INSTITUTIONAL STRUCTURES FOR EQUITABLE AND SUSTAINABLE WATER RESOURCE MANAGEMENT IN THE MIDDLE EAST

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Public Administration

in

Water Resources Management

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by

Michael Raphael Davidson

June 2006

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Dr. Montgomery Van Wart, Chair Department of Public Administration	Date
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PREFACE

The Eastern Mediterranean region of Israel and Palestine consumes virtually all its available freshwater today. The population of these two entities will double in thirty years. Major regional droughts are likely to occur within that same time period. Most importantly, the region is bereft of any effective, regional, institutional framework that has the mandate and support of local and international communities to formulate and enforce joint water resource management policies.

David Brooks stated in his Keynote Address at the Second Conference of the Israeli-Palestinian International Academic Conference on Water in Antalya, Turkey 2004, "One could place the Israeli-Palestinian situation in a good news-bad news framework. The good news is that Israeli-Palestinian water issues can be resolved by political will. The bad news is that they can only be resolved by political will."[1]

[1] David Brooks, "Water Demand Management as Governance: Lessons from the Middle East and South Africa." *In 2nd Israeli-Palestinian International Conference on Water for Life Held in Antalya, Turkey 10-14 October 2004.*

There are performance criteria for effective groundwater management regimes that are universally accepted, if not adopted, by water managers around the world. The design of water resource management institutions takes into consideration the sustainability of water resources, transferability, efficiency and equity. True sustainability is the equilibrium between current and future use. It is not enough to measure the inflow and outflow of an aquifer but one must take into account the quality and distribution as well. Transferability is the capacity of the institutional structures to foster "relatively free market transactions that can allocate the resource according to highest economic uses"[2]. Efficiency is defined as optimization of benefits relative to costs and equity is concerned with the fair and defensible distribution of the resource.

These criteria are manageable when the political entity in question is a singular political body. There

[2] Gregory A. Thomas, "Centralized vs. Decentralized Approaches to Groundwater Management and Allocation in the Context of Overdevelopment: A Comparison with Respect of Criteria of Sustainable Use: Transferability, Efficiency, Equity", in Eran Feitelson and Marwan Haddad Ed. *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective*: International Development Research Centre and Kluwer Academic Publishers, 2005, p. 178.

may be water basins within that political body competing for water allocations but there are clear and well-accepted structures of governance, adjudication and concerns for conjunctive use.

When water resource management institutional structures are in the design stage for transboundary water basins and aquifers, other factors that must be taken into consideration are the administrative and political functionality of the transboundary co-riparian entities, the relative institutional, economic, military parity between the two (or more) entities, the level of trust and confidence between the states and the commonality of purpose and vision.

The complexities of the Middle East are notoriously labyrinthine in nature and developing institutional structures to accommodate all market sectors across political and social divides is a monumental task. In light of the urgency of water-related issues in the region, we do not have the luxury of pontificating about past inequities and adamantly maintaining accusatory stances. Israel and Palestine draw water from the same well.

DEDICATION

I dedicate this thesis to my family; Robin, Molly, Oren and Elah whose support and patience is only eclipsed by my pride in, and love, of them.

ACKNOWLEDGMENTS

It is my honor to acknowledge the support of Dr. Montgomery Van Wart, Chair of Public Administration at California State University, San Bernardino and Dr. Guenther Kress, Professor of Public Administration and Head of the Water Resources Specialty at California State University, San Bernardino, who have gone far out of their way to support my endeavors.

In addition, this paper is built upon the eloquent and passionate research and entreaties of the water resource community in the Middle East. I am indebted to the many Israelis and Palestinians who have dedicated their professional lives in support of the proposition that cooperative water management in the region is not only possible, but will set the course toward peace.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

PURPOSE AND BACKGROUND

Major Sections of Investigation

The central questions that will be examined in this paper are:

1. Does an integrated institutional framework, which provides for equitable and sustainable water resource management for the Eastern Mediterranean, exist today?
2. If not, what are the strategies and institutional structures required to allow for effective water resource management in the region?

This paper will be divided into four broad sections:

The Challenges of the Region

The Challenges of the region, vis-à-vis water management, interact with all aspects of physical and societal life: the geography, geology and hydrology; population growth; cultural mores; societal demands; political relationships. I shall provide a short, clear overview of the water balance in the region and show how severe, far-reaching and imbalanced are freshwater supply, demand and allocation.

Institutions Affecting Water Management

The Institutions that have affected water management include: the Joint Water Commission; the Israeli Water Commission and Water Commissioner; civil and military Israeli authorities; Zionism; the Palestinian Authority and Palestinian Water Authority; International and Regional treaties and agreements; international organizations; Non-Governmental Organizations (NGO's). This section will include an explication of the international rule and code of law developed for water management and weighs its applicability for the region.

Propositions for Institutional Management

Suggested propositions for integrated institutional water resource management in the Middle East are several: Separate, Coordinated, Joint, Independent or Private. This section will also look at alternative, local structures and the special role of NGO's. Additionally, institutional reform required for integrated water resource management in Palestine will be described and analyzed.

Recommendations for Institutional Management

Recommendations for integrated institutional water resource management in the current political context comprise the final section. Joint water management studies and proposals came into their fore in the 1980's and models for

transboundary water management for the Middle East were widely disseminated and debated during the halcyon atmosphere of the Oslo Accords in the mid 1990's. There was a setback to the confidence-building efforts that had been engendered up to that point once the second Intifada in 2000 took root. The 2006 elections in Palestine and Israel and their aftermath, have manifested an atmosphere wherein all the previously taken steps in confidence building have vanished. Today, bold concepts of joint water management are not under consideration by local, national governments. Nonetheless, because of inadequate and fragile water supplies, a centralized governance body may be required to manage water resources in the region but such a structure must be flexible enough to incorporate alternative, local, subsidiary models for responsive and equitable resource management. The challenge of creating those institutional structures to accommodate both sectors will be presented in this section.

The challenges that face effective, sustainable and equitable water management are myriad and complex. The lack of water and the inequitable allocation of water have contributed to conflict at the international and intranational levels. "The primary challenge is to get ahead of the 'crisis curve', and to help develop institutional capacity and a culture of cooperation in advance of costly,

time-consuming crises, which in turn threaten lives, regional stability and ecosystem health."[3]

The institutions discussed below are also of numerous varieties. They range in scope and size from formalized institutions such as treaties and government agencies to informal subsidiaries such as village councils and agreements in principle. The size, formality and efficacy of these institutions are often not correlative.

Integrated Water Management

In integrated water management programs societal sectors that must be addressed and satisfied include health and sanitation, environment, ecology, hydroelectric power, irrigation, recreation, industrial and domestic. All of these purposes interact and a management plan that adequately sustains each one needs to be able to collect, collate, interpret and act upon scientifically based data that is transparently shared among all parties. All stakeholders in the region must have access to this information and be given the opportunity to become actively involved in policy making. A body that governs such an integrated management program must be representative of its constituents, cognizant of

[3] Mark W. Rosegrant, "Policies and Institutions for Sustainable Water Resource Management: A Research Agenda", *Challenge Program on Water and Food Background Paper 5.* Available at http://www.iwmi.cgiar.org/challenge-program/pdf/paper5.pdf. Accessed February 15, 2006.

water quality and quantity issues, include planning and decision-making bodies, have enforcement capabilities, incorporate dispute mechanism means and maintain transparent and reliable means of income.[4]

The Role of NGO's in the Middle East

In support of this thesis I will review the institutions of the international and regional water resource management community. NGO's have been of extraordinary value in the Middle East and it is likely that in the current political atmosphere their role will be increased as regional governmental cooperation is in flux. There are NGO's in the region which are controlled jointly by Israelis and Palestinians and serve not only to provide technical assistance and links to donor communities, but which have also developed and nurtured meaningful personal relationships among their members. New and creative thinking in the region has challenged the 'zero-sum' equation and provided water management theory based on a 'win-win' scenario. For Palestinians, in particular, who have not enjoyed the benefits of international recognition, often these NGO's have provided their voice and face.

4 R. Laster, J. Gat and D. Livney, "Water Flowing Under the Law", accessed on January 15, 2006, available on line at http://www.ors.regione.lombardia.it

Nomenclature

A word about nomenclature is relevant at this point. In this paper I use the term "Palestine" liberally. As of this writing, there is no state of Palestine. Israel has officially withdrawn from the Gaza Strip and that area is now under control of the Palestinian Authority. There are several towns in the West Bank that are also under the authority of the Palestinian Authority. It is conventional wisdom that once the final status negotiations between Israel and the Palestinian Authority conclude that the official state of Palestine will be established. Any major change in water policy will not be instituted for some time and it is likely that the final agreement on a regional water policy, if there is one, will be negotiated between the states of Israel and Palestine. There are also different names used by Palestinians and Israelis for many of the same locales in the region. For example, Lake Kinneret is also called Lake Tiberias and the Sea of Galilee. The streams of northern Israel, southern Syria and southeastern Lebanon are, at times, spelled differently as well. I will use the commonly used spellings that appear in literature published by the Israel-Palestine Center for Research and Information (IPCRI), which is the only think tank in the region, equally composed of Palestinians and Israelis. I will use the term "MCM" to

describe “Million Cubic Meters” which is the standard used to gauge yearly quantities of water and the term “m^3” to connote “Cubic Meters” which is often used to describe the hourly or daily flow of a water source.

CHAPTER TWO

GEOGRAPHY AND HYDROLOGY OF THE EASTERN MEDITERRANEAN

Geography

Israel and Palestine comprise a landmass equivalent in size to the state of New Jersey. The population of Israel is approximately 6.7 million and the two areas of Palestine; the West Bank and Gaza Strip, have populations of 2.4 million and 1.4 million, respectively. Israel's landmass consists of 22,072 square kilometers (sq. km) while the West Bank and Gaza Strip consist of 5,970 and 365 sq. km, respectively.[5]

Climate and Population

Israel and Palestine are located in the eastern Mediterranean situated in a transition zone between Mediterranean subtropical and arid climates. The people of the region have always been keenly aware of the limits imposed by scarce water resources. Israel and Palestine consume all available fresh water in their shared watershed annually. The population in Palestine (West Bank and Gaza) is growing at an annual rate of 4.0% (expected to double its current 3.5 million population in thirty years) while

[5] Bbc.co.uk http://news.bbc.co.uk/1/hi/world/middle_east/country_profiles/803257.stm

Israel's population growth is a bit more modest at 2.0%. In spite of Israel having achieved the greatest degree of agricultural irrigation efficiency in the world, it is likely that increasing water demand will create intolerable stress on available resources by 2025.[6] The division of these resources is a contentious issue and the impending water crisis compels new thinking in the realm of water resource management policy for the Middle East.

The Watershed of the Eastern Mediterranean

The map in Figure 1 shows the watershed of the region, the major water pipelines including the National Water Carrier and the areas of the West Bank and Gaza Strip.

[6] Jonathan Lautze, Meredith Reeves, Rosaura Vega, Paul Kirshen, *International Water Resources Association,* Winter International, Volume 30, p. 197, June 2005.

Figure 1

Reprinted from: Sunshine.com
http://www.sunship.com/mideast/info/maps/israel-water-systems-map.html

Hydrology

Fresh Water Supply

There are three major freshwater sources for the region: The Jordan River Basin, the Mountain Aquifer and the Coastal Aquifer.

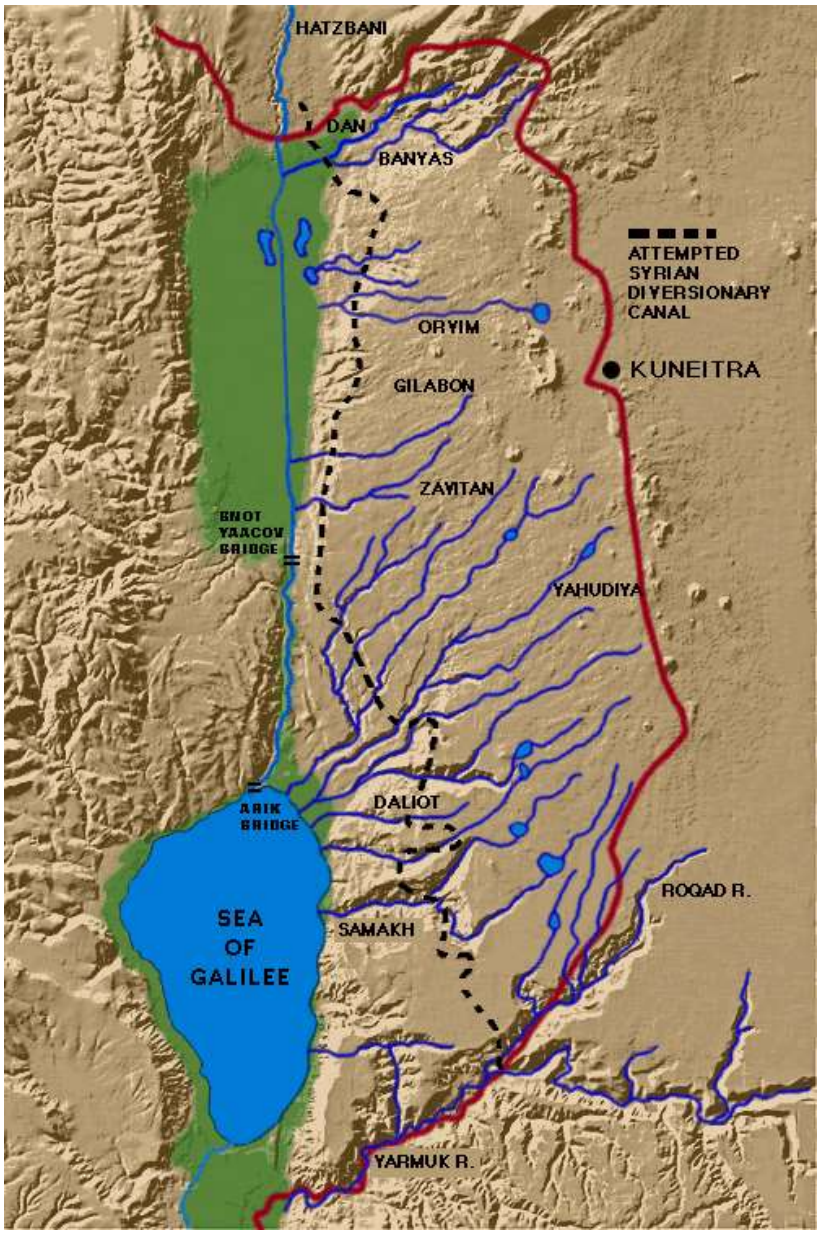
The Jordan River Basin. The Jordan River Basin is depicted in Figure 2. It consists of two distinct sections: the Upper Jordan (north of Lake Kinneret or Sea of Galilee) and Lower Jordan (south of Lake Kinneret to the Dead Sea). With the exception of the Litani River in southern Lebanon, the Dan River, and Lake Kinneret, which are situated wholly within the internationally recognized borders of Israel, all of the other rivers and streams that feed the Jordan River Basin are trans-boundary and co-riparian. The major tributaries of the Upper Jordan are:

- The Dan River, which rises in Israel and has an annual average flow of 250 MCM;
- The Hatzbani River, which rises in Lebanon and discharges 150 MCM/year;
- The Banias River, which rises in the Golan Heights and discharges 150 MCM/year.

These three rivers all drain into Lake Kinneret. Ten kilometers south of the Lake the Jordan River intersects with the Yarmuk River. The Yarmuk has an annual average flow of

400 MCM although Israeli, Syrian and Jordanian withdrawals have rendered the Yarmuk's contribution to the Jordan River nearly insignificant. The Yarmuk serves as the border between Syria and Jordan and once it joins the Jordan it forms the current border between Israel and the West Bank. There are a number of small tributaries and wadis (ancient riverbeds that only flow during winter) that complete the basin.

Figure 2



Reprinted from "Peace with the Golan: Water Issues of the Golan Heights"
http://www.golan.org.il/water.html

The Coastal Aquifer. The Coastal Aquifer, which is formed of sand and sandstone, provides Israel's most densely populated region (including the largest city, Tel Aviv) with 15% of the state's total freshwater supply, or 280 MCM annually. The Coastal Aquifer is neatly divided into two sub-aquifers wherein water to Israel is provided from the northern sub-aquifer and Gaza from the southern. Gaza draws about 50 MCM annually from its 'sub-aquifer'.

The Coastal Aquifer is 3-5 meters above sea level in its natural state but is now thought to be only 1 meter above sea level due to over pumping. The chloride level has increased from 100 ppm in the 1970's to 155 ppm today.

The Mountain Aquifer. The Mountain Aquifer consists of karstic, limestone/dolomite formations with recharge areas mostly along the upper mountain slopes and ridges at levels above 500 meters above sea level. The Mountain Aquifer, located primarily in the West Bank, drains an annual total of 650 MCM and is made up of three discrete basins:

The Western Aquifer. The Western Aquifer (termed The Yarkon-Taninim aquifer in Israel) provides more than half the total yield of the Aquifer (about 350 MCM/year). It flows westerly into Israel. Approximately 40 MCM are brackish waters. The Western Aquifer is the largest of the three basins, some 6,000 km^2. The exposed replenishment

area covers about 1800 km^2 of which 1400 km^2 (78%) lie within the West Bank. Of the annual recharge: 344 MCM is consumed by Israelis, or 91%; about 22 MCM, or 6%, by Palestinians. Jewish settlements consume about 10 MCM or 2% of the total discharge.

The North-Eastern Aquifer. The North-Eastern Aquifer flows about 130 MCM/year of which 70 MCM are brackish. The primary flow of the North-Eastern Aquifer is north by northeast and rises in Israel as the Ma'ayan Harod Springs. The North-Eastern Aquifer consists of two overlaying sub-aquifers: the Eocene limestone aquifer often referred to as the Nablus-Jenin-Gilboa basin, and the deeper limestone-dolomite Cenomanian aquifer, which is the more productive. The North-Eastern Aquifer covers 1044 km^2 and precipitation recharges an average volume of 145 MCM. The aquifer lies predominantly in the West Bank and the recharge area is situated wholly in the West Bank. The natural outflow springs are located within Israel in the Beit She'an (Beisan) and Yezre'el (Marj Bani Amr) valleys.

The Eastern Aquifer. The Eastern Aquifer is the only basin the Mountain Aquifer system that lies and rises entirely in the West Bank. It discharges about 150 MCM/year and provides all the consumptive water for Palestinians and Jewish settlers living in the West Bank.

The Eastern Aquifer covers an area of 3,080 km^2. This aquifer is the most dramatic and asymmetrical basin. It stretches from the mountaintop at 600-800 meters above sea level to the Jordan (Syrian-African) Rift at 350-400 meters below sea level. An average precipitation volume of 172 MCM recharges groundwater, although evapotranspiration rates are among the highest in the world reaching 3000mm annually. (Refer to Table 2). The springs that are discharged from this aquifer proliferate in the area of the Dead Sea and carry high levels of salinity. Palestinians consume about 69 MCM or 43% of abstracted water from the Eastern Aquifer, Jewish settlers consume about 50 MCM or 31% and another 40 MCM or 25% are consumed by Israelis within the 'green line' (area delineated as international boundary pre-June, 1967). Table 1 provides a summary of freshwater availability and use by Israelis, Palestinians and Jewish Settlers in the West Bank in 1995.

Evaporation and Recharge

The only sources of recharge for the Mountain Aquifer are precipitation and run-off. The annual infiltration volume is 600 MCM/year. However, precipitation in the region is inconsistent and widely varies from an average of 600 mm in the mountains to 100 mm in the arid Jordan

Valley. Evapotranspiration rates far exceed annual rainfall.

Figure 3

TABLE 1

Summary of Fresh Water Availability and Use in MCM/year in 1995

SOURCE	ANNUAL RECHARGE	USED BY ISRAEL	USED BY SETTLERS[7]	USED BY PALESTINIANS	TOTAL USE
Western Aquifer	362	344	10	22	376
Eastern Aquifer	172	40	50	70	160
North-Eastern Aquifer	145	105	5	30	140
Coastal Aquifer	250	260	0	0	260
Gaza Sub-Aquifer	55	0	0	110	110
Jordan River Basin	1311	685	20	0	705
TOTAL	2295	1434	85	232	

Source: Marwan Haddad, "The Dilemma Over Palestinian Water Rights,"[8] in *Joint Management of Shared Aquifers-The Fourth Workshop*, ed. Eran Feitelson and Marwan Haddad, The Harry S. Truman Institute for the Advancement of Peace and the Palestine Consultancy Group. Jerusalem, 1995.

The Hydrologic Cycle.

Because the overwhelming source of recharge water for the aquifers is precipitation it is salient to place precipitation in its place in the hydrologic cycle. The hydrologic cycle is actually a complex web of continual flows, or fluxes of water among the major 'reservoirs' or stocks of water. The sun provides the energy that causes

[7] "Settlers" refers to Jewish settlers living in the area of the West Bank. Jewish settlers were evacuated from Gaza in mid August 2005.
[8] Marwan Haddad, "The Dilemma Over Palestinian Water Rights," in Eran Feitelson and Marwan Haddad, Eds. *Joint Management of Shared Aquifers; The Fourth Workshop, Jerusalem:* The Harry S. Truman Research Institute for the Advancement of Peace, 1998, p. 96.

evaporation and mixes water vapor in the atmosphere and thereby drives the cycle against the pull of gravity.[9] The water balance equation (Harte, 1985) for the land (as opposed to the sea) is expressed by $P_L=E_{LS} + E_{LL} + R$: whereas P_L= rate of precipitation on land; E_{LS}= rate of evapotranspiration from land of water that fall as precipitation on the sea; E_{LL}=rate of evapotranspiration from land of water that falls as precipitation on the land: R=rate of runoff from land to sea. Runoff to the sea is minimal, in particular in the area of the Mountain Aquifer. Evapotranspiration is a factor that manifestly affects the total water balance in the region. Table 2 illustrates the average annual precipitation, evapotranspiration rates and temperature ranges for the region. The area is among the most water scarce in the world and evapotranspiration rates among the world's highest.

[9] S. Lawrence Dingman, *Physical Hydrology*, Macmillan Publishing Company, New York, 1993

TABLE 2

Summary of Average Precipitation,
Evapotranspiration and Temperatures

REGION	ANNUAL RAINFALL (mm)	ANNUAL EVAPOTRANSPIRATION (mm)	DAILY TEMPERATURE (^{0}C)	ANNUAL TEMPERATURE RANGE (^{0}C)
Coastal Plain	400-600	1700	19	13-26
Mountains	500-700	1850	17	8.5-22
Jordan Valley	50-150	2300	23	11-40

Source: Yoav Harpaz, Marwan Haddad and Shaul Arlosoroff, "Overview of the Mountain Aquifer": A Shared Israeli-Palestinian Resource", in *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective,* ed. Eran Feitelson and Marwan Haddad. Ottawa, Canada: International Development Research Centre and Kluwer Academic Publishers, 2005.

Mekorot and the National Water Carrier

Mekorot, in Hebrew, means "sources" and, true to its moniker, Mekorot has been the source of water Israelis have turned to for piped water since 1937.

Mekorot supplies 90% of Israel's drinking water and 80% of water overall. Mekorot supplies about 1004 MCM/annually to Israel and consumes about 6% of Israel's electrical power. Mekorot's water supply system consists of:

- 800 pumping stations
- 1,200 wells
- 3,050 pumps
- 10,500 km. of large-diameter pipes
- 570 concrete and steel reservoirs
- 95 earthen reservoirs

- 6 laboratories

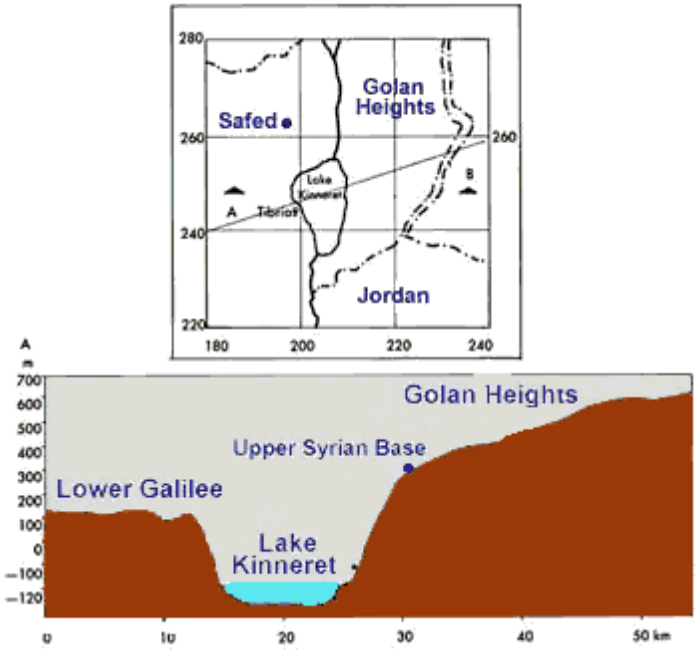
Mekorot's crown achievement is the National Water Carrier. This system's pumping capacity is 72,000 cubic meter/hour and the total lift of 400 meters at the Sapir Pumping Station on the southern coast of Lake Kinneret requires several of the largest diameter centrifugal pumps in the world. The primary purpose of the system is to pump water from Lake Kinneret to the populated areas of Israel. The Lake covers about 170 sq. km containing 4,000 MCM of water. The National Water Carrier is illustrated in Figure 4.

Figure 4

The original plan for the National Water Carrier, in 1953, when Jordan formed the border between Israel and Syria, called for drawing the water of the Jordan River above Lake Kinneret at, approximately, sea level but Syrian and UN opposition enjoined Israel from diverting Jordan River water. The economic affect of this decision was significant as it forced Israel to pump all its water out of Lake Kinneret at an en elevation of -100 to -120 meters

below sea level. Figure 5 illustrates the relative location of Lake Kinneret and its elevation.

Figure 5



Desalinated Water

Desalinated water in the region falls into one of two categories: Seawater desalination and brackish desalination. Brackish water can be treated and delivered for irrigation purposes to farms in Israel and Palestine for about \$0.20-\$0.50/m^3 or, roughly the cost of currently pumped, piped and delivered freshwater to Israeli farms. (The cost of delivered water to Palestine will be addressed later in this paper).

Desalinated seawater in Israel is already the major drinking water supply for the southernmost area (Eilat is the largest southern city with a population of about 40,000 people).

The Ashkelon Desalination Plant

Israel inaugurated the final stage of the plant in Ashkelon, (on the southern Mediterranean coast of Israel) on February 9, 2006. This is now the single largest seawater desalination plant for drinking water in the world, producing 110 MCM/annually. Its total capacity is equivalent to 5-6% of Israel's potable demand. The Ashkelon plant reduces salinity from 40,750 TDS to <40 TDS (a 99.9% salinity reduction).[10] The cost of desalinated seawater is more economical today than in year's past due to increased energy efficiency and a growing use of reverse osmosis technology. The plant in Ashkelon cost $250 million to construct. The overall revenue over the period of the contract will be in the region of $825 million. The contract for the Ashkelon facility - the first in the series of large-scale seawater desalination units - was awarded in September 2001, after an extensive tendering process beginning in July of the previous year. The

[10] http://www.water-technology.net/projects/israel/specs.html accessed February 12, 2006

concession was granted on a Build-Operate-Transfer (BOT) basis and at the end of the 25-year period, the plant transfers to the Government of Israel. Originally intended to produce only 50 million m^3/yr, after the formal signatures were completed in November 2001, further negotiations were entered into between February and April 2002 to double the output. This second agreement was signed in April 2002 and work on the three-phase construction program began a year later. The Ashkelon facility operating at full capacity will itself contribute 25% of the initial target set out in the Israeli government's master plan. [11]

Proposals for Desalinated Water in Israel

Today, Israel's National Water Company, *Mekorot*, operates 29 desalination plants within Israel, producing 22.5 MCM/year of treated brackish water for irrigation purposes, and 114 MCM/year of treated seawater for drinking purposes since the inauguration of the Ashkelon plant. There are many proposals under consideration to increase Israel's desalinated seawater and brackish capacity to 20% of total demand by the year 2010.[12]

Plans for Desalinated Seawater in Gaza

[11] Ibid
[12] Michael Zaide, Planning Division-Water Commission, Israel. http://www.un.org/esa/sustdev/csd/csd12/statements/israel_1904.pdf

There are two small plants, financed by the French Government and Austrian Government to provide Gaza with 0.5 MCM/year and O.2 MCM/year, respectively. These two plants will be ready to accommodate a capacity of 2.0 MCM/year and 1.0 MCM/year. USAID has agreed to finance a larger desalination plant (as full donation) with a capacity of 22MCM/year with a final phase capacity in the year 2020 of 55 MCM/year.

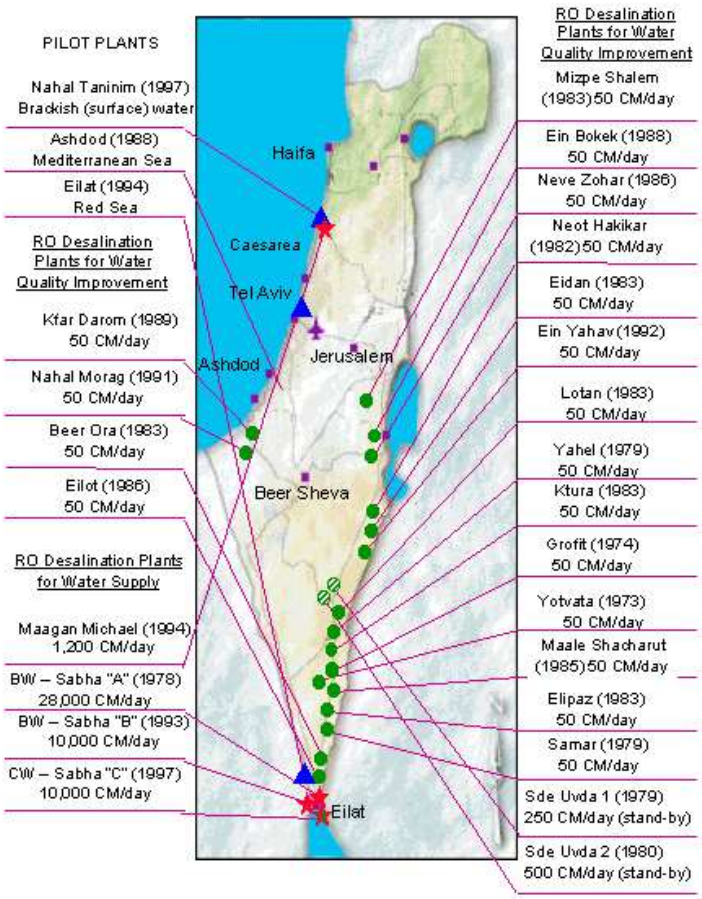
The Cost of Desalinated Seawater

The cost of desalinated seawater is quite elastic as advanced technologies move forward. The Eilat-Ashkelon Pipeline Corporation (EAPC), which lies around 700m north of an existing Israel Electrical Company power station uses advanced SWRO (Reverse Osmosis) technology and state-of-the-art energy recovery systems to reduce operating costs and help achieve one of the lowest water prices ($0.527/m³) ever offered for this kind of operation.[13] For calculating the cost of seawater as part of an overall economic scheme for the region a delivered cubic meter of seawater from smaller plants carries a price of $0.80/m³.[14]

[13] water-technology.net http://www.water-technology.net/projects/israel/index.html#israel6.
[14] Arlosoroff, Shaul, "Water Resource Management in Israel", In *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective, ed.* Eran Feitelson and Marwan Haddad ed. International Development Research Centre and Kluwer Academic Publishers, 2005, p. 73.

