and high. In the low scenario the conditions were assumed to stay as they are: no more economical development, and no more funds with a resultant low level of standard of living. In this
scenario the demand was assumed to stay constant until 2015. For the medium scenario, it was assumed that the annual increase of demand was according to a growth rate, which was assumed to be 1.25 % (Samhan, 2007) this percentage is an optimistic value as it expects improvement in the economy which would increase the per capita income leading to an acceptable standard of living. The third scenario assumes better economical growth, increased international funding, improvement and development in national and local income. It also assumes achievements in the assertion of Palestinian rights through negotiations. This scenario would result in improvements in the standard of living. Consequently, the annual growth rate of the per capita demand for the high scenario is logically assumed to reach double of that in the medium scenario at 2.5% (RWH, samhan, 1999). Based on this assessment table no. 54 and Figure no.55 show the trend of consumption for these locations. It shows the current consumption (L/C/D) and the projections up to the year 2015, for both agricultural and domestic purposes. The medium scenario is only considered in this study, not that the calculations based on the data taken from the sample.


<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3/capita/month</td>
<td>1.1</td>
<td>0.9</td>
<td>2.0</td>
</tr>
<tr>
<td>m³/capita/month</td>
<td>1.1</td>
<td>0.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Consumption</td>
<td>1.1</td>
<td>0.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Available Water</td>
<td>1.9</td>
<td>22.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Gap</td>
<td>0.1</td>
<td>1.2</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Table 19 and Figure 55 show the available water for both domestic and agricultural consumption, which comes from rainwater and purchased water tankers. It also shows the current and projected gap in water supply for the years 2010 and 2015. These residents are unable to afford the water, since the expenses disbursed on water supply for the both purposes are high in comparison to their low income. Consequently the project supplied them a water quantity that are able to cover the gap and substitute them for the expenses of water tankers. The saved amount of money will improve their income partially and will partially bridge the gap between income and expense?

Figure no. 56 shows the decrease in poverty levels due to micro projects which was established for the 38 families to minimize the gap in poverty level:
Figure 56. Decrease in Poverty Gap Due to Micro-Income Generation by water subsidy

It was estimated that the decrease in Extreme Poverty Line (EPL) ranges was estimated at 39 $ / month for a close family income to poverty line to 329 $ / months for extreme poor family. In which case these interventions assist those families to graduate from extreme poverty or to minimize their gap from poverty level.

It was estimated that the expenditure percentage on water for 38 families on their income ranges between 7% to 147%. This means that the percentage increases as family income decreases. In order to improve the income of these families a yearly subsidy was provided. In each case the targeted families got a subsidy of 312 $ to cover the cost of supplying 65m3 /year. This subsidy was done for the first year, in which the families will not disburse any more cash for water supply for this year. This also means that the available water was estimated at 7.6 m3 /c /y from subsidy, and 6.0 m3 /c/y from rainwater. As a result, the maximum amount to be purchased reached 21.1 m3/year, while the minimum amount was estimated at -2.3 m3 (this minus means that the family will save 2.3 m3 for improving water availability, in other words they will not buy any amount of water through the year). This approach will be continued for the 2015. The decrease in poverty due to the full subsidy of water supplied by tankers, in particular in
winter per family, in addition to rainwater utilization at household level is shown in Figure no.55 shown above.

Figure 57. Poverty Reduction Level

As a result of this subsidy for the extreme poverty families through a water subsidy and rainwater, the poverty gap was reduced by 18.5%. These beneficiaries still needed additional support and water was supplied to them for the next number of years (2010 up to 2015). In Figure no.56, the EPL/capita, current per capita income, saving due to water supply and rainwater, income improvement due to micro-agricultural projects borne from water subsidy and the increase in per capita income are shown (Figure 57).

It was estimated as a result of the continuous follow up to the micro projects implemented for them, their projects will be improved and enlarged in the next six years in which the product of their farms will be able to bridge the remaining gap and those families expected to graduated totally for extreme poverty line, even their will improve per capita income which will reach 27.2 $ from a base line of 4.5$/c, for the year 2015, also all the families in the case will above insecure food line and the water poverty line.
as well, provided that: their current individual a micro-individual agricultural projects will have a growth rate of 10%, a full subsidy of water supply at consumption rate of 2m³/c/m for both agricultural and domestic consumptions. Figure no. 57 shows to what extent the extra support will bridge the gap completely in which 90% of the 38 families will be graduated totally form poverty. Figure no. 58 Shows level of graduation from poverty comparable by end of 2015, incomparable to the situation in the year 1999.

Figure 58. Final Graduation from Extreme Poverty by End of 2015

Figure 58 shows that 90% of the families have graduated from poverty, while the 10% who represent the extremely poorest the poor of targeted families, need more interventions to enable them to maximize their income which will in turn help them to graduate from poverty.
Impact of water subsidy

- Additional income created through household agriculture and will increase the families’ power to secure their food and water.
- The quantity and quality of food which is needed to sustain the family’s livelihood are improved. Some of the most vulnerable groups will cross the poverty line and will have a better standard of living in terms of food and water security.
- 90% of the families graduated from extreme poverty and started to have an opportunity to improve income per capita due to the methodology implemented in order to subsidy them.
- 10% of the families, considered as extremely poorest of the poor, still needed to be supported by other interventions.
- It is estimated that per-capita income is increased dramatically by 10 times as a result of this approach, provided a continuous of technical follow up to the projects and water subsidy up to the year 2015.

5.14. Findings of Governance and Water Management Level

Key findings of the governance are following

- The poor performance of water institutions: three headline indicators will prove the status. First the average unaccounted water across the country about 40% amongst the highest in the Middle East this indicates poor management, the second indicator is the lack of transparency and poor financial management and monitoring. The third indicator is bills collection rates less than 60% indicating the mismanagement and dissatisfaction linked to bad services.
- The fragmented water institution and lack of coordination
- Bad and outdated legal system, some regulations are over 200 years old, inherited from the Turkish Mandate.
- Despite willingness to reform, progress has been very slow or nonexistent.
• Despite the importance of a tariff structure as part of coping strategies, there has been a lack of political will.
• One of the largest driver for bad governance is the Israeli government socioeconomic and political measures
• PWA is not performing to expectations and is donors, not resident, driven.
• The influence of international donors and NGOs.

5.15. Uncertainties Findings
Palestine is living under occupation since 1967 and the whole area in troubles since about one hundred years, all this conditions caused instable and a set of uncertainties such as:
• Uncertainties in the political, socioeconomic and environmental arenas are the main drivers behind the poor management of the water sector and the declining socioeconomic conditions.
• The Palestinian economy is highly dependent on international aid and a large reduction will be noticeable in the near future due to the global crises. This will lead to less investment in water sector, which was the biggest beneficiary from donor’s money.
• Israel takes unilateral water-related actions that act against Palestinian interests.
• Uncertainties lead to mismanagement and poor utilities performance
• There is a correlation between uncertainties and the revenues of utilities, affordability and sustainability of water services

5.16. Water Pricing Policy and Tariff Findings
The different municipalities and organizations working in the water sectors apply different tariff structures depending on the limited available statements and illustrations which are also applied considered only limited key principles needed for necessary tariff design. Therefore, the water tariff system has not been set according to clear and correct scientific fundaments. Since the public service accounts that are offered by the municipality are not separated from each other in fact, are merged together and since the governmental accounting systems are applied and not the modern systems such as the
accrual basis; therefore, the municipalities suffer from several problems in the current circumstances which have led to the following results:

1. **The applied distributed prices are unfair:** it is not pro poor and there is no categorization for different users (agriculture, domestic and others)

2. **Expense coverage:** Some municipalities don’t cover their own expenses. Their expenses exceed the revenue although they have modified their own water tariff system they have done so without following correct criteria

3. **The prices are high and the means of regulations and control are minimal:**
   The price of one cubic meter of water has become expensive before even reaching the consumer which has led to the fact that some consumers are unable to afford paying the water bills which of course, leads to more problems.

The current water tariff systems are not meeting the following objectives

1. regaining expenses so that each water department can regain the actual cost for water generating and allocation;

2. achieving social justice as the tariff structure sets a price that those who have limited income can afford to meet their main needs of water in a way that sets an ascending tariff;

3. The water tariff system aims at achieving economic efficiency. The tariff structure sets an economical price for the high water consuming standards to encourage water resources preservation and so that it will be an indicator for the consumers of what the prices would become in future.

4. To be a tool for decision makers to decide the choice of subsidy.

**5.17. Water and Poverty**

The data obtained from the field and interviews showed clearly the relation between poverty and water and any water subsidy will help people to produce their food and saving money to afford other basic rights. Water subsidy through fair water tariff or making the water available through cheaper pricing will impact the status of poverty and will enhance the social safety net. Additionally, fair and reasonable water tariff structure not only will help the people to have basic water need but will support efficiently the
household economy and the public health issues, in other words making water affordable and available to the poor people will have positive inter-sector positive impact.

5.18. Summary of the Chapter
The chapter illustrated in different format the analyzed primary data which is mainly from the field survey, interviews, and observations, the national level data was obtained from multi resources such as documents, report of official and international organizations. The data were illustrated to give overall picture of the case study
The main findings and related analyses were presented in this chapter. The chapter includes data and findings on water supply, water tariffs, governance, poverty and the primary data on the socioeconomic status of households. Also, the chapter highlighted the relationships between water consumption, family size, water consumption and water cost and the direct and indirect role of subsidy on poverty alleviation. Finally, the chapter outlined the main impact of uncertainties on water management.
Chapter Six; Design of Water Tariff Structure

6.1. Introduction
Based on the data collected and the research’s main finding, the main query of the research (What is the pro-poor and most efficient water tariff structure can be implemented under uncertain conditions?). It is also clear that a new progressive and applicable water tariff is urgently needed, however the tariff structure doesn’t stand alone it should come in parallel with a reform process and modification of the current legal and institutional arrangements. This must be an integral part of the water policy if it is to serve the general objective of the national interest. Assessing the economic value of water is a difficult task (Tamimi et al, 2005). Water price should reflect socio-economic components consisting of both benefits and costs, in terms of social, environmental, health, economic, and political impacts that result from the use of water. Thus, the criteria for price setting may differ from one area to another and from one water use to another (Tamimi et al, 2005). A water tariff can be a powerful and versatile management tool for both the water utility and community if it strikes a desirable balance among the objectives that are relevant to its situation. No single tariff design can meet all the objectives all the time. (Rogers et al, 2002). By taking into consideration the scale of poverty, the water consumptions data, the general water status and the impact of uncertainties on water sector performance the chapter introduces the proposed model for water tariff and describes in details the added value of this model in the Palestinian context.

6.2. Current water tariff system
Types of water pricing schemes that currently exist in the West Bank vary from the flat rate pricing structure to the increased block tariff system in the best cases (Rabi et al, 2002). These types are:

6.2.1. Peak Pricing
This type has been used for decades. Under a peak pricing system, prices of a service vary in accordance to the level of use at different times (Tamimi et al, 2005). When applied to a water rate structure, this system would assume a peak pricing determined by

110 Despite the use of IBT but without justification and doesn’t take into consideration the socioeconomic indicators and the impact of uncertainties.
seasonal use. Water utilities are expected to set rate charges higher in summer season than they are in winter (Tamimi et al., 2005). This system fails to promote equity. “Under a straightforward peak pricing structure, a high-income family pays the same amount per cubic meter of water that a low-income family pays. This violates the concept of vertical equity (unequal should be treated unequally). However, this system “creates revenue stability and promotes resource conservation through price differences based upon quantity of consumption at different times” (Rabi et al., 2002).

6.2.2. Flat Rates
This system is becoming less and less common. A flat rate suggests a single rate for all users. Everyone pays the same amount per cubic meter of water, regardless of income or quantity of water consumed (Tamimi et al., 2005). This system violates the principals of both horizontal and vertical equity, and penalizes low income households as they pay a higher portion of their income for water. Accordingly, the greater the income gap between families, the larger is the gap of unequal water distribution (Tamimi et al., 2005). In addition, this system does not create incentives for higher income households to conserve water, because the price stays the same no matter how much water a family consumes. In brief, this system violates affordability, equity, sustainability, and revenue stability (Rabi et al., 2002).

6.2.3. Lifeline Rate.
Under this system a specified amount of water known as the “lifeline”; which is equal to the quantity necessary to cover the basic needs, is supplied at a rate set below marginal cost. At any quantity consumed beyond this “lifeline” amount, a higher rate will take effect. This type of system is also known as a two-tariff system (Tamimi et al., 2005.). This system pushes for equity of water distribution and for gaining access to water for low income families when water conservation becomes more considerable.

