LOCALIZED COOPERATION BETWEEN ISRAELIS AND PALESTINIANS IN WATER RESOURCE MANAGEMENT WITHIN THE CONTEXT OF NATIONAL UNILATERALISM

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This paper will examine the local attempts to jointly manage trans-boundary water basins within the context of Israel's recent pronouncements toward unilateralism. The First Oslo agreements of 1993, subsequent 1994 Jordan/Israel treaty and Oslo II accords of 1995, while not ascribing water rights to Palestinians, gave hope to territorial recognition and joint environmental management. However, the "High Politics" of the region today discourages cooperation and collaboration between the parties and the notion that "…water decision makers will make the hydrologic reality follow the political needs"[1] is gaining momentum. Israel and Palestine both link their respective highest-order goals; security and national rights, with unfettered allocation of water. Securitization of water resource management; linking water issues to national security concerns, dominates long-term planning in Israel and is the foundation of Palestinian national aspirations. Since 1967, Israel has maintained total control over the water resources of Palestine. Though Israel is the upstream riparian of only two of the five trans-boundary water resources in the region, with Palestine in an upstream position in the other three[2], its position as hydro-hegemon of the Jordan river basin and major aquifers is absolute. Nevertheless, attempts to institute local trans-boundary water regimes have come to fruition in the region. These collaborative ventures have addressed water catchment basins, wastewater treatment facilities and local river basins. There have been no practical attempts to jointly manage groundwater basins. While local, cooperative regimes continue to flourish, albeit on a modest scale, current plans on the part of Israeli authorities to address the extant and growing water crisis in the region, call for unilateral determination of the water resource management policy for the region. The centerpiece of that policy is a dramatic increase in desalinated seawater for both Israel and Palestine and a reduction of allocation of and access to Mountain Aquifer water for the Palestinians. Water consumption in Israel is approximately 275 liters per person per day while the Palestinians currently consume about 80 liters per day. It can easily be gleaned that the status quo is untenable. Unilateral management of water resources does not guarantee security nor sustainability; discourages joint management, represses cooperation and confidence-building and ignores matters of equity.

KEY TERMS: Transboundary Israel Water, Palestine Water, Middle East hydrology*

[1] Aaron Wolf, personal email correspondence, January 8, 2007.
[2] Phillips, et al, p. 21

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INTRODUCTION

Successful water resource management in the Middle East is an attainable goal. While conventional wisdom has it that life in the region is largely strife ridden and foreboding, discussions among the parties on water matters has been a constant, to one degree or another, for the past fifty years. A marked increase in joint research between Israelis, Palestinians and Jordanians began twenty years ago. Political activity heralding the approach of Palestinian sovereignty coupled with an awareness of the mounting magnitude of regional water quality and quantity issues encouraged the proliferation of research and development in this field among the parties and the international community.

The water crisis in the Middle East is not limited to water quantity and quality. Water is intricately intertwined into the political fabric of the region. Much has been written about the economic, military and environmental securitization of water[3] and, while it has not been a singular casus belli for any of the hostilities between Israel and her neighbors, water sources have constantly been part of the discussion among military and political strategists. The region of Israel and Palestine is largely arid or semi-arid with precipitation rates of 250 mm/annually in most of the region compounded by extremely high evapotranspiration rates ranging from 1700-2300 mm/annually.[4] Finally, the spatial considerations of water distribution and lack of holding capacity, in conjunction with high population rates, exacerbate the crisis.

This paper will first review the hydrologic parameters of the region, then describe the attempts by Palestinians and Israelis to jointly, cooperatively, manage, and govern local, challenged water basins. The paper will then synthesize Israel's unilateral response to the impending water crisis within the context of its policy goals. Finally, knowing full-well that "efforts to de-link water from the overall political situation are futile…" this paper shall attempt to illustrate " … the potential unifying power that a trans-boundary water resource provides to increase the sharing of benefits, deepen dialogue, and thereby assist in economic (environmental and security) development."[5]

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[3] See Anthony Richard Turton, *The Political Aspects of Institutional Developments in the Water Sector: South Africa and its International River Basins*, University of Pretoria, May 2003.