Desalination is a major component of any integrated water management plan for the region and will be addressed as such in the third section of this paper. Figure 6 illustrates the pilot projects undertaken by Israel as of today.

Figure 6



Projections for Desalinated Seawater in Israel

The State of Israel's Master Plan calls for a constant freshwater availability of 1,467 MCM in each year and a

steady increase in desalinated seawater, brackish water and reclaimed water:

Table 3

Projections for Desalinated Growth within Israel 2002-2010

YEAR	Fresh	Reclaimed	Desalinated	Brackish	Required Supplement
2002	1,467	298	0	166	35
2005	1,467	403	355	166	26
2010	1,467	509	500	140	-75

Source: State of Israel Ministry of Infrastructures, Water Commission, Planning Division; *Transitional Master Plan for Water Sector Development 2002-2010.* June 2002

CHAPTER THREE

POPULATION

Projected Population Growth

Population in the region will double within thirty years. Figures 7 and 8[15] show the growing population curves among Israelis and Palestinians.

Figure 7

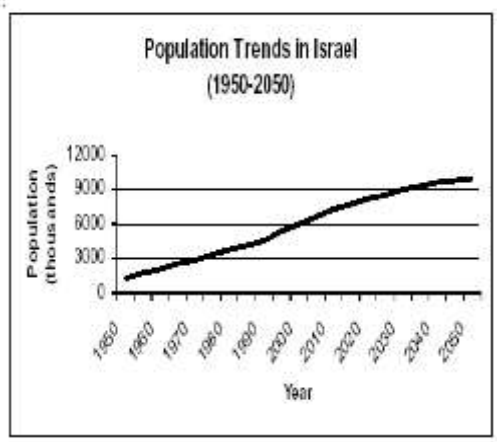
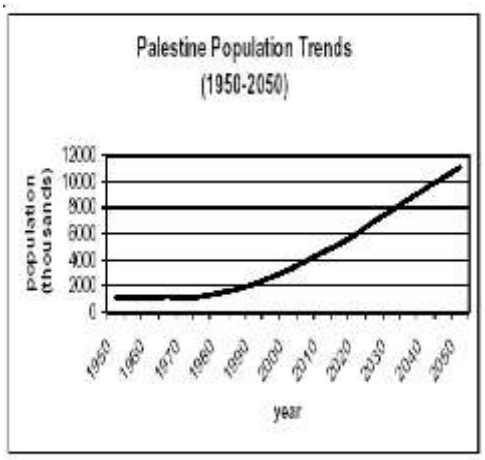


Figure 8



Source: United Nations 2002 as shown in Jonathan Lautze, Meredith Reeves, Rosaura Vega and Paul Kirshen, "Water Allocation, Climate Change, and Sustainable Peace", *Water International,* IWRA, Volume 30, June 2005

These figures include both natural population increase and medium variant immigration.

The population projections below in Tables 4 and 5 are based on a relatively static ratio of water per capita for all water sectors. The only significant increase per

[15] United Nations 2002 as shown in Jonathan Lautze, Meredith Reeves, Rosaura Vega and Paul Kirshen, "Water Allocation, Climate Change, and Sustainable Peace", *Water International,* IWRA, Volume 30, June 2005

capita is in the industrial sector in the Palestinian population, which provides for a 9% growth in industrial use for water per capita from 2010 to 2020. Of significance is static per capita use of agricultural water in the Israeli population.

Population and Water Demand

The total projected water demand for Palestine and Israel is 3051 MCM by 2010 and 3943 in 2020. Water demand management is also a major component of any integrated water resource management program for the region and will be addressed later. Tables 4 and 5 depict population projections and water consumption projections in Palestine and Israel from 2000-2020.

Table 4

Palestinian Population Projections and Water Consumption Patterns (MCM)

YEAR	Population	Gaza	West Bank	Domestic	Agriculture	Industrial	Total
2000	3,160,000	1,140,000	2,020,000	263	217	18	498
2010	4,930,000	1,870,000	3,060,000	484	305	37	826
2020	6,580,000	2,620,000	3,960,000	787	415	61	1263

Source: Eckstein, Z., and Fishelson, G. "The Water System in Israel" Submitted to the Harvard Middle East Water Project, 1994

Table 5

Israeli Population Projections and Water Consumption Patterns (MCM)

YEAR	Population	Domestic	Agriculture	Industrial	Environment and Storage	Total
2000	6,498,000	690	1,010	129	26	1855
2010	7,300,000	886	1,122	167	50	2225
2020	8,600,000	1000	1,350	230	100	2680

Source: State of Israel; *Transitional Master Plan for Water Sector Development 2000-2010* Ministry of National Infrastructures; Water Commission, Planning Division. Executive Summary, June 2002

CHAPTER FOUR

WATER DEMAND

Water Consumption

Palestinian Consumption

Current water resources in Palestine provide a per capita average of one-half of the World Health Organization's daily requirement. Palestinians average about 70 liters/day of fresh water although 66% of the population averages less than 50 liters/day[16].

Israeli Consumption

The Israeli average, by contrast, is about 300 liters/day. If one takes industrial water consumption into account then the average annual Israeli water consumption reaches five times the average Palestinian's.[17]

Sewage Connections

The percentage of the population that is connected to sewer networks in Palestine is 45.8% overall: 66.3% in Gaza

[16] http://www.passia.org/index_pfacts.htm

[17] Ibid. Rashed Al-Sa'ed, "Obstacles and Chances to Cut Pollution Load Discharges from Urban Palestine", Water Studies Institute, Bir Zeit University, West Bank, Palestinian Authority, IWRA, *Water Authority*, December, 2005

and 34.6% in the West Bank.[18] In Israel 95% of all produced sewage is collected in central sewage systems.[19]

Overdrawn Water and Unaccounted-for Water

The water that is extracted by Palestinians in the West Bank and Gaza Strip, particularly the latter, exceeds the natural replenishment rate leading to aquifer degradation, seawater intrusion, and overall decline of the Gaza Coastal Aquifer of 1.6 meters/year, and a concomitant paucity of water for health, agriculture and industry. Because of the scarcity of new infrastructure in Palestine the amount of 'unaccounted for water' in the West Bank is 40% and in Gaza, 50%. For the most part this is water that is lost due to leaking pipes.[20]

Water Withdrawals in Palestine

In the West Bank total water demand is about 120 MCM and in Gaza about 125 MCM. When Israel captured the West Bank and Gaza in 1967, Palestinians, from that point onward, have been prohibited from further developing their water resources. Although Palestinian withdrawal has increased modestly from approximately 200 MCM/year in 1967

[18] http:www.moh.gov.ps/index.asp
[19] Israel Ministry of Environment, http://www.sviva.gov.il/Enviroment/bin/en.jsp?enPage=BlankPage&enDisplay=view&enDispWhat=Object&enDispWho=Articals^l2276&enZone=Indic_Wastewater
[20] http://www.piccr.org/publications/special27e.pdf

to 240 MCM/year in 2000, the population nearly tripled in the same time interval. In other words, while Palestinian water withdrawal in 2000 stood at 107 to 120 percent of its 1967 level, the Palestinian population in 2000 was nearly 300% its 1967 level; hence a substantial decrease in gross per capita withdrawal.[21] Table 6 illustrates an overall picture of water demand in the West Bank and Gaza.

TABLE 6

Water Demand in the West Bank and Gaza

	WEST BANK	GAZA
Number of wells	305	3,855
Total well discharge	58 MCM	122 MCM
Number of springs	126	0
Total spring discharge	25 MCM	0
Mekorot water	32 MCM	5 MCM
Total Available	116 MCM	244 MCM

Source: Ihab Barghothi; House Committee on International Relations *U.S. House of Representatives*

Water Suppliers to the West Bank and Populations Served

Mekorot, Jerusalem and Palestinian councils. There are three main domestic water suppliers in the West Bank: Mekorot, the Municipality of Jerusalem, and the Palestinian municipal village councils and water utilities of the West

[21] Lautze 2.

Bank.[22] Mekorot supplies about 11% of the water to the West Bank from sources within Israel; Mekorot supplies about 15% of the water to the West Bank from sources within the West Bank; the Municipality of Jerusalem supplies about 1% of West Bank water from sources within the West Bank; and the Municipalities and Village Councils of the West Bank provide about 16% of the water to the West Bank from sources within the West Bank.[23]

Table 7 illustrates the districts of the West Bank, the population served/not served by one of the three providers and the number of villages served/not served. The 179 villages in the West Bank that are not served by piped water receive their water either by tanks or from cisterns, which are filled with rainwater.[24]

[22] Nassereddin, Taher, "Legal and Administrative Responsibility of Domestic Water Supply to the Palestinians", in Eran Feitelson and Marwan Haddad Ed. *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective*: International Development Research Centre and Kluwer Academic Publishers, 2005, p.110.
[23] Ibid. p. 112
[24] Ibid

TABLE 7

Distribution of Water Supply in the West Bank by Population and Number of Localities Served[25]

District	Population Served			Number of Villages Served		
	Served	**Unserved**	**Total**	**Served**	**Unserved**	**Total**
Jenin	112,923	65,247	178,170	34	41	75
Tulkarem	86,452	23,858	110,310	15	23	38
Qalqilia	50,497	14,891	65,388	16	17	33
Salfit	33,100	11,174	44,274	14	7	21
Tubas	22,578	8,931	31,509	7	2	9
Nablus	178,137	139,798	217,935	32	24	56
Ramallah	225,873	8,517	234,390	85	8	93
Jerusalem	254,387	0	254,387	23	0	23
Jericho	27,599	484	28,083	12	1	13
Bethlehem	110,430	2,583	113,013	40	10	50
Hebron	276,085	18,031	294,116	51	46	97
TOTAL	**1,378,061**	**293,514**	**1,571,575**	**329**	**179**	**508**

Source: Taher Nassereddin, "Legal and Administrative Responsibility of Domestic Water Supply to the Palestinians", in Eran Feitelson and Marwan Haddad Ed. *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective.* Ottawa, Canada: International Development Research Centre and Kluwer Academic Publishers, 2005, p.114.

Water Tankers. During the heated and irrigation-intensive summer months, some villages on the West Bank normally served by Israeli sources are cut off for periods

[25] Nassereddin, p. 114

of 2-3 weeks at a time.[26] When these sources are not available, private tank vendors in the West Bank conduct a brisk Black Market business in water sales. A more complete discussion of water pricing and the economics of water appear later but Table 8 provides an illuminating affect of the unavailability of piped water in times of stress. The average cost of piped water to consumers in all of the districts below average between $1.00-$1.50/m^3.

TABLE 8

The Price of Water Sold by Tank Vendors in Different Districts of the West Bank 2003

District	Cost per CM ($ at March, 2003 exchange)
Bethlehem	4.90
Hebron	3.63
Jenin	2.56
Nablus	2.99
Qalqilia	2.35
Ramallah	4.91
Salfit	4.70
Tubas	2.35
Tulkarem	3.20

Source: Yasser Nasser, "Palestinian Water Rights and Needs", *Water in Palestine: Problems, Politics and Prospects*, Ed. Fadia Daibes, Jerusalem: Palestinian Academic Society for the Study of International Affairs, 2003 p. 108

A detailed depiction of domestic water allocations in Palestine is presented below in Table 9. A more detailed analysis of water tariffs in Palestine is found below in the discussion of the PWA.

[26] Interview with Saul Arlosoroff, December 28, 2005

TABLE 9

Domestic Water Allocations in Palestine 2005

Governorate	Water Supply for Domestic Sector MCM	Population 2004	Daily Allocation per capita L/c/d
Palestinian Territory	142.85	3,637,529	107.5
West Bank	73.02	2,055,227	97.3
Jenin	4.93	246,685	54.7
Tubas	0.69	45,168	41.8
Tulkarem	6.67	162,936	112.1
Nablus	9.84	317,331	84.9
Qalkiliya	3.96	90,960	119.2
Salfit	1.67	60,132	76
Ramallah/El-Bireh	13.19	270,678	133.4
Jericho	3.09	40,909	206.8
Jerusalem	6.79	144,597	128.6
Bethlehem	12.39	169,190	200.5
Hebron	9.80	506,641	53
Gaza Strip	69.83	1,337,236	143

Source: Palestinian Center Bureau of Statistics 2005. Population projections, revised data 2005. Ramallah, Palestine

CHAPTER FIVE

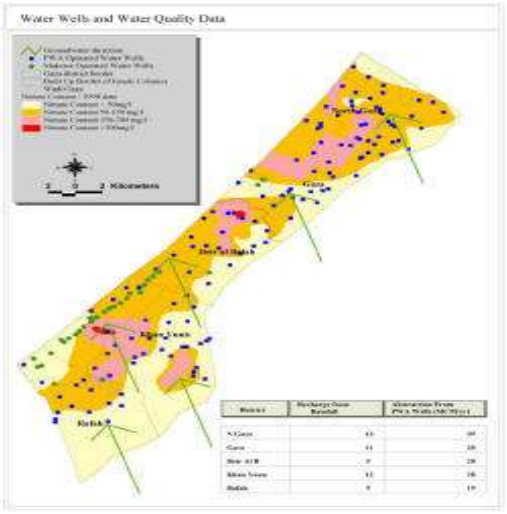
BRIEF SURVEY OF GAZA, WEST BANK AND ISRAEL

Gaza

All of Gaza's water emanates from the Gaza Coastal Aquifer. Karen Assaf, Ph.D., is currently director of the Department of Water Planning at the Ministry of Planning and International Cooperation working in the Palestinian Water Authority, Palestinian Interim Self-Government Authority. In correspondence with her about the water situation in Gaza she wrote, "There are many, many wells in Gaza (Table 6).... maybe reaching 3,000 - but most of them are shallow and are used for agriculture or household use. The water situation is so bad in Gaza that many have just dug in their yards, or living rooms to get to the shallow water table. Of course the water is very brackish. Only about 12% of the water in Gaza is really fit to drink, according to WHO standards…"[27] Figure 9 depicts the well distribution in Gaza.

[27] Karen Assaf,, email correspondence with author, September 28 2005.

Figure 9



Source: Reprinted from Applied Resource Institute, Jerusalem: 2004

Population. Approximately 1.4 million people live in Gaza today and it is already the most densely populated region in the Northern Hemisphere with 3,500 people per sq. km. It is presumed that the population will increase to 2.3 million in ten years and the density will increase to 5,800 people per sq.km.

Size, Poverty and Unemployment. Gaza is an arid area some 360 sq. km in size. Unemployment in Gaza is 50%; the per capita income is about $600/year: 81% of the population live below the poverty line.[28]

The West Bank

Size, Geography and Ethnicity. The West Bank is quite a bit larger than Gaza. It is about the size of the state of Delaware, 5,860 sq. km. The West Bank is landlocked and topographically diverse. Its low spot is the lowest place on Earth, the Dead Sea at -408 meters, and its highest point is well above 1,000 meters above sea level. The population today is about 2.4 million and there are about 187,000 Jewish settlers in the area. While Gaza is 99.7% Moslem, the West Bank, though still predominantly Moslem is also home to an 8% Christian Arab population and, as mentioned, 7% Jewish.

Unemployment and Poverty. Unemployment is about 27%. The per capita income is $800/year and approximately 59% of the population lives below the poverty line.[29] Figure 10 provides a political overview of the West Bank.

[28] http://www.cia.gov/cia/publications/factbook/geos/gz.html
[29] http://www.cia.gov/cia/publications/factbook/geos/we.html

Figure 10

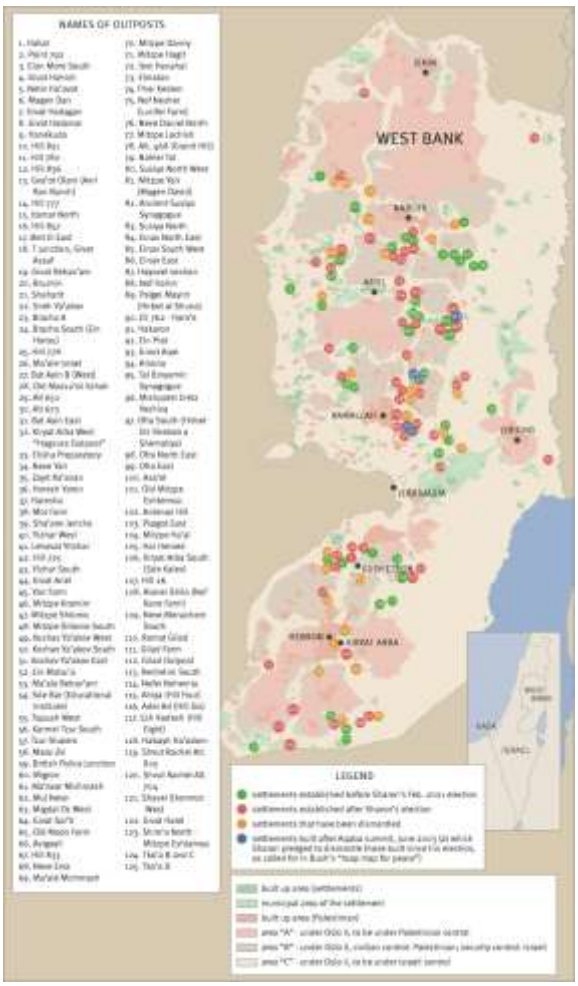
Source:
http://www.infoplease.com/atlas/country/westbank.html

Jewish Settlers in the West Bank

Of the total 679 MCM of West Bank groundwater approximately 56.6% is used by Israel for use within Israel; 23.8% is used by the approximate 187,000 Jewish

settlers in the West Bank (excluding those residing in East Jerusalem); and, the approximate 1.8 million Palestinians living in the West Bank use 19.6%[30] Figure 11 is an overview of the Jewish settlements in the West Bank.

Figure 11



Source:
www.pbs.org/wgbh/pages/frontline/shows/israel/art/map.gif

[30] Fayez Freijat, "Impact of Jewish Settlements on Palestinian Water Resources", *Water in Palestine: Problems, Politics and Prospects*, Palestinian Academic Society for the Study of International Affairs, Fadia Daibes, Editor, Jerusalem, 2003.

Israel

Israel's territory is approximately 1,017 sq. km. with a population of about 6.2 million. Within Israel, 76% are Jewish; 15% are Muslim and about 8% Arab Christian. Israel achieved independence and declared statehood in 1948. 18% of the population lives below the poverty line and 11% are unemployed. Israel's GDP is $128 billion and per capita income is about $20,000/year.[31] Figure 12 provides a political overview of Israel today.

Figure 12

Source: http://elca.org/countrypackets/israel/dsec.html

[31] http://www.cia.gov/cia/publications/factbook/geos/is.html

CHAPTER SIX

WATER QUALITY

Quality of Water in Gaza

The only source of water supply for domestic, agricultural and industrial uses in Gaza is local groundwater. The Gaza Aquifer is composed of sand and sandstone and varies in thickness from 10 meters in the eastern boundary to 150 meters along the coast but the fresh water interface ranges from 10 meters above mean sea level in the southeastern area to less than 2 meters above sea level along the coast. As aforementioned, the available yield of the Aquifer is about 91 MCM/year while total abstraction is greater than 150 MCM/year.

Chemical Threats to the Gaza Aquifer

The most serious chemical threats to the groundwater are elevated levels of chloride and nitrate concentrations.[32] Acceptable levels of nitrate in drinking water, according to the U.S. Environmental Protection

[32] Fayeq El-Madhoun, "Drinking Water Quality: Evaluation of Chloride and Nitrate Concentrations of Wells Supplies Gaza Governorates (1990-2002) Palestine" Palestinian National Authority, Gaza Governorate, Environmental and Informational Center, presented at *Water for Life in the Middle East* Conference, Antalya, Turkey, 2004, available at http://www.ipcri.org/watconf/elmadhoun.pdf, accessed January 2, 2005.

Agency (EPA), are 10 mg/L[33] and 250 mg/L for chlorides.[34] Testing of drinking wells in Gaza, illustrated in Table 10, indicate levels of nitrate in drinking water greater than ten times the maximum acceptable EPA levels. Chlorides resident in drinking wells in Gaza show mean levels greater than 1.5 times the maximum acceptable levels of the EPA with readings as high as nine times the maximum acceptable level.

TABLE 10

Chloride and Nitrate Concentrations (mg/L) in Drinking Wells Among Gaza Governorates (1999-2002)

		Chloride		**Nitrate**	
Governorate	# Samples	Mean	Maximum	Mean	Maximum
North	198	126.9	489.5	114.4	360
Gaza	242	402.4	2180.5	121.3	291
Middle	40	488.9	782	65	104
Khan Younis	109	777.8	1580	190	383
Rafah	60	514.7	1236	110.1	240
TOTAL	649	397.1	2180.5	126.2	383

Source: Fayeq El-Madhoun, "Drinking Water Quality: Evaluation of Chloride and Nitrate Concentrations of Wells Supplies Gaza Governorates (1990-2002) Palestine" Palestinian National Authority, Gaza Governorate, Environmental and Informational Center

Additionally, the Aquifer is extremely vulnerable to pollution due to years of overpumping resulting in seawater intrusion and upconing of saline groundwater. These

[33] US EPA, "List of Drinking Water Contaminants and MCLs" available at: http://www.epa.gov/OGWDW/mcl.html#mcls, accessed on March 18, 2006
[34] Ibid.

phenomena are due primarily to anthropogenic causes: agricultural practices and waste management, in particular. In 2001, there were 137 dumping sites in Palestine (133 in the West Bank and 4 in Gaza) of which 118 had no health monitoring and 108 had no environmental supervision. Some 32% of the localities in Palestine have no solid waste collecting services.[35] The refugee camps in Gaza, with one exception (Jalabia) have no sewage facilities. The three extant water treatment plants do not function effectively and approximately 70-80% of the domestic wastewater produced in Gaza is discharged into the environment either directly, after collection in cesspits, or through leakage into the Mediterranean.[36]

Water-Related Disease in Gaza

Statistics from the Center for Disease Control and Prevention reveal that there were more than 17,000 cases of water-related illnesses during 2002-03 in Gaza. However, since many symptoms are often confused with other sicknesses, some researchers feel as many as 25 outbreaks go unreported for every one reported, since many people are

[35] PCBS, *Environmental Statistics*, 2003.
[36] Amani Alfarra and Sami Lubad; "Health Effects Due to Poor Wastewater Treatments in Gaza Strip", IPCRI Conference, Antalya, Turkey, 2004.

exposed to potentially harmful microbes and pesticides, through drinking tap water and taking showers.[37]

Quality of Water in the Mountain Aquifer

The major water source for the West Bank is also the most important groundwater resource shared by Israelis and Palestinians: the Mountain Aquifer. "Most of the waters in the upper levels of the three basins-within the West Bank and Jerusalem area, where rain recharge is intense-are rated as of potable quality with only slight salt content: 50-150 mg chlorides per liter."[38] Chloride levels in the Western basin are generally of similar quality except in several regions (Ayalon, Hartiv and Amatzia in particular) where chloride levels reach 300-400 mg/L. Brackish waters in the Beersheba region reach 200-300 mg/L.[39]

Imbalances in the Mountain Aquifer

The greatest threat to continued abstraction of the Mountain Aquifer is the lowering of the water table and concomitant rise of saline seawater in the Western basin. Rainwater is the only source of recharge and precipitation

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[37] Ibid.
[38] Harpaz, Yoav, Haddad, Marwan and Arlosoroff, Shaul, "Overview of the Mountain Aquifer: A Shared Israeli-Palestinian Resource" in Eran Feitelson and Marwan Haddad Ed. *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective*: International Development Research Centre and Kluwer Academic Publishers, 2005, p. 52.
[39] Ibid

rates in the region vary widely from year to year. Table 2 provides rainfall and evapotranspiration rates for the Aquifer which illustrate that ET far exceeds annual precipitation. Nonetheless, there is some infiltration into the Aquifer and it does serve as the largest storage reservoir for Israel and Palestine.

Widespread pumping of the Mountain Aquifer commenced in the 1950's alongside many other developing countries as the centrifugal pump came into prominence. Until that time, the northern and southern springs of the Western basin (Taninim and Yarkon areas, respectively) discharged annual rates of 300 MCM[40]. Before massive pumping was instituted, the British, during the Mandate period of 1917-1947, exploited these springs for water usage in Jerusalem. Once the Israeli authorities realized that saline water bodies were in close proximity to the fresh-water levels close to production wells, they instituted a water management policy aimed at preventing a considerable drop in fresh-water levels in the vicinity of the Taninim (northern) springs which, by the 1960's, were producing

[40] Kahane, Yona, "The Turonian-Cenomanian Aquifer: The Need for a Joint Monitoring and Management Programme", in Eran Feitelson and Marwan Haddad Ed. *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective*: International Development Research Centre and Kluwer Academic Publishers, 2005, p. 92.

about 40 MCM/year. A determination was made to ensure that water levels would not drop below +9.00 m.[41] Water levels in the areas of pumpage rise an average of 3.5 m/year. The sensitivity of the Western basin vis-à-vis seawater intrusion is such that operation of the Yarkon-Taninim Aquifer for the National Water System today is managed conjunctively with the operating regime of Lake Kinneret if and when economically justified.[42]

Pollution Threats to the Mountain Aquifer

Within the Mountain Aquifer potential sources of groundwater pollution include: infiltration from septic tanks, cesspools, pit latrines and other sanitation facilities; breakage and subsequent leakage from sewage systems; infiltration from wastewater ponds/storage and from irrigation with treated and/or untreated wastewater; seepage from treatment plants; leachates from solid concentrations and disposal sites; leachates from pesticides and fertilizers; leakages or spills from oil and fuel installations, gasoline stations, fuel tankers, storage tanks for toxic materials, animal sheds, etc.[43] One

[41] Ibid
[42] Ibid
[43] Ibid, p. 99

cubic meter of heavy oil or fuel will render 200 x106 MCM of potable water unfit for consumption.[44]

The sensitivity of the Aquifer to pollution lies in its limestone, karstic, fractured unsaturated zone. The lack of overlying soil cover, together with its geological character, make the Mountain Aquifer susceptible to high infiltration rates and short detention times. Of the 870 wells pumping from the Aquifer today, some 550 supply potable water. 170, or 31%, of those wells are protected against pollution but the remaining 69% are either classified as having direct contact between the soil and the aquifer or indirectly hydraulically linked and subject to pollution.[45]

Figure 13 shows a three-dimensional schematic sketch of the Mountain Aquifer and its major layers. The Eastern and Western (Yarkon-Taninim) basins are clearly defined, as are the major pumping wells in the confined area of the Western basin.

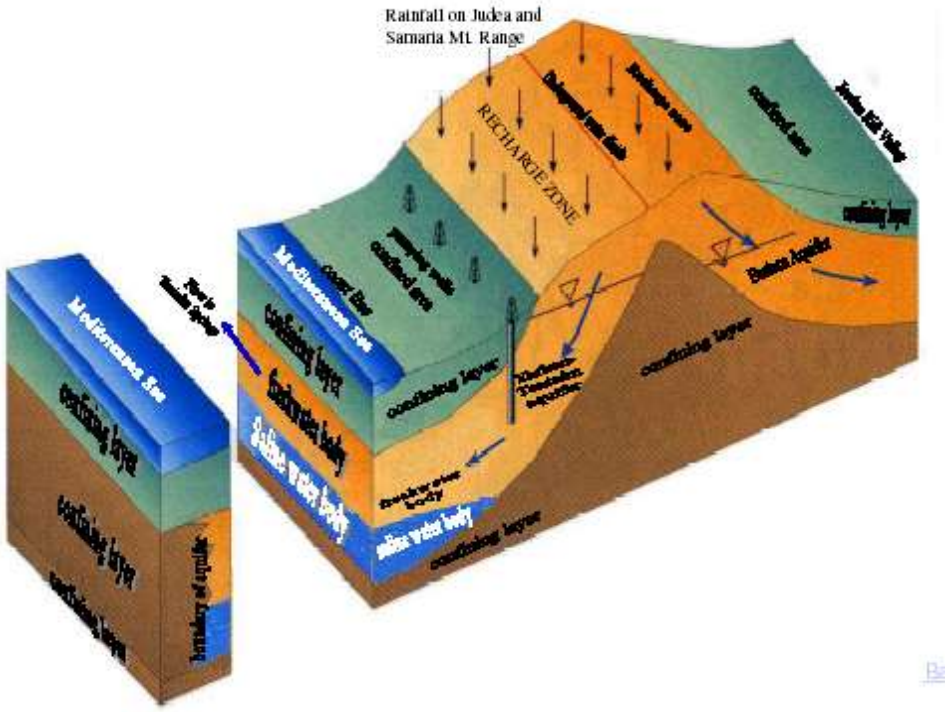
Salinization of the Mountain Aquifer

The danger of over-pumping can be gleaned from Figure 14: as the interface between the freshwater body and saline

[44] Ibid. p. 102 (according to EPA and WHO standards)
[45] Ibid, p. 101

water body rises, the risk of salt water intrusion increases.