6.2.4. Increasing Block Tariff (IBT)
This system is becoming increasingly acceptable in the West Bank. It is like the “lifeline” system, except that IBT does not only meet the basic needs of the entire population, but it also fully recovers the economic costs for the utilities involved (Tamimi et al., 2005).
“Under IBT, water utility charges the consumer a unit price for the first number of specified units abstracted. This initial amount is what comprises the first block. Ideally, the first block should be considered as a ‘lifeline’ quantity, and is provided at a price set below marginal cost but this is not the case in Palestine. From this point, a second ‘block’ starts where the price of water per cubic meter increases. This price stays to a given level of consumption. Following that level, the third block starts, and the price increases again accordingly. This repeats itself for the total number of blocks” (Rabi et al, 2002.). This system should subsidize the first “block” for low income families so that everyone can meet their basic water needs. It promotes both horizontal and vertical equity through the use of a cross subsidy from the rich to the poor (Tamimi et al, 2005). Furthermore, it promotes water conservation. (Tamimi et al, 2005). The problem with current application of this system, it is not associated with socioeconomic conditions and not proper to deal with uncertainties,

6.3. Which Water Tariff System is More Relevant to the West Bank?
Before beginning to design a tariff system, the available pricing systems are weighted in accordance to their applicability to the objectives of an ideal water tariff, taking into consideration the uncertain and difficult conditions in the West Bank to justify the decision. Then, the systems are compared with each other in order to consider the best system that fits with the West Bank circumstances. Table 20 shows the comparison based on the following scale:
A: Highly applicable = 4
B: Applicable = 3
C: Weakly applicable = 2
D: Inapplicable = 1
Table 19. Weighting Different Tariff Structures

If A, B, C and D were weighted as 4, 3, 2 and 1 respectively, then the weights of peak pricing, flat rates, lifeline rate, and increasing block tariff are 15, 14, 25 and 31, respectively. According to this simple weighting, it is clear that the IBT system meets most of the objectives of an ideal tariff system (the weighting have been done during the stakeholders and focus groups sessions)\textsuperscript{111}. Therefore, this system is appropriate for the West Bank. The above weighting is based on the following discussion:

### 6.3.1. Peak Pricing

Data shows that water consumption in summer is higher than it is in winter. Thus peak pricing system assumes rate charges higher in summer season than in winter. Based on our findings, this policy is affecting the poor more than the high income families in the WB. As pointed out previously, in summer, the poorest families pay 16.5% of their income for lower water consumption compared to the highest income families who pay 2.6% of their income for higher water consumption. Peak pricing forces the poor to further decrease their consumption which leads to hygienic problems, or renders them unable to pay for water. On the other hand, the increased prices in summer is affecting

\textsuperscript{111} After explanation the objective of the research and explaining the different tariff structure, the stakeholders and participants in focus groups sessions have been asked to weight each tariff structure that they believe proper to Palestinian conditions.
the willingness to pay of the users as this increase is not accompanied with enhanced services and does not have tangible justification. As for income redistribution, this system does not meet this objective since water prices are the same paid for all water uses (domestic, agricultural, and industrial uses). The aforementioned facts prove that this system is not desirable in the West Bank.

6.3.2. Flat Rates
This system is the simplest and the most transparent one. However, it is the worst to be applied in the West Bank. As water resources are limited in the WB and the gap between water supply and demand already exists, this system increases the gap as it does not create incentives for high income households to conserve water. Data pointed out previously that water consumption increases as income increases. Therefore, the absence of financial restrictions in this system will increase water consumption by rich families leaving the poor large families with high water cut frequencies. Both systems (peak pricing and flat rates) are politically sensitive. Because a large proportion of the population is not able to pay the water bills, water utilities face financial problems and deficits. And as the main water supplier in WB is “Mekorot”, the Palestinian Authority becomes responsible to pay the debts to avoid water cuts and negative public reaction.

6.3.3. Lifeline rates
This system is better than the previous two. It takes into consideration the basic needs of the poor, who constitute more than 50% of the Palestinian population. At the same time, the increase in water prices above the lifeline quantity discourages high income families from consuming more water. However, this lifeline has to be large enough to satisfy the large size of poor families’ needs. Based on the results, the average water consumption for the families below the poverty line (205NIS/capita/month), 39.14% of the total surveyed families, is about 21.5m³/month. Therefore, this value is suggested for the lifeline rate. However, the lifeline rates applied in the current lifeline system ranges is between 5-10 L in all WB districts except in Jericho (20L) where water is highly available (Tamimi et al, 2005). Also, more blocks are required to control the intermediate and high water consumption for the remaining 60% of the households.
5.3.4. IBT system
This system proves to meet all of the objectives relevant to WB situations, when properly designed (as will be explained below). However, this system is being applied differently in WB districts without logical and scientific procedures in determining the number, size, and price for each block. Instead of covering the costs by achieving cross subsidies from the rich to the poor, they are covered by including the minimum payment (fixed initial price paid regardless of the amount of water consumed) in the first block price and increasing this payment based on the gap between water supply and demand (Tamimi et al, 2005). Therefore, there is a need for a new IBT system to be properly set to fit with the socioeconomic and political conditions in the WB. Accordingly, this paper will suggest a new IBT structure, based on previous analysis of the socioeconomic dimension of the current pricing policy in the WB. (More details given in the literature review chapter two section 2.9.1 and 2.9.2)

6.3.4. a. Weakness of the current ‘IBT’ and other tariff Systems
The amount of water a household “needs” for essential purposes is controversial. As the size of the initial block is not adjusted for the number of members of a household, one could argue that a volume of 4-6 cubic meters per month does not meet the essential needs of a household with ten members. Thus, large families are usually under-served by this system (Whittington, 1992, PWA, 2005). In addition, IBT structures can only work if each household has a private metered water connection (Whittington, 1992). In fact, in many areas in developing countries, this condition has not been met. Private, metered water connections are often only available to upper and middle income households; the poor often obtain their water through shared connections with their neighbors (Whittington, 1992). In such case, water consumption by shared households quickly exceeds the volume of the initial block, pushing water use into the higher priced blocks. And as households sharing water connections are more likely to be poor, the IBT will have the opposite effect from that intended when the poor pay higher average prices for water than the rich (Whittington, 1992).
6.4. Suggested Modified Locally Applicable ‘IBT’ Structure

The international experience, the local socioeconomic conditions and the uncertainties are making the IBT system the most appropriate one for Palestinian Territories. The interclass subsidy, the uncertainties, improvement of utilities performance and meeting the water basic needs of the large families can be improved by the application of IBT. Three key decisions are to be taken regarding: (1) the number of blocks, (2) the quantity of water designated to each block, particularly the lifeline rate block, and (3) the prices to be charged for each block. To achieve this objective, a Modified Locally Applicable IBT structure (MLA-IBT) is proposed based on the following outline:

- Previously analyzed socioeconomic indicators and pro-poor policies are the basic guidelines to be considered in designing the structure.
- The model consists of four blocks.
- Each block has a justified range based mainly on the relationship between average monthly incomes per capita versus average monthly water consumption for households in the summer. Figure 59 clarifies this relationship.

![Figure 59: The relationship between average monthly income per capita and average monthly water consumption for household in the summer.](image)

---

112 The proposed new tariff structure based on the shortages of the current tariff and the international experience, additionally the local conditions: poverty, lack of performance and the output of the calculation of WPI

113 The tariff structure only for domestic use. the commercial tariff should be used to subsidize the domestic use
• The new things done in the proposed structure are
  • Re-distributing the blocks based on socioeconomic indicators
  • The distribution of the blocks will serve the objective of the research to be pro poor and efficient
  • The distribution of the blocks takes into consideration the importance of increasing the revenues without economic burden on poor people
  • The new system will help the utilities to choose the best target group for subsidy and from where that subsidy coming or from where should come.
  • The majority of the people will pay according their socioeconomic class and the payment will not exceed the international standard for percentage of water bill of the income
  • The blocks taking into consideration the vulnerability of the social groups for uncertainties

6.4.1. First Block
Setting the volume of the initial block is one of the major difficulties in formulating an IBT system. It is usually set at a level far exceeding the minimum “lifeline” requirement. WHO and the World Bank set the initial block water amount at more than three times the minimum requirement (15m³/month) to benefit not only the poor, but also the upper and middle classes (Tamimi et al., 2005). However, the approach followed in this STUDY is to determine the first block’s volume differences. As our objective is to satisfy the basic needs for all families at an affordable price, the volume of the first block has to be determined based on the maximum amount of water consumption for the households’ income under poverty line. This block is suggested to be subsidized either from the other blocks or from the government when the other blocks cannot subsidize the first one. This may be the case in the winter when low water consumption from the fourth block can be used to subsidize the first one. Data reveals that the maximum water consumption for the surveyed families with income under the poverty line (39.14%) is 21.5 m³/ month.
Therefore, 21.5 m$^3$ is the suggested lifeline rate of the first block, which will achieve a minimum water requirement of 93L/capita/day for an average family size. This amount is almost close to the 100/L/capita minimum water requirement for domestic use stated by WHO for scarce water countries (the normal standard is 150 l/c/day). Although all families will benefit from the first block, water consumption for families above the poverty line (around 55% of the families) has to be controlled by the increased prices of additional blocks.

6.4.2. Second Block
The volume range of the second block is determined as between 21.5-26.7 m$^3$. It includes the people who are very close to the poverty line and are vulnerable to the uncertain socio-economic conditions in Palestine. 45.67% of the surveyed families are expected to be under the poverty line if current conditions continue. Consequently, this block is not supposed to either subsidize other blocks or to cover sustainability costs such as expansion and enhancement of water resources. However, it does achieve cost recovery for the water utilities.

6.4.3. Third Block
The volume of the third block is determined to range between 26.7-35.4 m$^3$. Based on the collected data and the information gathered by different social and economical institutions, it was found that the families, who are consuming water quantities in the range of this block, seem to have no affordability problems under current conditions. However, their income shows that they are not relatively rich (450 -676.2 NIS). This block is supposed to achieve cost recovery and cover the cost of water resources’ development without the cost of their sustainability. However, cross subsidy can be applied in this block if the municipalities or water utilities have insufficient revenue.

6.4.4. Fourth Block
The fourth block, which is above 35.4 m$^3$, is designed for higher income people who consume an above average amount of water. Since this group has the capacity to apply cross subsidy, this block is suggested to cover the cost for development and sustainability of water resources. The above mentioned four blocks are the main components that
should be taken into consideration when the government decides the water price and the rate of subsidy (figure 60). That can be done by deciding which block will be subsidized and which one will cover the cost of the subsidy. Also, this model gives high flexibility for the government to decide in which district (geographical district, rural, or urban areas) and for which community (marginalized, poor-low income, or under highly sensitive political or social conditions) the tariff system can be applied. However, the decision to subsidize or not and the amount of subsidy will depend on the seasonal time (winter or summer) and on the social and financial agenda of the government or the water utility. In determining the water price for each block, the issue of covering water costs to guarantee sustainability has to be taken into consideration. Determining water costs for each block is beyond the scope of this study, however the general equation for water pricing in the suggested MAL-IBT system should be as follows

\[
Net\ Cost = WcB_1 \times C_1 + WcB_2 \times C_2 + WcB_3 \times C_3 + WcB_4 \times C_4 + Sg
\]

Where;

- Net Cost: includes water cost, operation and maintenance cost, developing water resources cost and sustainability cost.
- \(WcB_i\) : water consumption in the block
- \(C_i\) : water cost in the block
- \(Sg\) : Governmental subsidy

Figure 60: The Structure of the New Proposed Tariff

The range of people will be served by 1st and 2nd blocks will range from 20-60% of the people which highly depend on uncertainties.
Figure 61. Integration of Tariff Structure with Database
6.5. The design of the water tariff concept
As described in Figure 61 the main idea of this structure is to enable the water utilities
and decision makers to use the socioeconomic indicators (by use of a data base) as a tool
to act under uncertainties, the database which includes household profiles, cluster of
household profiles (socioeconomic data). In case of any emergency conditions the water
utility can decide which social group and which block will be subsidized. The decision
will be based on dynamic data. In other words, the proposed structure will be flexible to
decide which target group is subject to subsidy (based on associated consumer profile)
additionally, by selection of any block the utility can choose the social class and the
percentage of the people will be effected by any decision (subsidy or increasing price)
This tariff structure can only be efficient if the data base is updated and validated
frequently.(Figure .61)

6.6. Institutionalization the tariff structure
The main concept behind the new tariff structure is how to make the pricing policy and
tariff a dynamic process and representing reality, the concept aims to institutionalize the
tariff structure based on three major pillars

1. The tariff structure itself (design the blocks and the criteria to design it
   such as income, consumption, poverty) as described above.
2. The good governance and enabling environment (legal and
   institutional reform)
3. The approach of check and balance (based on performance the utility
   can produce a dynamic tariff structure)

In order to improve the governance of water tariff and pricing policy the need to
institutionalize the whole process is very high and can be done by:

• Producing terms of reference and a set of criteria for water tariffs (it will be
  necessary to solve the problem of scattered tariff structure)
• Accepting the principal of public participation will help reduce tension and
  create a trusting environment
• Dealing with uncertainties with transparent accountable tools (currently there
  is no access to information)
• Reform of the utility structure is not urgent, but this process should be done after the formulation of a clear vision of what kind of policy and strategy the utility needs

• The ability of management and the updating of the information system in order to coping the uncertainties. (See annex for proposed data management)

The main component of this new proposal is the data base and its management
The anticipated data base would produce information enabling decision makers in the utilities to subsidize or to ask the government to cover the gap of revenues. The database will also help in better planning and management by using the following data:

• Customer socioeconomic profile
• Cluster households profiles
• Water consumptions
• Leakage data
• Illegal connections data

6.7. What makes the proposed new tariff, applicable in Palestine and pro-poor?
This new tariff structure is based on the main research question- what kind of tariff structure needed in Palestine to be pro-poor and dealing with uncertainties. It is expected to achieve the following:

• By redistribution of the consumers group, the water consumption of approximately 35-50-% of the extremely poor and poor people will match the first block, they will therefore pay the minimum flat rate (the first block is the cheapest and lower income level households do not usually pass the upper limit (21.5m³ family/month).