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

[5] David Phillips and Anders Jägerskog, "Human Development Report 2006; Managing Trans-Boundary Waters for Human Development", United Nations Development Program.

A Water Review of the Region

With the exception of the Litani River in southern Lebanon, the Dan River and Lake Kinneret (Sea of Galilee) situated wholly within the internationally recognized border of Israel, all the other surface and groundwater sources are co-riparian and trans-boundary. The Jordan River is 260 km long and drains an area of 18,300km^3. The major tributaries of the Upper Jordan are the Dan, which rises in Israel and has an annual average flow of 250Mm^3, the Hasbani, which rises in Lebanon and discharges 150Mm^3/year and the Banias, which rises in the Golan Heights, discharges about 150Mm^3 annually. These rivers all drain into Lake Kinneret. Ten kilometers south of the Lake the Jordan intersects with the Yarmouk River. The Yarmouk serves as the border between Jordan and Syria as it meanders southwesterly forming the border between Israel and Jordan. The Yarmouk has an annual discharge of 400Mm^3 although Syrian, Jordanian and Israeli withdrawals have rendered the Yarmouk's contribution to the Jordan River near naught. The Yarmouk also serves as the border between Syria and Jordan. Once the Yarmouk joins the Jordan River it forms the current border between Israel and the West Bank. Several tributaries and small wadis (ancient riverbeds that flow only during the Winter) drain into the Jordan at that point and any remaining water in the Jordan flows into the Dead Sea.

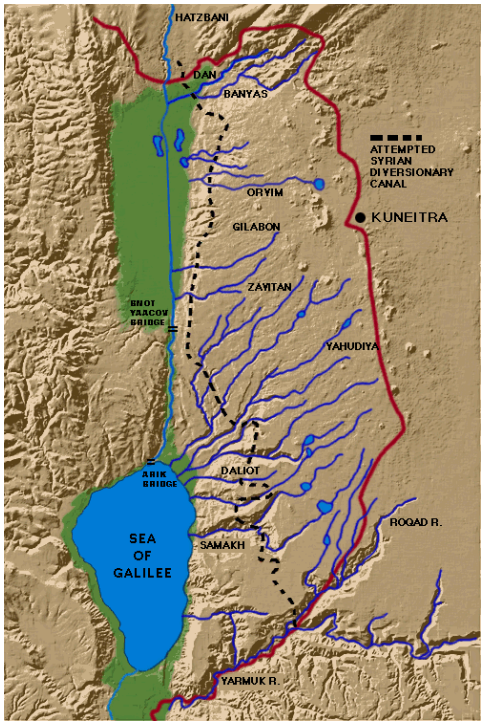

Figure 1. The Jordan River Basin Watershed

Israel's National Water Carrier was completed in 1964 and was designed to extract about 400 Mm^3 from the Upper Jordan and Lake Kinneret. Jordan constructed the Ghor Canal in 1959 with designs to divert the Yarmouk River for the purpose of providing irrigation water to the slopes along the eastern bank of the Jordan Valley. Complete manifestation of those plans was never realized and maximum annual flows

today, in the renamed King Abdullah Canal, are approximately 130 Mm^3. Syria constructed an intricate network of dams and barges along the Yarmouk and withdraws 250 Mm^3 annually. In summary, the Jordan River Basin that discharged upwards of 1,300 Mm^3 into the Dead Sea in the 1950's now discharges about 60 Mm^3 annually and salinity levels reach 2,000 ppm.

Israel's three major storage basins are the Jordan River basin and the coastal and mountain aquifers. These sources comprise 1500 Mm^3 or, 3/4 of Israel's domestic consumption. Israel is drawing virtually all of its available fresh water. Palestinians in the occupied West Bank rely exclusively on the mountain aquifer, much of which is over-pumped and whose water is in a deteriorating state. Palestinians in the Gaza Strip withdraw all their water from the rapidly deteriorating and unhealthful Coastal Aquifer. One-half of all the region's water is provided by two aquifers. 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 is located primarily in the West Bank, drains an annual total of 650 Mm^3 and consists of three discrete basins: The Western aquifer (termed the Yarkon-Taninim in Israel) provides more than half the total yield, about 350 Mm^3/annually. It flows westerly into Israel and estimates are that 40 Mm^3 are brackish waters. The North-Eastern aquifer flows about 130 Mm^3/annually of which 70 Mm^3 are brackish. This aquifer rises in Israel forming the Ma'ayan Harod Springs. The Eastern aquifer is the only basin in the Mountain aquifer that lies and rises entirely in the West Bank, discharges 150 Mm^3/annually and provides virtually all the consumptive water for Palestinians and Jewish settlers living in the West Bank. Precipitation is the sole means of recharge in the Mountain aquifer and the annual infiltration volume is 600 Mm^3.