Figure 13



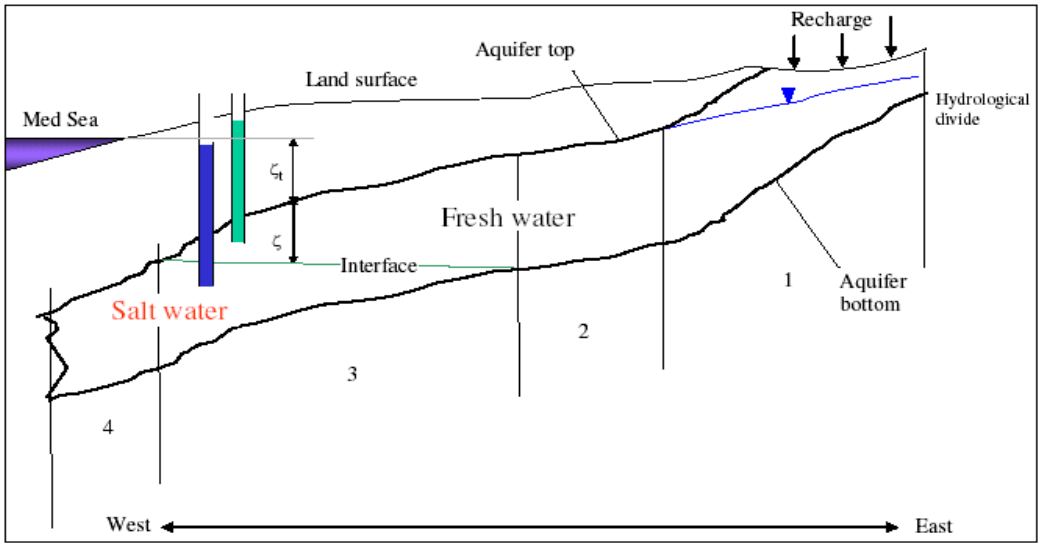
Source: Amir Paster and Gideon Dagan. "Salinization Processes in the Western Mountain Aquifer in Israel: A conceptual and Quantitative Model of the Deep Saltwater Body." M.S. thesis, Tel Aviv University, 2004.

The interface is apparently rising at a rate of 1-10 meters/year. In years 1988-2002 it rose by at least 50 meters, related to an estimated inflow of at least 300 MCM of seawater.[46]

[46] Paster, Amir and Dagan, Gideon, "Salinization Processes in the Western Mountain Aquifer in Israel: A Conceptual and Quantitative Model of the Deep Saltwater Body", Tel Aviv University, 2004

Figure 14

Schematic cross-section of the aquifer



Flow zones: 1- phreatic zone, 2- confined zone, 3- interface zone, 4- saltwater zone (where no flow occurs).

Source: Amir Paster and Gideon Dagan. "Salinization Processes in the Western Mountain Aquifer in Israel: A conceptual and Quantitative Model of the Deep Saltwater Body." M.S. thesis, Tel Aviv University, 2004.

The increase in salinity and overall degradation of water quality in the Mountain Aquifer coincides with the development of anoxic conditions and the appearance of H2S.[47] Anoxic conditions refer to the depletion of dissolved oxygen. Salinization of the Upper sub-aquifer in the Kefar Urriya pumping fields (located at the western foothills of the Judea Mountains which pumps water from the Mountain Aquifer), has been investigated in several studies

[47] Avihu Burg, Ittai Gavrieli and Joseph Guttman, "Changes in Water Quality Along the Water Flow From the Recharge Area to the Confined Area-The Western Mountain Aquifer, Kefar-Uriyya Case Study", Israeli-Palestinian International Conference on Water for Life, Antalya, Turkey, October 10-14, 2004.

(Guttman, 1980; Guttman and Kronfield, 1982; Kroituro, 1987; Ecker, 1995; Guttman and Ettinger, 1997; Rosenthal, et al, 1999; Avisar et al, 2000, 2003; Katz, 2001; Frumkin and Gvirtzman, 2003).[48] The mechanisms proposed for salinization in all of the aforementioned studies included inflow of water derived from an evaporitic body, residual brines from a marine intrusion and flushing of salts and organic matter from the overlaying local mountain group. The coincidence of salinization and the development of reducing conditions were not cited. In the most recent study (Burg, 2004), the analysis shows water quality degradation is occurring due to seepage of saline, organic-rich water from the bituminous rocks to the underlying Mountain Aquifer. This organic matter is the 'fuel' that consumes the dissolved oxygen, changes the redox state of the water and serves as substrate for bacterial sulfate reduction to produce H2S. The assumption is that these conditions exist throughout the Mountain Aquifer and that similar degradation may occur elsewhere. In the area of study the Kefar-Uriyya pumping fields exhibited a dramatic salinity gradient over a distance of only a few kilometers from <180-ppm CL in the east to >400 ppm CL in the west.[49]

[48] Ibid
[49] Ibid

Untreated Sewage in the Mountain Aquifer

The sewage of over two million people flows untreated in the recharge area of the Mountain Aquifer, percolating into the largest and most significant groundwater reservoir in the region.[50] Sewage from Palestinian sources on the Mountain Aquifer's recharge area is estimated at 46 million cubic meters per year.[51] In rural Palestinian West Bank settlements more than 60% of sewage is disposed of in unlined cesspits and whereas 70% of urban Palestinian dwellings in the West Bank are connected to a sewage network, these networks, in a majority of cases, discharge the sewage without treatment into streams in the open environment.[52] As of this writing, there is only one operating sewage treatment plant in the West Bank, in El-Bireh.

The obstacles confounding the establishment of a sound infrastructure for wastewater treatment and urban storm water discharge are several: insensitive Israeli environmental policy now and during the past period of occupation; lack of financial and technical human

[50] Zecharya Tagar, Tamar Keinan and Gidon Bromberg, "A Sleeping Time Bomb: Pollution of the Mountain Aquifer by Sewage", Friends of the Earth Middle East. Available at: http://www.ipcri.org/watconf/papers/zecharya.pdf. Accessed February 10, 2005.
[51] Ibid
[52] Ibid

resources; insufficient maintenance of sewage facilities; poor environmental awareness and commitment.[53]

Sewage Treatment in Jewish Settlements in the West Bank

Data regarding sewage treatment of Jewish settlements in the West Bank is not readily available. The Israeli Water Commission reports that 70% of the settlements' sewage is treated satisfactorily. Conflicting reports (Tagar) indicate that as much as 48% of sewage produced by settlements on the West Bank is treated inadequately or beneath the standards set by Israel proper.[54] The 'contribution' of Israeli settlements in the West Bank to the total organic and inorganic pollution loads is estimated to be at 400,000 population equivalents.[55]

Quality of Water in Israel

Just as the fires in the Cuyahoga River in Ohio in June of 1969 helped spur an avalanche of pollution control activities resulting in the Clean Water Act, Great Lakes Water Quality Agreement and the creation of the federal and

[53] Rashed Al-Sa'ed, "Obstacles and Chances to Cut Pollution Load Discharges from Urban Palestine", Water Studies Institute, Bir Zeit University, West Bank, Palestinian Authority, IWRA, *Water Authority*, December, 2005
[54] Ibid
[55] Rashed Al-Sa'ed, p. 538

state Environmental Protection Agencies[56] so did the tragic collapse of the bridge spanning Tel Aviv's Yarkon River during the Maccabi Athletic Games in 1997, when four Australians lost their lives due, at least in part, to the state of the water itself into which they fell which was so heavily polluted with sewage[57], spur the substantive environmental evaluation of Israel's natural resources.

Environmental Indicators

Israel's history and development of its institutional water structures are presented later in this paper in greater detail. Israel has only recently begun to develop environmental and sustainable development indicators. These indicators are meant to increase public awareness of the state of the environment in Israel, on the one hand, and to communicate information to decision makers on environmental and sustainable development trends, on the other hand. The environmental indicators in several key areas have been compiled by the Ministry of the Environment in the publication *The Environment in Israel 2002.*[58] The indicators include Air Quality, Environmental Planning, Hazardous Substances, Landscape and Biodiversity, Marine

[56] http://www.epa.gov/glnpo/aoc/cuyahoga.html

57 ABC News On-Line Service, available at http://www.abc.net.au/rn/science/earth/stories/s1118244.htm. Accessed March 10 2005.

58 The Environment in Israel 2002, available at http://www.environment.gov.il, accessed January 5 2005

Waters, Noise, Population Growth, Soil and Fuel Pollution, Solid Waste, Water and Rivers and Wastewater Treatment.

Sewage Treatment in Israel

More than 500 facilities for the treatment of sewage exist in Israel today, of which 26 are major wastewater treatment plants. Out of a total of 440 million cubic meters of sewage produced in Israel in 2001, 95% was collected in central sewage systems, 80% was treated, and 65% (285 MCM) was reclaimed for reuse. By 2001 70% of the effluents produced by the country's treatment plants complied with the standards set in regulations; 20 mg/L BOD and 30 mg/L suspended solids.[59]

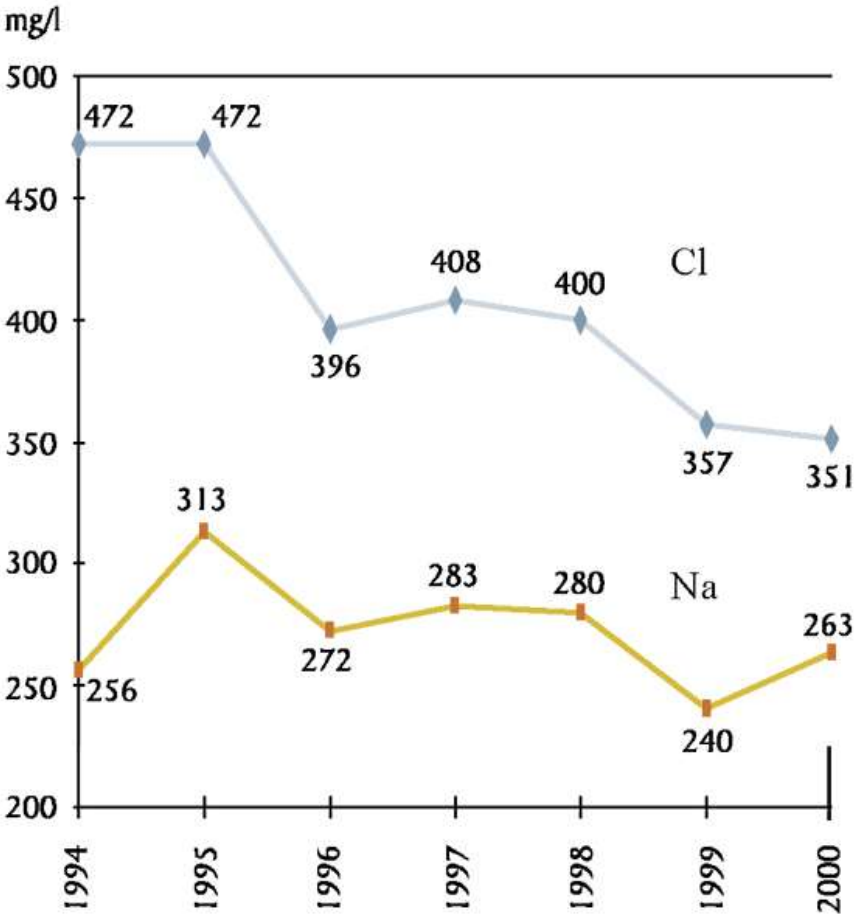
Chemical Monitoring of Effluent Water in Israel

With the growth in effluent water for irrigation purposes, high levels of chloride, sodium and boron become the critical concentrations that require monitoring. Figure 15 illustrates the levels of chloride and sodium in Haifa and Figure 16 depicts the chloride levels in the Dan region, which includes the city of Tel Aviv. Tel Aviv and Haifa produce about 40% of effluents generated by Israel. Enforcement activities began in 1994.

[59] Ibid

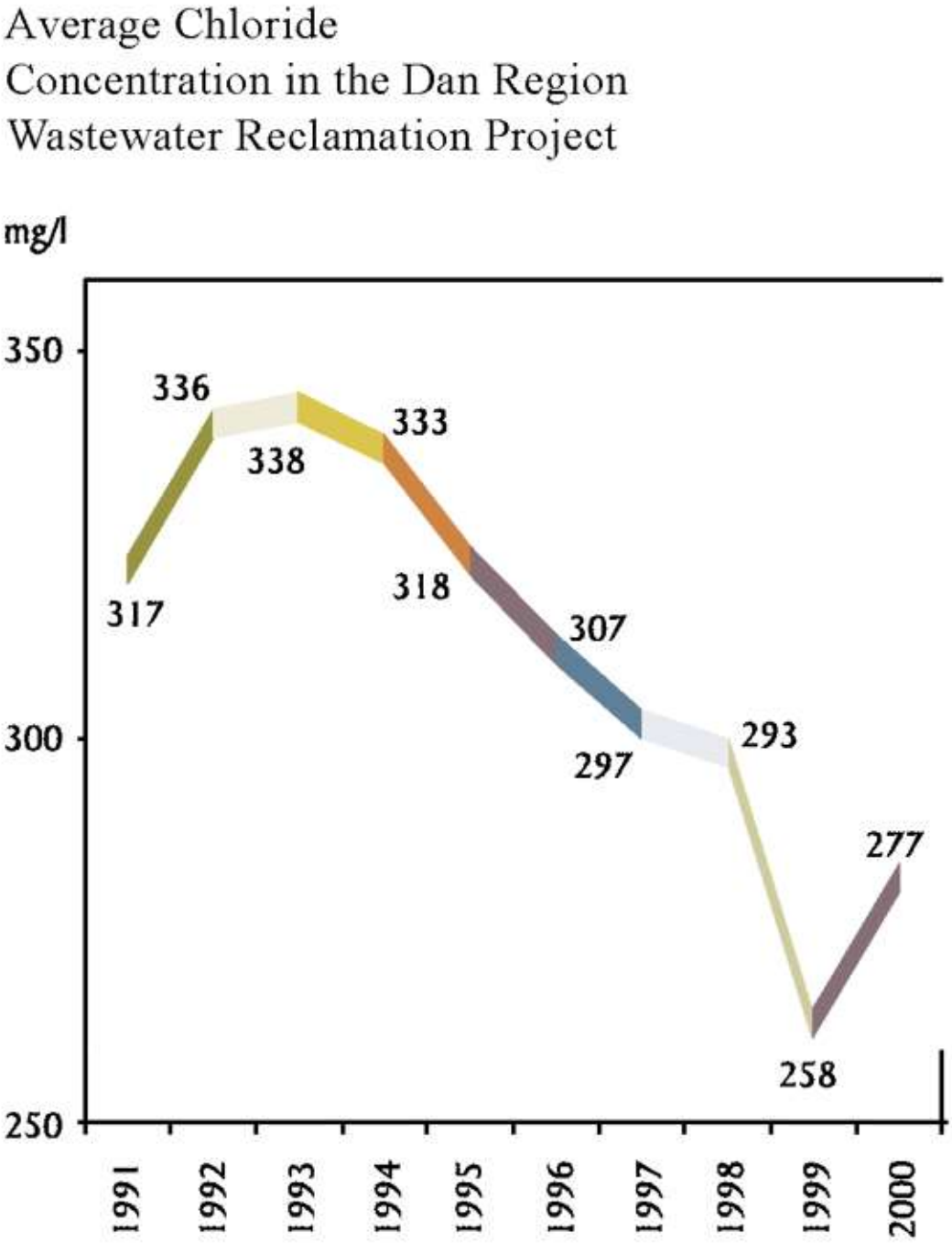
Figure 15

Chloride and Sodium
Concentrations in the Haifa Wastewater Treatment Plant



Source: Israel Ministry of Environment, 2003.

Figure 16

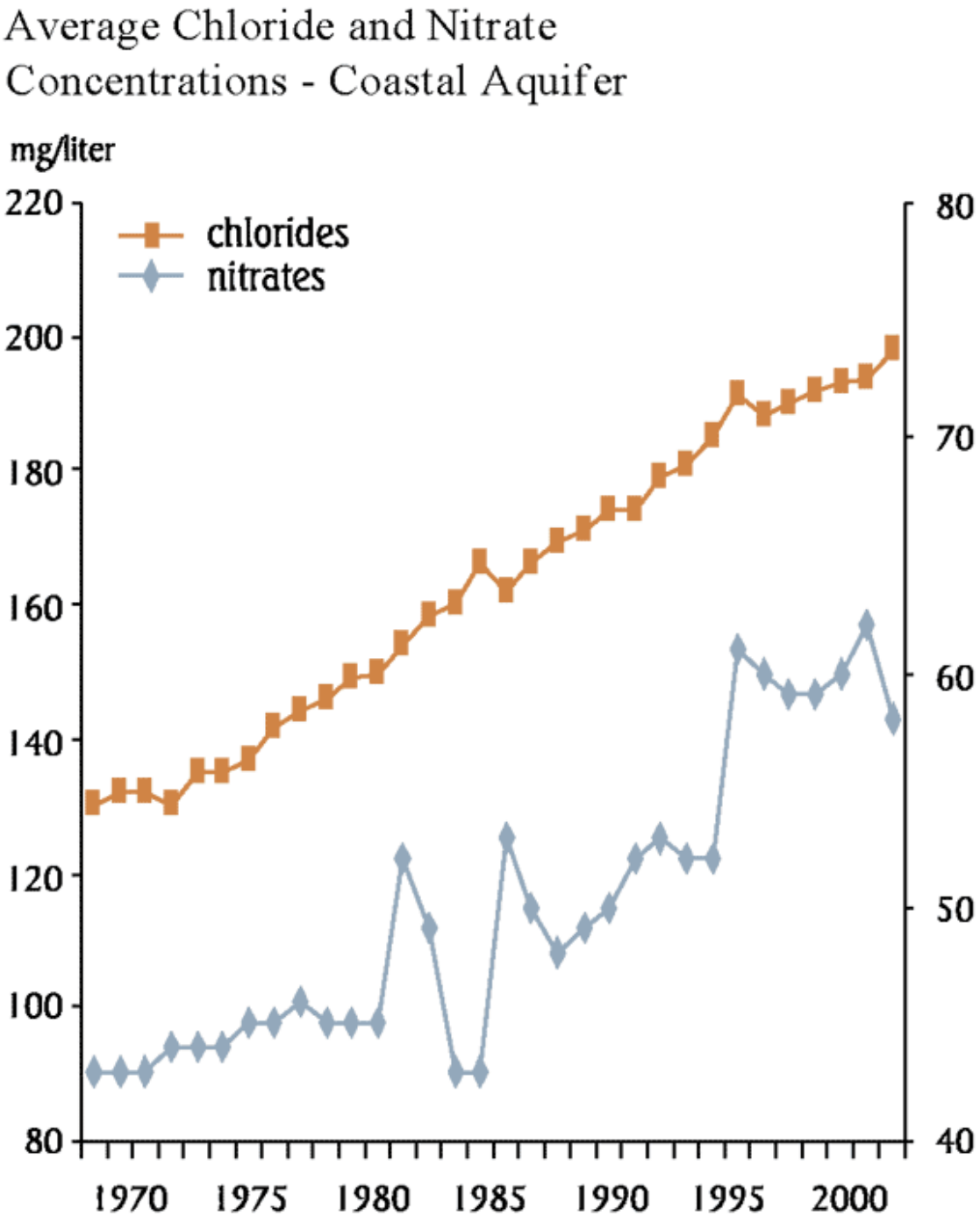


Source: Israel Ministry of Environment, 2003

According to the Hydrological Service, average chloride concentrations in the Coastal Aquifer have increased at a rate of 2.4 mg/L per year since 1970 and reached 198 mg/L in 2000. Average nitrate concentrations have increased from 30 mg/L in 1950 to 59 mg/L in 2000, an annual rate of increase of about 0.6 mg/L.[60] Figure 17 shows the growing levels of nitrate and chloride concentrations in the Northern Coastal sub-Aquifer. (Refer to Table 10 for nitrate and chloride concentrations in the Southern (Gaza) sub-Aquifer.

[60] Ibid

Figure 17



Source: Israel Ministry of Environment, 2003

CHAPTER SEVEN

CULTURAL CHALLENGES

Transboundary water resource management problems are common throughout the world. International transboundary groundwater problems represent a distinct and important category, but not all transboundary groundwaters are international.[61]

Resolution of water conflicts within one nation can be challenging but the commonality of language, shared government, common tradition of law and familiarity and acceptance of water use can facilitate the adjudication of disputes. There are notable cases, however, where the presence of all of these common factors has not been sufficient to resolve water conflicts between, for example, contiguous states of the United States.

The differences in economic, political, and military resources (across boundaries)[62] between Israelis and Palestinians are substantive and meaningful. A major portion of this paper contrasts those institutional disparities. The gaps in those areas have indeed compounded the resolution of the Middle East conflict and have

[61] William Blomquist and Helen Ingram, "Boundaries Seen and Unseen: Resolving Transboundary Groundwater Problems", *Water International,* International Water Resources Association, June 2003
[62] Ibid

precluded a voluntary establishment of joint management of regional water resources.

The optimism among water resource researchers who live and work in the Middle East is based on the assumption that the above-mentioned factors are solvable. The end of Israeli occupation, restoration of confidence and faith in institutional reform, coupled with a significant increase in Palestinian quality of life and political stability represent the foundation for progress.

Islam and Judaism

Ethnic, cultural and religious differences between Israelis and Palestinians, between Jews and Muslims, are not compounding factors standing in the way of this conflict's resolution. While a thorough discussion of the religions and ethnicity of the region is beyond the scope of this paper, it is important to point out that Islam and Judaism do share common ancestry and both have historic and fundamental precepts regarding the equitable allocation of water. Islam has many references and injunctions that regulate human-environment interactions. Specifically, Islam requires its adherents to conserve water, consider the

water needs of non-human species and refrain from irreparably degrading water and other natural resources.[63]

It is argued that a broadly sustainable system of water resources management in Islamic countries is more likely to be realized if management instruments incorporate a range of additional inputs from the religious, spiritual and the resource-based spheres. Culturally sensitive demand management strategies require a deliberate effort to educate people on the positive link between Islam and water conservation.[64] Notwithstanding the doctrinal nature of Islam, there also exists a tenet of *ijtihad* or 'independent reasoning' by learned Muslims, which allows them to deal with new developments and challenges that they experience in their daily lives. This explains the *fatwa* or 'religious decree or opinion' that was issued in Saudi Arabia permitting the use of recycled wastewater for irrigation purposes. This confluence of Islamic teachings and modern-day independent thinking made possible the re-use of millions of cubic meters of treated effluent.[65]

The application of the Islamic approach to aquifer management begins with faith in Allah and His unlimited

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[63] Hussein A. Amery, "Islamic Water Management", *Water International*, Volume 26, , International Water Resources Association December 2001.

[64] ibid

[65] Ibid

capabilities, including knowledge, power, management, wisdom, justice and mercy. Individuals and groups, therefore, must seek Allah's approval for their actions and follow Allah's decrees such as: securing and distributing sufficient drinking water for all creatures; forbidding the use of water as a monopoly; not using water as a commodity to be bought and sold but to ensure its distribution among all creatures to fulfill their basic needs.[66]

Because the Bible was written in a part of the world where water is scarce it is not surprising that water features significantly in the lives of the people. The scarceness of water was taken very seriously and parables of drought are linked to the wrath of God. The Jewish prophets Elijah, Jeremiah and Haggai all predicted droughts as punishment from God. Conversely, rainfall is a sign of God's favor and goodness.

Pollution and undrinkable water were also very serious matters in the Old Testament. One of the ten plagues turned the waters of the Nile to blood and interpretations have often divined that this is a metaphor for pollution. Pure water (the word for pure, "tahor" is the same in

[66] Marwan Haddad, "The Islamic Approach to the Environment and Sustainable Groundwater Management", in Eran Feitelson and Marwan Haddad Ed. *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective*: International Development Research Centre and Kluwer Academic Publishers, 2005

Hebrew and Arabic), was needed for cleansing in the Temple and is also used frequently as symbols for God's blessings.[67]

"When the poor and needy seek water, and there is none and their tongue faileth for thirst, I the Lord will hear them, I the God of Israel will not forsake them. I will open rivers in high places and fountains in the midst of the valleys: I will make the wilderness a pool of water and the dry land springs of water".[68] The perceived conflict between Jews and Muslims is often based on false assumptions. The two religions originated from the same ancestor and the common precept of both faiths is that Islam and Judaism are, first and fundamentally, ways of life. The essence of each faith does not preclude the proliferation of the other. Finally, it should be remembered that when Ishmael and Isaac went their separate ways to institutionalize and promulgate Islam and Judaism, respectively, they both returned to Hebron when their father, Abraham, lay on his death bed and, together, they buried him, honoring their common father and common heritage.

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[67] http://www.thewaterpage.com/religion_bible.htm. Accessed on March 2, 2006.
[68] Isaiah 41:17-18, available at http://www.thewaterpage.com/religion_bible.htm, accessed on March 2, 2006.

Israeli/Palestinian Cooperation

The major NGO's in the region actively pursuing conflict resolution are joint Israeli/Palestinian organizations. The major research proposals (many of which are cited herein) are joint proposals by Israelis and Palestinians. In particular, Professor Eran Feitelson, Ph.D. who is the Head of the School of Public Policy and the Chair of the Department of Geography at the Hebrew University of Jerusalem and the Harry S. Truman Research Institute for the Advancement of Peace, Mount Scopus, Jerusalem and Marwan Haddad, Professor at the College of Environmental Engineering at An-Najah University, Nablus, Palestinian Territory and researcher at the Palestine Consultancy Group (PCG) in East Jerusalem manifest the preeminent model for cooperation and common understanding of the need for joint resolution of water resource issues in the Middle East .

As is exemplified in the third section of this paper, local Israeli and Palestinian municipalities have successfully resolved complex water delivery and treatment problems when permitted to negotiate directly with one another. There are other examples of cooperation between Israeli and Palestinian individuals and institutions.

Universities within Israel and in Palestine have cordial exchanges of information and share international stages at conferences, the board of Directors of the Middle East Desalination Resource Center include Arabs and Israelis. The founders of the State of Israel were largely European in origin and had less in common with Palestinians two and three generations ago but the head of the Labor Party today was born and raised in Morocco. The vast majority of Israelis are Middle Eastern by birth today.

A community of local professional water resource researchers and members of NGO's who have developed models for integrated, sustainable and equitable water resource management institutions for the Middle East regularly meet and share experiences and the results of their work. They have drawn upon international law precedents, treaties, hydrogeological data, demographic studies, economic theories, political science and social science. The models they have generated, in turn, are inclusive and reflective of all these sectors of society.

From the mid-1980 to 1995 there was a 'slew' (Feitelson, 1995) of conferences, studies, exchanges of information, creation of NGOs, pilot projects, funding of projects and the early development of institutional structures such as the Palestine Water Authority, Joint

Water Commission, etc. The loss of confidence that resulted from the first Intifada dampened the progress of joint management and reached a nadir in 2000 when the second Intifada erupted. Virtually all management proposals from 2000-2005 were incremental in design based on small ('sequential/flexible') steps to, initially, re-gain and re-engender confidence, on both sides. The notion of basin management was proposed during this phase. At this point, establishing a sense of confidence has taken a back seat to officially recognizing the existence of each party. The proposed structures for institutional reform in the water sector are now shrouded in fog.

CHAPTER EIGHT

INSTITUTIONAL STRUCTURES FOR WATER MANAGEMENT

Legal Institutional Background

While groundwater makes up about 98% of the world's fresh water apart from the glaciers and polar ice-caps[69] and is recognized as a source of diminishing quality and quantity as well as a touchstone for conflict (particularly in arid zones) international legal disputation and adjudication of transboundary groundwater aquifers is largely absent. Moreover, "…there are no internationally accepted criteria for allocating shared water resources."[70]

Literature is replete with historical treaties related to water but they are primarily pre-disposed to remedy disputes over surface water access and quantity. International treaties that have a direct bearing on groundwater are largely theoretical and have yet to be used for purposes of adjudication. Negotiated settlements between two parties, such as the Oslo Accords of 1993 and 1995 do have a direct bearing over water allocations in the

[69] Environment Canada. http://www.ec.gc.ca/envhome.html

[70] Aaron T. Wolf, "From Rights to Needs: Water Allocations in International Treaties", *Management of Shared Groundwater Resources: The Israeli Palestinian Case with an International Perspective,* Eran Feitelson and Marwan Haddad, editors, International Development Resource Center, Toronto, 2000.

region and those Interim Accords will be examined in detail below.

Prior to the Oslo agreements, the United Nations Food and Agriculture Organization filed more than 3,600 treaties relating to international water resources between 1805 and 1984, the majority of which dealt with matters of navigation.[71] The "Transboundary Freshwater Dispute Database" is a collection of 145 treaties, which deal with water exclusive of boundaries or fishing rights disputes in the 20th century.[72] Of those treaties, 49 deal with issues of water allocations for consumptive or non-consumptive uses.

From Rights to Needs

In general, the parties to these treaties initiated their negotiating positions on the basis of 'water rights' wherein, for example, upstream riparians, such as the Palestinians in the West Bank and the Indians in the Indus region, invoked "some variation of the Harmon Doctrine[73], claiming that water rights originate where the water falls".[74] Downstream riparians regularly made claims of

[71] Ibid
[72] Ibid
[73] The Harmon Doctrine was named after US Attorney General Judson Harmon when, in 1895, he opined that international law did not impose any obligation on the United States regarding how it used waters within its sovereign borders.
[74] Ibid

prior appropriation. However, at the end of the day, in virtually every case, the disputes were eventually resolved on the basis of 'needs'; not 'rights'. Demands for water based on the needs for irrigation and increasing populations were often cited as preemptory.

Negotiating water allocations based on 'needs' rather than 'rights' is more likely to bear fruit. Wolf (1993) and Rothman (1995)[75] cite two basic reasons why this is so:

1. The process of negotiation and bargaining that leads to success involves a sense of empathy and, when agonizing over water allocation problems, it is much easier to empathize with the opposition's need for water than with his or her overriding right to the same water.
2. Water rights are much more difficult to quantify than are water needs. The issues of water rights between Israelis and Palestinians in the Interim Agreement of 1995 involve a poorly defined and non-quantifiable Israeli recognition of Palestinian water *rights* but the Agreement clearly states that Palestinian water *needs* are 70-80 MCM/year and that Israel, toward that

[75] Ibid

end, will provide 28.6 MCM.[76] Parenthetically, this Interim agreement represents the only treaty in the study wherein existing (partial) use (Israeli use of the Mountain Aquifer) was relinquished.

All of the treaties in the database prioritize water use and each cites domestic use as the highest priority. Subsequent use priorities vary but generally include agriculture, sanitation, hydroelectric power, industry and irrigation. "Notably absent in all of these lists are any instream or other environmental requirements".[77] As will be discussed later, the requirements for environmental water needs are growing more rapidly than any other sector in the Middle East.

Palestinians have seen fit to base many of their arguments about disparate water allocations as a function of water rights and as an extension of human rights. "…The Palestinian people must be allowed to enjoy their right to both self-determination and the freedom to develop their society, and like any other free people, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies in a manner consistent with the common good of all people in the

[76] Israeli Ministry of Foreign Affairs. *Israel-Palestinian Interim Agreement on the West Bank and the Gaza Strip.* Jerusalem: State of Israel, 1995, p. 179

[77] Ibid

region. Eventually Palestinians must have greater access to, control over, and use of their natural resources in general and water resources in particular."[78]

The World Health Organization has set a benchmark of 100 liters per day per capita as the minimum amount of clean water required for human sustenance.[79] Average consumption in the West Bank is less than this mark in many locations. Table 7 shows the discrepancy of water consumption in different areas in the West Bank.