• Extended families that have more than 12 members (this is approximately 12% of Palestine and usually classified as poor since they have large family size living in one household) will be encouraged to have a separate water meter for each small family. They will have a separate meter fitting them in the first block while now
according the old tariff structure their consumption matches the third or fourth block which is the highest price.

- The poor people and vulnerable people will be encouraged to pay since their bills will be minimum and affordable, this will encourage the water utility to continue to service them. Currently the water utility cuts the water for households that don’t pay for two months. This would mean that water will be available to meet their basic human needs.

- The old tariff structure has no interclass subsidy (rich to poor), in fact the opposite was the case. The rich people pay 2% of their income and the poor up to 16.5% (nowadays up to 30% for un-served villages). The new tariff will reverse this situation and the poor people will start paying the minimum which is 1-2% of their income and the price for rich people will increase up to 5-6% of their income.

- This tariff structure will enable the water utilities to improve the collection rates and to sustain services, however if the collection rate reaches 70-80% the new tariff will make the water utilities approach cost recovery. The research concluded that the weighted average water price that are willing to pay 6.7 NIS/m³ while the largest percentage (62.5) indicates that willing to pay 3 NIS/m³ which affordable price for most of the poor people who have minimum consumption rate.

6.8. What makes this tariff working under uncertainties?
Firstly the main goal of any government or water authority is to keep the basic services such as water at an accepted level; however the uncertainties (socioeconomic, political and environmental) sometimes make this goal impossible. In this case some measures and coping strategies should be taken, in the Palestinian case, the formulation of water policy including water tariffs is a must however the content of the water policy should deal with the Palestinian context.

The proposed water tariff is designed to deal with this context by:

- The tariff is based on socioeconomic indicators and the socioeconomic profile of the consumer, cluster of consumers and/or the entire community. This will enable the water utility or the government to decide who, how much and when will
subsidize the water bill in the case of emergencies or declining socioeconomic conditions. In other words the tariff structure will serve as a vehicle to decide the target groups and the size of subsidy (first block or second block...etc) since each block represent a social group to some extent.

- based on this tariff structure and the consumers profile the utility, can work at fund raising or emergency recovery fund using strong justified data. This is important as the utility has a deficit and financial problems, under worse uncertainties, such as in case of internal violence or Israeli incursions, the utility has no ability to collect bills. It can also justify the subsidy use by showing who didn’t pay and why.

- The proposed tariff structure will be attached to the database or GIS. While several donors have trained and provided water utilities with data bases and GIS software unfortunately most of them are not or only partially utilized. By using this database the performance indicators of water utility will be improved by:
  a) The ability to monitor the consumption per consumer
  b) The ability to decide subsidies
  c) The ability to better financial management and planning
  d) The ability to improve services by planning water running (rotation among clusters of households)
  e) This will increase the reputation and credibility of the utility and help to create trust among the people which will lead to better revenue.
  f) Reducing the delay in payment of bills will help the utilities to make better planning for cash flow.

### 6.9. What makes this tariff structure popular?

It is expected that the proposed tariff structure will be welcomed by different groups such as the politicians who will see it as part of their agenda for social safety and pro-poor policies. The utilities will introduce it as a successful story and as a good performance in comparison with the past. The community will deal with it as a help from the government and as a monitoring tool for the accountability of the utility. However the most important dimension of this tariff structure is the ownership (relatively to make everybody happy).
6.10. Risks and Assumptions

As other issues in the Middle East Nothing is without risk. Based on that, the main objective is to make this tariff structure able to achieve the following goals:

- The willingness to change among the water utilities
- The political support and endorsement
- The necessarily legal and institutional arrangement have been reformed and an enabling environment created

But the main risk will remain with rapid political change and the possibility of a collapse of the official institution. This has a low probability but is still a high risk. Additionally, the influence of donors who are pushing Palestinian water authority for full privatization. The additional expected risk can be the Israeli policies to impose a new water policy on Palestinian water sector.

6.11. Required Policies for Tariff Changes

A tariff policy for Palestine should be designed to meet the selected criteria agreed for the sector; in practice, this is essentially a political process, where all parties involved must agree to the outcomes. The impact of the policies is likely to be disappointing if consensus cannot be reached between the policymakers and the implementers. Tariff policy, like most policies, is essentially concerned with the art of political negotiation between vested interests. In Palestine at the present time, the vested interests include mayors, local government agencies, and households—often working under very strained conditions resulting from budgetary constraints, Israeli security controls, and economic recession.

Changes in the tariff may be triggered by:

- Annual assessment of the utilities financial performance: related to the achievement of technical and financial performance improvement targets. This would include an assessment of how successfully the utility management has implemented improvement programs during the year based on performance benchmarks or indicators, and an assessment of improvement targets for the following year. It will be the responsibility of the utility managers to justify tariff increases from these causes to the PWA.
• Changes due to extraordinary circumstances: related to circumstances out of the management control of the utilities. These would include unforeseen price rises for fuel and labor; the cost of capital borrowing (if any), the cost of Mekorout water delivered from Israeli-run systems; unavoidable costs incurred in dealing with emergencies such as drought, security clamp-downs; etc. The utility manager would be expected to demonstrate and justify the need to cover the additional costs to user- representatives in the municipalities.

• Changes to PWA policy: related to policy changes made by the PWA for the sector. Perhaps the most obvious policy change will be the establishment of the regional utilities and an equalization tariff that will result in winners and losers. It may be expected that any inter-municipal transfers will be compensated for at least in part by other budgetary means.

• Recommended to suggest a special IBT model that achieves cross subsidy from the industrial sector to the agricultural one; as farmers are usually the less fortunate group.

The current situation of most water utilities in the West Bank reveals that their financial problems are partly because of their policies which rarely reflect the public willingness to pay, and partly due to the water pricing related decisions made by utilities that often reflect political motives, thus removing incentives for customers to conserve water. Taking into consideration the international experience in implementing IBT and the preliminary reaction of stakeholders, MLA-IBT implementation in the West Bank would result in the following issues:

• Bridge the gap between revenue and costs.
• By expected achievement of cost recovery, the performance of water utilities will be improved.
• Customer satisfaction and community appreciation for the high level performance of the utilities.
• By customer satisfaction and community appreciation, good governance objectives will be achievable.
• Political appreciations and a sustainable social agenda will be achievable to the satisfaction of all stakeholders.

6.13. Application of the Model (Pilot Scale)
In order to validate and to check the applicability of the proposed model, a representative cluster of villages were selected, the selection of the cluster took into consideration the socioeconomic indicators, the water status, the performance of the water suppliers and uncertainties to be close as much as possible to the indicators at national level.

Bani Zaid is a cluster of five villages in the northwest of the West Bank (see location map figure 62). The total population is around 7,500 persons distributed in 1,041 households, with a population growth rate of 3.9%. The Municipality is managed by an elected Council. Among the Council’s responsibilities are managing daily issues and the water supply, which is followed up by a Water Unit with a limited staff (one engineer, a plumber, an accountant, and two fee collectors). The Municipality purchases water from the Israeli Water Company, Mekorot, for 3.4 NIS/m³. Due to the insufficient water quantity pumped from the source (60 hours a week), the Municipality rotates the supply among the villages. The Municipality has a future strategy and short term plan to reconsider the structure of the Water Unit. Besides the social conflict among the villages, the council applied a different tariff structure, but without justification or transparency.

115 The number calculated based on the municipality records
The data was collected by reviewing the files of the municipality and the field survey, 60 questionnaires (socioeconomic and water data) were distributed and the households were monitored (payment and water consumption), the monitoring program aimed to see the impact of the proposed tariff structure on consumer payment and revenues without ignoring the socioeconomic and uncertainties during the monitoring.

6.13.1. a. Socio-economic conditions of the residents
Similar to other Palestinian rural areas, the Bani Zaid cluster is an agricultural-based community where the main income sources of the residents are agriculture and employment in public institutions. The number of poor people is relatively higher than
the country average and, as described in Table 33, the family size is more than 7 members each. An extended family with more than 20 people living in the same house is a common phenomenon. The villages have different social and economic problems such as tribal-based election of councils, large income gap between families, dominant social figures, political factions, etc. (Table. 21)

Table 20. Main Socioeconomic Indicators in Comparison with The National Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>National</th>
<th>Bani Zaid</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family size</td>
<td>7.71</td>
<td>7.2</td>
<td></td>
</tr>
<tr>
<td>Poverty (%)</td>
<td>55\textsuperscript{116}</td>
<td>65</td>
<td>Uncertainties are very high and figures are subject to change each month</td>
</tr>
<tr>
<td>Unemployment (%)</td>
<td>51</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Income ($/person/yr)</td>
<td>890</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>Water consumption (m\textsuperscript{3}/person/yr)</td>
<td>65</td>
<td>86.4</td>
<td>For connected areas</td>
</tr>
<tr>
<td>Price ($/m\textsuperscript{3})</td>
<td>1.5</td>
<td>1.3</td>
<td>This is the average price</td>
</tr>
<tr>
<td>Payment (%)</td>
<td>64</td>
<td>32.7</td>
<td>The survey was conducted during the months when the Government was unable to pay the salaries</td>
</tr>
<tr>
<td>Number of households/1000 person</td>
<td>112</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Population growth rate</td>
<td>3.0</td>
<td>3.9</td>
<td></td>
</tr>
</tbody>
</table>

Poverty
Statistics related to poverty indicate that about 65\textsuperscript{117} (Ministry of Social Welfare, 2007) of the people live under the National Poverty Line while the remainder of the families is slightly above the Poverty Line.

\textsuperscript{116} According to 2007 statistics
\textsuperscript{117} This number is a dynamic and changeable by the rapid changes of political and socioeconomic situation of the area.
Income

The main income source of the families is generated by agricultural activities; free labor in the local market also contributes to a large portion of the family income. Despite the relatively large family sizes and vast agricultural area; poor marketing opportunities, closures\textsuperscript{118} and other factors contribute to an average income in the area being less than 1 US$/day, which means the average income per household is under the Poverty Line. Another clear indicator is that the revenue generated by agriculture is very dependent on the type of agriculture, since irrigated or greenhouse agriculture reaches 27,000 NIS per dunum (1000 m\(^2\)) while rain-fed agriculture only 200 NIS. These figures clearly indicate that any rapid decrease in the availability of water resources or the reallocation of water from the agricultural sector to domestic use will cause large reductions in the income of households. The area has a relatively high unemployment rate. As indicated in Table 33, the average unemployment rate is 43%; the high percentage of seasonal work means that during some parts of the year, more than 80% of the people will be jobless. From a water management point of view, people’s affordability of water will be at a minimal level, leading to the failure of the water utility or other supply provider.

6.13.1.b. Water supply

As mentioned above, the Municipality purchases water in bulk and distributes it to the people after adding additional costs. The water network was constructed in 1975, and its main problems are: a high percentage of leakage (45%) and low pressure (20% of the residents receive water only after midnight). In the last five years and due to rapid population growth and unplanned urban expansion, the network has been extended by 20%, causing more complicated water supply problems. One of the major problems is that the Municipality has no detailed plan for the network. New connections are usually done by the Water Unit without taking into consideration any engineering parameters (such as future connections, pressures, demand, etc.). Despite the fact that the Municipality is willing to solve the mentioned problems, the institutional capacity, the lack of financial resources, the lack of strategy and vision, the absence of government

\textsuperscript{118} Because the political problems many places used to be closed military area for different periods
support, and social conflicts among the people are the main obstacles to overcome the problems mentioned.  

6.13. 2. Criteria for selecting the Case Study
The following criteria were chosen in order to insure a realistic representation of the pilot area:

- population size should match with the average population of the rural areas
- poverty rate is within the average of the national rate
- connected with a water network
- data availability and accessibility
- high level of municipality cooperation with the researcher in particular, the acceptance to apply the proposed tariff
- water consumption falls with the national range
- access to households’ water meters

6.13.3. Statement of specific problem
The main problem of Bani Zaid Municipality is people’s low affordability of water, which along with an absence of governmental support, causes a lack of revenue to the municipality. The main income source is the water bills; during the years 2005-2006, the average percentage revenue of the water bills was 32.2% because of the high percentage of consumers who were not able to or did not want to pay. Social conflict and a lack of cooperation became common. In order to cover the financial gap, the municipality increased the price of water from time to time, causing a decrease in the number of people that could pay. As a result of all these problems, the Municipality entered a loop and lost its credibility.