The Coastal aquifer is formed of sand and sandstone and neatly divided into two sub-aquifers; the northern sub-aquifer provides 15% of Israel's total supply, about 280 Mm^3/annually. The southern sub-aquifer is the sole source of water for Gaza. In its natural state, the southern sub-aquifer, is 3-5 meters above sea level but due to over pumping, particularly in the 1970's and 1980's, the level was drawn down to 1 meter; sea water has intruded and the chloride level has increased from 100 ppm to 155 ppm.

Gaza is bereft of rivers, receives an annual inflow of 50 Mm^3 from the southern Coastal aquifer, seawater has extended 1.5 km into the fresh water aquifer.

Figure 2. Flowchart of the Mountain Aquifer

Summary of Fresh Water Availability

Table 1. Annual Summary of Fresh Water supply by Source and Consumer Sector (Mm^3)

Source	Total	Used by Israel	Used by Settlers	Used by Palestinians
Western Aquifer	310-362	313-333	10	21-27
Eastern Aquifer	80-172	0	35-150	62-78
North-Eastern Aquifer	131-145	101-115	5	20-25
Coastal Aquifer	250-280	200-230		50
Jordan River	1060-1287	560-650		

Water Demand

Table 2. Annual Palestinian Population Projections and Water consumption patterns by sectors (Mm^3)

Year	Population	Domestic Use	Agricultural Use	Industrial Use	TOTAL
1990	2,037,000	78	140	7	225
2000	3,451,900	263	217	18	498
2010	4,776,900	484	305	37	826
2020	6,219,500	787	415	61	1263

Table 3. Israeli Population Projections and Water consumption patterns by sectors (Mm^3)

	Population	Urban Sector	Agricultural Irrigation				Total
			Fresh	Brackish	Effluents	Total	
2000	6,365,800	772	880	103	275	1258	2030
2010	7,542,300	1060	680	85	495	1260	2320
2020	8,548,000	1330	600	60	565	1225	2555

DAILY DOMESTIC WATER CONSUMPTION PER CAPITA

Table 4. Daily domestic Water consumption per capita (Liters/day)

Israel	275
Jordan	115 (85)*
Palestine (West Bank and Gaza)	63-104 (50)*
Lebanon	150
Syria	130
Minimum required for safe hygienic conditions	100
Typical households in industrialized countries	250
North American average	500

**The numbers in parentheses represent the estimate of actual consumption after accounting for leaks.*

Cooperation Between Israelis and Palestinians

Joint water management studies and proposals came into their fore in the 1980's and models for trans-boundary 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, at the national level, have vanished.

Currently, there is no cooperation on water management issues between Israel and the Palestinian Authority. Israel and Palestine do not recognize each other. In the West Bank, all water distribution decisions are made by the Israeli Defense Forces as the West Bank is still an administered occupied territory of Israel. Israel enjoys absolute water hegemony in the region.

Substantive contributions to equitable management of water resources in the Middle East have been sought out, incubated, supported and executed with the assistance of non-government organizations.

"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 coordinators 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 FOME 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.

The "Good Water Neighbors" (GWN) project was established in 2001 by EcoPeace/Friends of the Earth Middle East (FoEME) "to raise awareness of the shared water problems of Palestinians, Jordanians and Israelis. The GWN methodology is an original idea that is based on identifying cross border communities and utilizing their mutual dependence on shared water resources as a basis for developing dialogue and cooperation on sustainable water management."[6] GWN focuses on the major water management issues in the region; lack of sewage treatment, over-pumping of the aquifers, excessive diversion of surface flows and challenges of implementing water demand management policies.