While clearly defined guiding principles and precedents regarding groundwater in the international arena are rare, if defined at all, the principle of 'prior use' is protected in every treaty within the "Transboundary Freshwater Dispute Database" when upstream/downstream river riparians are the parties in dispute.

International Water Treaties

Prior Appropriation

In terms of groundwater resources and international law in the Middle East, Israelis claim a prior use before

[78] Yasser Nasser, "Palestinian Water Rights and Needs", *Water in Palestine: Problems, Politics and Prospects*, Palestinian Academic Society for the Study of International Affairs, Fadia Daibes, Editor, Jerusalem, 2003.
[79] WHO. *Domestic Water Quantity, Service Level and Health*, accessed on March 12, 2006, available at http://www/who.int/water_sanitation_health/diseases/wsh0302/en/

the state of Israel (pre-1948) of the Mountain Aquifer for irrigation purposes and a more extensive and intensive use once statehood was declared. Moreover, Israelis bolster their claims by citing the "…significant damage that would result from the loss of the Israel's current level of use, necessary to meet the country's vital economic needs".[80] Palestinian development of the Mountain Aquifer prior to 1948 was limited due to lack of Palestinian resources and did not increase to any significant degree between 1948 and 1967 when the Jordanians administered the area of the West Bank. "Between 1948 and 1967, the Jordanian regime directed all its resources to the development of the East Bank, which at the time was less developed than the West Bank."[81]

Prior Use and the Geneva Convention

Among Palestinians, the argument of prior use does resonate[82] and is augmented by the claim that Israel is in violation of the Geneva Convention which delineates the limits and obligations of the 'belligerent occupier". The

[80] Yoram Eckstein and Gabriel E. Eckstein, "Groundwater Resources and International Law in the Middle East Process", *International Water Resources Association*, June 2003.
[81] Nasser, p. 91
[82] In an interview on December 29, 2005 with Dr. Fadia Daibes in Jerusalem, she adamantly maintained that the Palestinian nation is a sovereign state entitled to the equitable treatment in the eyes of the law as any sovereign state in the world and that any water re-allocation for the West Bank would only be accepted by Palestinians as 'just compensation' for water taken from the Palestinian sovereignty in the West Bank.

Geneva Convention holds that the occupier may not use the natural resources of the occupied land for the furtherance of civilian activities, only necessary military functions. The Israelis dismiss the argument on prima facie grounds maintaining that the Geneva Convention Accords are designed to remedy only disputes between two sovereign nations effectively eliminating the "Palestinian Authority" as an internationally recognized sovereign entity.

Helsinki

The International Law Association (ILA) adopted the Helsinki Rules of 1966 for the purpose of addressing the status of groundwater within the context of international law. The Helsinki rules list eleven hydrographic and socio-political factors, which ought to be taken into account as a whole in water allocations. The rules include, but are not limited to[83]:

- Geography of the basin
- Hydrology of the basin
- History of past use
- Climate affecting the basin
- Economic and social needs

[83] Jad Isaac and Maher Owewi, "The Potential of GIS in Water Management and Conflict Resolution", in *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective,* Eran Feitelson and Marwan Haddad, editors, p. 335.

- ❖ Population dependent on basin's water
- ❖ Availability of other resources
- ❖ Comparative costs of alternative means of satisfying the economic and social needs
- ❖ Avoiding the unnecessary exploitation of basin's water
- ❖ Practicability of compensating one or more co-basin states when disputes arise
- ❖ Degree to which needs of a basin state can be satisfied without damaging co-basin state

These rules have been used in conjunction with domestic criteria is settling water disputes but the Helsinki rules are not binding. The body of work represented in the Rules is important and has served as a foundation for further codification of international groundwater rules. The basic rule adopted in 1966 was that equitable and reasonable utilization (often called the 'doctrine of hydrological unity'[84]) was the overriding principle for managing transboundary use and water management. Steady decline of water quality, exponential population growth and the threat of climate change gave pause to ILA's earlier thinking and set in motion a series of meetings, conventions and a proliferation of new rules to deal with a new reality. The Water Resources Committee of the ILA met ten times between

[84] Eckstein, p. 159

1997 and 2004 finally codifying the complete set of rules at the Berlin Conference in 2004.

Bellagio

The Bellagio Draft Treaty, developed in 1989, attempts to provide a legal framework for groundwater negotiations. The Bellagio Draft Treaty was developed by a group of experienced legal practitioners and scientists from many parts of the world who came together to identify basic requirements for protection and use of international groundwater supplies. Treaty provisions and international agencies with jurisdiction over groundwater are limited in scope and often unable to address the issues. The goal of the draft treaty is to provide mechanisms for dealing with uncontrolled drawdown, depletion, drought reserves, water quality, protection of recharge areas, and public health emergencies, along with procedures for settling disputes. The Bellagio Draft Treaty does not take environmental or ecological considerations into account.

The work began upon the joint initiative of Professor Al Utton and Mexican Ambassador Cesar Sepulveda in 1977 that convened a group to study the issues. Many proposals and drafts were circulated over the years and in 1987, a conference was convened in Bellagio, Italy. The notes and tapes from the 1987 meeting became a principal basis for

the preparation of the Bellagio Draft Treaty, authored by Professors R.D. Hayton, G. E. Radosevich and Albert E. Utton[85].

The Draft requires joint management of shared aquifers and describes principles based on mutual respect, good neighborliness, and reciprocity. While the Draft recognizes that obtaining groundwater data can prove difficult and expensive, and mutually acceptable information relies on cooperative and reciprocal negotiations, it does provide a useful framework for future groundwater diplomacy.[86]

"Increasing populations and industrial and agricultural development worldwide are placing much greater demands on groundwater supplies. Many of these groundwater basins or aquifers underlie two or more countries and are, thus, international or transboundary. Withdrawals from one country can drain life-giving water from a neighboring country and, as a consequence, be the source of severe and protracted conflict. Unfortunately, international law and treaty practice are only at a beginning stage. With the goal of advancing international law and institutions on the

[85] http://uttoncenter.unm.edu/bellagio_treaty.html
[86] Jesse H. Hamner and Aaron T. Wolf, "Patterns in International Water Resource Treaties: The Transboundary Freshwater Dispute Database", *Colorado Journal of International Environmental Law and Policy*. 1997 Yearbook, 1998.

matter, a multi-disciplinary group of specialists over an eight-year period have developed a draft international groundwater treaty. The draft provides mechanisms by mutual agreement rather than continuing to be subjected to unilateral taking. The treaty addresses contamination, depletion, drought and transboundary transfers as well as withdrawal and recharge issues. The fundamental goal is to achieve joint, optimum utilization and avoidance or resolution of disputes over shared groundwaters in a time of ever-increasing pressures upon this priceless resource."[87]

The Asymmetrical Relationship Between Israel and Palestine

All of the above treaties (and others promulgated within the context of the United Nations) "institutionalize the inherent conflict between 'reasonable and equitable use' and 'the obligation not to cause harm' and by not prioritizing principles of sharing, the work does not make great strides in delineating the allocation of

[87]Robert D. Hayton and Albert E. Utton, , *The Ixtapa Draft Agreement Relating to the Use of Transboundary Groundwaters*, The Bellagio Draft Treaty 25 Nat. Res. J. 715 (1985). http://uttoncenter.unm.edu/pdfs/Bellagio_Draft_Treaty_E.pdf

transboundary waters-an issue that is at the heart of most international water conflicts"[88]

The outstanding difference between the Interim Agreement of Israel and Palestine in 1995 and all the other treaties delineated above is the asymmetrical relationship between the two parties. The relationship between Israel and Palestine is one of Occupier and Occupied Territory, respectively. There have been no prior agreements between two such entities. Within the Interim agreement the only references to 'rights' are in the context of the yet-to-be negotiated Final Status Agreement

Changing of the Guard in Palestine

The West Bank and Gaza do not form a singular geographical unit and, throughout time, these two entities have fallen under the sovereignty of different rulers. "A new ruler did usually not impose immediately a new legal system but enacted overtime, a new set of norms as supplementary to the existing one. Only when necessary the new ruler repealed the old laws and enacted new one to replace the old, pre-existing, laws"[89]

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[88] Wolf p. 149

[89] Hiba Husseini,, "The Palestinian Water Authority: Developments and Challenges Involving the Legal Framework and Capacity of the PWA", Israeli-Palestinian International Conference on Water for Life, Antalya, Turkey, October 10-14, 2004.

Ottoman Rule and the British Mandate

Both areas fell under Ottoman Rule until 1918 and, subsequent to World War I, by order of the League of Nations, became part of the British Mandate until the War of 1948.

The Impact of Israeli Statehood on Palestine

When Israel became an independent state the area of the West Bank was incorporated into the Hashemite Kingdom of Jordan and the Gaza Strip fell under Egyptian Military rule. Egypt refrained from incorporating Gaza and therefore did not apply any pre-existing legal norms.

Israeli Military Rule Over the West Bank and Gaza. Following the 1967 War both Gaza and the West Bank came under Israel Military Rule. Military Order 92 (August 15, 1967) provided for the transfer of all administrative, executive, judicial and monitoring authorities from the various governors, municipalities and village councils to one person, an Israeli official appointed by the Military Commander. Saul Arlosoroff, as the deputy water commissioner of Israel was appointed by General Tzur, assistant Minister of Defense to Mr. Moshe Dayan, to act as the responsible authority on water affairs management and development in the Occupied Territories, for the local populations (non Jewish settlements), in the Golan Heights,

the West Bank and Gaza. (This appointment), of course, it (sic) was agreed with the relevant governors in each of the territories.[90] This official was responsible for granting, stopping or adjusting permits, setting and collecting fees and taxes, monitoring water use and setting quotas, stopping the activities of any or all water entities or committees and forming alternative entities, the members of which he himself was responsible for appointing.[91] Mr. Arlosoroff implemented a policy designed to foster a relationship between Israel and the Palestinians akin to that of a lion and a lamb. Israel sought to provide a minimum amount of water ("no one died of thirst") to the Palestinians; enough for sustenance and certainly inadequate supply for growth and development. Mr. Arlosoroff held this position from 1967-1978 when the rival Likud party came to power and replaced the Labor Party (of which Mr. Arlosoroff was a member) positions of power. The water policy for the Occupied Territories of the more conservative Likud Party was not substantively different from Labor's. The major difference was, whereas Labor sought to maintain a level of pacific stability in the

[90] Email correspondence with Saul Arlosoroff, March 23, 2006
[91] Fadia Daibes, "Water-Related Politics and Legal Aspects", *Water in Palestine; Water, Problems Prospects*, Jerusalem, 2003

Occupied Territories, Likud went out of its way to make the Palestinians' lives as miserable as possible.[92]

Military Orders Affecting Water. Military Order 158 (November 19, 1967) prohibited new construction of water installations without a new official permit. It precludes construction of previously planned Jordanian installations.

Military Order 291 (December 19, 1968) stipulated that all prior settlements of dispute over land and water were now invalid.

Oslo and the Development of the Joint Water Committee OSLO I

The operative agreement between Israel and Palestine is the seminal 'Declaration on Interim Self-Government Arrangement of 1993 between Israelis and Palestinians' or, "Oslo I Accord". This agreement contains provisions that are of relevance to water management. In Annex III of the Accord the parties agree to establish an Israel-Palestinian Committee on Economic Cooperation focusing, among other matters on environmental issues, water, energy and industry.

OSLO II

The Oslo II Accords of 1995 states that, "Israel recognizes the Palestinian water rights in the West Bank.

[92] Interview with Saul Arlosoroff, Tel Aviv, December 28, 2005

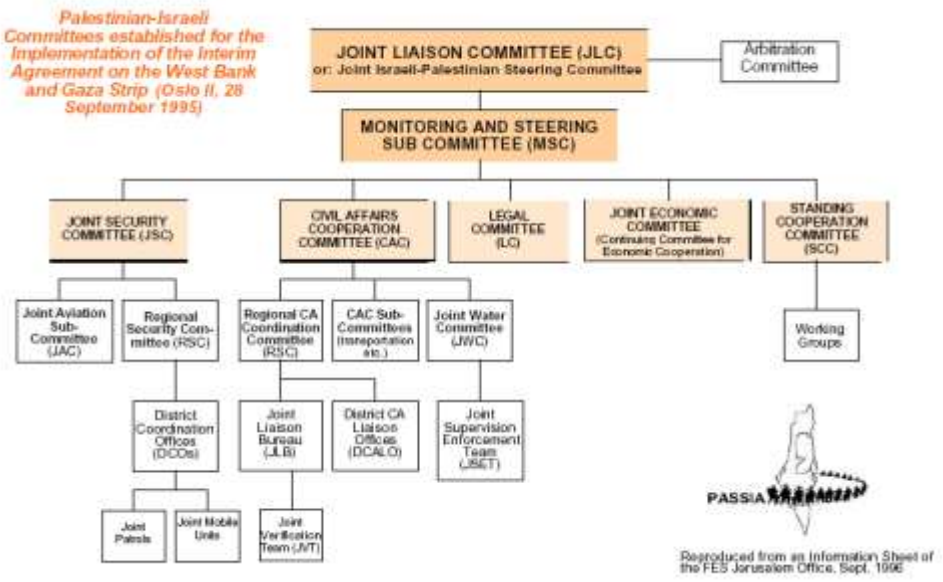
These will be negotiated in the permanent status negotiations and settled in the Permanent Status Agreement relating to various water sources…the Israeli side shall transfer to the Palestinian side, and the Palestinian side shall assume powers and responsibilities in the sphere of water and sewage in the West Bank related solely to Palestinians, that are currently held by the military government and its Civil Administration, except for the issues that will be negotiated in the permanent status negotiations, in accordance with the provisions of this Article."[93]

Joint Israeli-Palestinian Committees

The Joint Israeli-Palestinian committees that were appointed by virtue of Oslo II are described in Figure 18.

[93] "Desk Study on the Environment in the Occupied Palestinian Territories:, United Nations Environment Programme, 2004.

Figure 18



Source: Reproduced from an information sheet of the FES Jerusalem Office, September 2996

The First "Intifada", or Palestinian uprising, from 1987-1991, gave rise and urgency to a conference in Madrid, which eventually led to the Oslo Accords. The Intifada shifted the center of gravity of Palestinian political leadership from the Palestinian Liberation Organization (PLO) in Tunis to the Occupied Territories resulting in the creation of the Palestinian National Authority in 1994. The second Intifada began in 2000, and, in its wake all of the above joint committee meetings between Israelis and Palestinians were halted and the committees disbanded, *with the notable exception of the Joint Water Committee.* The

Joint Water Committee (JWC) has continued to meet on a continual basis.

The Joint Water Committee

The Oslo II Agreement of 1995 established the Joint Water Committee (JWC) assigning it the responsibility for overseeing the management of all the West Bank's water and sewage resources and systems.[94] The JWC is comprised of an equal number of Palestinians and Israelis (generally 4), decisions must be reached by consensus and each side maintains a veto over any proposal. All water-related issues that the JWC discusses are solely concerned with Occupied Palestine. Water-related issues relevant to Israel are not within the purview of the Committee.

Projects considered by the JWC are typically not implemented with due haste. "While the Palestinians attribute many problems and delays in decisions regarding Palestinian projects to Israeli unwillingness, the Israelis maintain that they have hydrological reasons for turning down Palestinian proposals. However, well-informed sources admit that Israel's refusal to agree on project proposals

[94] Israel and the PLO, *Interim Agreement,* Annex III, Appendix I, Article 40

with the Palestinians are sometimes due to political rather than technical reasons"[95]

An additional reason which delays implementation of proposals is the fact that all four members of the JWC must physically sign all protocols and minutes. Travel restrictions for Palestinians within the Occupied Territories affects the two Palestinian members of the Committee and transmission of these protocols is difficult because they do not fall within the public domain. There are challenges to the 'secrecy' of these protocols to the Israeli Supreme Court.[96] It is not unusual for committee members to withhold signatures as part of the bargaining process as well.

The major impact of the Joint Water Committee is symbolic and political but, as such, should not be under-estimated. It recognizes and enunciates the hydrological interdependence between Israel and Palestine. The original heads of the Palestinian and Israeli delegations, Ihab Barghouti and Meir Ben-Meir, respectively, acknowledged that joint mechanisms for dealing with transboundary waters are necessary and that position has been re-enforced by the

[95] Anders Jägerskog, "Why the States/Entities in the Jordan River Basin are Co-operating over their Scarce Water Resource", *The Hague Conference on Environment, Security and Sustainable Development* May 9-12, 2004

[96] Challenges by private legal firms and by the Israeli Ministry of Agriculture's *Freedom of Information* Division.

respective heads of the JWC today (up until the 2006 elections in Palestine); Shimon Tal, the Water Commissioner for Israel and Fadel Kawash, the head of the Palestinian Water Authority[97] have continued to publicly appreciate the necessity of such cooperation. For example, the fanfare accompanying the recent opening of the Ashkelon Desalination Plant in Israel was subdued by the ominous threat of Palestinians' plans to lay a sewage pipe that drains into the sea in the northern Gaza Strip, (which would) "paralyze the largest desalination plant in Ashkelon and pollute the nearby beaches". [98] Palestinian water commissioner Fadel Kawash, aware of Israel's concerns remarked, "In principle, I accept that there cannot be unsupervised discharge of sewage, to the sea or anywhere else. Both sides will suffer if the situation gets out of hand. Today we have one sewage pipeline from the Gaza Strip to the sea, in the vicinity of Gaza City [Sheikh Ajlin]. Waste flows in the direction of Israel in the Wadi Hanun area. I agree that spilling sewage into the sea should not be allowed. But bear in mind that there is a huge pool of sewage near Beit Lakiya, covering some 400 dunams of land.'

[97] However, since the formation of the Hamas led government in Palestine, Mr. Kawash has been removed from office

[98] Ze'ev Schiff, "From Wastewater to War", *Palestine Media Center*, available at: http://www.palestine-pmc.com/details.asp?cat=4&id=2382, accessed on March 2, 2006.

Kawash says that the cleanup in the northern Gaza Strip could take at least two years."[99]

Earlier, in 2002, Fadel Kawash also stated in an interview in the *Jerusalem Post* that Palestinians were working together with their Israeli counterparts to prevent pollution of water through the JWC in spite of the Intifada.[100]

Nonetheless, the effectiveness of the JWC is constrained by its structural context. Israel presumes the hegemonic role and enjoys the more powerful position vis-à-vis economic size, military strength and international standing. By contrast, Israel also entered into a similar agreement with Jordan as part of the Peace Agreement of 1994 and the water agreement has served to enhance and formalize "regime cooperation between the two states."[101] The major difference between the two agreements is that while the treaty between Israel and Jordan was signed by two sovereign states empowered to negotiate rights and obligations, the Interim Agreement between Israel and Palestine concerns only the behavior of the latter.

[99] Ibid
[100] Anders Jägerskog, op cit.
[101] ibid

Israel's Water Institutions

Water Law

Israel has a clearly defined and developed water institution history. The State was founded in 1948 and for the first ten years riparian and appropriative rights were extensively used to claim water rights. The most significant change to Israel's water structure and history was the adoption of the Water Law in 1959. This Law essentially vested the ownership of all water resources in the state. Section 1 of the Water Law lays down the underlying philosophy of Israel's approach to its water resources by providing that: "The water resources of the State are public property; they are subject to the control of the State and are destined for the requirements of its inhabitants and for the development of the country".[102] The Law goes on to say that there is no private or governmental ownership of water. All water resources belong to the public and are controlled by the State of Israel as the custodian for its residents"[103] Israeli law requires of each and every water user a license and stipulates that land ownership in Israel does not include the right to the water flowing through the land, beneath it or drawn from wells

[102] "Israel's Water Economy", Israel Ministry of Foreign Affairs, August 2002 http://www.mfa.gov.il
[103] Ibid.

situated thereon. In short, there are no riparian laws whatsoever. A fundamental provision in the law is the obligation to provide water solely by measurement, and to each consumer separately. In other words, each point of connection must be metered. The Water Commissioner has ultimate authority to authorize or cease production of any wells in the country.

Water Rates in Israel

Domestic consumption rates are progressive and rise with an increase in the amount of water consumed. One price is given for the initial 8 cubic meters per month for each housing unit and a second price is charged for the next 7 cubic meters. Thereafter, for each additional cubic meter the price increases. Each family member (over 4 family members) is entitled to an additional 3 cubic meters a month charged at the lowest rate. There are separate rates for 'gardening' and an overall restriction on the total amount of landscape water per month, per residence.

While it costs *Mekorot*, Israel's national water company, on average, $0.34/$m^3$ to convey water to the Israeli farmer, farmers only pay approximately $0.16/ m^3 due to the

subsidization. Palestinian water rates average between $1.00- $1.20/ m^3.[104]

The Water Commission

Israel's Parliament, the "Knesset", assigned management and responsibility for Israel's water to the Ministry of Agriculture, where it remained until 1996. Currently, the aegis for water management is found within the Ministry of Infrastructure. The Prime Minister appointed a Water Commission (currently operating within the Ministry of Infrastructure) to enforce water policy.

The farming community ("kibbutzim" or collective farms) of Israel in the 1960's through the 1980's was extremely strong, particularly when the Labor Party (which favored socialist policies) was in power. While the Water Commissioner wielded great power: determining which water projects would be built; determining water appropriations; enforcing flood and pollution prevention measures, the Water Court, which was established with the aim of settling water disputes between the Water Commissioner and 'citizens', was dominated by the Ministry of Agriculture. The Water Council, also established to serve as a

[104] Nawal Atwan,, "Allocations of Water and Responsibilities in an Israeli-Palestinian Water Accord", Princeton University Press, January 5 2000. http://www.princeton.edu/wws401c/nawal.pdf.

'consultant' to the Commissioner, was largely comprised of members of the agrarian community. [105]

At the time of this organizational structure, the farming community consumed about 75% of all available water. That number has been reduced today to 67%.[106]

Academicians and scientists in Israel began to advise the government in the mid 1990's that a drought of serious proportion was nearing its inevitable arrival. In 1997 and 1998 the Water Commission planned a 40% reduction in agricultural allocations. Minimum record rainfalls did occur in 1998-99 and emergency decrees were promulgated affecting all water sectors of Israel but rather than enforcing the emergency decree as it was written, the agricultural sector's quota was only cut by 27%. The difference was provided by overexploitation from the Mountain Aquifer.[107] The recharge rate during that year was only 47% such that the water deficit in the country, in 1999, was 847 MCM.[108] In 2000, the ultimate Water Commission recommendation was a 60% reduction in agricultural water but that was slashed to 33% and, in that year, the water deficit was 385 MCM or a replenishment rate

[105]Itay Fischhendler. Forthcoming. The politics of water allocation in Israel. In: Feitelson, E., and Shamir, U *(Ed.).. Water for Dry Land.* Resources for the Future Press.
[106] Ibid.
[107] Fischhendler, 2
[108] Ibid

of 68%. In 2000 a new Water Commissioner was appointed, Shimon Tal (who maintains the post today) and he suggested a 56% cut in water allocations to agriculture but was only able to implement a 50% cut "…knowing that the difference would be provided by overexploiting the Coastal Aquifer".[109] The following year a 73% suggestion waned to 44% and, again, "the result of this limited cutback in another dry year was the further exploitation of the Coastal Aquifer. This has exacerbated the salinity rate in many wells, forcing their closure."[110]

Fragmentation of Water Governance in Israel

As Israel's water sector became more complex with the occupation of the West Bank, Gaza Strip and Golan Heights in the aftermath of the Six Day War in June of 1967, the responsibilities for water management became more fragmented. The Ministry of the Environment became responsible for water pollution issues, the Ministry of Health assumed responsibility for water quality affecting public health and the Ministry of the Interior began to supervise the operation of local authorities in issue related to water supply to urban users and wastewater treatment. Financing of all water projects fell under the

[109] Ibid.
[110] Ibid.

jurisdiction of the Ministry of Finance. During the 1960's and subsequently, water tariffs, under the purview of the Ministry of Finance, were established to reflect a subsidized rate for agriculture.

According to Israel's Ministry of Foreign Affairs[111] "The rates for industrial and agriculture are lower than those for domestic consumption and services for two major reasons: 1) Water for agriculture and industry is designated for production, and 2) Water for agriculture is supplied on a less reliable basis and is of poorer quality".

During this period of fragmentation and increasing water demand due to the expansion of agriculture and increased territory, there were no overarching coordination efforts between these ministries.

Zionism. It would be remiss to not briefly mention the "Zionist Imperative" at work. Israel's raison d'etre was the establishment of a Jewish homeland where Jews could 're-claim the soil' and 'make the desert bloom'. The allocation of water and subsidized price for water has as much to do with furthering and cementing the Zionist dream as any economic reasons. During the first ten years after

[111] "Israel's Water Economy", Israel Ministry of Foreign Affairs, August 2002 http://www.mfa.gov.il

Israel's declared statehood (1948-1958) mass immigration from North Africa, Arab countries to the east and southeast, and Eastern Europe doubled Israel's population from 800,000 to over 1.5 million. In a period of thirty years, the population was quadrupled to 3.5 million.[112] Development of territory, particularly in the urban center of Tel Aviv and in the southern desert was not only a pragmatic move to absorb all the new settlers but was also part of the new, Jewish national expression and ideology. Settling the land, tilling the soil and making it productive became the new national imperative. The water infrastructure had to be national in character and in scope so a system to ensure equal pricing for water was instituted regardless of location. The mandate given to Mekorot and to its, then, construction and planning partner, Tahal, was to develop an extensive and complex central water distribution system to facilitate the establishment of hundreds of new settlements.

As the years went on and the major initial thrusts for rapid development were successful and well advanced, the dominant agricultural establishment which controlled water development and management evolved slowly and became more

[112] Hillel Shuval, "Sustainable Water Development Under Conditions of Scarcity: Israel as a Case Study", presented at *Water for Life in the Middle East* Conference, Antalya, Turkey, 2004, available at http://www.ipcri.org/watconf/elmadhoun.pdf, accessed January 2, 2005

and more a normal economically and socially oriented vested interest group. Progressively, this group became more concerned with the standard of living of the collective settlements and farmers in general. These settlements were primarily collective farms called kibbutzim and part of the larger Labor party. While never achieving a total population greater than 5% of the country, these settlements disproportionately contributed to the political and military leadership of Israel. The early heads of state (David Ben-Gurion, Golda Meir, Yigal Allon, et al) and the current Water Commissioner were members of kibbutzim. National economic growth from the 1950's through the 1970's was largely due to the agricultural and industrial successes of this movement. During this period expansion was unbridled and unfettered by environmental concerns.

Movement Toward Privatization

In 2005 the government of Israel[113], announced its view that market forces are the most suitable tools for the efficient use of water in the urban and agricultural sectors. Accordingly, water prices that are largely determined by the Government, based on the existing block rate and non-tradable allocations, are to be converted into a market negotiating system. This change would eventually lead to a greater involvement of the private sector in the production and supply of water to the various consumers. Further, it is anticipated that rational water use will be achieved by the creation of new water suppliers, carved out of Mekorot. The role of Mekorot will be limited to the operation of the National Water Carrier, while the regional water supply schemes will be privatized and defined as public service under the supervision of the Water Commissioner.

Shares allocation attracting dividends and voting rights will replace existing water rights. To balance between supply and demand, a shadow price reflecting the water value at the source will be added, thus rendering the historic allocations ineffective. Regulation orders will

[113] "The Water Sector" Ministry of National Infrastructures, available at; http://eng.mni.gov.il, accessed on November 2 2005.

still be maintained in case of emergency, such as during a series of drought years. Subsidized prices, if available, will be fully indicated and calculated reflecting their portion of the full costs and budgeted for each specific system.

The initialization of privatization was established under the Water and Sewage Corporation Law of 2001 of the Public Authority on Water Corporations. This was the first substantive law challenging the sanctity of the Basic Water Law of 1959. The aim is to encourage business investment in essential infrastructure and to relieve local authorities of the financial and tactical burdens of water supply and distribution. According to the law a public representative is supposed to be appointed to the board of the Public Authority and on May 17, 2005 the High Court of Justice (Israel's Supreme Court), responding to a petition by the Israel Union for Environmental Defense, ordered the State of Israel to freeze its deliberations related to water tariffs currently underway within the privatization framework, and to explain to the court within thirty days why it has ignored its obligation to include

representatives of the public on the board of the Public Authority.[114]

Israel Ministry of the Environment

The Ministry of the Environment has called for proposals to local authorities, municipal and regional environmental units, private entrepreneurs and industrial plants to submit requests for financial assistance in eleven different subjects. The projects include[115]:

1. Support to local authorities for establishing construction and demolition waste infrastructure
2. Support to local environmental units
3. Support to local authorities for recycling mixed waste in sorting and recycling plants
4. Support to private entrepreneurs for treating olive press wastes
5. Support to local authorities for purchasing equipment for noise and radiation measurements
6. Support to private entrepreneurs and industrial plants for conducting feasibility studies on reducing pollutant emissions at source

[114] Israel Union for Environmental Defense, available at http://www.iued.org.il, Accessed February 1, 2006

[115] http://www.environment.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Object&enDispWho=News^12928&enZone=e_news

7. Support to private entrepreneurs and industrial plants for reducing hazardous waste at source
8. Support to local authorities for purchasing and maintaining equipment for treating hazardous waste accidents
9. Support to local authorities for conducting training courses on environmental subjects
10. Support to local authorities for the Green School certification process
11. Support to local authorities for implementing cleanup campaigns and educational activities.

Israel's Legal Framework for Water Protection

The Water Law of 1959 serves to provide the framework for the control and protection of Israel's water sources. The law states that all water sources in Israel are public property and that every person is entitled to use water, as long as that use does not cause the salination or depletion of the water resource. In 1971, the law was amended to include prohibitions against direct or indirect water pollution, regardless of the state of the water beforehand. The Minister of the Environment is authorized to protect water quality, to prevent water pollution, and to

promulgate regulations on these issues. Regulations supportive of the Water Law include:[116]

- Prohibitions on the rinsing of containers, used for spraying of chemical and biological substances into water sources
- Prohibitions on aerial spraying of chemicals and biological agents for agricultural purposes near surface water sources
- Restrictions on the use of cesspools and septic tanks; conditions for the establishment and operation of gas stations to prevent fuel leaks
- Requirements for evaporation ponds and reservoirs
- Regulations on the reduction of salt use in industrial water softening processes and on the discharge of brines
- Regulations on protecting water sources from heavy metals and other pollutants by limiting the volume of wastewater discharged from pollution sources and reducing pollutant concentrations
- Regulations on sewage disposal from vessels, which are largely aimed at preventing pollution in Lake Kinneret

[116] Ibid

- ❖ Regulations on the pH values of industrial sewage, which are aimed to prevent the pollution of water sources from the impacts of corrosion
- ❖ Regulations on the use of sludge aimed at preventing pollution as a result of improper treatment of sludge

The Ministry of Health

The Ministry of Health is responsible for the quality of drinking water within the framework of Regulations Concerning the Sanitary Quality of Drinking Water under the Public Health Ordinance. A 1995 regulation established conditions for drilling water wells including quality assessment based on microbial and chemical tests and establishment of three protection zones around drinking water wells in which different types of activities are prohibited. Israel's amended regulations (2000) on drinking water, within the framework of the Public Health Ordinance, set limits on concentrations of various chemicals and microbes in drinking water and specify requirements for sampling and testing. Rules promulgated under the Public Health Ordinance in 1981 specify the treatment required for wastewater and list the crops suitable for effluent irrigation in accordance with the treatment level.