6.13.4. Tariff and pricing system
The Municipality Council is the body responsible for setting the price and tariff structure. The current pricing system is not based on any criteria (cost recovery, social fairness, environment, etc). The interviews showed a lack of transparency, since the consumers

---

119 Some houses in the high level areas didn’t receive water because the lack of water pressure
120 Because the lack of transparency the people lost the trust
have no background about the procedures and no prior notice about the increase in prices.

The price and tariff structure during the study are shown in Table 22.

<table>
<thead>
<tr>
<th>Block (water consumption, m³)</th>
<th>Price NIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>Flat 48</td>
</tr>
<tr>
<td>11-21</td>
<td>4</td>
</tr>
<tr>
<td>22-40</td>
<td>4.5</td>
</tr>
<tr>
<td>41-60</td>
<td>5</td>
</tr>
<tr>
<td>Above 60</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Table 21. Price and Tariff Structure Used during the Study Period

The municipality collects monthly fees; the consumer is given 15 days to pay his/her bill, after which penalties are tacked on if the bill is unpaid. After the fees have been collected, the Municipality credits the money to its general account. There is no annual review of the financial performance of the Water Unit, which led the researcher to analyze the performance from a hard copy printout. This research showed that the pricing system is not consistent, there is no legal base to increase the prices, and no evaluations have been done during the history of the Municipality. (Table 23)

<table>
<thead>
<tr>
<th>Item</th>
<th>Qalqilya</th>
<th>Jericho</th>
<th>Salfest</th>
<th>Bani Zaid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person/connection</td>
<td>7.05</td>
<td>6.53</td>
<td>5.13</td>
<td>8.29</td>
</tr>
<tr>
<td>Employee/1000 connection</td>
<td>3.85</td>
<td>9.71</td>
<td>3.19</td>
<td>0.004</td>
</tr>
<tr>
<td>Water supply/capita</td>
<td>178.42</td>
<td>313.71</td>
<td>124.88</td>
<td>110</td>
</tr>
<tr>
<td>Water consumption/capita</td>
<td>127.23</td>
<td>201.89</td>
<td>76.83</td>
<td>86.4</td>
</tr>
<tr>
<td>Losses</td>
<td>28.69</td>
<td>35.65</td>
<td>38.48</td>
<td>22</td>
</tr>
<tr>
<td>Revenue rate</td>
<td>76.98</td>
<td>77.84</td>
<td>47.03</td>
<td>32.2</td>
</tr>
</tbody>
</table>

Table 22. Some Cities Performance Indicators
6.13.5. Methodology
The general methodology which was proposed in chapter three was implemented which during the qualitative, quantitative data and case study data collections (sub case study) The research was conducted in several stages:

6.13.5. a. Desk work
In order to construct a clear understanding about the consumers and the trends of their attitude towards the payment, the records of 2005, 2006 and the first eight months of 2007 were investigated and tabulated. Despite the absence of a database, the regular and continuous records of the consumers were taken into consideration while the remaining was neglected. Part of the desk work was also to review the limited qualitative data is exist in the municipality files.

6.13.5. b. Field study
In order to conduct a successful field survey, one of the villages (Nabi Saleh) was chosen to be a representative of the entire cluster\textsuperscript{121}. The village has 60 households, all of which were included in the monitoring program. In order to carry out the survey and monitoring, the following field work was conducted:

*Baseline Survey*

The baseline survey was implemented in four phases:

The first phase was a participatory rapid appraisal (PRA), which aimed to gather general information about the village, such as the social structure, water problems, consumer satisfaction, gender issues, and other preliminary data which may be used as background information. The second phase was the implementation of data on socio-economic and water related data; in order to implement this phase, a detailed questionnaire was prepared. In the final design of the questionnaire, the households were taken as the main target of the interviews. The third phase was to conduct a preliminary survey to investigate the status of water meters in each household. The checklist included: meter

\textsuperscript{121} The people in the village were very cooperatives and allowed to the researcher to visit their water meters and to fill the questionnaires.
ownership, technical status of the water meter, etc. The fourth phase was the monitoring of the households payments and attitude towards the water tariff

6.13.5. c. Monitoring

The main aim of the monitoring was to evaluate the perception of the consumers towards the new tariff structure. Indicators were prepared and monitored for the duration of eight months (January-August), which included the summer and winter period, and the new tariff was applied for an eight months trial period. However, due to the change of the Village Council, the implementation of the new tariff stopped and the previous one was reapplied. After that, a virtual bill was produced by the researcher and each household was interviewed to ask if they were willing to pay or not. (See annex IX)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family size</td>
<td>Number of people/meter</td>
</tr>
<tr>
<td>Consumption</td>
<td>Monthly water consumption</td>
</tr>
<tr>
<td>Income</td>
<td>Monthly income/household</td>
</tr>
<tr>
<td>Cost of water (monthly)</td>
<td>Value of bill</td>
</tr>
<tr>
<td>Payment (monthly)</td>
<td>Amount actually paid</td>
</tr>
<tr>
<td>Tariff block</td>
<td>Consumer block according old tariff</td>
</tr>
<tr>
<td>New suggest tariff block</td>
<td>Consumer block according new tariff</td>
</tr>
<tr>
<td>Cost of new tariff block</td>
<td>Bill according to the new tariff</td>
</tr>
<tr>
<td>Payment</td>
<td>Actual payment according new tariff</td>
</tr>
</tbody>
</table>

Table 23. Main Indicators for Monitoring the Performance

Through the monitoring program, the above data (Table 24) was collected in order to measure the effect of the new tariff not only at the household level but also at the municipality level (total revenue) and to measure the number of consumers who pay their bills.
6.13.5. d. Focus Groups (FG)

The focus groups as a research method was discussed in details, however it is useful to brief it here since the main objective of the conducting focus group sessions is to focus on specific conditions and can be used as local focus groups.

In order to guarantee public participation and ensure a community based approach, four sessions with focus groups were organized. The focus groups were divided into three categories:

**Experts Sub FG:** In order to discuss the socio-economic approach and to obtain feedback on the proposed tariff structure, the experts included a water supply engineer, social scientist, economist, and community development specialist.

**Stakeholders Sub FG:** Stakeholders were involved to assess the importance of a tariff structure as a tool for supply–demand management and to ensure harmony between the policy formulation and implementation levels. In addition to applicability and needs for reform, the institutional legal arrangements were discussed. The stakeholders’ session included representatives from the water authority, municipality, donors, the Ministry of Local Authorities, and NGOs.

**Consumers Sub FG:** Three different sessions were conducted to collect feedback from the consumers. One of the sessions aimed to analyze the problem from the consumers’ point of view, the second session discussed the consumers’ proposals of a fair tariff structures, and the last session aimed to gather feedback on the suggested one.

6.13.5. e. Interviews:

In order to understand the drivers of the specific problems having qualitative data can help in modify or to change part of the model two level of interviews was conducted at municipality level, the first was before and the second after the application of the model.

The interviewees were the mayor and members of the council, five consumers from each village and the fee collectors, also specific interviews have been done with the General Director (GD) of the ministry of local authority, the GD of ministry of planning and the Director of water authority. (See Annex VIII)\(^{122}\)

---

\(^{122}\) The annex “list of people interviewed or consulted"
6.13.5. f. Secondary Data:
The importance of the secondary data was its use for the comparison of old and new data, to understand the households socioeconomic status and to the general data about the area, the secondary data were: the municipality documents, the village councils documents and water authority files related to the pilot area.

6.13.5. g. Observation
The observation technique was used to explore the data and possible important input was not possible to see it in the files such as the tendency of illegal connections and discussions between the fees collector and the people who do not pay the bills. The main point was observed that people willingness to pay so high if they guarantee a good services and regularity of water flow.

6.13.5. h. Field Notes:
The researcher used his field notes to complete any missing data or information, some information obtained from field notes was significant such as the expression of people about not receiving the salaries and their attitude towards the municipality and fee collectors. Additionally most of the meters were broken or have a technical problem.

6.13.5. i. Data Management (Validation, Processing, Analyzing)
The collected data was validated by ignoring inconsistent, irrelevant, and random double checking of the questionnaires by interviewing different persons in the same household, and the data was analyzed by SPSS. The general data was collected from different sources: the Municipality, households, the Palestinian Water Authority, and NGOs. The household data was collected through questionnaires conducted by the researcher and the bill collector at the end of each month.

Based on a nationwide survey and the socio-economic indicators, a new tariff structure was introduced to the municipality, in order to help overcome the problem of the high financial deficit resulting from the high percentage of unpaid bills. The proposed tariff structure is illustrated in the following Table 25.
Table 24. Proposed Tariff

<table>
<thead>
<tr>
<th>Old structure</th>
<th>New structure</th>
<th>Price (NIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>0-21.5</td>
<td>Flat 48</td>
</tr>
<tr>
<td>11-21</td>
<td>21.5-26.7</td>
<td>4</td>
</tr>
<tr>
<td>22-40</td>
<td>26.7-35.4</td>
<td>4.5</td>
</tr>
<tr>
<td>41-60</td>
<td>Above 35.4</td>
<td>5</td>
</tr>
<tr>
<td>Above 60</td>
<td></td>
<td>5.5</td>
</tr>
</tbody>
</table>

Based on the Palestinian uncertain conditions and the failure of water suppliers the researcher convinced that getting the tariff structure right is fundamental to achieving the main objectives of reforming water pricing policy and overcome difficulties are facing water suppliers and people.

The key objectives of a proposed domestic water tariff are:

- Making basic essential need cheap (the new tariff will make the first block upper limit meets the essential need - around 100 l/capita/day), this will serve around 60% (sharp poor and poor people). International experience indicates that a cheap or free "Human Right" block also increases the efficient usage. The consumer can compressed it use to be under this block which also benefit the objective of dealing with scarcity.

- The number of people who are willing to pay will increase (since the bill will be less than the current situation). Due to that increasing of willingness to pay the revenue of water supplier expected to be more.

- Based on the socioeconomic uncertainties, the water supplier can decide to make the first block cheap (affordable) or even free (in case of decision to do subsidy).

- Making the efficient household use affordable: pricing the second block to ensure affordability for an average household using water efficiency set a solid benchmark around which concession for low income households.

- It makes excessive use expensive. The expensive higher blocks should discourage water wastage for many users.
• It is simple. Water supplier report that when the people understand their consumption will be the base of their bill, they are more likely to use water efficient.

6.15. Output and Analysis

6.15.1. Family size and monthly water consumption
It was found that there is a direct relationship between family size and the quantity of monthly water consumption (figure 63), both in the winter and summer. But when the amount of consumption is calculated per capita, this amount will be small (between 80-90 L/capita/day) since the extended family members average more than 11 members. The case of the targeted area is not different from the national level.

![Figure 63. Family Size Vs Water Consumption](image)

The figure shows that in the case of a large family their consumption is high despite the fact that they are classified as poor and most of the extended family are very high since they are sharing the same meter and that’s why they match the highest prices block (forth) despite the fact they are in the sharp poverty group

6.15.2. Family size and monthly water cost
The data shows that people pay 2-4.2% and additional 4-6 % from the additional purchased water (tankers) of their income to cover the water cost. It clear from the figure
64 that there is a direct relationship between total water consumption (from local network and additional supply) and monthly water cost for most of the surveyed families. This could be attributed to the fact that most of these large size families normally live either in rural areas or in districts with low water supply availability (water network). Therefore, these families consume the highest additional supply (which are normally more expensive than water from the local network in these districts) compared to the other families and consequently, they consume less water but pay higher prices.

![Figure 64. Family Size Vs Monthly Water Payment](image)

Additionally, water costs in the summer are higher than in the winter, attributed to higher water consumption during the summer. Moreover, it was found that the exponential trend line for water cost in the summer has a higher correlation value with family size (0.61) than that in the winter (0.33). This could be due to the higher water consumption from additional supply in summertime compared to wintertime. And as the additional supply is expensive, buying higher amounts in the summer will clarify and strengthen the relationship between family size and monthly water cost more than in the winter. Due to irregular water availability, the demand for additional water supplies (tanks, springs water, bottled water) increases in most cases as alternative resources (availability and accessibility). Also, these families are forced to buy water at higher costs to cover their basic needs regardless of their monthly income.
6.16. The impact of applying the proposed tariff structure

After monitoring 57 households for eight months (four months in the summer and four in the winter), the following changes occurred, as clarified in Table 26 and figure 65. The average number of households who paid was 32.2, while after the application of the new tariff, the number of people who paid increased to 43.75. In other words, the average increased percentage is 20.18%, even taking into consideration that during the first four months, the government did not pay the salaries of its employees.