The first phase of GWN consisted of eleven Palestinian, Israeli and Jordanian communities and by 2005 that number grew to seventeen. Each community is partnered with a neighboring cross-boundary community. Among the achievements of GWN is the 'water-wise' building model adopted by the Palestinians of Tulkarem (on the West Bank) together with the Israelis of neighboring Emek Hefer. Water-saving devices were installed at thirty-six schools and twenty-two mosques in those two communities.

The cooperative venture of Emek Hefer and Tulkarem is the most oft-cited and frequently- researched model of Israeli/Palestinian collaboration on trans-boundary joint management. 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

[6] Friends of the Earth: Middle East web site, available at http://www.foeme.org/projects.php?ind=32.

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 then-Palestinian Authority President Arafat 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.[7] 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."[8]

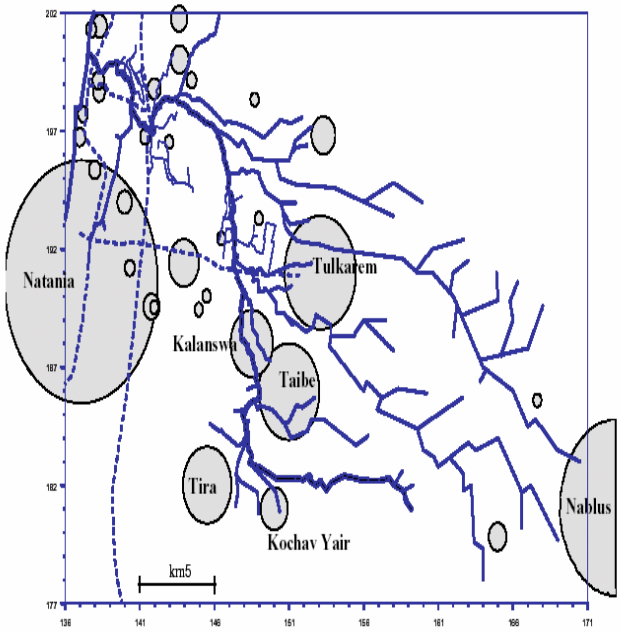

Figure 3. Alexander River-Wadi Zeim Basin

[7] Translated by Eyal Benvenisti
[8] Benvenisti

Figure 4. Alexander River-Wadi Zeim location

The full report on the Emek Hefer/Tulkarem project is available as an "OPTIMA" (Optimisation for Sustainable Water Resources Management) report cited as "Case Study: Alexander River-Wadi Zeimer Basin"[9] This report analyzes and synthesizes a three-year study of the local regime and reviews the physiologic, hydrological, demographic, land-use, institutional, regulatory and gender issues affected by the project. Water quality, from the project's inception to 2005, was substantially improved; access to the river for recreation and tourism was significantly increased. Equally important as the outcomes cited in the report, is the process that was utilized to achieve these goals. The process resembles that of "collaborative adaptive management"; a tool used with growing frequency in the United States to solve environmental issues between two parties sharing the same water entity. Such a process requires identification of the issue, openness of dialogue, confidence in one another, identification of and forum for all engaged stakeholders, scientific analysis and modeling, and, finally, consensus of action. Once such a consensus is reached, an action plan is executed and then reviewed and re-assessed over time. This is a process beyond the scope of "Best Management Practices" in that it requires consensus among the parties. It is rare that Collaborative Adaptive Management plans are utilized to affect national water resource management policies but, in the case of the Middle East, the adoption of such proposals requires the cooperation and financial assistance of donor nations. Since 2005 the stakeholders (15 Israeli public and non-

[9] Available on line at http://www.ess.co.at/OPTIMA/FTP/D11.1.pdf.

governmental organizations and 30 Palestinian organizations) have not been permitted to meet within Israel and are now planning to meet and review the progress of the project in Malta in 2007. Water treatment plans throughout the West Bank and in Gaza, since the Second (Al-Aksa) Intifada, and Israel's response to that uprising, have been cancelled. "Plans for the construction of the Gaza desal plant and the Hebron wastewater treatment plant have been cancelled."[10]

It is clear, from the joint letter written by the leaders of Tulkarem and Emek Hefer, that Israelis and Palestinians have engaged in the process of "benefits-sharing" whereby the "needs" of both communities have been addressed and attempts have been made to govern local basins. In the case of the Kidron Valley-Wadi Nar region east of Jerusalem, a local jointly-managed water basin is attempting to form its own governance body. 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 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, in 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 platforms for joint management of trans-boundary rivers. As of this writing there is mirror authority on the Palestinian side.[11]

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 national system. Similarly, there is no 'national' system for ecological management within the Palestinian Authority.