The Local Authorities Sewage Law of 1962 prescribes the rights and duties of local authorities in the design, construction and maintenance of sewage systems. This law requires each local authority to maintain its sewage system in proper condition. This sector of water treatment is the least centralized within Israel and individual water basins have the greatest amount of latitude in designing and managing these systems.

Business licenses applications in Israel require affidavits for industrial effluent treatment, salt concentrations in sewage and threshold values for chlorides, sodium, fluorides and boron.

Enforcement of Environmental Regulations

Several enforcement mechanisms have been set up in the Ministry of the Environment to increase efficiency and efficacy, most within the Enforcement Coordination Division. They include:[117]

- Finable Offense System: Responsible for all aspects of the "finable offense" procedure, from collection, computerization and validation of reports on environmental offenses to dispatch of fine notices to suspected offenders;

[117] http://www.sviva.gov.il/Enviroment/bin/en.jsp?enPage=BlankPage&enDisplay=view&enDispWhat=Object&enDispWho=Articals^l3631&enZone=enforce_mech

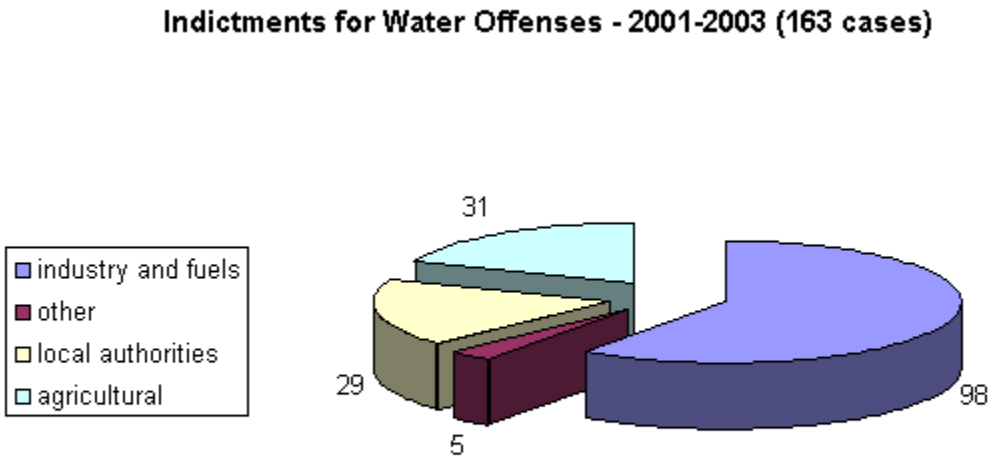
- Collection System: Responsible for collecting unpaid fines, both "finable offenses" and fines imposed by the courts;
- Cleanliness Trustee System: Responsible for recruiting and training Cleanliness Inspectors (from among civil servants and inspectors of government agencies and local authorities) and Cleanliness Trustees (from the general public).
- Environmental Problem Solving Project: Designed to "fix" critical problems, with the participation of stakeholders.
- Negotiated Rulemaking: Designed to foster stakeholder participation in the establishment of standards and regulations to promote compliance.

In order to maximize the efficiency of the Environment Ministry's enforcement efforts, training sessions for ministerial personnel have been held, enforcement coordinators have been appointed to all of the ministry's regional offices, enforcement teams (including relevant staff members, the Green Police, enforcement coordinators and directors of regional offices) have been set up, and standardized enforcement procedures are being formulated for different areas—whether landfills, land-based sources

of marine pollution or pest control. At the same time, coordination among all enforcement bodies—from the Green Police, to all divisions of the ministry, to the regional offices—is being increased. The ultimate goal is to improve environmental enforcement through more effective oversight over implementation of environmental legislation. The ultimate aim of environmental legislation is to prevent pollution and promote environmental quality. In this context, enforcement is an essential means of assuring compliance with the country's environmental laws and regulations. Israel's environmental legislation is enforced through administrative, civil and criminal measures. Although major emphasis is placed on administrative enforcement, criminal prosecution is often an effective deterrent tool, especially because of the personal responsibility imposed on directors of economic and public corporations. The criminal enforcement system uses sanctions, including imprisonment, to promote deterrence and help ensure compliance with environmental legislation.[118] Figure 197 depicts the indictments for water offenses from 2001-2003.

[118] Ibid

Figure 19



Source: Israel Ministry of Environment

Palestine's Water Institutions

The PWA; Palestine Water Authority. The mandate of the Palestine Water Authority (PWA) is to serve as the main regulatory body for water resources management and development in Palestine and its objectives, as enunciated by Ihab Barghothi, Ph.D., advisor to the PWA[119] are to:

- Execute the National Water Policy as approved by the National Water Council;
- Ensure most efficient management of available water resources in Palestine;
- Seek to achieve and develop water security through optimal planning and management of water resources and

[119] Barghothi, 2

explore further resources to ensure balanced management between supply and demand;

- ❖ Set standards and establish technical specifications to assure quality control of water works;
- ❖ License the exploitation of water resources including the construction of water projects;
- ❖ Seek to achieve strong cooperation between PWA and other relevant parties.

The core functions of the PWA are to:[120]

- ❖ Support negotiations on expansion of Palestinian Water rights toward gaining control over its equitable share of the region's water resources;
- ❖ Be in charge of management and allocation of water resources including issuing and supervision of water abstraction licenses;
- ❖ Provide water resources and water sector information services;
- ❖ Undertake water "master planning" functions:
- ❖ Take charge of donor coordination within the water sector;
- ❖ Be a regulator of water and wastewater utility operations;

[120] Ibid.

- Promote public awareness, stakeholder participation and mutual trust among interest groups.

The PWA was established in 1995 under (Palestinian) Presidential Order No. 90, acting under the direct responsibility of the President of the Palestinian National Authority (PNA). In the same decree, the National Water Council (NWC) was also established and its purpose is to approve projects and capital expenditures related to water. The Head of the Water Committee is the President of the Palestinian National Authority. All of the members of the NWC are:

- PNA President, Head of Committee
- Minister of Agriculture, Member
- Minister of Planning and International Cooperation, Member
- Minister of Justice, Member
- Ministry of Industry, Member
- Ministry of Local Government, Member
- Representative of Palestinian Universities, Member

The PWA recognizes, as available, 650 MCM of the Mountain Aquifer and an additional 70 MCM of wadi (ancient river beds only active in the winter months) surface runoff to support the water needs of the West Bank. The PWA recognizes that the Gaza Coastal Aquifer is the sole source

of water for the Gaza Strip and estimates a renewable recharge rate of 45 MCM. Total use of the Mountain Aquifer is about 120 MCM of which 86 MCM is used to irrigate 90,000 dunam (22,000 acres or 9,000 hectares). The remaining 34 MCM are used for domestic and industrial consumption with more than 40% unaccounted for water, as mentioned above. In Gaza, the PWA estimates demand of 125 MCM irrigating 120,000 dunam (30,000 acres or 12,000 hectares).

The PWA asserts that Israel is controlling 85% of the water from the Palestinian groundwater. (Refer to earlier discussion of water supply and the Mountain Aquifer). The PWA has established four regional utilities throughout the West Bank and Gaza and divided them geographically:

1. Northern Utility; Nablus, Jenin, Tulkarem, Qalqilia, Salfit and Tubas Governorates
2. Central Utility; Jerusalem, Ramallah, Al-Bireh and Jericho Governorates
3. Southern Utility; Hebron and Bethlehem Governorates
4. Coastal Utility; Gaza Strip Governorates

The PWA recognizes “Oslo II” as the basis for water sector planning and project implementation during the ‘interim period’ and until a final status agreement is reached. The PWA has prepared its final status negotiating position, which was articulated at the U.S. House of

Representatives Committee on International Relations meeting on May 5, 2004 by Ihab Barghothi, advisor to the Palestinian Water Authority.[121]

Barghothi summarized the Palestinian demands as:

- Total and permanent Palestinian sovereignty coupled with actual control over all resources of the (Eastern) aquifer, whether ground or surface.
- Redistribution of the water resources of these (Western and Northeastern aquifers), on the basis of equitable and reasonable distribution principle, without any precedent conditions, and to dismiss the statement, which says it is necessary to honor the Israelis' current utilization.
- Total and permanent Palestinian sovereignty and actual control over watercourses inside the Gaza Strip.
- Complete participation in the aquifer management, and at the same level with other countries riparian in this aquifer.
- To get a commitment from the Israeli side to pump the Palestinians' share of water from the aquifer through Lake Tiberias, by a pipeline or canal connecting between Lake Tiberias and the (Jordan) Valley area at

[121] Barghothi 3.

the starting point of the northern borders of the West Bank along the Jordan River.

Palestinian Water Tariffs. All joint water proposals include provisions for water markets, degrees of financial privatization, water transfers, or, quite frequently, all three. A discussion of the benefits and disadvantages of water transfers is necessary to fully explicate the notion of joint management. However, in order for that discussion to be appropriate for Palestinians as well it will be necessary to review the current state of their institutional water price policies and programs.

At this point in time it is not realistic to ask a Palestinian how much a cubic meter of water costs. The answer is determined by where he/she lives, what manner and method is used for calculating the cost, whence the water is derived, in what form it is delivered and, finally, where it is measured. Within Israel, the discussion revolves around subsidized costs for agriculture and industry, 'shadow' costs and marginal costs. Water is uniformly and centrally provided for domestic use. That is simply not the case in Palestine.

Water Law No. 3 of 2002 of the Palestinian Authority re-affirmed the formation of the Palestine Water Authority (PWA) and the High Water Council. Article 9 of this law

specified that the PWA is entrusted with a number of powers including:

- ❖ Setting the general water policy.
- ❖ Setting the policy for development and utilization of water resources and their different usages.
- ❖ Authorizing plans and programs aimed at regulating water usage, preventing wastage, and conserving consumption.
- ❖ Confirming the allocation of funds for investment in the water sector.

Further, Article 20 of the law stipulates that, a unified tariff system for water shall be set. Article 26 prescribes that the regional utilities and water user associations shall set the prices of water for different usage, in accordance with the tariff system. Article 35 of the same Law stipulates the penalties to be imposed for violating the law's provisions.

The reality of water tariffs in West Bank Governorates in 2002 is represented below in Table 11 and the water tariffs in Gaza Strip Governorates in 2002 are shown in Table 12.[122]

Several points of discrepancy are shown in the tables. The highest price for 100 cubic meters of water is 198 NIS in the Gaza Strip Governorate of Absan Al-Kabireh whereas

[122] http://www.piccr.org/publications/special27e.pdf

the highest price in the West Bank for an equivalent amount of water is 900 NIS. Within the West Bank approximately the same disparity is apparent, 100 NIS in Jericho and 900 NIS in Nablus.

TABLE 11

Water tariffs in West Bank Governorates in 2002

Consumption (m^3)	Ramallah El-Bireh	Nablus	Hebron	Jenin	Jericho	Salfit	Tulkarem	Qalkiliya	Tubas	Bethlehem
	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS
	Every Two Months	Per Month	Per Month	Per Month	Per Month	Every Two Months	Per Month	Per Month	Per Month	Every Two Months
0-5	42	26	25	22.8	29	36	17	15	14	48
10	42	45.5	45	43.8	29	36	27	17.5	21.5	48
20	80	113.8	85	85.8	29	71	47	22.5	49	88
30	112	195	135	127	39	106	67	27.5	79	128
40	152	276.3	185	169.8	49	146	93.4	32.8	109	168
50	204	380	235	211.8	59	186	119.8	40.3	139	208
60	256	484.3	285	271.8	69	226	146.2	47.8	169	248
70	308	588.2	335	331.8	79	271	172.6	56	199	288
80	360	692.2	385	391.8	89	316	199	71	229	328
90	412	796.2	435	451.8	99	361	225.4	86	259	368
100	464	900	485	511.8	109	406	251.8	101	289	408

Prices in New Israel Shekels (NIS). 1 NIS=$0.25 approximately
Source: http://www.piccr.org/publications/special27e.pdf

TABLE 12

Water tariffs in Gaza Strip Governorates in 2002

Consumption (m^3)	Gaza City	Rafah	Khan Younis	Deir Al-Balah	Beit Lahya	Jabalya	Absan El-Kabireh
	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS	Price NIS
	Every Two Months	Per Month	Per Month	Per Month	Per Month	Every Two Months	Per Month
0-5	1.8	30	40	15	30	40	34
10	3	30	40	15	30	40	34
20	8	30	40	21	30	40	38
30	13	30	40	33	30	40	58
40	22	45	40	50.5	38	40	78
50	31	60	55	68	46	48	98
60	40	80	75	85.5	54	56	118
70	49	100	95	103	62	64	138
80	58	120	115	120.5	70	72	158
90	65	140	135	138	78	80	178
100	74	160	155	155	86	88	198

Source: http://www.piccr.org/publications/special27e.pdf

The disparities in the billing cycles are significant as well. Some Governorates bill customers monthly and other every two months. The minimum tariff is not pro-rated so customers pay 26 NIS for the first $5m^3$ of water in Nablus and those in the city of Tubas, for example, pay 14

NIS. There is also no differentiation in prices for different market sectors. All market sectors: agriculture, industry, sanitation, drinking, public landscape, etc., pay the same rates.

The reasons for these discrepancies are primarily found in the source of the water purchased. Water purchased from Mekorot, Israel's water company, generated from artesian wells, generated from shallow wells and water generated from springs carry different costs. Water purchased from Mekorot represents the vast majority of water consumed in the West Bank and Gaza Strip. An average cost of one cubic meter of water the West Bank Water Department sold to its customers (that had been purchased from Mekorot) was 2.38 NIS. The cost of generating water from artesian wells in Ramallah averages about 3.5 NIS/m^3. Pumping water from shallow wells is less expensive than the first two options and averages about 1-1.5 NIS per cubic meter although the quality of shallow well water is generally less than that of water generated from deeper wells or purchased from Israel. The least amount of energy for water production is expended on springs or surface

water. The Governorate of Jericho spends about 0.70 NIS per cubic meter for spring water.[123]

Most municipalities still use diesel motors and aging generators in water production which makes the true cost of water production even higher and the delivery of water less efficient than in Israel.

The true cost of water is not calculated by the accounting system in the PWA. Scientific, modern methods of accounting are not practiced and 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.[124] Many institutions in the Palestinian Authority have water exemptions. Schools, camps, places of worship have been regularly exempted from paying water bills. Other consumers have received Presidential decrees excusing them from paying their water bills and many public entities such as ministries and local authorities are not forced to pay for their water either. The financial deficit for the West Bank Water Department in 2002 was 300

[123] Ibid
[124] ibid

million NIS.[125] Five of the largest eight West Bank municipalities lost money for every liter sold.

Non-Government Organizations (NGO's)

NGO's can and do provide means of communication for Israelis and Palestinians and enable them to meet on more equal terms than governmental channels permit[126]. They are not beholden to the winds of politics nor are they restricted to work with whomever they choose. However, the most effective on-the-ground NGO's are made up of local Israelis and Palestinians but travel arrangements for those Palestinians living in the West Bank and Gaza are severely restricted by the Israeli Military and Civil Authorities.

The most active and prolific NGO's addressing Israel Palestine Water Management issues are:

The Israel Palestine Center for Research and Information

The Israel Palestine Center for research and Information (IPCRI), founded in Jerusalem in 1988, is the only joint Israeli-Palestinian public policy think-tank in the world. It is devoted to developing practical solutions

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[125] ibid

[126] R. Twite, "The Role of NGOs in Promoting Regional Cooperation Over Environmental and Water Issues in Israel and Palestine-Successes and Limitations", presented at *Water for Life in the Middle East* Conference, Antalya, Turkey, 2004, available at http://www.ipcri.org/watconf/elmadhoun.pdf, accessed January 2, 2005.

for the Israeli-Palestinian conflict. IPCRI is an organization of 26 people with a governing board directed by two chairmen and two co-directors. It consists of Israeli and Palestinian civil servants, academicians and professionals. The goal of IPCRI, is "to bring about change, social change in awareness and patterns of thought that bring about change in the behavior patterns of all those involved in the education process"[127]. The seminal conference held on Middle Eastern water issues was the First Israeli-Palestinian Conference in Zurich in 1992. The 'breakthrough' conference held on Middle Eastern water issues, since Oslo II, was the IPCRI Second Israeli-Palestinian Conference held in Turkey, October 10-14, 2004[128] 140 speakers addressed this conference on a wide range of water related topics salient to the Middle East. The conference sponsors included USAID, UNESCO, the Heinrich Böll Foundation and the IWRA. IPCRI is participating in the OPTIMA (Optimization for Sustainable Water Management) that bring together 14 partners from 12 different Mediterranean countries. IPCRI's part in the project in OPTIMA is concerned with socio-economic

[127] http://www.ipcri.org, Accessed November 2, 2002
[128] Http://www.ipcri-waterdconference.org, Accessed November 18, 2004

management of the Mountain Aquifer. The three major units of IPCRI are:

- The Strategic Analysis Unit (SAU) which is an interdisciplinary unit of twelve groups headed by both an Israeli and Palestinian leader and consists of: The Political Group, Border Regime, Economic Development and Cooperation, Economics and Security, Culture of Peace, Jerusalem, Water, Security Coordination, Agriculture, Environment, Media and Human Rights.
- The Environment and Water Department (E&W) which was established in 1994 and deals with issues such as environmental standards in agriculture, environment and public health, water pollution, the allocation of water, the development of new innovative models for joint management of natural resources
- Peace Education which focuses on incorporating the peace process in elementary and high school textbooks and conducting focus group and teacher training in Israel and in Palestine.

Friends of the Earth; Middle East

"Good Water Neighbors" is the project name of the regional Friends of the Earth; Middle East. The project is aimed at fostering people-to-people information exchange,

dialog and cooperation on the protection, equitable and sustainable use of water and environment resources in Jordan, Palestine and Israel. The Project staff coordination team consist of twelve field researchers living in the community where water projects are underway, six expert advisors (two from each political entity) to accompany, advise and evaluate the projects, three councilors whose task it is to consult and maintain contact with the government representatives. The projects that FoEME have initiated include: Transportation Policy and the Environmental Repercussions of By-Pass Roads; Sustainable Tourism for the Gulf of Aqaba, Jordan; Regional Development Plan for the Dead Sea Basin; Replacement of Water Tanks for Palestinians whose tanks were destroyed by the fighting during the Intifada in the Bethlehem area.

In 2005, FoEME dedicated its forces to mitigation efforts in the Mountain Aquifer. Officials from Israel, the Palestinian Authority and donor countries, as well as the US representative to the Quartet, met on January 31, 2006 to discuss groundwater pollution and ways to alleviate it at a symposium organized by Friends of the Earth Middle East (FoEME). A new report published by FoEME found that over 1 million tons of waste per year is dumped in unsanitary conditions, polluting scarce water resources

shared by Israelis and Palestinians. The report, titled “A Seeping Time Bomb: Pollution of the Mountain Aquifer by Solid Waste”, found that as the rampant pollution continues all sides share the blame. “The restrictions on movement imposed by Israel; denial by Israel of the Palestinian use of preferred sites in area C; lack of vigorous attempts by the PA to implement the Palestinian environment policy, and lack of international funding and recognition of the severity of the issue are all responsible”, said Nader Khateeb, Palestinian Director of FoEME. Bringing together officials and decision makers from Israel and the PA, as well as the international community, the symposium represents a unique opportunity to resume cooperative efforts to prevent groundwater pollution for the first time since the Intifada. "Israel and the Palestinian Authority failed to maintain the needed environmental cooperation" said Zach Tagar, from FoEME Tel-Aviv office. "By refusing to cooperate over issues of shared interest, both governments are failing their people who suffer from water and air pollution. Due to the strategic importance of water, it is crucial that both sides resume cooperation immediately", he added. The symposium was held at the Notre Dame Hotel in Jerusalem. FoEME is organizing a site tour

of the Dir Dibwan (planned) dumpsite near Ramallah highlighting the pollution issue at hand.[129]

On September 25, 2005 Friends of the Earth Middle East presented the experience of community based water cooperation at the UN during a seminar organized by the US mission to the UN entitled; "The Role of NGOs in Promoting Peace in the Middle East".

FoEME presented lessons learned from four years of experience of the "Good Water Makes Good Neighbor" project, a community based activity focusing on pairs of Palestinian, Israeli and Jordanian communities that share a common water source (river, stream or groundwater). The project was one of few that not only survived but also expanded in spite of the ongoing Intifada because of the interdependence associated with water resources and the understanding that water is a basic necessity to life. "All our water resources are shared and how one side manages water issues directly impacts the lives of the other side", said Mr. Gidon Bromberg, the Israeli director of Friends of the Earth Middle East. "The interdependence naturally associated over water means that communities must be working together to solve common water problems". The Good

[129] http://www.FoEME.org/press.php?ind=26

Water Neighbors (GWN) project has worked in 11 communities, supported by the European Union and the U.S. Government. In light of its tremendous success, it is now being expanded to include 6 additional communities. "Water can be a bridge for peace" said the Palestinian Director of FoEME, Mr. Nader Khatib, who also spoke at the UN event. "The water resources are so scarce in the Middle East that we have to work together with our Israeli neighbors in order to help guarantee that we as Palestinians get our fair share of water and all together stop the pollution of the water resource." Over 200 representatives of delegations to the United Nations and other NGOs, which have representatives in the United States, were present, in addition to coverage by the UN and local press corps. Ambassador John R. Bolton hosted a reception later in the evening, which allowed the NGO representatives to meet and engage with members of the UN community.

The Center for Environmental Diplomacy

The Center for Environmental Diplomacy (CED) is a regional cooperative venture among Israelis, Palestinians and Jordanians working to provide expertise to protect the environment in the West Bank and Jordan Valley. CED works in alliance with others to shape a future of peace and security through management of natural resources. CED

founded TEPP (Tri-Lateral Environmental Peace Plan), an applied environmental diplomacy project, to act as a public/private partnership with the three governments, other NGOs and hydrologic and environmental experts for the purpose of establishing two watershed conservation districts: WED, which is the West Bank Environmental District and JVED, the Jordan Valley Environmental District. CED gained the support for JVED from the newly democratically elected Mayor of Jericho, Mr. Hassan Selah, the city Health and Environmental managers and Dr. Saeb Erakat, Palestinian Minister for Internal Affairs. On March 1, 2005 TEPP established a third Environmental District in Jericho (JED). TEPP is lead by its Council of Ministers (COM). The TEPP, in seeking to remove the environment from the political stalemates that regularly frustrate the immediate parties from time to time, supports the implementation of the UNEP Desk Study on the Environment in the Occupied Palestinian Territories.[130] The UNEP is the tome written at the behest and approval of the State of Israel, Palestinian Authority and 120 other countries and 90 ministers who attended the conference in

[130] For the complete UN Study refer to Töpfer, Klaus Desk Study on the Environment in the Occupied Palestinian Territories, United Nations Environmental Programme, New York: UNEP, 2005.

Cartegna, Columbia in February 2002 with the purpose of outlining the state of the environment in the Occupied Territories and identify major areas of environmental damage requiring immediate attention.

The International Development Research Center

The International Development Research Center (IDRC) is a Canadian public corporation created by the Parliament of Canada in 1970 to help developing countries use science and technology to find practical, long-term solutions to the social, economic, and environmental problems they face. IDRC has worked in close collaboration with the Middle East and North Africa since 1971. Three years later the Centre established a permanent presence in the area with the opening of a regional office in Beirut, Lebanon. Relocated to Cairo, Egypt in 1976, this office is the focus of activities in 10 countries and territories extending from Turkey to Morocco. In the past 30 years IDRC has supported more than 550 research projects directed and managed by researchers and institutions in the region. A series of Country Profiles provides an overview of IDRC's work in the region by country and includes project highlights. Based on IDRC's Corporate Strategy and Program Framework (CSPF 2005-2010), three broad Program Areas are supported in the

region, namely: Environment and Natural Resource Management (ENRM), Information and Communications Technologies for Development (ICT4D), and Social and Economic Policy (SEP).[131]

Scientific Working Groups

Executive Action Team

Multilateral working groups to advance the Middle East Peace Process were established in 1992. The Water Data Banks Project, established in 1994, is a product of that process. Dr. Karen Assaf and Mustafa F. Nuseibeh of the Palestinian Water Authority were instrumental in this project as was Hazim El-Naser of the Jordanian Ministry of Water and Irrigation, Shmuel Kessler and Meir Ben-Zvi of the Israeli Hydrological Service. The goal of this project is to standardize and adopt data collection and storage techniques in the region and improve communication among the scientific community in the region. An executive team, or EXACT, manages the project, comprised of scientific water experts from Palestine, Jordan and Israel. EXACT has set a new standard for scientific data base management in the Middle East. The project has successfully trained water managers and field technicians in the fields of:

[131] http://www.idrc.ca/en/ev-83249-201-1-DO_TOPIC.html

database development, interpretation of water quality network data, installation and operation of hydro-meteorological and stream gauging stations. Classroom training has been conducted in the fields of: statistical water analysis for water resources, laboratory review procedures, preparation of laboratory quality assurance plans, water-quality field measurements, fundamentals of relational database design, rainfall intensity data analysis, use of digitalizing rainfall intensity strip chart software and use of RAINPLOT software. EXACT has successfully exacted substantial funding from donor countries for equipment and training. According to Dr. Assaf, perhaps the greatest single success is the effective and continuing communication channels that have been established among colleagues from the Core Party participating agencies.

Euro-Mediterranean Water Information System

The Euro-Mediterranean Water Information System is an information and knowledge exchange tool that was developed in 1999 to share information and to promote common outputs and cooperation programs exclusively on water related issues in the Mediterranean region. Both the Palestine Authority and Israel are among the 15 European and 12

Mediterranean partners. This is an information gathering and dissemination organization that is structured around National Focal Points and Technical Units assigned to particular geographic areas in the region. The categories of information management that EMWIS has organized include: institutions, documentation, training, research and development and data management.

Geohydrological Information Center

The Geohydrological Information Center (GIC) is the brainchild of an Israeli-Palestinian-Jordanian research team. This team collaborated on this project representing the Department of Geophysics and Planetary Sciences, Tel Aviv University; EWRE, Environmental and Water Resource Engineering, Haifa, Israel; An Najah University, Nablus, The West Bank, Palestinian Authority; and PHG, Palestine Hydrological Group, Ramallah, The West Bank, The Palestinian Authority. The purpose of the GIC was to provide an information management system to integrate all available data with respect to the Dead Sea and Jordan Valley area. It was determined that the political situation, heretofore, prevented the efficient management of the water policy of the area around the Dead Sea and Lower Jordan basin. However, "…now a day when peace has been achieved, to a certain extent, between Israel, the

Palestinians and Jordan, it is in great need to provide a better management of the water policy on both side of the river" *(Annat Yellin, Department of Geophysics and Planetary Science, Tel Aviv University)*

Middle East Desalination Resource Center

Based in Oman, the Middle East Desalination Resource Center (MEDRC) has been the force behind the construction of the largest and most efficient systems throughout the Arabian Peninsula. MEDRC is committed to reducing the cost of desalination through research, capacity and education. The Executive Board has been broadened to include Ambassador Sayyid Badr bin hamad al bu Said, the Executive Council Chairman who is also the Sultanate of Oman's Under Secretary for the Ministry of Foreign Affairs; Dr. Charles Lawson, the Executive Council Vice Chairman, who is the Senior Advisor for Science and Technology in the Bureau of Near Eastern Affairs of the U.S. Department of State; Mr. Jacob Keidar who is the Director of the Multilateral Peace Talks Coordination and Water Issues Department at the Ministry of Foreign Affairs in Israel; Mr. Fadle Said Kawash who was the Deputy head of the Palestinian Water Authority and the Coordinator of the Water Negotiation Committee; Mr. Fayez Bataineh who is the Assistant Secretary General for Technical Affairs in the Ministry of

Water and Irrigation, Jordan. There are also representatives from Japan and South Korea on the Executive Council.

Palestine Hydrology Group

The Palestine Hydrology Group (PHG) is striving, in cooperation with the local communities, to protect and develop water and environmental resources and to ensure just and equal provision of water and sanitation services to the rural and marginal communities in the West Bank and Gaza. PHG is also striving to promote research capacity and infrastructure for the sector in Palestine and seek international networking and partnerships to participate actively in promoting the sustainability and just allocation of water resources at local, regional and global levels. "The Palestinian Hydrology Group is a non-profit, non-government organization that protects and develops the water resources of Palestine. We strive, through community participation, to achieve justice in the service, allocation, and protection of the water resources of Palestine, since the sustainability of this resource is vital for the protection of the Palestinian nation, the protection of future generation, and the protection of the planet. We shall nurture the development of our employees

and will assist them in fulfilling their personnel objectives."[132]

PHG was a two-person operation that worked out of the office of the Palestinian Agricultural Relief Committee (PARC). PARC hosted the group for two years, providing logistical support, and introducing PHG to outside funding and professional organizations. The first activity of PHG was to conduct a field study on the natural springs in the West Bank. At the end of a year and half of fieldwork the study was published, and an action program was developed in order to utilize the potential of the neglected springs. The action program began with a pilot project at Arura village in Ramallah area, and was funded by Oxfam, UK. At the completion of the pilot project an economic evaluation of the project was conducted. The results of evaluation illustrated the feasibility of the project and so Oxfam agreed to support similar projects. This signaled the beginning of PHG as an official NGO. Since this first project, 10 years ago, PHG has continued its involvement in spring rehabilitation. Since the cooperation of the local community is a crucial factor in the success of any project, PHG had to work hard in its early years to earn the trust and respect of these communities. Many

[132] http://www.php.org/background/background.html#top

communities were initially reluctant to deal with yet another new agency because of their previous, disappointing experiences with other program implementing agencies. However, the determination of PHG to earn the confidence of the communities was strong and so within the next two years they traveled into the northern rural area to spread news of their mission. The success of their visits was evidenced by the requests for PHG assistance, which soon followed. The confidence of the communities had been won over, and has been strengthened with each passing year of PHG operation. This is evidenced by the fact that in 1997, PHG received over 2000 requests from individuals and communities to help construct cisterns. PHG is now a well-known name in relation to the development, and protection of water supplies throughout the West Bank and Gaza Strip.[133]

Applied Research Institute of Jerusalem

Founded in 1990, the Applied Research Institute of Jerusalem (ARIJ) is a non-profit organization dedicated to promoting sustainable development in the occupied Palestinian territories and the self-reliance of the Palestinian people through greater control over their natural resources.