Table 25. The Impact of The New Tariff

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of household who paid (old tariff) 2005-2006</td>
<td>30</td>
<td>36</td>
<td>41</td>
<td>33</td>
<td>33</td>
<td>28</td>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>No household who paid (new tariff) 2007</td>
<td>52</td>
<td>44</td>
<td>47</td>
<td>43</td>
<td>41</td>
<td>41</td>
<td>40</td>
<td>42</td>
</tr>
<tr>
<td>Increasing %</td>
<td>38.60</td>
<td>14.04</td>
<td>10.53</td>
<td>17.54</td>
<td>14.04</td>
<td>22.81</td>
<td>19.30</td>
<td>24.56</td>
</tr>
</tbody>
</table>

Figure 65. Number and % of People Who Paid in The Old and New Tariff Systems

An additional impact of the new tariff system are not only the number of households who received low cost invoices increased, but the number of households who paid their invoices increased and, as direct impact, the total revenue of the municipality increased.
(table .27 and figure 66). The following table shows the differences between the total revenue from targeted households before and after the new tariff structure.

Table 26. Increasing Revenue after the Implementation of The New Tariff

<table>
<thead>
<tr>
<th>Revenue (NIS)</th>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old (2006-2007)</td>
<td></td>
<td>1567</td>
<td>1784</td>
<td>2394</td>
<td>2195</td>
<td>2456</td>
<td>2787</td>
<td>3128</td>
<td>3253</td>
</tr>
<tr>
<td>New (2008)</td>
<td></td>
<td>2711</td>
<td>2064</td>
<td>3057</td>
<td>2658</td>
<td>2749</td>
<td>3269</td>
<td>4381</td>
<td>5098</td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td>1144</td>
<td>280</td>
<td>663</td>
<td>463</td>
<td>293</td>
<td>482</td>
<td>1253</td>
<td>1845</td>
</tr>
<tr>
<td>% increase</td>
<td></td>
<td>73.01</td>
<td>15.70</td>
<td>27.70</td>
<td>21.09</td>
<td>11.93</td>
<td>17.29</td>
<td>40.06</td>
<td>56.72</td>
</tr>
</tbody>
</table>

The average increase was 33% with an average amount of 803 NIS. If we apply this percentage on the entire cluster of the villages, the total additional revenue would be 201,122.8 NIS, which equals 13% of the total cost of water.

![Comparison of revenue between old and new tariff structure](image)

Figure 66 Comparison of revenues between old and new tariff
6.17. Stakeholder Response
As mentioned above, several meetings were conducted with different stakeholders; however, each stakeholder has a different interest and a different approach to deal with the tariff problem. The following are the reactions of each stakeholder:

6.17.1. Beneficiaries:
More than 95% of the interviewed households expressed their approval for the new tariff structure; however, most of them presented recommendations such as: bills should be due during the first week of the month so that consumers can pay after they receive their salaries; the payment grace period should be extended; and there should be more than one meter for extended families, which would help divide the consumption into more than one family, lowering their bills. However, the beneficiaries’ reactions highly depend on general economic conditions and satisfaction with the political and social background of the elected municipality council.

6.17.2. Experts:
Meeting with experts (water supply engineers, economists, social scientists, community developments) concluded with several recommendations:

- More time for monitoring the program
- The results depends highly on uncertainties
- The first block range is wide which could be more suitable for very poor communities
- Larger numbers of household should be interviewed (i.e. the sample size should be bigger)

6.17.3. Stakeholders:
Since the number of stakeholders is high, the main stakeholders were invited to the workshop and the approach was presented to them; the people who attended the workshop represented local NGOs, international NGOs, donors, ministries (finance, agriculture, and local government), and municipalities. The main recommendations of the workshop were:

- The need to reform the tariff structure is highly needed and top priority.
• The tariff structure should correspond closely to the government’s social agenda
• Social fairness and a pro-poor policy should be the main criteria for a new tariff structure.
• Participatory approach should be applied during the formulation of water policy.
• Uncertainties are the main obstacles of developing sustainable water policy, due to this facts the tariff structure should serve the strategy to cope the uncertainties
6.18. Lessons Learned:

Several key lessons can be learned from the pilot study

| Lesson one: | It is important that the socioeconomic profiles be attached to the consumer water payment record. |
| Lesson two: | Transparency and social acceptance of any pricing system are the key issues in making it successful |
| Lesson three | Payment methods (smoothness, timing, behavior of the collector) are extremely important issues for improving the revenue |
| Lesson four: | Water data and financial management part of the supplier problems |
| Lesson five: | Good governance and the democratic structure of the municipality are an integral part of the efficient water policy otherwise the risk of social conflict is high |
| Lesson six: | Public awareness, transparency and a transition period are preconditions for the introduction of a new tariff structure |
| Lesson seven: | Uncertainties have high significant impact on payments (during the time of no salaries from the government the revenue rate was low) or the change of the council of the municipality |

The added value of the proposed tariff structure; the ability to apply it under uncertainties since the utility can decide on the best time for subsidy, to which social group and to define also, when the sever poor, poor people and vulnerable are able to pay the cost (not more than 4%) and in the same time can guarantee the basic water needs. The applicability in similar conditions in particular under uncertainties or poor countries or in decentralized tariff structures for specific social groups and marginalized areas.
6.19. Summary of the Chapter

This chapter is presented the field data analysis and the results of the survey, the economic data (income, poverty, water bills, and cost of water, etc) and the social data (family size, types of families, etc). Additionally the current tariff systems, as well as their advantages and disadvantages were mentioned. The proposed tariff structure (modified locally applicable IBT) structure; the reasons behind the selection of the proposed structure were given. This chapter stands as an application of the proposed tariff structure and the impact of socio economic based tariff structure on water supply management and the performance of water utility. Therefore the selection of the geographical location and the case study (pilot-micro level) serves as a model for the nation level (macro). This chapter also explores the reaction of different stakeholders and the economic revenue of the new application. This chapter aims to recommend and to explain an efficient pro- poor water tariff structure which was stated as the main objective of the research
Chapter Seven: Conclusion and Recommendations.

7.1. Introduction

The research had aimed to produce a tariff structure under a rapidly changing and complex socioeconomic and political situation. The researcher was committed to boundaries such as a the tariff structure will accommodate the social national agenda, minimum sustainability of the water authority by the use of inter-class and governmental subsidies and proposing steps to achieve good governance, which is the main step towards transparency and a creation of trust between utilities and served communities. Additionally the lessons learned from the pilot projects are important when the proposed tariff is introduced at a national scale. the application of tariff structure proved at pilot project will serve the majority of the poor people (45-50%) of the population and will reduce the water bills of the poor from 16% of their income to 2-3 %. if the tariff applied at national scale the impact on revenues and performance of the utilities will be remarkable and will help to sustain the services at uncertain conditions.

The importance of the socioeconomic profiles to be attached with the consumer water payment record; transparency and social acceptance of any pricing system are the key issues in making it successful. Payment methods such as smoothness, timing, and the behavior of the collector are important issues for improving the revenue. Water data and financial management are part of the suppliers’ problems. Good governance and the democratic structure of the municipality must be a part of an efficient water policy otherwise the risk of social conflict is high. To introduce a new tariff structure, public awareness, transparency and a transition period is a pre-condition to being accepted. Uncertainties impacting on payment are highly significant, for example, during 2009 no salaries were paid by the government, so the revenue rate was low). The conclusions are initially structured around a review of the primary research question: What is the pro-poor and most efficient water tariff structure can be implementable under several uncertainties?
7.2. Is the Proposed Tariff Structure Pro-Poor?

Based on the obtained data and its analysis, the proposed structure will enable the deep poor and poor people who currently pay 16.5% of their income to pay their minimum bill. These consumers would be under the first block which is cheaper and a flat rate since they consume approximately 21m³. This amount will be less than (2-3%) of their income, since their average income ranges between 1,800-1,965 NIS. Also, by this new tariff structure the middle class people will pay 3-4% of their average income. This means the percentage of reduction for deep and poor people will be approximately 14% of their income. Additionally vulnerable people who currently are qualified to be poor (by declining the socioeconomic and political conditions), will also be benefit from the new structure. Therefore the new tariff will accommodate more than 50% of the people if the socioeconomic situation declines further. More than 60% of the poor people surveyed expressed their willingness to pay the average price which was maintained by new tariff. This tariff, if applied will save this category of consumer approximately 141NIS) allowing them to afford other basic needs. The field experience showed the saving occurred by reducing the water bills will help the poor people to gradually graduate from poverty and using the saving to afford other basic needs such as food; by producing it in a home garden and/or livestock such as a sheep, and with the accumulated saving they can start small scale income generation projects. The field data also showed that by providing the basic water needs (enough for drinking and household agriculture) to un-served villages, with the minimum or first block price from a public filling point:

- 90 % of the families graduated totally from extreme poverty and had an opportunity to improve income per capita. This was due to the methodology implemented in order to subsidy them.
- 10% of the families were still considered as extremely poorest of the poor and they still needed to be supported by other interventions.
- Per-capita income was increased dramatically by 10 times provided there is a continuous of technical follow up to the projects and water subsidy up to the year 2015.
• The approach of supporting poor families by water subsidy and water availability related projects such as food production will precipitate creating provider and producer families instead of recipient families; minimize poverty, promote social safety conditions for extremely poor families, and secure basic needs of food and water. Support of such families will allow graduating from extreme poverty to a higher level of income in which they will be able to independently secure themselves.

7.3. What are the factors should be considered to minimize the impact of uncertainties (Sub-Q2)?

Referring to table 12, which indicates in detail the uncertainties facing the water sector; the application of the proposed tariff structure will help the beneficiaries to overcome and reduce the damages occurred by the uncertain economic and political environment. At the individual level the new tariff system will enable beneficiaries to secure their basic water needs and to instead, use this money to pay for other basic needs. At the utilities level, the new tariff structure will help the utility companies to continue services in the worst case scenario by sustaining at a reasonable level the number of people who keep paying their bills, which is not the case at present time. By producing a consumer socioeconomic profile, through a dynamic database and GIS) the utilities and government can more easily decide when and how much subsidy will be given to the people or utility. The subsidy will be based on pre-determined criteria such as family size, unemployment, average income, cluster of households…etc).

7.4. What are the main steps which should be taken to reform the legal and institutional arrangement in order to enable the environment of the new tariff structure (SubQ 3)?

As shown in the data analysis chapter and by using the concept of IWRM, the tariff structure is one of the essential components of a national water policy. However it should come in parallel with the proper legal and institutional arrangements. The data showed that an un-unified system, lacking in socioeconomic indicators, social acceptance and low law enforcement would create a poor environment for a progressive tariff structure. The slow process of institutionalization of water utilities would also
make any water tariff structure insufficient and disable its ability to achieve its primary objectives. Attempts to address the institutional problems and water tariff policy have been made by a number of donors in the recent past, but there has been little or no success in this regard. This has resulted in the provision of conflicting advice to the PWA concerning effectively the same issues and the PWA decision makers have neither the capacity nor the experience to make coherent decisions amongst the multiple preferences given by external consultants. Under such circumstances, the donors threaten to become part of the problem neither than contributing to critically needed solutions proposed to date concerning water utilities. There is also a tendency for service providers treat Palestine as a huge entity, rather than poor small country.\footnote{This conclusion based on several interviews and an internal evaluation report done by PWA.}

7.5. What is the impact of proposed new model of tariff structure on utilities Performance (SUB Q4)?

Based on the qualitative and quantitative data been obtained from the field, the expected impact of a new structure on water utilities can be summarized as the following:

The pilot experiment in Beni Zeid village proved that by increasing the maximum level of the first block from 10 to 21.5, the average number of households who paid their bill increased from 32.2 to 43.7 (20.17% of the total number of households). Despite the fact that the amount of money paid per household decreased, an increase in revenue was recorded due to the increasing number of households who paid, which led in turn to an increase in the revenue of municipality. More than 95% of the households at the pilot scale, expressed their approval for the new water tariff structure however they complained about the date (last week of the month) and method of collection (cash on the spot). Most of the water utilities managers appreciated the concept of database and consumer socioeconomic profiles, however they are hesitate about the cost of it. It is clear from the field work that has been done that most of water utilities price their water without any criteria or legal reference and the political interest of the governor body is the priority. The impact of uncertainties on the water utilities is very high, for example during 2007 the average revenue of water utilities decreased to 10% as the government was unable to pay the salaries of employees. Except for two, the status of governance of
water utilities was almost as bad (the total 11 water supplier). The main problems are: no clear guidelines for pricing, no regular evaluation for performance and very poor financial management. It was extremely difficult to understand the real cost and revenues occurred from water services. The impact of the new tariff not only improved the revenues, making it closer to cost recovery, but will also help to increase the efficiency of the water utilities in terms of the level of knowledge about their consumers, since the problem of the water utilities is that the only thing known about the consumer if he paid the bill or not. The sensitivity analysis showed the current practices of the water utilities. To cover the lack of revenues by increasing the water prices is neither practical nor fair for the people who pay; the only solution is to improve the collection rates. By the new proposed model this can be achieved, making price increases unnecessarily and infrequent.