One attempt to institute local governance of a water catchment basin is still in the throes of negotiation. 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 twenty years. Israel's Dead Sea Drainage Board and the Palestinian Authority jointly share the water basin in question. Neither party has agreed to accept responsibility for the effluent. The lack of Palestinian cooperation became an "excellent excuse" for the Jerusalem water company to do nothing over the years.[12]

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

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

[10] Gary Cohen, Director, Water Resources and Infrastructure Office, USAID, West Bank and Gaza; personal email correspondence with author, January 10, 2007.

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

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

among sovereign states.[13] Because 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:[14]

1. Diverse and comprehensive sources of information that are up to date;
2. 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;
3. Scientific criteria for determining water quality and quantity, and economic criteria for determining cost and income;
4. An efficient forum for exchange of that information;
5. Public access and involvement;
6. Transparency by creating appropriate mechanisms for a public overview.

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

1. 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;
2. Planning and decision making bodies;
3. Enforcement mechanisms;
4. Dispute resolution mechanisms;
5. A source of income to carry out its activities

The activities of jointly-managed NGO's in the region have been handicapped by Israel's restriction of access to information and data regarding water quality and quantity of groundwater and by the evaporation of donor technical and monetary support, particularly by the United States.

IPCRI or the Israel/Palestine Center for Research and Information, (http://www.ipcri.org/), 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 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". The most significant conference held on Middle Eastern water issues, since Oslo II was the IPCRI Second Israeli-Palestinian Conference held in Turkey, October 10-14, 2004 (http://www.ipcri-waterconference.org). 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 Boll 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

[13] Ibid
[14] Ibid

project in OPTIMA is concerned with socio-economic management of the Mountain Aquifer. The three major units of IPCRI are:

1. The Strategic Analysis Unit (SAU) which is an interdisciplinary unit of twelve groups headed by both an Israeli and Palestinian leader and consist 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.
2. 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
3. The Peace Education Unit 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.

Center for Environmental Diplomacy

The Center for Environmental Diplomacy 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: West Bank Environmental District and JVED: 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, Dr. Klaus Topfer, UNEP Executive Director. 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 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.

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, and 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 manages the project or EXACT, 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: 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, and preparation of laboratory quality assurance plans, water-quality field measurements, and 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 Center

Based in Oman, MEDRC (Middle East Desalination Center) 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.

Desalination and Unilateralism

Among the most significant changes in water policy in recent years was the decision taken by the State of Israel to move water policy and allotment responsibilities from the Ministry of Agriculture to an independent and professional Water commissioner whose link to the government is the Ministry of Infrastructure. Shimon Tal (recently replaced by Uri Shani) was appointed as Water Commissioner. Water conservation, particularly in the domestic sector, has been his platform. Heralded as a window of opportunity to increase cooperation in the region, Shimon Tal and Nabil Shariff, of the Palestinian Water Authority joined in an IPCRI/Swedish Water House sponsored seminar in June 2004 in Stockholm, Sweden to grapple with difficult and complex issues that now appear to be eminently soluble.

Israel's projections, according to the Ministry of Infrastructure in 2001, call for 400 Mm^3 of annual desalinated seawater and upgrading 500 Mm^3 of wastewater effluent for agricultural and industrial purposes. In December 1999 the Ministry of Infrastructure issued a fiat to the agricultural sector restricting the total water quantity, of any quality, to 1160 Mm^3 of which no more than 530 Mm^3 could be freshwater. Freshwater consumption in agriculture in 2001 totaled 560 Mm^3. Increased wastewater treatment in Israel is a major part of Israel's unilateral water policy.

The major thrust of Israel's unilateral water policy is the dramatic rise in planning and construction of desalination plants.

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.

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).