[133] ibid

The Institute works specifically to augment the local stock of scientific and technical knowledge and to introduce and devise more efficient methods of resource utilization and conservation, improved practices, and appropriate technology.

ARIJ plays an active role in the local community as an advocate for greater co-operation among local institutions, international and non-governmental organizations. In its capacity as a national research institute, it frequently provides current data and research necessary to the formulation of position papers and policy strategies on such issues as land and water resources. Moreover, through its work with donor institutions and regional and international experts, ARIJ promotes an environment conducive to the introduction of new initiatives and ideas and thus serves as a facilitator in the co-ordination of multilateral activities.

Although initially conceived to confront issues facing the agricultural community, ARIJ has since broadened its agenda to include a wide spectrum of environmental concerns. Early research priorities focused on cultivation in marginal lands, livestock production, agro-industries and marketing, and water management and utilization. As water issues gained precedence, the Water Research Unit and

the Rainfed Farming Unit were created to better identify research goals and implement project objectives.

In 1994 the Environmental Research Unit was established to conduct an overview of environmental conditions in the West Bank and Gaza and subsequently to assist in the formulation of strategy options, policy guidelines, and national standards and legislation. A precursor to these objectives is the development of a comprehensive Environmental Information System, which will serve the region as a foundation for in depth research.

In 1994 also, the GIS and Landuse Unit was created with the aim of using up-to-date data and mapping technology for analysis planning and modeling of sustainable development in Palestine.

In the shadow of the ongoing massive wave of development and investment activities in Palestine in the mid 1990's, it was feared that the basic terms of sustainable development and conservation of the environment and its resources would be disregarded. To address this concern, ARIJ created the Environmental Resource Planning and Assessment (ERPA) Unit on 1 January 1996.

Additionally, ARIJ instituted a Resource Centre, which makes scientific data, literature, and periodicals on a wide range of subjects available to the local community.

The Institute also maintains a data analysis center, laboratory, weather station, and a hydroponics unit. A garden allows the Institute to cultivate and compare new varieties before introducing them to the local community.

ARIJ receives technical and financial support from a variety of international governmental and non-governmental organizations that grant funding on a project basis.

Moreover, ARIJ has signed an affiliation agreement with Al-Quds University in 1996. The President of Al-Quds University, Dr. Sari Nusseibeh and the President of the board of trustees of the Applied Research Institute-Jerusalem (ARIJ), Mr. Daoud Istanbuli signed an agreement that creates a role model for institutional cooperation aimed at promoting the research capabilities in Palestine to meet the growing needs of the Palestinian society for research and technology as essential ingredients in comprehensive development.[134]

Any institutional structure for water resource management in the Middle East must include the participation of NGO's. While cooperation among the governments of Palestine and Israel are at a nadir, cooperation between Palestinians and Israelis who are members of NGO's is extraordinarily high and seemingly

[134] http://www.poica.org/arij/arij.php

impervious to political machinations and party politics. Moreover, these NGO's attract funding from outside sources for technical projects, research projects, conferences and publishing. The men and women working for and contributing to these NGO's are among the world's most prolific and learned water resource theoreticians. These aforementioned NGO's coupled with the noted academicians of the region form a trans-boundary community, which, if allowed to flourish, mobilize and help govern, can serve as a vanguard for further cooperation among the political entities.

Even as political entities are reticent about entering into any discussions of joint interest, there is a conference planned to be held in Amman, Jordan entitled, "Scientific Forum: Environment and Water Resources of the Dead Sea and Jordan Rift Valley" on September 11-16, 2006 which is co-organized by Jordan University, Amman; Jordan Valley Authority, Amman; Al-Quds University, East Jerusalem; Environmental Research Center, Leipzig-Halle, Germany; Palestinian Hydrology Group, Ramallah; Tel Aviv University, Tel Aviv. The Conference is supported by the Federal Ministry for Research and Education, Germany and International Association of Hydrogeologists (IAH), Karst

Commission.[135] Israeli universities and Palestinian universities and regional NGO's continue to cooperate and their successes and consistency has attracted sponsors and donors, particularly from Germany.

[135] http://www.agk.uni-karlsruhe.de/misc/Aqaba_2006_invitation.pdf

CHAPTER NINE

PROPOSITIONS FOR INTEGRATED INSTITUTIONAL WATER RESOURCE MANAGEMENT PROGRAMS

Propositions and suggestions for successful joint management of shared water resources in the Middle East share common assumptions: water resources in the region are trans-boundary; water resources in the region are scarce and at risk; population growth in the Eastern Mediterranean is rapidly increasing; there can be no final settlement or rapprochement between Israel and Palestine without a satisfactory, equitable water management program; scientific data and research must continue to flourish in a cooperative and transparent fashion; trust and confidence-building measures between parties must serve as the foundation for joint management. There is also agreement among theoreticians of joint water management in the Middle East that institutions and regulations must be governed transparently, however, there is no consensus as to whether or not institutional development in the water sector should be used as a governance tool. The motivating factor for nations to consider joint management of trans-boundary water resources is the water shortages that are upon us. Water resource development is not the quid pro quo solution to the scarcity that faces the Middle East. Desalination

will be necessary to partially meet the growing populations' demands but any fundamental institutional program must address resource allocation, demand management and water quality. Turkey and Israel had signed an agreement that called for the importation of 50 MCM/annually from Turkey's Mangavat River. That arrangement has been suspended due, primarily, to the recent increase in the price of oil making the transportation of barges impractical. Shaul Arlosoroff maintained all along that one could not bring water from Turkey at an affordable price.[136]

Because water institutions are multi-disciplinary and intersect with economics, law and public policy and are strongly influenced by myriad externalities such as resource endowment, demography, science and technology, and security needs, only an integrated approach to institutional changes that aims to modernize and strengthen regulations and administrative arrangements can have the maximum, synergistic effect on the region.

Institutional arrangements for developing and managing water resources have been termed the 'transmission gears' between policy objectives and field-level performance.

[136] Ha'Aretz, May 4, 2006 accessible at http://www.haaretzdaily.com/hasen/spages/702903.html

Whereas policies raise questions about what is to be done, institutional analysis asks who is expected to do it, and with what resources and how are the institutional building blocks expected to interact.[137]

There is scant practical experience in joint management of shared aquifers while there is extensive experience in the management of cross-boundary surface water.[138] The treaties aforementioned do not provide operative models for the Middle East nor are they enforceable to the parties in the Middle East. Country-specific studies (Saleth and Dinar, 1999 et al) are common but studies evaluating institutional underpinnings of water sector performance with a cross-country perspective are rather rare.[139] There are lessons to be learned from other countries' experience with water scarcity but, by and large, the eventual joint management program in the Middle East will most likely serve to enlighten other areas of conflict around the world rather than be the beneficiary of programs and policies adopted elsewhere. There is no

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[137] E. Chioccioli, A. Hamdy and C. Lacirignola, "Institutional Capacity Building and Integrated Water Resources Management in the Mediterranean", *The International Conference on Water and Sustainable Development*, Paris, 19-21 March 1998. Available at http://www.oieau.fr/ciedd/contributions/at2/resume/rciheam.htm. Accessed on January 22, 2006.

[138] Eran Feitelson and Marwan Haddad, "Identification of joint Management Structures for Shared Aquifers: A Cooperative Palestinian-Israeli Effort", World Bank Technical paper No. 415

[139] Saleth and Dinar, 2

equivalent conflict in the world where water resource management is so inextricably linked to the overall peace process and one nation is militarily occupied by the other. "There are many, many, groups of people that feel occupied (in the rest of the world), but few whose land is recognized as legally being under military occupation"[140]

The Johnston Plan

Several international proposals for political solutions to the water conflict in the Middle East have been proffered over the course of the past ninety years. While the Johnston Plan did not relate specifically to groundwater and was never ratified by the parties in the Middle East, it is worth noting for two reasons. First, its precepts still provide, de facto, manners of behavior in water management within Israel and Jordan. Second, the plan is in the throes of being re-visited although the prerequisites for its adoption today are many and, within the current political atmosphere, seemingly insurmountable.

Special Ambassador of the United States, Eric Johnston, presented the Johnston Plan in 1955 for the

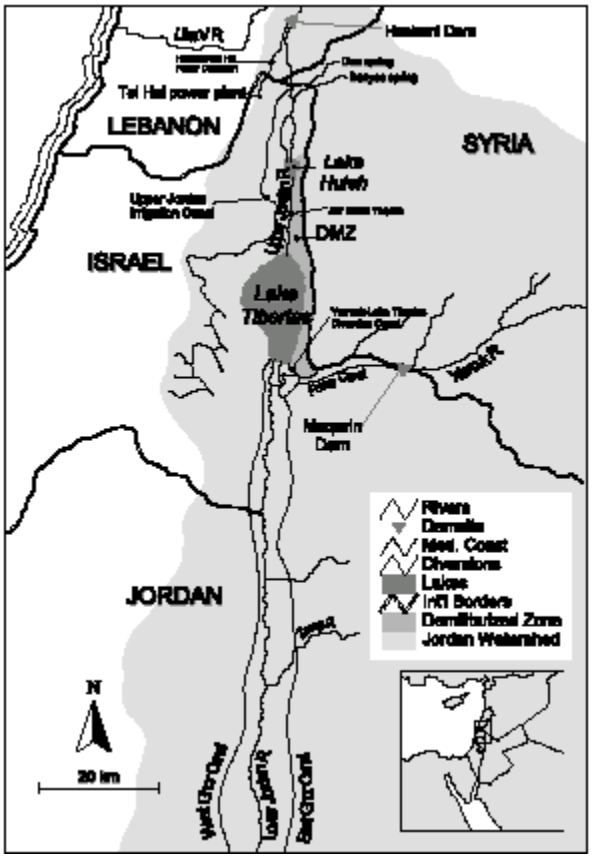
[140] Aaron T. Wolfe, Ph.D., Department of Geosciences, Oregon State University, email correspondence in reply to question, "It appears to me that transboundary water management generally crosses borders of sovereign states or nations. The area of my prime interest is the Middle East, in general, and between Israel and Palestine, in particular. Their relationship is one of 'occupier' and 'occupied'. Do you know of any other similar scenarios in the world (either today or in the past?), January 2, 2006

purpose of satisfying all the Jordan River basin riparians' needs. The provisions in the Plan called for:[141]

- Riparian water quotas, including quantities, basis of estimation, priorities of extraction, points of extraction, and spatial utilization (in and out of basin boundaries)
- Regulatory works, including diversion canals and dams and their location (See Figure 20)
- A joint management body, including international representation

[141] Sharif L. Emusa, "Toward a Unified Management Regime: The Johnston Plan Revisited", *Yale F and ES Bulletin*, available at http://www.yale.edu/environment/publications/bulletin/103pdfs/103elmusa.pdf. Accessed on March 1, 2006.

Figure 20



Source: Sharif L. Emusa, "Toward a Unified Management Regime: The Johnston Plan Revisited", *Yale F and ES Bulletin*,

The quotas were to be allocated according to the geographical locations of the riparians. Lebanon was to get water from the Hatzbani, Syria from the Banias, the Upper Jordan and the Yarmuk river, Jordan from the Yarmuk, the Lower Jordan and local wadis. While Johnston returned the United States under the assumption that all the parties were to approve, forthwith, the plan, there was never any indication that any of the parties had any intention of

doing so. The Arab states had not, to this point, recognized the State of Israel and this plan required such a statement.

The Johnston Plan did not take into account any environmental protection provisions and, of course, the political reality and state of management resources in the region are substantively different today than in the 1950's. The attraction of the Plan and the reasons for its revival today is that its major provisions for joint management resonate with current proposals today and, if there is an eventual accommodation between Israel and Syria, in particular, the engineering schemes detailed in the Johnston Plan could be a viable starting point. Syria is a water-rich country but is in the throes of a water dispute with Turkey concerning the allocation of Euphrates River water. One possible scenario suggests that should Syria be the beneficiary of its demands for Euphrates River water it may be possible to discuss the easement or elimination of the diversion dams it has erected on the Yarmuk River permitting the regeneration of flow of that river on Jordan's behalf.

Management Methods of Shared Aquifers

There are several options for managing shared aquifers and the four most commonly weighed are: separately, in a coordinated manner, jointly or by delegating responsibility to an outside body.[142]

Separate Management

When nations decide to manage their aquifer(s) separately they develop their own policies, determine the extraction rates, set their own standards and establish their own water rights. This option may be optimum when hydrogeological interdependence is not present between neighboring states. This method of management may seem the least expensive and is usually the default position that sovereign states decide to take.

Since the recent elections in Palestine[143] "the JWC (has) not met for sometime and Fadel Kawash is out, and as far as I know there is no one in his stead."[144] There is an aura of fog surrounding the future of the possibility for joint water management in the region and there have been several developments recently of a foreboding nature. The

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[142] Marwan Haddad, Eran Feitelson and Saul Arlosoroff, "The Management of Shared Aquifers", *Management of Shared Aquifers: The Israeli-Palestinian Case with an International Perspective*, Ed. Eran Feitelson and Marwan Haddad, 2005

[143] Elections in Palestine, February 2006 wherein Hamas won a majority vote

[144] Email correspondence from Saul Arlosoroff, March 24, 2006.

Israeli elections (March 2006) displayed a plurality in support of continued unilateral withdrawal from the West Bank. Israel unilaterally withdrew from Gaza in September 2005 and the newly formed government of the Palestinian Authority does not recognize the existence of the State of Israel. Furthermore, the Israel Water Commission is weighing the possibility of completely abandoning the Eastern Aquifer.[145]

The option of "Separate Management" of the Mountain Aquifer must be viewed as a distinct possibility even though its adoption will "result to a race to the bottom, as the aquifer will increasingly be over-pumped."[146] Under this regimen each side will determine its own pumping rates and, undoubtedly, the Palestinians will increase their extractions to provide more domestic water and foster agricultural growth and reduce their dependence on Israeli sources. Israel can respond by either reducing its pumpage in order to maintain sustainability of the Mountain Aquifer or continuing its present rate of extraction. Should over-pumping occur in an exacerbated, unabated, unregulated and unrestricted manner, the concerns of saline intrusions into the aquifer, increase of pollution due to landfills, other

[145] Email correspondence from Aaron T. Wolfe, January 18, 2006.
[146] Feitelson, 2.

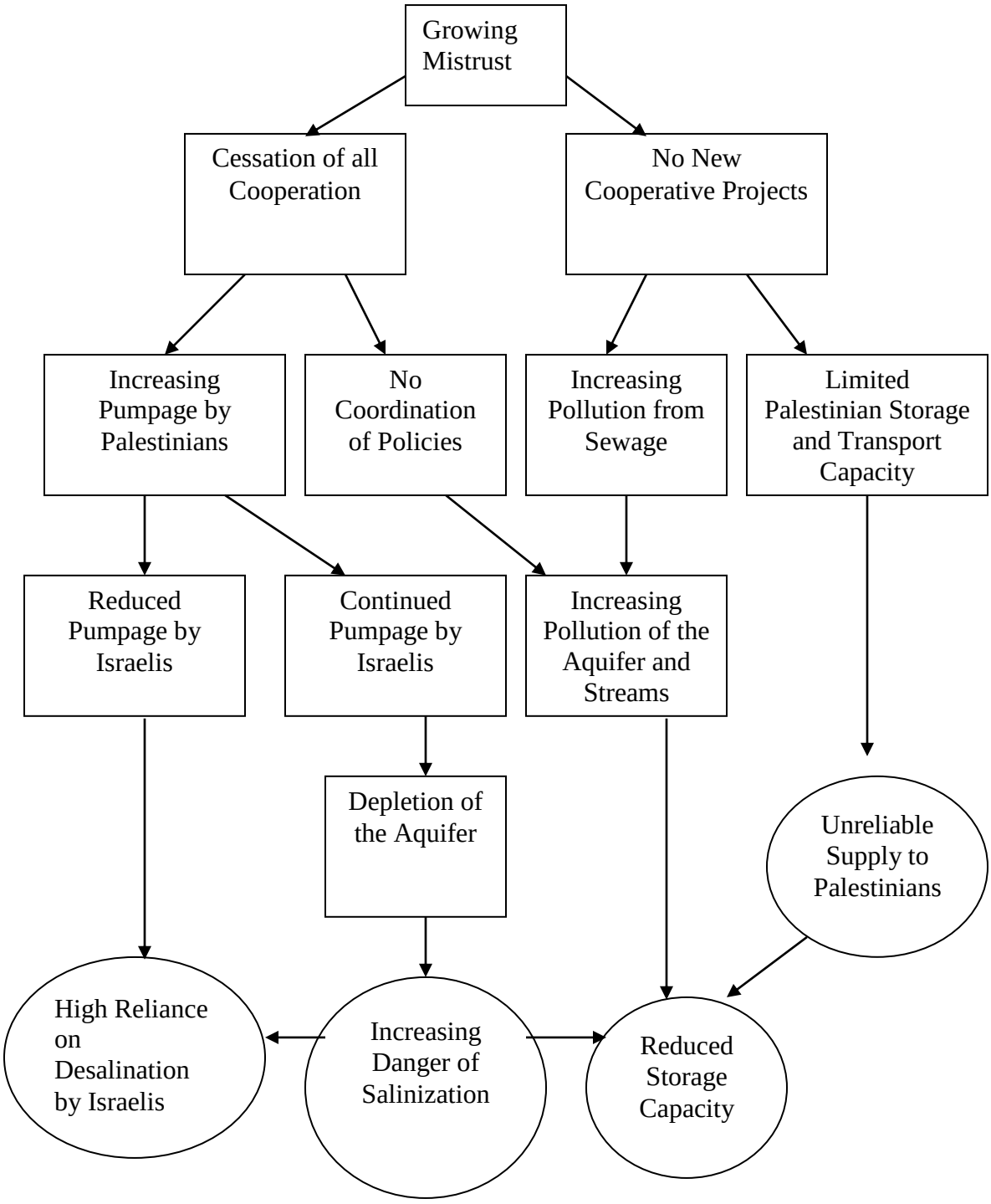
point and non-point sources, wastewater collection, treatment and re-use would be realized in short order.

From any long-term perspective it is obvious that separation is an inferior option. This will remain true also after the introduction of large-scale desalination in Israel, as long as desalination will remain more costly than pumping from the aquifer. The implication of a higher cost for desalinated water over pumped water, regardless of the size of the difference in cost, will encourage pumpage. Groundwater issues are generally less perceptible than surface water issues and the ability to rectify the damage to groundwater is costly and limited. Thus it is likely that by the time the damage is apparent enough to generate action, and assuming that Palestinian authorities have the technical, economic and managerial wherewithal, it may be very late and much of the damage could be irreparable. Figure 20 illustrates the implications of separation.[147]

[147] Ibid

FIGURE 21

The Implications of Separation Management of Groundwater



Coordinated Management

Coordinated management in circumstances of a transboundary aquifer provides for each party the right to manage the portion of the aquifer within its boundaries. However, both parties agree to coordinate specific elements seen as useful by them. Those elements may have to do with extraction rates in a commonly shared area that must be coordinated to assure reasonable pumpage rates by both parties. In cases where there is an imbalance between extraction and recharge rates and the health of the aquifer is at risk, it is likely that this mode of management will be insufficient.

Joint Management

Joint management is predicated on the establishment of a single institution agreed to by both or all transboundary parties whose task it is to manage the aquifer. This method of aquifer management is clearly defined in purpose but lends itself to many variations in structure. Generally speaking, this option includes relinquishment, to one degree or another, of the parties' sovereignty. Not surprisingly, this method of aquifer management lies largely in the realm of the theoretical.

JWM. The initial attempt to pursue joint water management (JWM) studies as a mechanism for pragmatically

resolving the water resource issues between Israel and Palestine was championed by two researchers: one Palestinian and one Israeli in 1993. Several NGO's and academic institutions provided funding and non-monetary support. The researchers were Professor Eran Feitelson and Professor Marwan Haddad. These researchers were joined by the leading experts in water issues in Israel and the Occupied Territories: Mr. Saul Arlosoroff, former deputy Water Commissioner of Israel, Mr. Ali Wahiadi, director of the Gaza Water Department and Mr. Taher Nasseredin, director of the West Bank Water Department. Funding was provided by two Canadian NGO's: International Development Research Center (IDRC) and CRB. The research institutions affiliated with the study were the Palestine Consultancy Group (an umbrella group of Palestinian research institutions) and the Truman Institute for the Advancement of Peace of the Hebrew University of Jerusalem. The impetus for the study was the success of the first IPCRI (Israel-Palestine Center for Research and Information) water conference of 1992.[148] The research began with a sense of promise if not euphoria during the first two years when Oslo I was signed in 1993, followed by the Gaza-Jericho accords of 1994 and finally Oslo II in 1995.

[148] Feitelson and Haddad, 2

Still, the reality of the asymmetrical relationship between Israel and Palestine was always felt and manifested itself by the difficulties Palestinian researchers had (and continue to have) in traveling to Jerusalem where all joint meetings were held. [149]

The first phase of the study included two closed international workshops consisting of thirty water experts: one-third Israeli, one-third Palestinian, and one-third international. The first workshop tackled issue of international experience with regard to cross-border water resources and the issues that need to be addressed when managing an aquifer in general and the Mountain Aquifer in particular. The second workshop concentrated on specific issues such as the requisites of the Mountain Aquifer, the potential of water trading and the legal and institutional facets of joint management.[150] Discussions were not recorded to ensure freedom of expression and freedom from retribution.

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[149] In gathering data for this paper I traveled to Israel in December, 2005 in hopes of meeting with Dr. Karen Assaf of the Arab Research Institute of Jerusalem and a key researcher at EXACT. When I emailed Dr. Assaf to arrange for a meeting in Jerusalem her reply was," If I am in Ramallah - of course, I would have time. BUT, if I am in Arrabeh/Jenin - then it would be too far. PLUS, I do not have a 'permit' to go to Jerusalem. I have been asking for one for a long time. If I do have my 'permit', then I can meet you in Jerusalem. If not, then we have to see where it would be possible. Email correspondence, November 23, 2005.

[150] Eran Feitelson and Marwan Haddad, 2

Institutional Structures and Goals. First structures that emanated from the workshops had several elements in common: all emphasized the need to begin with confidence building measures, in particular joint monitoring and data sharing and the establishment of conflict resolution mechanisms. Overall, the institutional structures that this team suggested were aligned according to their ultimate goals. In the end, four main goals, or "Type of JWM Structure"[151] were identified and the individual activities were collated according to their contribution toward achieving these goals and by the priority each activity represented for each structure. The 'Sequencing of Activities' incorporation by type of JWM structure is detailed in Table 12. These four goals are thus seen as the optional directions that an institution building initiative may take:

1. Resource or Aquifer protection; long-term protection of water quality
2. Crisis management; spills, containment, floods, droughts
3. Economic Efficiency; promotion of efficient water use, reduce transaction costs

[151] ibid

4. Comprehensive Integrative-comprehensive structures; all facets of aquifer management

This table was compiled as a minimalist one limited to those activities that need be incorporated in each state to make the process rational and operational. The numbers in each column represent the priority of each activity for the structure, as analyzed by the project team and the stage in which it needs to be incorporated into the structure. In other words, a number one designation in a certain column means that this activity should be included in the first stage of the structure of that particular column.

TABLE 13

'Sequencing of Activities' (incorporation by type) of JWM structure

Structure Type Activities	Resource Protection	Crisis Management	Economic Efficiency	Comprehensive Integrated
Monitor water resources	1	1	4	1
Monitor Water extraction	1	1	1	2
Crisis management	2	1		2
Preparation for drought	5	3	3	3
Licensing for drilling and pumping	5		4	2
Wastewater management	2			4
Landfill siting	3			5
Hazardous waste disposal	3	2	2	4
Enforcement	3	2	2	4
Funding of joint projects	4	3	4	3
Impose and collect taxes			3	5
Planning of supply and resource	4			2
Difference/conflict management	2	2	2	2
Structure modification	4	4	3	3
Pass by laws				5
Coordinate standards and regulations	3	3	3	4
Research and development	3	2		2
Operation (pumpage)				3
Price setting			2	5
Data-base compilation	1	1	1	1
Facilitate water trading			2	5

Source: Eran Feitelson and Marwan Haddad, *Identification of Joint Management Structures for Shared Aquifers: A Cooperative Palestinian-Israeli Effort.* Washington, D.C.: World Bank 1998

Exclusion of National Institutions. While the JWM identified twenty-one structure type activities and prioritized them according to the four aforementioned goals, two caveats to the overall institutional structure for the JWM point to the inherent difficulty of implementing such a plan:

- Water rights and allocation agreements are to be determined separately.
- The JWM will not supplant the existing water institutions of the different parties (The Israeli Water Commissioner and the Palestinian Water Authority)

The basis for inducement for joint management among the parties is that they all have a joint and vested interest in maintaining the water quality of the aquifer and its storage capacity.[152]

Objectives of JWM. The long-term objectives for the JWM are identified as stages. Stage one includes monitoring of the quality and quantity of water in the aquifer and the compilation of resulting data in a joint database. Stage two addresses threats to the aquifer, wastewater issues and preparation of plans for containing pollution incidents and resolving disagreements. Stage

[152] Ibid

three involves setting standards, control of solid and hazardous waste and implementation of long-term solutions. Subsequent stages include steps to protect the aquifer as well as drought planning and the assumption of drilling licensing power.

Structural Levels. The JWM proposes an institutional structure of four levels:

1. Decision makers and mediators
2. Aquifer Protection Commission (APC) to be composed of high-ranking representatives of the main interests (water, health, environment, agriculture and industry from different parties)
3. Research coordination and standard setting
4. Local and regional authorities

The economic structure of the JWM calls for two groups: the first group contains structures intended to facilitate trading of water allocations to allow greater flexibility in accommodating changes in circumstances and coping with situations of rapid shifts in demand. This group would encourage market mechanisms to facilitate such adjustments. The second structural group would engage in utilities. This would open the way for the private sector to become involved in the management of the aquifer and attract funding.

The institutional structure of an economically based JWM would include three basic elements: Board of Directors; Aquifer Utility or Water Trading Authority; and Local Authorities that supply the water to end users.

Obstacles and Constraints. Obstacles or constraints that may preclude or delay the establishment of a JWM structure in the Middle East have been revealed in the accumulated experience of the Joint Water Commission (JWC) and its field operatives; Joint Supervision and Enforcement Teams (JSETS). As earlier mentioned, the JWC was an outgrowth of the Oslo II Agreement and is often cited as the one continuous strand of communication on water matters between Israel and Palestine. However, "Palestinians feel that the JWC's purpose has been to further Israeli control, and that it has not addressed Palestinian needs (Nasseredin, 1998). Several Israeli projects proceeded without the JWC's authorization. Information and data on water resources and use requested by the Palestinians have not been provided to them. At the same time the water supply to Palestinian cities and towns continues to be precarious. In most cities and towns running water is not available to all households throughout the year. As a result there has been a loss of confidence in the

coordination of structures that were established."[153] This mechanism established in the Oslo II Agreement in 1995 "did not establish a structure that would actively manage the shared groundwater resource, or at least certain facets of it necessary to achieve a coherent goal. It also did not include measures for developing the institutional structure or resolving disagreements, since it was for an interim period. Moreover, despite the call for data sharing in the accords no data sharing occurred."[154]

In the fourth workshop participants reached several important conclusions with regard to water rights and water allocations:[155]

Rights and Allocation Priorities. Water rights need to account for variances in quality and over time. The allocation of water, when defined as a function of quality and time has to take into account the use of water, as the priority should be given to the domestic sector.

The domestic sector should have priority rights regardless of nationality and all people should have an equal right to water on a per-capita basis for domestic use

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[153] Ibid
[154] Marwan Haddad, Eran Feitelson, Saul Arlosoroff and Taher Nassereddin, "A Proposed Agenda for joint Israeli-Palestinian Management of Shared Groundwater", *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective,* Eran Feitelson and Marwan Haddad, editors.
[155] ibid

Enhancing Palestinian water supply, prior to establishing a comprehensive JWM structure, should be instituted as a confidence-building step.

This study suggested a step-by-step or 'flexible/sequential' approach for the identification and structuring of joint management systems for shared aquifers with special reference to the Mountain Aquifer and its role in the Israeli Palestinian case. The study is significant as it represents a truly joint, academic effort conducted on parallel tracks among Israeli and Palestinian researchers. The study was supported by international agencies and NGO's whose support came with 'no strings attached'[156]

Regional Institutional Proposal

A regional institutional framework proposed for the implementation of an integrated regional approach consisting of a regional water board operating through three units for technical, implementation, and management aspects of projects and activities was introduced in 1999.[157] This proposal is far-reaching as it attempts to engage all the parties in the Middle East that currently share the wider water basins of the region: Turkey, Syria,

[156] Ibid.
[157] Marwan Haddad, "Institutional Framework for Regional Cooperation in the Development of Water Supply and Demand in the Middle East", *Journal of the American Water Resources Association, August*, 1999.

Iraq, Lebanon, Israel, Palestine, Egypt and Sudan. It pre-supposes that local water differences and conflicts among regional parties can be resolved.

"Due to political complexity of the disputes, the higher costs involved, and the recent development in the peace process, the Middle East countries are convinced more than ever before that the most promising and least costly solution to their present and future water shortages probably is an integrated regional approach which incorporates and accounts for the needs of all neighboring countries."[158] Succinctly, Haddad recommends that, "In order for such a regional solution to be reached we need on one hand that local water differences and conflicts among the regional parties be fairly and equitably resolved and on the other had that regional water projects to be properly planned, designed, executed and managed to meet the qualitative and quantitative water demands of each of the countries in the region with time, space, and at an affordable cost. Accordingly, a regional water institution is needed with an infrastructure, a mandate and an authority, and funding that corresponds to the goals set."[159]

[158] Ibid
[159] Ibid

Regional Water Board Structure. This proposition for an institutional arrangement for the Middle East sets up a regional water board (RWB) consisting of all the national stakeholders in the region: Turkey, Israel, Iraq, Palestine, Lebanon, Jordan, Syria Egypt and Sudan. The proposition calls for the establishment of a Regional Water Company (RWC) responsible for conducting all works related to the project tender including construction, installation , operation and maintenance of water projects. In order to secure international support it is suggested that the Multilateral Working Group on Water Resources (MWGWR) be used as the nucleus for this regional institution. Multilateral working groups to advance the Middle East Peace Process were formed in January 1992. One of these groups, the Multilateral Working Group on Water Resources, endorsed the Water Data Banks Project in November 1994. The Water Data Banks Project consists of a series of specific actions to be taken by the Israelis, Jordanians, and Palestinians that are designed to foster the adoption of common, standardized data collection and storage techniques among the Parties, improve the quality of the water resources data collected in the region, and to improve communication among the scientific community in the region. The project is managed by an Executive Action Team (EXACT),

an important NGO in the region, comprised of water experts from Israeli, Jordanian, and Palestinian water-management agencies. Technical and financial support to EXACT is contributed by the European Union, France, The Netherlands, and the United States. Former donors include Australia and Canada.[160]

An operative mechanism to facilitate progress is the notion of accepted "terms of reference" (TOR) so that everyone agrees on the roles and levels of involvement of the regional parties.