7.6. What lies beneath the unwillingness to pay and what are the measures should be applied? (SubQ.5)

When it realized by consumers that services are not free, the reaction is generally negative. The term ‘water pricing policy’ does not communicate very well to the public. Mentioning ‘water policy’ and pointing out that one of the aspects is pricing could be an option to avoid such a reaction. Several research studies show a gap between what people say and what they do, this is partially true in Palestine the researcher noticed that people who are receiving water from Israeli company they don’t willing to pay and they have a trend to have illegal connections.\(^{124}\) It is important for developing a water pricing policy to achieve the most accurate figures concerning what the public are prepared to pay for water in certain situations. There are a variety of possible explanations as to why market research overstates consumer willingness to pay. One problem may lay with flaws in the surveys themselves. Common errors (Byrnes et al. 1995) include failure to:

- Define adequately the environmental problem under consideration.
- Express how the program would solve the environmental problem.
- State a specific financial amount being requested of respondents to solve the problem.
- Explain how respondents’ payments would be collected and administered.

\(^{124}\) They believe the purchased water is belong to Palestinians and controlled by Israelis by power
- Detail the length and breadth of the program measures.
- Contrast the programs’ costs and benefits with alternative programs and methods currently in use.
- Describe sufficiently the proposed program so as to engender trust in respondents that the programs are realistic and can be accomplished in the suggested time period.

Other reasons include:

- Peoples’ attitudes towards the environment may be supportive, but they are faced with many demands on their pocketbooks and cannot satisfy them all. It is easy to say yes when you do not have to put real money on the table.
- Environmental benefits are public goods. No one can really own them, so it may be more difficult to get people to buy something they cannot own.
- It might be that there is a lack of awareness and understanding about some of the basics behind the concept of water pricing.
- Water pricing policy is a new concept in the Palestinian Territories. It does not enjoy a widespread and immediate recognition. Introducing a new type of concept requires time to penetrate consumer awareness and understanding.
- Most new products are heavily marketed and promoted to inform consumer of the product’s presence and benefits. This has not yet happened with water pricing.

A water pricing policy stands or falls with the citizens. While it is possible to enforce a water pricing policy by inspectors and police, a new policy will be more successful if it is accepted and respected by the public. For this reason citizens and organizations have to be involved with the development of a water pricing policy. Attention should also be given to publications. Negative media attention to the idea of water pricing policy overall may create a credibility problem. The effects of a water pricing policy on citizens should also be taken into consideration, specially its social impacts, such as: the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs and generally cope as members of society. The term includes cultural impacts involving changes to the norms, values and beliefs that guide and rationalize their cognition of themselves and society.

Among the social criteria that directly affect the water pricing policy are:
- community stability: uncertainties one of the issues was taken into consideration during the design of the new tariff structure by the socioeconomic parameters based flexible and dynamic tariff structure
- diversity among the users; the proposed tariff structure recognizing and dealing with different social groups and more attentions were given to the poor people and marginalized communities
- The organizational structure of the authorities: the reform process and the enhancing the capacity of the water utilities are part of the successful application of the tariff structure.

Policymakers determine what weight, if any, should be placed on social criteria and how those criteria are balanced against other relevant factors. Often that determination is made with the help of a Social Impact Assessment (SEA). The policymakers and decision-makers decide about the exact water pricing policy. In some countries research has been done on ‘willingness to pay’. Citizens made clear that they were willing to pay more than the current price for water. However after those researches, the authorities did not increase charges. This could be due to politics. Some policymakers are worried about their position and want to keep the support of the people. The reason for not putting up the price could also be from an ethical point of view. If the state’s economy is poor it is difficult to expect people to pay more. The proposed restructuring plan for the water pricing policy can also be considered controversial by the general public who may query the destination of the extra revenue, particularly in the context of corruption and good governance issues. Based on these facts, several pre conditions can make the new tariff structure a Success story

7.6.1. Willingness to pay conclusions
The public’s willingness to pay is the most important component for establishing the water tariff and the multivariate analysis of the results has shown that there are nine independent variables influencing the various categories of willingness to pay in various degrees. The variables are as follows:
   1. Geographic location of respondent - district
   2. Sex of respondent
   3. Reliability of existing water supply services
4. Current water use level
5. Family size
6. Profession of respondent
7. Education level of respondent
8. Average monthly income of the family
9. Type of residential area (City – Village – Refugee Camp)

7.6.1. a. Willingness to pay to recover cost (WPRC)
It was concluded that people in the connected areas are willing to pay an average of 4.1 NIS\textsuperscript{125} for each m\textsuperscript{3} used. This rate is assumed to be equivalent to recovery or marginal cost of water. However the main variables influencing the WPRC were found to be the district of the respondent explicitly or in conjunction with other interrelated variables. For example the income level in Ramallah was the main variable influencing this type of willingness to pay, where people with income $\leq$ 2000 NIS were willing to pay less (4.3 NIS/m\textsuperscript{3}) than the people with income ranging between 2000 – 5600 NIS per month (5.07 NIS/month). However gender was the main variable that has impact in the districts of Jericho, Nablus, Tulkarm, Qalqilia and Salfit. It was found that females are willing to pay (3.86 NIS/m\textsuperscript{3}) more than males (2.76 NIS/m\textsuperscript{3}). Meanwhile, the water supply reliability was the main variable influencing WPRC in the Hebron district. People with unreliable water supply are willing to pay (6.4 NIS/m\textsuperscript{3}) more than people with relatively reliable water supply (4.68 NIS/m\textsuperscript{3}). Again the results obtained from Bethlehem were interesting. People were generally uninterested in paying for water. The average rate that people are willing to pay was found to be 0.54 NIS/m\textsuperscript{3}, which is even less than the production cost of each m\textsuperscript{3} at the source.

7.6.1.b. Willingness to Pay for Developing the Resources (WPFD)
The average monthly cost that people are willing to pay for WPFD was found to be almost 10NIS. The variation across districts was found to be the main influencing factor. However, there has been other variables interrelated to some districts affecting the willingness to pay for water resources development. For example, gender found to be the main factor affecting this type of willingness to the pay in Hebron district. Females are

\textsuperscript{125} 1 US$=4 NIS
willing to pay (23/NIS/month) more than males (7.1 NIS/month). This is can be explained, by understanding the situation of women who suffering from lack of water and the time consumed by them in order to bring water from far distance, in some occasions, they need to bring water on their heads. The situation was different again in the districts of Jerusalem, Ramallah, Jericho, Bethlehem and Nablus. The main influencing factor was education level. It was found that there are other factors such as gender and income level effecting people with low education levels. Again females among this category of people are willing to pay more than males. People with higher income are willing to pay more. Meanwhile, the factors affecting the people with higher level of education were found to be reliability of supply services. This is also affected by the type of residential area (City or village) and whether they have any water supply problems.

7.6.1.c. Willingness to Pay to Insure Sustainability

It was found that people are willing to pay an average of almost 10 NIS/month also to insure the sustainability of supply. Yet this category of willingness to pay is mainly influenced by gender. Females again are willing to pay almost double quantity the males are willing to pay (12.2 NIS versus 7 NIS). Willingness to pay among females is also varying from one district to another but females in Hebron are found to be willing to pay the highest rates at (23 NIS/month). In the mean time, the female willingness to pay in the districts of Ramallah, Jerusalem, Jericho, Bethlehem, Nablus and Tulkarm was affected by education level. It was also found here that income level has the main impact on the people with low education. Among those, the people with higher income are willing to pay more. The factor influencing the willingness to pay of the males participants was the monthly income. Again there was variation among the males depending on their level of education. Males with up to 15 years of education are willing to pay the highest rate of 14 NIS. It seems likely that females in all districts valued water more than males and this is why they are willing to pay more for it. It is probably natural because the women are the main water user in the house and they know the value of its availability. Their opinions were almost independent of any other variable except in some cases where the education level played a major role in their reaction. It can also be concluded that the willingness to pay is a function of several social and economic
parameters. Therefore any tariff structure should consider such parameters in a holistic manner.

7.7. What are the added values to engage the stakeholders and community participation into the process of formulation tariff structure? (SubQ.6).

Ownership and stakeholders dialogue are key issues relating to strategies and policies in the water sector in Palestine. The need for dialogue process facilitation in situation of increasing water scarcities, and declining socioeconomic conditions is very high and top priority. Qualitative data were also obtained such as: lack of coordination, different interest, political influence and the lobbying groups. The stakeholder’s dialogue and consultation should take into consideration the local conditions, the different kinds of externalities and the socioeconomic and political uncertainties. Facilitation is even more necessary in order to pro-actively involve marginalized and voiceless groups such as women and the poorest layers of society in rural communities. It gives an example of how a stakeholder approach for changing values from charity based to rights based, institutionalizing the stake holders involvement will help for optimal management through creation community ownership of the project. This kind of dialogue will help in promoting the new pricing policies and improving the trust between water utilities and communities. Stakeholders sessions were done in order to discuss the importance of stakeholder’s dialogue to produce efficient water pricing systems and progressive tariff structure their main conclusions were:

- Stake holder dialogue is a dynamic process and should be integrated in all steps of the project cycle
- All stakeholders’ participation are needed for success
- Over expectation might be cause serious damage and interruption during implementation
- Institutionalizing the stake holder dialogue will play the part of a guarantee for the future sustainability of the project
- Marginalized and poor groups can use the dialogue as a platform to guarantee their rights
- Stakeholder dialogue is not demand driven (not show off or donors request) it is an essential part of participatory approach and a key issue for any policy implementation.

Based on the above conclusions, it becomes clear that the current tariff structures has several shortcomings and don’t meet the minimum standards of the main requirement for any water tariff structure, additionally the current water tariff lacks any set of criteria, justification or suitability for current Palestinian conditions. In brief the current water tariff structures are not flexible or sufficient to overcome the rapid changes of political and socioeconomic conditions and it is the main cause of lack of revenue. The analysis of the qualitative and quantitative data have been collected, proved and confirmed the main hypotheses that the current tariff doesn’t meet basic requirements and the secondary hypothesis that the current tariff is unable to deal with uncertainties, as it is not part of a good governance or integrated vision also the analysis of the data showed that the new tariff structure will relieve the poor people and to some extent, will deal with the uncertain environment.

Figure 67. Summary of Research Flow
### Brief Key Findings

- Water availability, accessibility and future water needs are the main concerns of the future water policy in Palestine.

- The current water tariff practices are not only inefficient but cause financial problems for both the poor people and the utility. It also is unable to deal with uncertainties, increases financial inequality and has no respond for changing circumstances.

- The key innovations of the new tariff are the structure of the blocks; based on income, family size and basic needs as well as the development of a dependable data base and socioeconomic profile.

- The new proposed tariff will secure the human basic need of water and will enable deep poor and poor to pay the minimum fees. (around 50% of the population)

- The new tariff structure will make the required needed amount of water available at affordable level 50% will pay less than 4% of their income and around 40% will pay the minimum rate.

- The political, socioeconomic and environmental uncertainties are the major driver for the poor management of the water sector; in particular pricing policy and the supply management component.

- The design of the new tariff structure will be based on socioeconomic data base and will be designed to be flexible and dynamic enough to serve under fluctuating circumstances.

- The new tariff structure will enable the water utility and the central government to take a decision on the size, time, and target groups for subsidies.

- A good governance and the reform of the institutions are preconditions for a efficient and transparent tariff structure and water policy.

- Despite the fact that there is a high willingness to pay the minimum price of water and to get water connection, the willingness to pay for sustainability, cost recovery and investment is still low; the reasons behind
this is the high and accelerated poverty and the lack of transparency in the water sector. However, the political sensitivity of water issue effect the level of willingness to pay in particular the people who served by Israeli water company

- Palestine will remain without an integrated water management, unless there is an improvement in the political and socioeconomic conditions and a minimizing of the conflicts between those with different agendas such as donors, Israel, and Palestine
- The new tariff will serve as a tool for several policy components such as demand management, poverty alleviation and good governance measures.
- Despite the fact of specific conditions on Palestinian territories, the tariff structure can be applied in the similar conditions with some modifications (taking into consideration the socioeconomic conditions). Also, the tariff structure can serve the objective of the most of poor countries which is the reduction of poverty.

7.8. Recommendations

The findings of this research give a good platform for a set of recommendations at several levels; Tariff Structure level, Policy Making Level, and Water Utilities Level,

7.8.1. At Tariff Structure Level

Based on the main findings and its related discussion the following recommendations should be taken into consideration:

- The water utilities should apply the proposed water tariff in order to increase their revenues by encouraging the people to pay.
- The water utilities should start a step by step process to build up a data base in order to make optimal use of the proposed new tariff structure possible.
- The tariff structure should be implemented by participatory approach: informing people by public meetings, leafleting and other tools is the shortest way to start such an implementation.
The new proposed tariff structure is a dynamic process, adjustment, decision to subsidize and defining groups can be done at any desired time, however it is recommended to do so only if that steps needed to cope the uncertainties

Well prepared utilities and good governance are essential conditions to make the model a success

The model should be dealt with as an integral part of the utility general water and social policies.

Clustering the consumers according to social, geographical and poverty conditions is highly recommended.

GIS based data or a simple data management model are important to have a dynamic tariff structure (see Annex I)\textsuperscript{126}

7.8.2. Recommendation at Policy Level
Based on international experience and data obtained from the current research the following recommendations can be presented:

- Since the political situation is uncertain updated studies are necessary to investigate future trends in water prices and the willingness to pay for increased water prices and also to be ready to recover expected uncertainties and emergencies to guarantee the sustainability of services and the utility itself.