This proposal recommends that the RWB consist of a steering board representing all the parties involved. Each member would be appointed by its representative state and would coordinate his/her national priorities and positions with the regional proposals and planned activities. Each member country would represent his/her "National Strategic Water Planning Body" and from that body be directed. Incremental activities are recommended such that success and confidence building can take place.

Regional Water Board Responsibilities. Ultimately, responsibilities of the RWB are to:

- Recommend and advise the parties in the region on the water demand and supply management in their countries

[160] EXACT. Available at http://exact-me.org/, accessed December 3, 2005

and the region in such a way to ensure the availability of sufficient water supply in a sustainable and integrated manner with time and space and in quality and quantity with minimum or reasonable cost.

- ❖ Steer and administer through a pre-accepted TOR and developed scale, appropriateness, capability, and financial stability, the tendering process related to the development of regional water projects and activities.
- ❖ Decide on implementation methodology for each regional water project and activities being direct through a turnkey, subcontract or any other implementation system.
- ❖ Oversee and supervise through a pre-accepted TOR the efficiency, compliance and works of the RWC.
- ❖ Coordinate through a pre-accepted TOR between the RWC and the regional parties.[161]

Regional Water Board Teams. The RWB is to be supported by three professional teams: a technical advisory unit (TAU); a project implementation unit (PIU); and a management unit (MU)

[161] Haddad, page 732

The TAU has two assigned units: supply and demand; and data management. These two units are responsible for studying, evaluating, assessing and reporting to the RWB on all matters related to national and/or regional water supply and demand issues, projects, plans and supervising works and compliance of RWC with signed agreements and contracts.

Managing all financial and administrative matters of RWB falls under the purview of the MU.

The PIU is responsible for project contracting and construction

Acceptance of any item subject to voting within the RWB requires a two-thirds majority and the MWGWR, it bears noting, would not have any voting rights but would serve in an advisory capacity. The decision-making process involves five steps:

1. Project Identification
2. Project Screening
3. Proposal Assessment and Evaluation
4. Final Decision
5. Project Implementation and Management

Regional Water Board Goals. The goals of the RWB are to prevent or at least minimize freshwater gaps in the Middle

East, improve crisis (drought) management, increase water and food availability and, overall, enhance economic growth and socio-economic conditions; quality of life.

Water markets and technology would be areas of focus for the RWB. RWB would discuss the exchange, transfer or sale of water as well as introduce high technological and performance levels and market functions in order to allocate and encourage local investment. Since the predominant water user in all nations of the Middle East is agriculture, it is hoped that the RWB can serve as a place for promoting agricultural trade between partners and for the exchange of 'virtual water'.

Financing the RWB is to be provided by either shares from the RWB members and/or contributions in the form of grants or loans

Implementation Obstacles and Constraints. The obstacles and constraints to the proposal are serious and not overlooked by its author. Haddad cites two major groups of obstacles: political and economic; and physical and legal.

There will be no place for sustainable cooperation in the Middle East if the fear of the peace process failure prevails and current practices in water management

continue. To give the proposal the best chance of success, Haddad emphasizes that national sovereignty and territorial integrity will not be jeopardized. The issues of who owns, controls and benefits from infrastructure changes and the extent of the authority of RWB and RWC are obstacles.

Delegation of Responsibility

Delegation of responsibility is the fourth option for aquifer management. This method of management assigns some aspects of aquifer management to an external body, which, could be an international agency or privately held corporation.

Alternative Means for Cooperative Management

The four options for aquifer management are not mutually exclusive. None of the above-mentioned methods has yet to be employed in the Middle East and the uniqueness of the asymmetrical and diminishing relationship between Israelis and Palestinians warrants analysis of alternate proposals for cooperative or collective management of some of the transboundary water issues in the region. For states to engage in normative structures of joint management water institutions they need to have sophisticated and stable national legal and economic traditions. National legal and

institutional arrangements for the internal uses of the resource shape each state's ability to commit itself to international obligations.[162] The Palestinian Authority is not in a position to discuss any relinquishment of sovereignty before the international community recognizes its sovereignty. Proposals to form joint management regimens between institutionally unequal partners are unlikely to be embraced by the parties. Nonetheless, the benefits for both parties, now and in the future, for joint management of shared resources are myriad while failure to adopt these means and measures will be catastrophic.

Perhaps a potentially powerful way to overcome the tension between the supranational institution and national governments is by creating links between the institution and sub-state entities, such as provinces or towns. Indeed, a crucial element in setting up shared institutions is the design of its levels of operation to tailor the specific geographic, political and social constraints of the region.[163] One particular case in point is the 1996 agreement between two local entities in the Middle East; one in Israel and one in neighboring Palestine.

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[162] Eyal Benvenisti, "The Legal Framework of Joint Management Institutions for Transboundary Water Resources", *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective*, Eran Feitelson and Marwan Haddad, editors.

[163] Ibid

The Case of Emek Hefer and Tulkarem

Emek Hefer is a Regional Council in the northern coastal plain of Israel where Israel is at its narrowest. Tulkarem is a Palestinian municipality in the West Bank and they both share a severely polluted basin in which runoff from Palestinian neighboring towns and villages and nearby Jewish settlements flows, ironically, under the separation barrier built recently by Israel, through a small stream into Israel. The situation could not be ameliorated by national governments although both Israel's Ministry of Environment and Palestinian Authority President Arafat agreed that the situation was untenable and did not object when the two localities suggested direct contact with each other to try and solve the problem. Residents of the two communities organized a regular regimen of contacts, signed petitions in support of stream restoration and agitated for international support for construction of wastewater treatment plants for both municipalities. Germany, in 2001 began construction of plants in Emek Hefer and in Tulkarem. Today most of the irrigation water used by Tulkarem farmers is treated wastewater and the Alexander River, which bore the brunt of wastewater pollution, and its flora and animals are in the process of restoration. The Mayors of both communities signed an agreement outlining their

commitment to cooperation.[164] The letter was originally written in Arabic and Hebrew and reads:

Letter of Intent

"The District of Tulkarem, the municipality of Tulkarem and Emek Hefer Regional Council recognize the acute necessity to promote and protect the environment, for the protection of the water we drink and the soil we cultivate. For the benefit of the inhabitants of Tulkarem and environs, the Hefer Valley and environs.

It was therefore decided to establish a steering and planning committee, which will be entrusted with supplying mutual expert solutions to resolve the problems in the short and immediate term and in the long term.
Those who stand at the helm will jointly work for obtaining funding and consent from international bodies, in an effort to realize the plans and to implement them"[165]

River Basin Management and Drainage Boards and the Case of the Kidron Valley. Israeli water law has created drainage authorities throughout the entire country. There are eleven drainage boards within Israel whose borders are drawn along catchment basin lines. This law gives drainage

[164] Translated by Eyal Benvenisti
[165] Benvenisti

authorities power of flood protection and prevention of runoff but does not currently provide a mandate for water resource management on a grand scale. Nonetheless, the Ministry of Environment has recently (2003) bestowed additional environmental protection powers upon two drainage boards and one authority is seeking additional powers to become a land conservation authority. These drainage boards can serve as a platform for joint management of a transboundary river. What is needed is a mirror authority on the Palestinian side.[166]

Israel's extensive compendia of water laws emphasize state control of water and its infrastructure reflects that foundation. It is, however, left to local or regional components of the system to manage sewage treatment making this function the weakest link in the system. Similarly, there is no 'national' system for ecological management within the Palestinian Authority. There are myriad examples and precedents for trans-boundary river and wastewater treatment joint management schemes in other parts of the world. For example, the Rhine Commission, created over one hundred years ago is a model of cooperative action among sovereign states.[167] Because

[166] R. Laster, J. Gat and D. Livney, "Water Flowing Under the Law", available at www.ors.regione.lombardia.it, accessed on January 3, 2006.
[167] Ibid

multiple purposes and agencies vie for river water it is necessary, not unlike aquifer management regimens, to ensure that any institutional management proposal be based on an Integrated Water Resource Management (IWRM) foundation. This approach is necessary in order to optimize and fully recognize all the legitimate, beneficial uses for clean water, including nature's and humans'. In order for any institutional structure to be effective for these purposes, it must have:[168]

- Diverse and comprehensive sources of information that are up to date;
- Logical data for determining water needs, including quantity and quality of water entering, remaining and leaving an aquifer, stream and other water bodies within the catchment basin;
- Scientific criteria for determining water quality and quantity, and economic criteria for determining cost and income;
- An efficient forum for exchange of that information;
- Public access and involvement;
- Transparency by creating appropriate mechanisms for a public overview.

[168] Ibid

If this institutional structure is also to serve as a governing body, it must also contain:

- An agreed-upon charter describing its powers and responsibilities, and its decision making process. The powers include setting the quantity and quality of water entering, remaining and leaving water bodies, and deciding on the permitted uses and distribution of these waters;
- Planning and decision making bodies;
- Enforcement mechanisms;
- Dispute resolution mechanisms;
- A source of income to carry out its activities

On December 5, 2005, the Municipality of Jerusalem, facing threats of legal action, submitted a proposal to stop the flow of sewage water from East Jerusalem villages into the Dead Sea. Currently, about one-third of all East Jerusalem wastewater flows into "Nahal Kidron" (the Kidron river or Wadi Nar) and from there, untreated, to the Dead Sea. This unabated flow has been uninterrupted for the past fifteen years. Israel's Dead Sea Drainage Board and the Palestinian Authority jointly share the water basin in question. Neither party has wanted to take responsibility for the effluent and lack of Palestinian cooperation became

an "excellent excuse" for the Jerusalem water company to do nothing over the years.[169]

A joint management plan for governing this common basin is in the nascent stages of development.

Transferability of European Institutional Experience to the Israeli-Palestinian Conflict: The Elbe/Kidron Case Study

The question of transferability of other institutional experiences to the conflict at hand has been examined above in the context of intranational v. international cases and in the context of international law and its applicability to the Israeli-Palestinian water conflict. Within the context of smaller, subsidiary water basins the question of transferability of the European experience to the Palestinian-Israeli experience is one that bears analysis, particularly in light of the national stagnation on water related discussions that has settled in since recent elections. One intriguing project that is currently under study is a joint venture between Israel, Palestine and Germany. The Israeli Team is composed of the Faculty of Law at the Hebrew University of Jerusalem, Tel-Hai College of the University of Haifa, and the Department of Geography of the Hebrew University of Jerusalem. The Palestinian

[169] Etgar Lefkovits, *The Jerusalem Post*,, December 6, 2005

Team is represented by the Palestinian Water Authority in Ramallah and the Water and Environmental Development Organization (WEDO) in Bethlehem. The Germans, who are providing the bulk of the funding for the project, are represented by the Centre for Water in Urban Areas, The Centre for Environmental Research in Leipzig (UFZ), the University of Trier Faculty of Law, the Environmental Policy Research Centre in Berlin, the Institute for Hydrology, Water Management and Environmental Engineering at the University of Bochum. The German Team Coordinator for the project and author of the report is Simone Klawitter of the Center for Water in Urban Areas in the Department of Environmental Economics and Policy in Berlin.[170] (It should be noted that the frequent incidence of German supported projects for water resource development in the Middle East is not coincidental. A number of German academic and scientific institutions are contributing toward this effort and, by contrast, the noted absence of American institutions in these endeavors is partially due to the American academic institutions acquiescence to the

[170] For the full report see, "" From Conflict to Collective Action: Institutional Change and Management Options to Govern Trans-Boundary Water Courses" http://www.fsp-wib.tu-berlin.de and http://umweltoekonomie.tu-berlin.de

United States Department of State warnings on travel to the region.)

The project is to study the effectiveness of existing trans-boundary water management institutions in the Elbe River Basin, the Kidron Valley where no trans-boundary water management institutions exist, and evaluate the alternative institutional arrangements based on a cost-benefit and multi-criteria analysis of separate and collective water and wastewater management options. Ultimately, this study is designed to serve as a Master Plan for the Kidron Valley. It is assumed that an integrated water resources management plan for the river basin will be the eventual recommended mechanism of the study. The study is divided into four areas of key research:

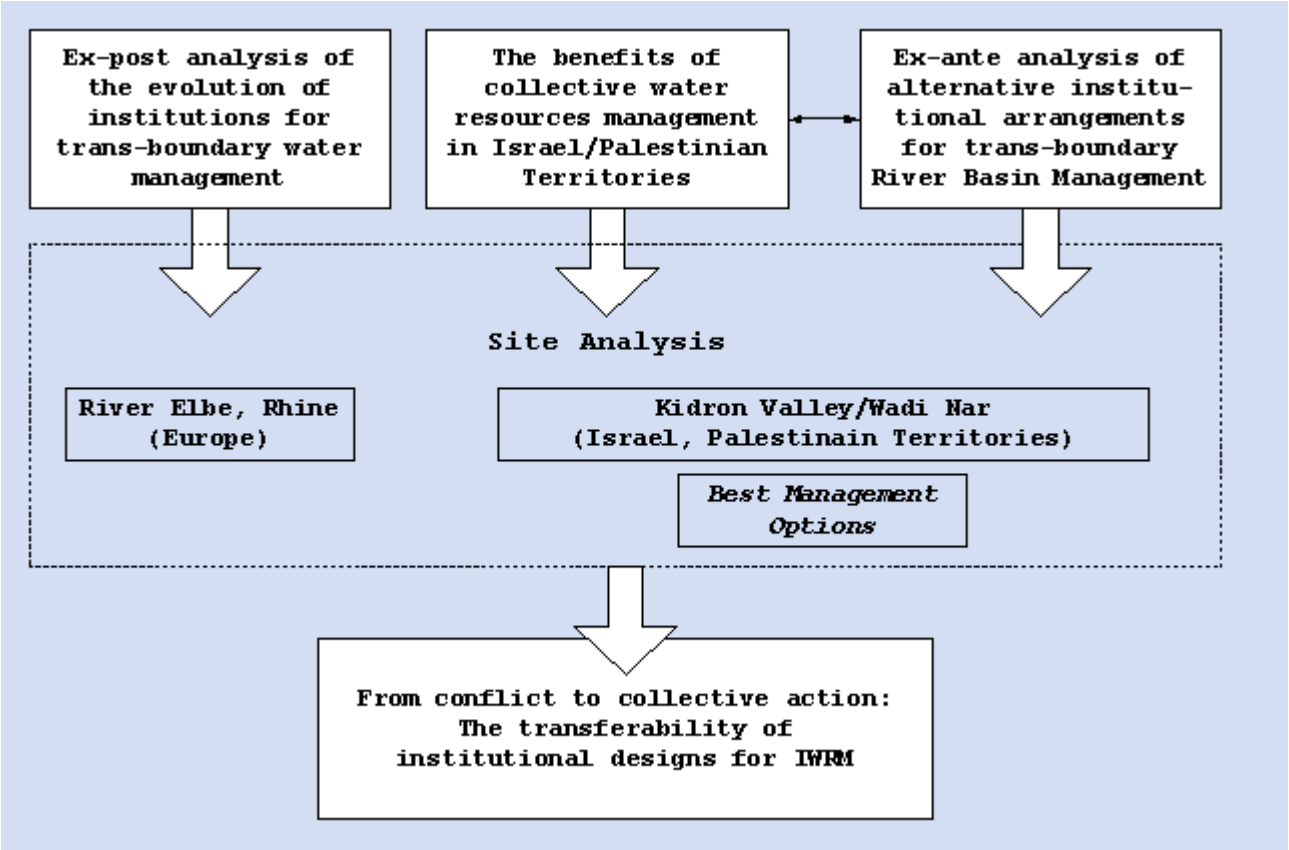
1. An ex-post analysis of the evolution of institutions for trans-boundary water management in Europe, using the Elbe/Rhine river basin as a case study
2. The identification of alternative management options and determination of the benefits of collective action over the present governance regime in the Israeli-Palestinian context, using the Kidron Valley as a case study

3. An ex-ante analysis of alternative institutional arrangement for the Kidron Valley (separate, coordinated, joint, franchising) taking the European experience into account
4. The analysis of the transferability of institutional design for IWRM among different climatic regions, and at different scales of river basin management. As a practical contribution towards IWRM, the research project will advise the ongoing effort to develop a Master Plan for the Kidron/Wadi Nar Basin.[171]

Figure 21 is a graphic depiction of the structure of the Elbe/Kidron Valley study.

[171] Ibid

Figure 22



Source: http://umweltoekonomie.tu-berlin.de

Friends of the Earth; Middle East

"Friends of the Earth; Middle East (FoEME) is an NGO whose organization and objectives have been detailed above. Their activities, however, are relevant to this section, which advocates alternative methods of joint water management. In particular, FoEME proposes community control over water basins hydrologically connected to the Mountain Aquifer and to pursue funding independent of Palestinian national policies and practices.

As aforementioned, the Mountain Aquifer is under a severe threat of pollution from the waste of three million people residing on its sensitive recharge area. Currently over one million tons of solid waste, and over 60 million cubic meters of wastewater are polluting the aquifer every year. In a report series published over the last two years, Eco Peace/Friends of the Earth Middle East, a joint Israeli, Palestinian and Jordanian NGO, has identified infrastructure projects in the West Bank that are expected to alleviate the pollution threat. "In response to the recent Quartet (United States, United Nations, European Union and Russia) statement on donors' assistance to the Palestinian Authority (refusal to provide donations to the Hamas led government until their charter is amended and recognize the State of Israel), we have called upon the Quartet, USAID, German Aid, European Commission and the World Bank to continue donor funding for sewage and solid waste projects" says Zach Tagar of FoEME and co-author of the reports.[172] "Without these projects, pollutants such as nitrate, chlorides, cadmium, lead, mercury and arsenic will continue to pollute both peoples scarce water resources."[173] For the implementation of pollution prevention projects,

[172] http://www.FoEME.org/press.php?ind=26
[173] Ibid

funds from the international community may be directed to Palestinian municipalities or directly to private contractors. In all of these projects, donor country agencies oversee project implementation on the ground. Gidon Bromberg is the Israeli Director of FoEME and declares that local municipalities have proven in several cases highly effective in implementing wastewater and solid waste projects. Recognizing the needs for their residents, they have devoted significant resources and motivation to the implementation of local projects under difficult conflict circumstances. Nader Khatib is the Palestinian Director of FoEME who adds that, "in some cases cooperation between Palestinian and Israeli municipalities proved successful where national authorities were unable to implement important projects. Further, the political leadership of major Palestinian municipalities has remained Fateh"[174] FoEME calls upon the international donor community to consider alternative avenues of development cooperation, for the benefit of both people, and for the prevention of exacerbated conflict over water.[175]

[174] Ibid
[175] ibid

Palestinian Institutional Reform

Current Status Review

The Palestinian Water Authority (PWA) is the institution in Palestine that is responsible for the water and wastewater sectors. The Ministry for Environment Affairs is responsible for water-related pollution control issues and coordinates with the PWA in issuing regulations and guidelines. The institutional structure of the public water sector including the technical and managerial staff is still weak. The current situation reflects the misconceptions about the inadequate wastewater infrastructures in Palestine. The political and economical situations as well as the weak inter-institutional coordination exacerbate this fact. The academic institutions play a key role in feeding the Palestinian institutions with sufficient technical staff. However, personal relationships sometimes rule the appointment when there are open job vacancies. It is not sufficient to have environmental law and guidelines without having an effective enforcement tools and alternatives.[176]

First and Second Order Scarcity. Palestinians suffer from a water shortage, which has been conceptualized as a

[176] Rashed Al-Sa'ed, 2

'first order scarcity condition'.[177] However, Palestinians also suffer from a "shortfall in the social resources necessary to manage this natural resource on a national level. This lack of social resources necessary to manage the natural resource is termed a 'second order scarcity condition'.[178] While the first order scarcity condition is largely in the hands of the Israelis, the resolution of the second order scarcity condition is largely in the hands of the Palestinians. The Palestinian Authority had the opportunity to resolve this problem, yet it failed to do so, and this failure must not be repeated.[179] The second order scarcity condition refers to the domestic, social, political and traditional constraints that manifest themselves, in this context, as weak water institutions. The issue has policy and temporal implications. If Palestinians can resolve the second order scarcity condition prior to future negotiations with Israel, then Israel will be unable to use the lack of Palestinian management efficiency and responsibility as a pretext for

[177] A first order scarcity condition means a lack of the natural resource, in this case water as defined by Ohlsson, L., see Yousef Nasser, "Palestinian Water Needs and Rights in the context of Past and future Development", *Water in Palestine: Problems, Politics and Prospects*, Palestinian Academic Society for the Study of International Affairs, Fadia Daibes, Editor, Jerusalem, 2003.
[178] Ibid
[179] ibid

not handing over Palestinian water rights.[180] A frequent entreaty by the Israelis when attempting to negotiate with Palestinians is that there simply is no partner in Palestine with whom to negotiate.

In order to make Palestine a viable partner in a joint water management program institutionalizing water resource management within Palestine is a requisite. Equally requisite is basic change in the relationship between Israel and Palestine. "The main reality is the Israeli military occupation of the Palestinian land and resources and the recognition of the fact that for as long as the current conflict continues, many institutional reforms will be meaningless."[181]

The structure of the Palestine Water Authority (PWA) has been presented earlier but it is helpful to draw a table reviewing the institutional framework. Table 13 illustrates the current institutions of the Palestinian Water Sector and their primary functions.[182]

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[180] Ibid

[181] Marwan Haddad, "Future Water Institutions in Palestine", *Water in Palestine: Problems, Politics and Prospects*, Palestinian Academic Society for the Study of International Affairs, Fadia Daibes, Editor, Jerusalem, 2003.

[182] Ibid. Data available at www.semide-ps.org, accessed on February 15, 2005.

TABLE 14

Current Institutions of Palestinian Water Sector

<table>
<tr><td colspan="2">Cabinet of Ministries</td><td rowspan="2">Decision Making Level</td></tr>
<tr><td colspan="2">National Water Council</td></tr>
<tr><td colspan="2">Palestinian Water Authority</td><td>Regulatory Level</td></tr>
<tr><td colspan="2">Bulk Water Utility</td><td rowspan="2">Service Delivery Level</td></tr>
<tr><td>Regional Water Utilities</td><td>Water Users' Association</td></tr>
</table>

Source: Marwan Haddad, "Future Water Institutions in Palestine", *Water in Palestine: Problems, Politics and Prospects*, ed. Fadia Daibes, Jerusalem: PASSIA, 2003

Inefficiencies in the PWA. The inefficiencies in Palestinian water institutions are due to over-employment in the water sector, poor training, lack of public administration guidelines and performance measures. Lack of coordination and cooperation between related institutions such as the PWA and the Palestinian Environmental Protection Agency (PEPA), Palestinian Ministry of Agriculture, Palestinian Ministry of Local Affairs, the Palestinian Ministry of Planning exacerbates the inefficiency of water services, supply and demand management, water quality monitoring, technical and technological development, public-private sector involvement and participation.[183]

[183] Haddad, 2

Financial Constraints. Financial constraints on Palestinian Water Institutions are a major concern. Proper planning cannot be accomplished without proper funding and there is virtually no investment on the part of the Israeli Civil Authority into water infrastructures in the Palestinian sector. In addition, there are many public groups that refuse to pay taxes in the Palestinian Authority and this phenomenon is particularly widespread among refugee camps and villages.[184]

Water infrastructure is a disjointed conglomerate of wells, pipes, springs, reservoirs, and pumping stations with no pretense of a united system.

Proposed Reforms. In light of the challenged state of Palestinian Water Institutions, what then become the requirements that need to be fulfilled in order for the anticipated reforms to prove successful and result in positive changes?[185]

- The reforms should be structural in nature;
- The reforms should be enforced by the law;
- Institutions should have the power and authority necessary to carry out reforms and follow up activities and tasks;

[184] Ibid
[185] Ibid

- ❖ Institutions should adopt, allow and integrate plans and policies relating to regional cooperation;
- ❖ The reforms should call for and make the most of the expected international support for the Palestinian people and the new State of Palestine.

The future water-related institutional reforms also necessitate the following:

- ❖ That there be continuous technical level development;
- ❖ That costs, tariffs, and fees be set so as to ensure cost recovery and sustainable development;
- ❖ That there should be continuous technical and human capacity building;
- ❖ That the environment should always be taken into consideration;
- ❖ That the public be involved in ongoing and future water activities and projects.
- ❖ Reform Proposal
- ❖ The overall structure suggested in this proposal posits a combination of centralized and decentralized water management systems, which will be the most cost-effective of all options.

Not unlike the structure of a typical American water utility, the proposal calls for:

Policy and programming, planning and design, engineering, operations and maintenance, resource development and asset management, including procurement, staffing, and inventory taking should be compartmentalized as departments within the PWA, with each department having a clear mandate, and Well drilling, the installation of strategic mains, reservoir building, fees and bills collection, and automatic control and/or monitoring of the water system should be transferred to the private sector.[186]

This proposal suggests that the table for Water-Related Institutional Structure in Palestine be modified to reflect a top-down and down-to-top management approach whereby a strong NWC would be in charge of strategic decision-making, an effective water system-managing PWA, fully operational regional and local water institutions, and a cooperative,supportive private sector all cooperating together with a clear legal/administrative mandate. Table 14 illustrates the proposed Institutional Structure.[187]

[186] Ibid
[187] Ibid

TABLE 15

Proposed Institutions of Palestinian Water Sector

<table>
<tr><td colspan="2">Ministry of Planning</td><td rowspan="2">Decision Making Level</td></tr>
<tr><td colspan="2">National Water Council</td></tr>
<tr><td colspan="2">Palestinian Water Authority</td><td>Management Level</td></tr>
<tr><td>Regional Water Utilities</td><td>Private Sector with or without International Joint Venture</td><td rowspan="2">Service Delivery Level</td></tr>
<tr><td>National, Regional, International and UN Coordination Unit</td><td>Public Coordination Unit</td></tr>
</table>

Source: Marwan Haddad, "Future Water Institutions in Palestine", *Water in Palestine: Problems, Politics and Prospects*, ed. Fadia Daibes Jerusalem: PASSIA, 2003

Among the most substantive changes suggested above is that the PWA changes its main function from a regulatory role to one involving full management of water resources. In order to facilitate that role, the proposal recommends that the PWA adopt organizational changes such as:

- Restructuring to include six main units: Technical; Administrative; Data Bank; Research and Development; Local, Regional, UN and International Cooperation; and Public Coordination
- Create three regional water utilities: West Bank Water; Gaza Strip Water; Jordan River Water.

- ❖ Department structure for policy and programming, planning and design, engineering, operations and maintenance, resource development and asset management, including procurement, staffing, and inventory taking.
- ❖ Expenditure and performance monitoring and control.
- ❖ Setting the tariff policy.
- ❖ Finally, this proposal suggests that once functional Palestinian institutional structures are in place regional cooperation on the order of the previously proposed "Regional Institutional Proposal" would be appropriate for Palestine water management.

Water Demand Management

Governing institutions for water management in the Middle East must provide for forward thinking water conservation. While the initial concern of any water authority will be the fair and equitable allocation of domestic freshwater to all the residents of the region, long range planning will be consumed with water conservation or, as it has become popularized, 'water demand management' (WDM). Water scarcity and socio-economic conditions follow a correlative path and conventional supply management will not be a sustainable

strategy. "Efficient use of water means that the contribution of water to human welfare is the optimum that may be achieved."[188]

Water Demand Management is widely accepted among professional water resource researchers. The International Development Research Center (see a fuller explanation of their activities above) published a survey of institutions and centers throughout the Middle East in 2004, which identified a preliminary inventory of all institutions involved in WDM issues in each country of the region. The list includes a brief description of activities as well as names and coordinates of contact persons. A questionnaire was sent to these institutions to seek further information on their WDM activities. Twenty-two institutions responded, and an analysis of the completed questionnaires showed that about 77% of the respondents indicated that WDM was one of their primary areas of research as compared to 30%for supply management issues and 23% for environmental and other water issues[189].

Water scarcity is a reality in the Middle East but is not always associated with pro-active water policies or

[188] Saul Arlosoroff, "Water Demand management-A Strategy to Deal with Water Scarcity, Israel: A Case Study, ", presented at *Water for Life in the Middle East* Conference, Antalya, Turkey, 2004, available at http://www.ipcri.org/watconf/elmadhoun.pdf, accessed January 2, 2005.

[189] http://www.idrc.ca/en/ev-31797-201-1-DO_TOPIC.html

institutional structures. The correct price of water will reflect the cost of water to society and that cost only manifests itself under conditions of scarcity. Technical advances in water efficiency and water markets and water pricing are the cornerstones of water demand management.

"Despite scarcity, demand management has historically received far less attention that supply management. This situation has to change, and not just by introducing new techniques, but also by treating water demand management as a major component of governance. This region has both the opportunity to become a world leader in demonstrating how water demand management can bring about major improvements in quality of life and in standard of living for its citizens."[190]

Water Demand Management as Governance

WDM as a concept of governance is composed of five components:[191]

1. Reducing the quantity or quality of water required to accomplish a specific task

[190] David B. Brooks and Sarah Wolfe, "Water Demand Management as Governance: Lessons from the Middle East and South Africa, presented at *Water for Life in the Middle East* Conference, Antalya, Turkey, 2004, available at http://www.ipcri.org/watconf/elmadhoun.pdf, accessed January 2, 2005

[191] David R. Brooks, "An Operational Definition of Water Demand Management", Third World Centre for Water Management, *International Journal of Water Resources Development*, September 2005

2. Adjusting the nature of the task so it can be accomplished with less water or lower quality water
3. Reducing losses in movement from source through use to disposal
4. Shifting time of use to off-peak periods
5. Increasing the ability of the system to operate during droughts

In addition, the following policy steps are suggested as central to water demand management:[192]

- ❖ Maintaining the public ownership and control of water.
- ❖ Metering water at every point of connection
- ❖ Increasing re-use of sewage effluent
- ❖ Increasing progressive, agronomic techniques
- ❖ Incorporating an economic water policy to allow water 'trading'
- ❖ Retrofitting older plumbing systems and utilizing more efficient urban water systems
- ❖ Reducing 'virtual water' loss when water-laden agricultural crops are exported.