- Detailed updated studies and databases of socio-economic conditions are necessary since the MLA-IBT model is highly dependent on accurate socio-economic data in order to enable the utility to take the right decision at the right time.

- Different socioeconomic groups’ representative pilot projects should be conducted in order to modify the model based on the results of the project.

- Essential development and institutional reform such as political and legal arrangements should be taken. Since good governance is not the good well it is the best practices and well established institutions.

- Training courses and capacity building are needed for individuals and institutions that are going to apply the model.

\textsuperscript{126} Annex I “Proposed Management Information System”
• Public awareness campaigns are needed to promote the new model in order to increase social acceptability and willingness to pay.
• Participation of all stakeholders’ in the process is the most effective way to have political approval to achieve the goals of the model.
• Political group’s engagement in the reform and policy formulation is an essential intervention to create political backing and ownership.
• Facilitation of the stakeholders dialogue and institutionalization it an art it is not only show off event.
• Any future water policy should deal with water as having an economic, social and environmental value, and not only as an economic tool.

15 steps to start action Plan should be taken by government

• Establishment of an active task force
• Start participatory approach
• Review the current status
• Engage the scientific community
• Do the SWOT analysis (strengths, weakness, opportunities, threats)
• Review the proposed model
• Create ownership of the model and increase public awareness
• Integrate the model with a socioeconomic national agenda
• Institutionalize the process by the creation of a water pricing unit in the Water Authority
• Draft a plan for a transition period and seek endorsement from the legislative body
• Draft a capacity building plan
• Review and evaluate the transition period
• Take the recommendation of evaluators seriously and act accordingly
• Create performance monitoring plan
• Establish achievement records and award the best practice
7.8.3. At Utility Level

Taking into consideration the output of data and the current status of the water utilities, the following recommendation can contribute improving the situation:

- The utilities have to apply a socioeconomic based water tariff, and to consider it as a dynamic process to serve under all conditions
- Since more than 50% of the people poor or vulnerable groups The utilities have to focus the incentives to serve them, these incentives will encourage them to pay which will lead to more revenues
- Efficient operations and management of the water utility will help to justify their funding from central government or donors. (see Annex II)

- The utilities have to ensure good governance to reduce or eliminate the possibilities of corruption which can be done by:
  - Transparent financial and billing systems
  - Institutionalization of the internal life of the utility
  - Active stakeholders dialogue and community participation
  - High readiness to deal with unexpected risks and uncertainties
- The utilities have to put utmost efforts to reduce leakage: the high percentage of leakages (between 40-60%) leads to a waste of resources.
- Pro poor policy and fair water pricing should be an integral part of the utility agenda without underestimating the importance of cost recovery (as much as possible).
- The utilities have to avoid any unjustified increase in prices; the efforts should be to concentrate on reduction of the operation costs and increasing the overall revenues.
- The utilities have to introduce clear Tariff Adjustment Application and Approval Process (see in Annex III)

---

127 Annex II “Efficiency improvement measures)
128 Annex III “the proposal Developed by discussion with official department at PWA”
7.9. Further Research Topics
Based on the field work and the interviews with stakeholders and some of the experts the following research topics can be proposed

- **Assessment of the impact of social powers and their influence, such as social figures, on water policy and management.**
  
  Such research can help to create an efficient water policy with minimum influence from political and social figures, since most of the developing countries face these particular kinds of problems when there is a weak central government.

- **Development of water poverty index as a tool for demand management**
  Despite the fact that, the index is promoted as a comprehensive tool to describe the general status of the water sector there is still very little research done to utilize this index in other specific topics such as demand management which is a key issue for several countries in the Middle East.

- **Sensitivity assessment and the vulnerability of flexible water tariff in instable political conditions**
  The research should focus on sensitivity analysis for all items of water utilities pricing and tariff performance such as energy, billing system, leakage, corruption ...etc.

- **Public participation in Integrated Water Management for a complex societal problem.**
  The application of private–public partnership and its impact on new Water Authorities. Very little experience exists in Palestine, and investigation of the importance of this model, by reviewing the international experience, will help to lessons to be learnt.

- **Sustainability of the good governance of water utilities under uncertainties in developing countries**
  The research has to focus on how to guarantee the sustainability of good governance during the uncertain conditions and political chaos.

- **Using a Contingent Valuation Method as a Tool Towards Efficient, Equitable and Sustainable Domestic Water Supply in the West Bank**
  This topic is important to match the willingness to pay with any future reform for water sector.
7.10. Limitation of the Research

The research faced several: Logistical and technical limitations:

Due to the political situation the restrictions of movement was a major obstacles to collect the primary data and to interview the people. The disappointed and frustrated people were so hesitant to give information because the internal political problems created a huge mistrust among people themselves and between people and official departments. Additionally due to uncertain political conditions during the period of nine months the government was unable to pay the salaries of the employers which cause a lack of revenues of the utilities (this happened during the application of the pilot, which made the monitoring of the real numbers of revenues and the people who pay so difficult and not realistic which cause the limitation of the period of monitoring.)

The other technical limitation was the contradiction in data: different resources producing different data for the same item (the data and information highly politicized)

This situation took long time to validate the data and to check the accuracy.

A limiting factor facing the researcher was the camouflage data produced by official departments in particular about the performance indicators or the parameters of good governance and reform (the majority was a data to make the donors happy not to show the real situation). Also some departments were hiding the data and without personal communication were so difficult to see the files or to obtain the information.

7.11. Summary of the Chapter

This chapter highlights the impact of the proposed tariff structure and the important steps needed to be completed in order to reform the current status. Additionally, the chapter presents a road map in the form of a set of recommendations to improve the efficiency and the performance indicators of the water utilities, and also presents the proposed future research topics.
REFERENCES.


266


Environmental Resources: Marginal cost Rate Design and Whole sale water market: CT Jai Press. Inc. Greenwich


86. Jean Lee, S K. (1992), Quantitative Versus Qualitative Research Methods - Two Approaches to Organization Studies, in Asia Pacific Journal of Management.9(1)


100. Mahta, L. (2003).Problems of Publicity and Access to Rights: Perspective from Water Domain. This paper was written as a background paper for the 2006 Human Development Report.
Expanded Sourcebook (2nd Ed.). Hopkins University Press


120. Poverty and Environment Partnership (PEP). (2002). Linking poverty reduction and water management This publication is a joint product of staff from SEI and UNDP, prepared on behalf of the Poverty-Environment Partnership.


122. PHG: Database Maps and Statistical data (restricted access)


271


166. Tamimi, A. (2008). Reforming water sector Through Stakeholders Dialogue – Case Study from Palestine: Accepted Paper to be Presented in International Conference will be held in Jerusalem: Water Values And Rights April 2009


175. United Nations Development Program.... New York: UNDP, online at: http://hdr.undp.org/reports/view_reports.cfm?year=0&country=c199&region=0&type=0&theme=0, (noted as UNDP SAHDR 2003).


mentality; Comment; Reply. In, Organization Studies. 14(5
Tariffs in Developing Countries. Economic development and Cultural change
Journal. vol .1.
agenda for South Asia. Water Policy. .5.
Tariffs in Developing Countries: University of North Carolina at Chapel Hill.
185. WHO (World health organization) 2006. Guidelines for Drinking Water:
volume 1, third edition, incorporating first Addendum. WHO. Geneva
186. WHO /UNICEF. (2000). Joint Monitoring Program for water and sanitation,
Gordian knot. Journal of Water Resources Planning and Management,
Data, the MIT Press, Cambridge, Massachusetts, London.
Report 17095-jo, Rural Development, water, and Environmental Dept.
MENA Region. Volume I and II.
one’s Business. Earth scan Publications Ltd
Science Quarterly , pp. 58


List of Annexes

Annex 1. Proposed Management information System (as a tool for better management and decision making) .......................................................... A
Annex 2. Efficiency Improvement Measures (as a tool for self and external evaluation) .......................................................... B
Annex 3. Tariff Adjustment Application and Approval process .................................. C
Annex 4. Questionnaires for Households ................................................................. D
Annex 5. Questionnaires for Water Utilities and Municipalities................................ I
Annex 6. Questionnaires for interviews with water utilities...................................... K
Annex 7. List of People Interviewed or Consulted ................................................... M
Annex 8. Categories for the People Participated in Focus Groups or Stakeholders Sessions ................................................................................. N
Annex 9. Published and Accepted Papers ................................................................ N
Annex 10. Pilot Project Data (Monitoring Sheet) .................................................... O
List of Annexes

Annex 1. Proposed Management information System (as a tool for better management and decision making) ........................................................................................................... B
Annex 2. Efficiency Improvement Measures (as a tool for self and external evaluation) .................................................................................................................... C
Annex 3. Tariff Adjustment Application and Approval process .................................. D
Annex 4. Questionnaires for Households ....................................................................... E
Annex 5. Questionnaires for Water Utilities and Municipalities ................................ J
Annex 6. Questionnaires for interviews with water utilities ......................................... L
Annex 7. List of People Interviewed or Consulted ............................................................. N
Annex 8. Categories for the People Participated in Focus Groups or Stakeholders Sessions ......................................................................................................................... O
Annex 9. Published and Accepted Papers .................................................................... O
Annex 10. Pilot Project Data (Monitoring Sheet) ............................................................... P
Annex 1. Proposed Management information System *(as a tool for better management and decision making)*

A necessary starting point for improving the services is the establishment of a reliable and adequate data collection and management information system. The following specific recommendations are made:

- Proper data collection and reporting procedures need to be developed and standardized to produce meaningful and comparable results. The prepared performance assessment spreadsheet provides a good basis for collecting and analyzing the required data.

- A uniform method of estimating depreciation charges should be developed, and existing fixed assets need to be revalued annually as a basis for calculating the annual depreciation charges. The fixed assets model developed for this study should be implemented and the necessary training provided.

- A cost accounting system that allows the water department costs to be disaggregated from the municipal account is essential. It is also important that cost accounting for all water departments and utilities are compatible and standardized. The cost accounting model that has been developed for this study should be implemented.

  - Thus, it is necessary that a unified tariff system be set in place as soon as possible to ensure that users receive service at prices that are affordable and equitable. Legislation is still being designed to this end, and it is expected that as the water sector is restructured under regional and national bulk water supply utilities, there will be convergence in water pricing. A Cost Accounts System (CAS) needs to be developed; which will allow accurate calculation of the costs that need to be covered in terms of water production, water conveyance, O & M costs, depreciation of fixed assets, staffing and administration. In addition, customer databases need to be developed to standardize customer auditing procedures.

- Establishment and implementation of compatible management information and utility liquidity or financial accounting models.

- The customer records in most water departments are incomplete, and proper databases of customer numbers, consumption patterns, bills and payment records, un-metered and un-authorized connections, etc. should be formalized and installed.

---

*1This tool developed by different discussion done with PWA and other consultants*
Annex 2. Efficiency Improvement Measures (as a tool for self and external evaluation)

There are several water demand management measures open to the municipal water departments and utilities, as well as their customers that may result in better and more efficient services, such as:

- Detailed registration of existing facilities (assets), dimensions, material, year of construction, connections, etc.
- Legalize illegal or unauthorized connections by installing meters.
- Install meters and establish separate accounts for each household and/or service subscriber.
- Check, calibrate and repair existing meters and replace inaccurate meters with more appropriate (volumetric) meter types. Implement pressure management programs, including installation of meters with instant and accumulated flow reading for the different supply zones.
- Leak detection and repair or pipe replacement programs based on zonal meter readings, sounding and electronic detection.
- Checking, maintenance, repair or replacement of leaking pumps, meters, automatic control valves and other installation.
- Improve meter reading efficiency by training and motivation of meter-readers.
- Stricter control with use of non-metered consumption.
- Impose adequate fines for late payment and enforce collection of accounts in arrears, for example by temporarily disconnecting customers.

The water users may themselves take measures to reduce in-house water consumption by repairing leaking plumbing and fixtures, and by installing water-saving facilities and appliances and may be motivated to do so by economic incentives and/or through increased awareness and motivation campaigns.

The municipal water department and utilities will now have access to the tariff model, but a new tariff should not be established without a prior discussion between the PWA and the municipalities on the policy issues related to the design tariff criteria; cost recovery, affordability, and resources allocation efficiency issues. However, the necessary information for such a discussion has not yet been adequately established, and must be prepared by the water department and utilities in co-operation with the PWA.

When a proper management information system and the existing system have been sufficiently documented, the municipalities should prepare time-bound action plans for how to improve the operating efficiency to acceptable levels—how

The action plans should include, but not be limited to the following actions:

- Familiarize and carry out training of selected trainers in the structure and use of the various computer models or tools that have been developed under this study.
• Implementation of the fixed assets model, performance assessment model, cost accounting system, and the tariff and crop models.
• Assess training needs with emphasis on enhancement of financial management and water demand management capability.
• Restructuring of the water department into autonomous municipal or regional utilities
• Development plans with cost for how to meet future water demands, as an approximation of the long-term marginal cost of water. Financial projections of the full operating costs, depreciation and debt service charges for a three to five year period.
• Financial year-by-year projections of revenues based on average unit costs or water sold.

Develop appropriate tariff structure to meet the projected revenue for the plan period, taking into consideration the "basic needs" of the lowest

Annex 3. Tariff Adjustment Application and Approval process (this is the process suggested by PWA)
Annex 4. Questionnaires for Households

**Questionnaire number:**
**Province of interviewee:**
**Name of country:**

Responsible body for water management

1. company
2. municipality
3. specific water unit within the council
4. village council
5. others: ______________________________

**General social information:**

1) sex of interviewee
1. Male 2. Female

2) what is the monthly average payment in NIS for the following public services:

<table>
<thead>
<tr>
<th>water</th>
<th>sanitation</th>
<th>electricity</th>
<th>clothing</th>
<th>residence</th>
<th>transportation</th>
<th>Education</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>remedy</th>
<th>heating</th>
<th>telephone</th>
<th>food</th>
<th>savings</th>
<th>Recreation</th>
</tr>
</thead>
</table>

3) family index:

**Notice: when filling in the table, please use numbers to indicate the chosen data:**

- age (second column)

1) 20 years or less 2) 21-35 years
3) 36-50 years 4) 51 years and above

- sex (third column)

1) Male 2) female

- education level (forth column)
1) Less than high school 
2) high school 
3) University degree (B.A) 
4) university degree (M.A. or PhD) 

- working state (fifth column) 
1) Works 
2) doesn’t work 

- type of profession (sixth column) 
1) No profession 
2) industry 
3) agriculture 
4) Commerce 
5) tourism 
6) security 
7) Governmental employee 
8) services (medical, engineering, advocacy…..) 

- monthly income/person (seventh column) 
1) Less than 1000 NIS 
2) 1001 - 2500 NIS 
3) 2501 – 5000 NIS 
4) 5001 NIS or more 

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Sex</th>
<th>Education level</th>
<th>Working state</th>
<th>Professional type</th>
<th>Monthly income (NIS)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
<td>(8)</td>
</tr>
</tbody>
</table>
Residence contents and private properties:

1) Number of rooms in the house? ___________________________

2) type of residence:
   1) Individual house          2) apartment
   [ ] Owned                   [ ] rented

3) what is the grand area of the residence:
   1) 60 m² or less            2) 61-100 m²          3) 101-140 m²
   4) 141-200 m²               5) 201 m² or more

4) Number of available bathrooms in the residence? ___________

5) availability of shower:
   1) Yes                      2) no

6) availability of a private car (not for work)
   1) Yes, _______ (cars)      2) no

7) availability of a washing machine in the residence
   1) Yes, automatic           2) yes, half automatic
   3) Yes, manual              4) no, not available

8) availability of a dish washer in the residence
   1) Yes                      2) no
**Water resources, prices and consumption**

1) What is the main water resource for your house?

1) Main water network  2) rainwater cistern  
3) Surrounding springs  4) purchasing from tanks  5) others

2) What is the additional water resource for your house?

1) Water tanks  2) springs  3) cistern  
4) mineral water

3) What is the name of the body or organization that supplies you with water?

4) How much money do you pay for each 1m³ of water?

1. _______________ NIS  2. I don't know

5) What is the time period for the water bill?

6) What is the monthly average rate of your water bill (from water networks)?

In summer (May – September) ________________________ NIS/ time period  
In winter (October – April) __________________________ NIS/ time period

7) What is the monthly average rate for water brought from other water resources?

In summer ____________________ NIS/monthly  
In winter ______________________ NIS/monthly

8) Do you consider the amount you pay for the water bill


9) How much, in your opinion, do you think you should pay for the monthly water bill?

_______________________ NIS/ time period

10) What are the conditions that should be available for you to pay additional amounts?

1) guarantee that the water will not be cut off  
2) periodical maintenance of the water networks
3) guarantee the quality of water
4) other

11) Have you ever been unable to afford paying any bills?
1) Yes  2) no

12) How would you react if you were unable to afford paying an increase in the water prices?
1. postpone the water bill to the following month
2. pay it in payments
3. transfer water through gallons from gardens or public places
4. request for water exemption
5. reduce water consumption
6. loan

13) How many cubic meters of water do you consume monthly?
In winter _______________________ / month
In summer _______________________ / month

14) Do you have any project related to the water network of the house including the agricultural and animal raising?
1. yes, ________________________________
2. no

15) most of the water is used for:
1. domestic use
2. agriculture
3. other

16) How many cubic meters of water do you need only for domestic use? _________________ m³

17) How much water do you store in the house water tanks?
1. nothing
2. 1-3 m³
3. more than 3 m³

18) Has the price of 1 m³ of water differed since the Intifada?
1. yes, ________________________________
2. no
Annex 5. Questionnaires for Water Utilities and Municipalities

Questionnaire Number: _____________________________________________

Name of Organization: ______________________________________________

Special questions concerning the researched area or body:

1) What is the type of the researched body?
   1) Private company  2) governmental (municipality,)
   3) Non profit organization  4) other

2) What is the main resource of the sold water?
   1) Private cisterns  2) West Bank Water Department
   3) Muskroot (Israeli water company)  4) governmental organization
   5) Other __________

3) number of customers whom you supply with water:_______________

4) percentage of customers who pay their water bills without delay:_____

5) quantity of water supplied monthly from the resource: __________m³

6) percentage of water loss from the water network:___________m³

7) Price of the cubic meter of water purchased from the main resource:
    __________ NIS.

8) The applied tariff system:
   1) United pricing  2) consumption groups  3) pricing
   4) according to the consuming sector  4) other_______________________

9) Price of one cubic meter of cold water

<table>
<thead>
<tr>
<th>Consumption sector</th>
<th>Consumption group(m³)</th>
<th>Cubic meter of water/NIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10) Average cost of the maintenance and operation: __________
    NIS/month
11) Tax percentage:___________________
12) Delay percentage:______________
13) Do you face any problem in paying back the amounts due for
    supplying water?
     1) Yes     2) no
14) What is the average monthly deficit : _______________ NIS
15) How do you pay these amounts?
     1) Customers contribution
     2) increase in the price of one cubic meter of water
     3) supporting body
     4) other ________________
16) in case of the inability of any customer to pay the water bill what is the
    procedures followed:
     1) cut off water
     2) give a warning and a chance to pay
     3) give a chance to pay the amount in payments
     4) other:_______________
17) On what basis are the exemptions put and who puts them?
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
Annex 6. Questionnaires for interviews with water utilities

Interview questions

1. Who pays the administrative expenses for the organization?
2. Is the municipality/village council/ or camp able to sell water without taking the permission and coordination with the authority or vice verse?
3. Is the municipality/village council/ or camp able to define and set a pricing system or tariff without taking permission and coordination with the authority or vice verse?
4. Can the municipality/village council/ or camp get financial support from any foreign body without taking permission and coordination with the authority?
5. On what basis are the taxes, fees and water tariffs defined and who defines them?
6. On what basis are the exemptions defined and who defines them and who is the beneficiary?
7. Is there an enforced support for the water bill in some areas and under what conditions?
8. What would happen (practically and in reality) if someone dug a cistern or well and sold the water without a license?
9. What would happen if a well owner or the municipality exceeded the permitted limit of the well?
10. What would happen if the water was used for a purpose other than what is mentioned in the license?
11. What would happen if the municipality/village council/ or camp didn’t pay the water bill?
12. How many employees are there in the development plan department?
13. Is the number of employees working in the planning department sufficient and suitable?
14. Is the specialization of each employee working in the planning department suitable and what are the gaps?
15. Are the necessary data and facilities needed for planning available at the department and in which method (written or disks)?
16. Is there a budget for the development planning and how much is it?
17. Is there a budget for the development itself, and how much is it and what is its source?
18. From where is the budget of the water authority? (Authority……%, other bodies….. %)?
19. what are the prospects for the development plans regarding:
   a. improving the water networks
   b. tanks
   c. pumping stations
   d. number and capacity of cisterns
   e. water loss
20. Public participation: how and to what extent does the public participate (if so), and what are the authorities plans regarding this issue?
21. How does the authority know the opinion of the public?
22. Is the public’s knowledge enriched?
23. If so, is it enriched by radio, newspaper, television or pamphlets?
24. Is there a need or necessity or even any plans to activate the public’s participation financially in water projects?
25. Is there a need or necessity or even any plans to activate the public’s participation in choosing and orienting the projects?
26. Is there a need to activate the public’s participation in the organization’s administration?
27. Is there a need to transfer the ownership of part of the water systems to the public (privatization)?
28. Is the waste water used for irrigating crops?

1. Yes   2. No

29. if yes:
   - in which areas
   - percentage of lands irrigated by waste water ____________%
   - quantity of water that is utilized _____________ m³

30. Has there been any complaints regarding the quality of water?
31. What is the percentage and reasons of water loss in the water networks?
32. Who is the legal responsible body for water resources (Palestinian Water Authority, Ministry of Agriculture, and Ministry of Local Affairs)?
33. What are the relinquishments and the sanctions up to now, and why?
34. Is there any relation or any plans for establishing a relationship between the water allocated for agriculture and the food product?
35. Is the water policies defined and set by the water authority and are authorized by the National Authority (government) or the other way around? And how are the policies merged into the national policies?
36. Is the water security affected by the increase or decrease of the food export including fruits and vegetables from Israel and how does the water authority consider or react towards this issue?
37. How do you calculate the water tariff and what is the percentage of cost reclamation?
38. What is the role of the private sector in consideration to the water services administration whether for irrigation, drinking or for industry purposes?
39. Will the current water distribution and allocation for agriculture, industry, tourism and drinking be changed in future and how?
40. What are the limits/disadvantages of the water distribution system between different sectors (industry/agriculture/drinking)?
41. How do you see the relationship between the water law and water needs?
42. Is it possible or permissible to change water rights such as selling agricultural water rights to a neighboring municipality?
43. What are the possible procedures and measurements that could be taken by the organization (water authority/water departments in municipalities) to reduce the water cost, thus reducing the water tariff?
44. How is it possible to guarantee the minimum amount of water to reach everybody within the political, economic and social changes?
45. How can the poor impact the applied water policies; meaning can the opinion of the poor be heard regarding the water services by the organizations working in the field of water such as the water authority?
46. What are the changes that should be applied by the organization in order to help raise the voice and opinion of the poor?
47. Can water privatization help in this field? And can the associations and nongovernmental organizations be of any help in this domain?
48. What are the organizational/legal means that can be applied and followed to substitute the water from agricultural sector to the drinking sector or to any other sector or vice versa?

Annex 7. List of People Interviewed or Consulted

Prof Eran Feitelson Hebrew University-Israel – October 20th 2007
Prof Franklin Fisher MIT –USA August, 20th, 2008
Dr Jonathan Chenoweth University of Surrey .UK April 20th , 2007
Prof Richard Laster Hebrew University, May 22nd 2006
Dr Nidal Salim –Geneva University .Switzerland, April, 2nd 2007
Eng. Kamal Issa, Palestinian water authority, continuous consultation
Prof. David Eaton, University of Texas, USA, May 5th 2006
Prof Amir Marii ALquds University-Palestine continuous consultation
Prof Edna Tusak Loehman Purdue University, USA November 29th 2007
Prof Amir Salman, Jordan University, Jordan 21st May 2008
Mr Ibraheem Safi head of Ramallah water Authority (consultation)
Prof .Munther Hadadeen Ex. Minister of water .Jordan. (Consultation)
Dr .Hazam Alnaser Ex Minister of water .Jordan. (Consultation)
Eng. Fadle Kawash technical advisor for prime minister .Palestine. (Consultation)
Dr Shadad Atilli Chairman of water authority .Palestine (consultation)
Dr Davis Degbi (GTZ) consultant
Annex 8. Categories for the People Participated in Focus Groups or Stakeholders Sessions

**People working in water utilities** (Managers and Financial departments)

To have a good understanding of the management problem in practice and real life.

**People from decision makers level** (Water Authority members of water council, legislators) to collect information about their visions and the future trends of the governmental policies.

**Experts** who knows the state of art (academia and practitioners)

To help in questionnaires design and feedback on the research process and designs.

**Consumers from different classes** to collect information about consumer’s perceptions and satisfactions and views towards daily problems.

**Donors and NGOs:** to investigate and analyze the roles of the major donors (World Bank, USAID…etc) and NGOs in order to investigate their role in water management values and good governance.

Annex 9. Published and Accepted Papers


**Papers Accepted**

• Alhassan, M. Tamimi, A. Future Palestinian water I: resources, allocation and Perception: Geography Compass Journal. Canada
• Tamimi, A. Hydro-Politics: Water and Difficult Dialogues on Resources Macalester College Journal-MN-USA

Tamimi A.A “The Role of Active Stakeholders Dialogue in Integrated water Resources Management: Case Study Palestine.; Water Resources; European Water association

Annex 10. Pilot Project Data (Monitoring Sheet)