Water Demand Management and Equity

[192] Saul Arlosoroff, "Water Demand Management-A Strategy to Deal with Water Scarcity, Israel-A Case Study", Israeli-Palestinian International Conference on Water for Life, Antalya, Turkey, October 10-14, 2004.

Water Demand Management is as much about equity as about efficiency. It is assumed that in developing countries, such as Palestine, water that is 'saved' by one sector would likely be used by a sector that, heretofore, did not enjoy basic human water requirements such as small farmers and women. Many functions of WDM are decentralized, fulfilled by local subsidiaries and put into practice at the point of each water well and water tap. Wider participation among stakeholders is presumed resulting in reduced environmental externalities. Programs to reduce (or not allocate funds for improving) water quality (where possible) and water quantities (where possible) must still be tailored to meet the needs and reflect the social milieu of the societies they are serving. For example, double-flush toilets may work to save water in Israel but when asked if that might be a viable tool for demand management in the West Bank, Fadia Daibes remarked, "First give the Palestinians in the West Bank toilets and then we can talk about how we flush them."[193]

Bedouin

The most disenfranchised group in the region are the Bedouin. Although the 120,000 Bedouin living in the Negev

[193] Interview with Fadia Daibes, December 28 2005 in Jerusalem.

comprise 25% of the total population in that region, they have suffered government neglect since the founding of the State of Israel. Approximately 40% of Bedouin have been relocated into seven government-planned townships, while the majority choose to maintain a rural lifestyle in 43 officially unrecognized villages. The Israeli government does not recognize the villages and, as a result, does not provide for infrastructure necessary for the most basic services including electricity and running water.[194] Any comprehensive water management proposal must include a satisfactory water demand management structure that takes the cultural and societal characteristics of the Bedouin into account.

Water Markets

A key component to efficient water demand management is the adoption of a new economic outlook on water value and the institutionalization of water markets.

Water markets assume that water is a commodity and, as such, has an economic value determined by the degree of its scarcity. Rather than dividing water in traditional manners and treating water as an object of rights and ownership, the water market philosophy posits that the ownership of water is the ownership of the monetary value

[194] http://www.nif.org/content.cfm?cat_id=1464&currbody=1

that the water represents and that who owns the water and who uses the water are not one in the same and, in fact, are analytically independent. Moreover, from this perspective one considers water value rather than water quantities.[195]

Water Allocation System.

The Water Allocation System (WAS) Model (Fisher 2005) sets as the upper bound of Middle Eastern water the replacement cost given by desalinated water at any given location. All conflicts over water can quantify the resolution costs by calculating the replacement cost according to market prices of the most expensive available water; desalinized water. This permits parties to estimate the benefits of cooperation and to compare the alternative costs of conflict. Replacing all the disputed water in the Mountain Aquifer, for example, with desalinated water at a cost of $0.70 amounts to a bit more than $100 million, substantially less than one fighter jet aircraft.[196]

WAS takes into account demand considerations and the benefits to be derived from water use rather than fixing water quantities to be delivered. In this respect this model dovetails with the Water Demand Management goals.

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[195] Franklin M. Fisher and Annette Huber-Lee, *Liquid Assets: An Economic Approach for Water Management and Conflict Resolution in the Middle East and Beyond*, RFF Press Book, Washington, D.C., 2005

[196] Ibid

WAS also permits the user to impose social values that differ from private ones and to impose policies that the optimization must respect.[197] The objective is to maximize the net benefit one can derive from any particular allocation of water at any particular location subject to constraints. The system of prices involved in solving the maximization benefit problem is called the 'shadow value', which, formulaically, is the rate at which the quantity being maximized (the net benefits of water) would increase if the associated constraint were relaxed by one unit. The shadow value of water at any one location, therefore, corresponds to the constraint that the quantity of water consumed in that location cannot exceed the quantity produced there plus the quantity imported less the quantity exported. Parties can use the shadow costs to determine the true value of their own water resources and the benefits, if any, of increasing their infrastructure and use this information to gauge the value and consequences of different water agreements. Water rights, when using this model, become largely symbolic.

The added benefit of analyzing water values in this manner is a paradigm shift in water planning. Rather than dealing with water rights and allocations, it allows

[197] ibid

parties to consider water permits, or, short-term licenses to use other parties' water based on standard, voluntary, optimization models. Nation-states would find this model very palatable as it precludes relinquishment of sovereignty. Conversely, any supra-national, joint management program, which assumes sovereignty on water issues, can also utilize water permits and transfers to optimize its own cost benefit analysis.

This model also encourages cooperation on a larger scale between transboundary countries in the Middle East. For example, if Israel knew that it would be possible to purchase water permits from a wastewater treatment plant in Gaza for the purpose of irrigating agricultural lands in the water-scarce Negev, a cooperative venture to construct such a facility would be economically viable and profitable for both parties.

Utility of Water Demand Management

"If water demand management is to aid in the resolution of water disputes between Israel and Palestine, and become a base for sustainable development, we must identify culture-and region-specific ways of promoting attitudes, incentives and policies to establish WDM as both means and ends for improving social, economic and

environmental conditions."[198] This is one of the challenges for effective and efficient water resource institutions. The economic tools for institutional policies such as the WAS model and detailed cost-benefit analyses will be utilized within the institutional regime for the purpose of saving water rather than cutting the budgets of normative government-funded water demand management programs.

The Conference on Water Demand Management was held in Jordan in 2004 and attended by 742 people from 38 countries.[199]

Water Demand Management is a tool for governance and an intricate part of any joint water resource management institution.

[198] David B. Brooks and Sara Wolfe, "Water Demand Management as Governance: Lessons from the Middle East and South Africa", (paper presented at the 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10-14 October 2004)
[199] Ibid, p. 11. Papers presented at the Jordan Conference are available at http://www.mwi.gov.jo/IWDMCP/Index/MON.htm.

CHAPTER TEN

SUMMARY

The water system of Israel, in particular its irrigation sector, is frequently cited as a model for other countries to emulate, struggling to cope with water scarcity and inefficiency. Israel's agricultural community has responded to the severe water restrictions admirably from a technological viewpoint. The adage that 'Necessity is the Mother of Invention' rang true from the 1960's through the 1980's when Israel led the world in advanced technology achievement for irrigation purposes. Israel invented the concepts of drip irrigation, sub-surface irrigation, fertigation, computerized central control systems, evapotranspiration scheduling and all the other components that comprise state-of-the-art water management.

Nonetheless, while this technology was implemented and crop production expanded, Israel's water resources were not protected. The decision-making process within Israel's government was not far-reaching and creative. Today, both major aquifers are over drawn and, in the case of the Coastal Aquifer, dangerously low in quantity and quality.

The population increases have outstripped any management plan. The political weakness of the

Palestinians, to this point, has made Israeli policy makers unresponsive. Israel has not provided all the stakeholders equal opportunity to influence water allocations and has disproportionately permitted agricultural interests to determine policy. Agriculture in Israel still consumes 67% of all freshwater and virtually all reclaimed water but the agricultural contribution to GDP has dwindled to a mere 2.4%.

Major and systematic institutional reform is required to re-shape water policy in the region. The Mountain Aquifer, Coastal Aquifer and Jordan River Basin are the only three sources of freshwater in the region and Palestinians and Israelis share all of those resources. For reasons of equity, sustainability and security, joint management of these resources is necessary. Of the four accepted modes of groundwater management: separate, cooperative, joint management or outside agency management, emphasis has been placed on variations of joint management. However, joint water management, regardless of the degree of sovereignty relinquished by the parties, pre-supposes stable internal institutional structures. The lack of such national structures has made alternative methods more popular and attractive, in particular, development of local water basin authority governance mechanisms.

The crisis in the region is such that if water resources remain stagnant, demand is not curtailed and population continues to grow as expected, by 2020 the region will require some 5000 MCM of water in an area, barring drought that will only have the capacity of 2000 MCM. An integrated approach that combines development of new water sources, demand management, increased efficiency, environmental stewardship and wastewater treatment is required. However, as long as there is political instability and weak institutions a bi-national plan is unlikely to be adopted. Moreover, even with political 'stability' if the asymmetrical relationship continues to characterize the status between Israel and Palestine, institutional disparity will persist.

In response to these challenges, policies and institutions must evolve to better manage the water resources in the region. As a prerequisite to fundamental, large-scale institutional reform Palestine must become a sovereign state. Its financial institutions, water development and allocation institutions, social, political and legal institutions must be functional and equitable before any joint management system can begin to collectively agonize over trans-boundary water management.

Water Demand Management is an integral part of any Joint Water Resource Program and must not only be incorporated into policy but must also serve as a governance tool. Water management must also meet the demands of all sectors of society and all economic classes of the population. Water management interfaces with all aspects of society such that an overall increase in quality of life will have to be attained before realistic water demand management can take hold. In other words, toilets and home plumbing will have to be installed before the population can discuss demand management on a micro scale.

The driving forces for significant institutional change in the Middle East are the promotion of equitable water resources, reduction of pollution, maintenance and long-term care of groundwater sources, confidence building and trust among parties. Cost-benefit ratios must also be included as a driving force.

Public and private investment is an important aspect of all joint management plans and toward that end both Palestine and Israel must be attractive and stable to attract investment.

Nowadays, with the growing pressure on water resources in many developing countries, it is time that demand management strategies be considered more seriously. Demand

management, including water allocation and pricing should be one of the first issues addressed. One of demand management's key problems is high transaction costs, which include those for research and information, bargaining and decision making and monitoring, enforcement and collection.

If the costs of developing new supplies are rapidly increasing and the transaction cost of reallocation of water or demand management is high, what can be done to hold down the costs of providing water? The key is to develop institutional structures that lower the transaction costs of demand management strategies. Here, decentralization could play a very effective role. Countries have achieved better quality services at lower costs by decentralizing the responsibility for delivering water service to local governments and transferring some functions to the private sector, autonomous entities, and community organizations.

Decentralization, especially in retail distribution of water, makes it easier to ensure financial autonomy and to involve the private sector and water users in water management. Smaller locally managed institutions, whether public or private, have more effective authority to charge

and collect fees and more freedom to manage without political interference.[200]

In the Middle East, a complex program combining the benefits of centralization and decentralization is likely to bring about lower costs of allocation and more effective water resource management.

[200] Alaerts, G.J., Blair, T.L. and Hartvelt F.J.A. (Eds.) (1991). A Strategy for Water Sector Capacity Building. Proceedings of UNDP Symposium, Delft, 3-5 June 1991, New York, UNDP, 191 pp. Available at http://www.oieau.fr/ciedd/contributions/at2/contribution/ciheam.htm, Accessed on March 1, 2006

CHAPTER ELEVEN

RECOMMENDATIONS

The challenges of establishing institutional structures for sustainable and equitable water management in the Middle East, as the discussion clearly shows, are formidable.

To ensure sustainable and equitable water management in the future, I propose the development of a joint water management authority that is structured to balance the geo-hydrological reality of the region with cultural, economic and political proclivities of the parties. Such a proposal must take into account temporal and spatial aspects of the region. As Itay Fischhendler has noted:

"All stakeholders should delegate to one body to set concurrently the policies of allocation, pricing and water quality. Having one body to address all aspects of water will allow tradeoffs to be weighed concerning the quantity, quality and pricing of water. It will also help to overcome the adverse implications of the administrative division that has long been misused by the agricultural sector"[201]

[201] Fischhendler

The following discussion addresses the rationale for the proposed Authority, institutional arrangements and the challenges and benefits to be derived from this joint water management system.

Joint Management Under Conditions of Asymmetry

The model required for sustainable and equitable water management in the contemporary Eastern Mediterranean calls for joint water management under conditions of asymmetrical institutional structures of the transboundary co-riparians.

Under the best of circumstances and most cooperative conditions, measurements to restrict or curtail water demands are unpopular and "can only be adopted and implemented successfully if the persons involved at the different levels-politicians, administrative officials, technical water resources management staff, water users and other stakeholders-have compatible and coherent attitudes on the issues, priorities, constraints and preferred actions in ground water resources management. The situation becomes even more complicated if the aquifers concerned are shared by different nationalities, as in the

case of the mountain aquifer shared by the Israelis and Palestinians."[202]

Sovereignty

The recommendation to form a single, sovereign water authority can only be attractive and appropriate when the trans-boundary riparians have reached an extraordinary level of confidence in each other and have developed internal institutions strong and stable enough to support relinquishment of sovereignty without protest. The decision of each entity to enter into a joint management regime must be carefully weighed. "States will agree to confer sovereign authority on the shared institution only if they retain important tools-such as veto power, control of budget, representatives in the institution's bureaucracy and judicial review-to ensure reasonable control over the decision-making process, the decisions adopted, their implementation or modification."[203] In other words, the

[202] Jac A.M. van der Gun, "From Monitoring and Modeling to Decision Support Frameworks for the Joint Management of Shared Aquifers", *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective,* Eran Feitelson and Marwan Haddad, editors.
[203] Eyal Benvenisti, "The Legal Framework of Joint Management Institutions for Transboundary Water Resources", *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective,* Eran Feitelson and Marwan Haddad, editors, p. 407

structure of a truly joint management system must be carefully crafted to serve each entity and be composed and supported equally by both entities. Any joint management structure must be designed for long-term success. Initial steps will be awkward and the eventual institutions must vigilantly neutralize predilections of narrow interest groups designed to discourage continuation of such institutions. In order to protect the institution, particularly in its early stages, the rules "precluding unilateral exit from treaty obligations"[204] must be strict.

The Challenge of Israeli Acquiescence

Institutional water resource structures in Israel are highly regulated and centralized. Policies adopted by a joint management plan would enjoy supremacy over normative national policies. The process of making Israel a full, unequivocal partner in a centralized, jointly managed and governed water authority, is daunting, complex and challenging. A joint management plan would be supported by legal, administrative and enforcement functions, which would supplant, supersede or creatively co-exist with current departments and policies within Israel and Palestine.

[204] Ibid, p. 410

Public Ownership

Israel is currently contemplating privatization options for water resource management. A public joint water resource management policy would be easier to institutionalize within national frameworks wherein "each participating state…establish(s) a flexible system of revocable permits for individual uses of the resource, instead of a system based on private ownership."[205] This is important for three reasons: Joint management regimes must be flexible in order to be sustainable, the permit system requires institutional framework that assigns, amends and revokes permits and, as such, reduces the likelihood of allocation appropriation by powerful interest groups, and a successful permit system that allocates water equitably would engender respect for the institution.

A successful, Middle Eastern joint management system needs to be publicly owned for two additional, specific reasons. First, management of water resources is a tool, which can be utilized as the means to further mutual cooperation between Israelis and Palestinians. Second, it would be important for a joint water resource management regime to become an integral part of the community at every level and, as a non-profit organization, its bylaws would

[205] Ibid, p. 409

provide for returning a percentage of income back to the community for good works and investment in infrastructure as part of a strategic plan. Any income above and beyond all its costs would be returned to the community.

The Future of the Joint Water Commission

Water resource management strategies are dependent on time and space. The political process needed to establish a joint regime is similarly dependent on optimal timing. As has been mentioned above, in spite of the two Intifadas and other setbacks in the relations between Palestine and Israel, the Joint Water Committee has continued to regularly meet. The residents of the Middle East are cognizant of the centrality of water resource management to the struggles of daily sustenance and long-term growth and development. Water mains and infrastructure have never been targets of terrorism. Today, the JWC has ceased to serve any corporeal functions. The JWC's only concern was the management of water in the West Bank. In the suggested structure for a new joint management regime, the JWC would surcease. Nonetheless, the foundation that the JWC laid would be used to support the structure of a new joint management institution and the appreciation for the need for water resource management by Israelis and Palestinians would serve to strengthen that foundation. A joint

statement by Israel and Palestine announcing the dissolution of the JWC in favor of the creation of a truly joint management institution would be the first step toward establishing a renewed sense of confidence. The initial proclamation should be accompanied with concrete steps to immediately increase domestic water allocations to the Palestinians equivalent to the WHO standards of 100 liters/day per capita.

Subsidiaries

The politics of the region have altered the focus of water resource management in several localities in the West Bank. Subsidiary or local water basins, which in the current structure are already responsible for wastewater treatment, are beginning to formulate governing institutional structures to serve trans-boundary catchment basins.. Local water basin authorities are calling for institutional reform with the assistance of non-government organizations. The link between a centralized, powerful supra-national water authority and subsidiaries is central to the success of the joint water management institution. This link would be erected with confidence building steps between the entities, as manifested by local subsidiary institutions. Satisfying local externalities can only be accomplished by local residents. The two aforementioned

cases of Emek Hefer/Tulkarem and the Kidron Valley basin, in particular, exemplify the importance of locally managed frameworks that effectuate cooperative management of highly polluted basins. The component of the joint management institution to incorporate these subsidiary actors as a vital tool for establishing a new sense of normalization in the region cannot be over-emphasized. There are precedents for similar subsidiary successes in Europe. For example, during the tempestuous 1991-1992 conflict in the former Yugoslavia, many dams were destroyed and it was not practical or possible to conduct negotiations on water resource management among national entities. "A low-level agreement was reached in 1992 between Serbs controlling the upstream Trebisnica River in Bosnia-Hercegovina and the Croat managers of the Dobrovnik hydropower plant. The agreement permitted the continuous flow of the river to the Dobrovnik plant in exchange for the Croat's guarantee to allow the continuation of supply of the river's water to the Bay of Kotor area in Montenegro".[206] Smaller, local subsidiaries are more intimately familiar with local externalities and, therefore, able to more efficiently and effectively, and at lower cost, focus on the pressing water resource issues providing an institutional model for joint

[206] Ibid, p. 415.

management on an intimate scale. These local subsidiaries would also promote public participation and encourage programs of equity. Nonetheless, a supra-national water authority is requisite to provide coordination, data acquisition, funding and other over-arching functions.

Eastern Mediterranean Water Authority

Structure

My proposal calls for the formation of the Eastern Mediterranean Water Authority (EMWA). The overarching structure of EMWA would be a supra-national, non-profit, centralized, governing unit, which would standardize rates, monitor water meters for every user and issue permits for water extractions. This would be an agency established by enabling legislation of both entities, Israel and Palestine. It would be granted political power to implement and enforce its allocation decisions. This agency would be endowed with the power not only to issue permits and establish criteria, but also to resolve conflicting claims, bring suit against violators, condemn property and purchase and import water from outside each entity or outside the watershed.

EMWA would, like the Regional Water Board suggested above by Professors Marwan Haddad and Eran Feitelson,

consist of several entities: a democratically-elected Board of Directors, a Water Utility and Local Authorities. In addition, it would include a Scientific Committee whose first task would be a complete water analysis and inventory of the Mountain Aquifer. The Scientific Committee would also bear responsibility for developing a transparent and efficient database and monitoring system for groundwater analysis. The Board of Directors, like the Board of Directors of IPCRI, would consist of an equal number of Palestinians and Israelis.

The Water Utility

The Water Utility would be structured in order to provide income to EMWA and to ensure that water tariffs are managed consistently and equitably throughout the region. The Utility would be co-managed equally by Palestinians and Israelis. The success of EMWA would turn on the effectiveness and efficiency exhibited by the Water Utility. It would not be enough for the Utility to become an 'operations and administration' body. The Utility would be required to develop a professional and dynamic strategic management framework. Its most significant responsibilities would be:[207]

[207] Gary Westerhoff, et al, *The Evolving Water Utility: Pathways to Higher Performance*, Denver, CO: American Water Works Association, 2003

- Protecting public health and safety by providing clean, safe and reliable supplies of water
- Planning, installing and maintaining infrastructure
- Responding to customers on a personal but technologically advanced level emphasizing the Utility's purpose as a provider of customer service
- Complying with regulations and transparently sharing water quality reports
- Assuring efficiency and cost-effectiveness. The publicly owned Water Utility must be efficient enough to stave off attempts by the private sector to purchase it
- Safeguarding the environment

Because of inevitably applied political pressure on the Utility to advance the interests of particular constituents, it would fall to the General Manager and Board of Directors of the Utility to exhibit leadership in dealing with outside agencies and to internally manage the Utility fairly.

Labor issues for the Utility are extremely important. The Utility would have to develop a strategic partnership with Israel's General Federation of Labor, the Histradrut, and cultivate a working relationship with Mekorot and the Palestinian Water Authority (PWA). EMWA would enjoy

supremacy over Mekorot and PWA but the manner in which working arrangements are negotiated and carried out would determine the level of harmony of joint water management in the region.

The Utility's human resource strategies and policies must encourage excellence and innovation must be supported by a positive labor-management relationship.[208] There is paucity, particular among Palestinians, of trained water and wastewater operators, managers and administrators. The Palestinian Authority has not fostered training and while there are indications that technical support in the new regime would be more highly regarded such training would fall under the purview of an Education sub-committee of the Scientific Committee of EMWA. These future managers must not only be cognizant of the hydrologic cycle but also expert on matters of microeconomics, legal structures and capacity building. Non-government organizations already operating in those fields should facilitate such training. There are academic institutions throughout Israel and Palestine that engage in such programs and, in particular, the Arava Institute for Environmental Studies in the south

[208] Ibid

of Israel already has a program where Palestinians, Jordanians and Israelis study together.[209]

Sequential/Flexible Approach

It is vital that such an organization succeeds and it is proper that it take small incremental steps, a 'sequential and flexible approach'.[210] EMWA should initially take control and govern the aforementioned Kidron Valley project. Its goal should be to establish sustainable and equitable basin management in the region on a local basis throughout the West Bank. The structure and methodology of governing basins would be determined by the Board of Directors together with local residents in the forms of focus groups, town and regional council meetings, economic analyses, and thorough analysis and evaluation of all stakeholder needs and demands. Transfers of water and development of water sources would be determined on a cost-benefit analysis taking into account current and future needs and water quality.

Benefits of EMWA

Efficiencies in Centralization. Advantages of such a supra-national water authority are multifarious. Chief

[209] http://www.arava.org/new/

[210] Eran Feitelson and Marwan Haddad, "A Sequential Flexible Approach to the Management of Shared Aquifers", *Management of Shared Groundwater Resources: The Israeli-Palestinian Case with an International Perspective"* ed. Eran Feitelson and Marwan Haddad, Ottawa, Canada: IDRC and Kluwer Academic Publishers, 2005.

among the benefits to a single authoritative water agency to manage the entire shared watershed is the coordination of all water-related activities under one agency. Diffusion and fragmentation of water administrative functions have a long history. In the Mediterranean region, from Roman times, control of water supply was never centralized under one agency. No self-respecting Ministry would agree to relinquish all authority over water, and so it continues today. In Israel, irrigation is under the aegis of the Ministry of Agriculture, the domestic supply and Water Commission are located in the Department of Infrastructure, sanitation is overseen by the Ministry of Health, hydro-electric power under the aegis of the Ministry of Energy, water quality and wastewater treatment managed by the Ministry of Health and by local agencies and environmental policy under the Ministry of the Environment. Competition among these departments exists and planning for different uses for the same source of water is counter-productive. Such fragmentation precludes effective public involvement in water management. Political will in Israel and political impotency in Palestine make joint water management challenging, particularly when cooperation among the governments has all but vanished.

Security. Essential to the success of any joint management plan or institution is that it not only satisfies everyone's needs in the region but that it enhances national security for both political entities. While on the surface it may be more evident that Palestine stands to benefit most since water would be more equitably allocated within a joint management structure than under the current regime. Israel has much to gain as well. Available wastewater would increase under joint management regimes, with adequate international funding, at a greater rate than projected population growth. That is to say, much of Palestine is without wastewater systems for its current population and development of this inexpensive water source for irrigation purposes can be significantly increased. In addition, as the population grows, wastewater (which represents 80-90% of all water used) plants will multiply providing a regular, reliable source of water for irrigation. Israel also has much to gain by an increase in quality of life in the region. As a rule, quality of life increases correlate with benefits throughout socio-economic milieus. If Palestine becomes a more stable, environmentally healthy and economically flourishing country it will to the benefit of all entities in the region. Just as the Palestinian Authority and State

of Israel agreed to look the other way and allow the town of Tulkarem and Regional Council of Emek Hefer to reach a trans-boundary management solution to a serious water quality problem, so shall the Palestinian Authority and State of Israel agree to allow EMWA to engage in water trading. This would allow EMWA to construct a water treatment facility in Gaza (desperately needed) and sell the water to southern Israeli communities who, in turn, would support a desalination plant off the coast of Gaza in the Mediterranean, for example. Security is most enhanced when resource interdependence is recognized and the institutions to manage those resource are equitably institutionalized.

Sustainable Management

The criteria for effective groundwater management are sustainability of water resources, transferability, efficiency and equity.

Sustainability. EMWA provides the best opportunity to satisfy the essential criterion of sustainability. Since the watershed of the Eastern Mediterranean is shared, only a joint management institution comprised of both national entities and cognizant of the hydrogeology, and water requirements of the region can guarantee sustainability of the regions' groundwater. Only a joint management regime

would have the necessary access, mandate and authority to conduct monitoring of groundwater sources.

Transferability. The expected exponential population growth coupled with the imminent expansion of water treatment plants and the planned development of desalination plants make water transfers inevitable. Such transfers can only be facilitated and coordinated by a joint management institution, such as EMWA, which has the built-in flexibility to engage local subsidiary agencies.

Efficiency. Efficient management of water resources can only be accomplished by cost-benefit analysis that takes into account all market segments and all population sectors. Efficient use of water, in particular, careful crop selection, water demand management, and recycled water is an underdeveloped area that require creative thinking on a regional level. It makes a difference to the resident of Tel Aviv that the farmer in Jenin is using treated wastewater for irrigation.

Equity. The first test of equity is the guarantee of minimum quantity and quality standards for domestic purposes regardless of location, ethnic or national origin and socio-economic status. Only a joint management plan, with a complex structure that provides for centralized standards while permitting locally administered conjunctive

use can guarantee optimal allocations of healthy quantities and qualities of domestic water.

The Role of NGO's

The Eastern Mediterranean is a semi-arid environment with a rapidly increasing population, diminishing quality of water, deteriorating political atmosphere, and waning and withering hopes for cooperation. The "Quartet"[211] cannot impose any water management plan for the region and international agreements and treaties cannot take root in soil that has not been prepared, fertilized and, of course, irrigated.

If, then, the prerequisite for any joint water management plan in the region requires confidence and trust between the stakeholders and national entities, it is reasonable to construct the institutional foundation for such a program among parties in the region who are cooperative, knowledgeable, highly respected and genuinely invested in sustaining the water resources in the region and managing them equitably on behalf of all water sectors; present and future, individual and collective. It is also necessary that such parties not be representative of any

[211] United States, United Nations, Russia and the European Union. The joint statement by the Quartet on the situation in the Middle East is accessible at http://www.un.org/News/dh/mideast/joint-statement.htm

particular, narrow interest group and that they be residents of the region.

Non-government organizations and local universities would play key roles in gathering, collating and disseminating scientific data but EMWA must consciously guarantee the transparency of such data and ensure that national entities share all available data. In order to accomplish these indispensable functions it would be necessary for all water resource management researchers, NGO's, members of all EMWA committees and appointed associates be given unfettered mobility throughout Palestine and Israel.

EMWA Headquarters

The importance of symbolism in the Middle East is not lost on anyone. The headquarters of EMWA should be located on the banks of the Alexander River; half in Palestine and half in Israel.

Dynamic Nature of EMWA

The structure of a joint management institution for the Middle East, such as EMWA, is a dynamic process. NGO's and academic institutions would be invited not only to engage in the determination of the institution's make-up but also to sit on its Board of Directors and serve as committee chairpersons. While EMWA would provide regional

coordination, standards, policies and procedures, including enforcement and adjudication, initial steps to engrain EMWA into the fabric of the region would be accomplished at the local, subsidiary level.

There are many legal, economic, political and hydrological questions that need to be addressed if such a supra-national institution is to be accepted. It is my operative suggestion that a conference be held in the region with all interested parties, including emissaries from Europe and Australia who, in particular, have developed innovative, progressive water utility institutions, for the purpose of considering a joint management institution for water resources. The political entities in the Middle East have choices. As mentioned, if current trends lead the region to "Separation Management" of the water resources, the future is bleak indeed for future generations. On the other hand, cooperation and equitable joint management of the scarce, natural resources of the Middle East can not only provide sustenance for its inhabitants but also a model for trans-boundary institutional resource management around the world.

CHAPTER TWELVE

CONCLUSION

The water crisis in the Middle East is magnifying with every passing day. Populations increase rapidly, depletion of the Coastal Aquifer continues unabated and few wastewater treatment plants are in the planning or construction mode.

Direct discussions, on national levels, between Israel and the Palestinian Authority are all but non-existent. Proposals for management by separation are being planned with abandon.

In spite of the current situation, local communities, who realize that their sustenance depends on joint management of water resources are reaching out to the 'other side' and forming governance agreements. Water in the Eastern Mediterranean has always been a touchstone for all facets of society and the residents of the region are cognizant of the tentative and delicate nature of that resource.

The Eastern Mediterranean political entities urgently need to re-engender a sense of confidence and trust in the region before 'separation' becomes the new normative

reality. It is naïve to think that a supra-national water authority can immediately take root in such an environment. It is clear, however, that under the right circumstances and in a nourishing atmosphere such a joint management regime would be the proper means to equitably manage the water resources and ensure sustainability. The cost-benefit analysis of such a proposal must be thorough but should take into consideration the 'associative' benefits of such an institution as well. The region's potential improvements in economic development require regular, reliable, equitable and sustainable water management as does the potential for overall improvements in quality of life. There is a bastion of local, academic and non-governmental organizations that are committed to working toward cooperative ventures for water resource management in the Eastern Mediterranean and are prepared to discuss, research and agonize over the institutional structure such a regime should take.

I believe that a supra-national, publicly owned, non-profit, water authority should be a topic of intense scrutiny with the clear understanding that such an authority, for the time being, cut its eye-teeth on local, subsidiary water issues.

In fewer than 15 years the joint population of Palestine and Israel will increase by one-third; from 9 million people to over 12 million people and water demand (at current rates) will increase by one-third from 2000 MCM, which is the maximum potential of fresh water sources in the area, to 3000 MCM. Palestinian water demands will only increase, per capita, over the next fifteen years and, within Israel, desalination cannot adequately replenish all the water required for its growing population.

The process of establishing an institution such as EMWA is every bit as important as the final product itself. Determining the appropriate structure for water resource management in the Middle East requires input from every sector of society. The hope is that Palestinians and Israelis can develop confidence-building steps to kick-start this process and thereby engage the legal, business, and community leadership of both entities toward this and future common goals. The success of this process, particularly in institutional groundwater management, also holds promise for the resolution of other transboundary water conflicts around the world and, as such, should be enthusiastically supported and studied by the world community.

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