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 Mm^3/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).[15] The cost of desalinated seawater is more economical today than in years' 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 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 Mm^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. [16]

Today, Israel's National Water Company, Mekorot, operates 29 desalination plants within Israel, producing 22.5 Mm^3/year of treated brackish water for irrigation purposes, and 114 Mm^3/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.[17]

Within Gaza there are two small plants, financed by the French Government and Austrian Government to provide Gaza with 0.5 Mm^3/year and O.2 Mm^3/year, respectively. These two plants will ultimately be ready to accommodate a capacity of 2.0 Mm^3/year and 1.0 Mm^3/year. USAID has cancelled its plans to finance a larger desalination plant (as full donation) initially scheduled to provide 22Mm^3/year with a final phase capacity in the year 2020 of 55 Mm^3/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 ($0.527/$m^3$)
ever offered for this kind of operation.[18] In comparison, the cost of seawater for the region of one delivered cubic meter of seawater from smaller plants carries a price of $0.80/$m^3$.[19]

Figure 5 illustrates the pilot projects undertaken by Israel as of today.

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

[16] Ibid

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

[18] Water-technology.net http://www.water-technology.net/projects/israel/index.html#israel6.

[19] 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.

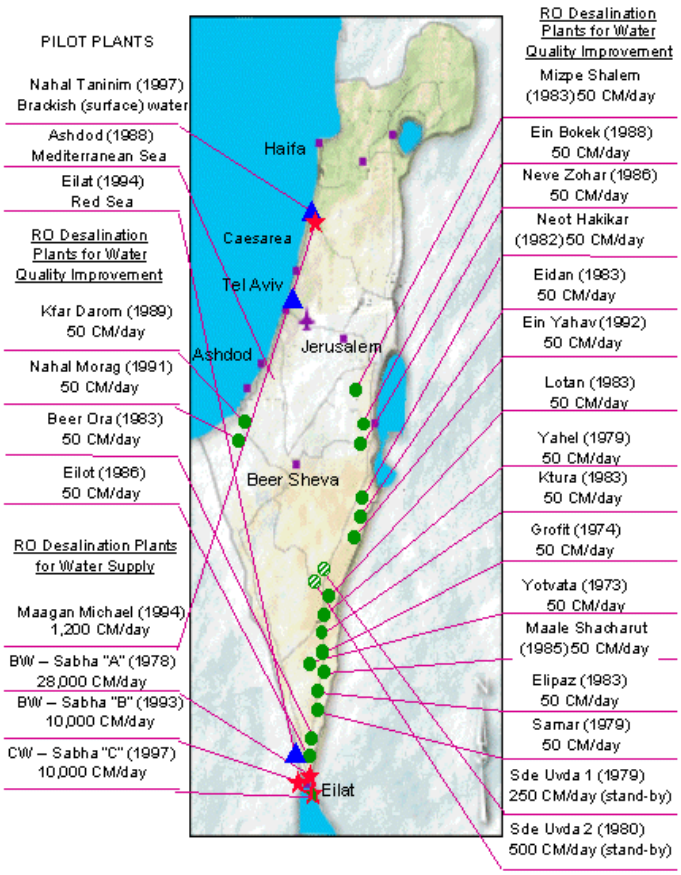

Figure 5. Desalination Pilot Projects

The State of Israel's Master Plan calls for a constant freshwater availability of 1,467 Mm^3 in each year and a steady increase in desalinated seawater, brackish water and reclaimed water.

Table 5. 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

The Planning Division of Israel's Water Commissioner commissioned a report by Mekorot's planning and construction partner, Tahal, in January, 2007, to determine where the optimum desalination plant should be built to provide desalinated water to the Palestinians. This study states that the average daily supply of potable water for West Bank Palestinians is about 81 liters/capita/day. However, approximately 38% of this supplied water is "unaccounted" or lost due to leaking pipes. The true average supply is about 50 liters/day. The study suggests that the required water for Palestinians in the West Bank is approximately 170 liters/day.

All current available water for the West Bank originates in the Mountain Aquifer. While, the study continues, it is theoretically possible to pump additional water from the Aquifer each additional pumped liter of water will have to come at the expense of currently pumped and supplied water by Israel from the Aquifer. In other words, the Aquifer has been fully exploited. Tahal's conclusion is that "The singular, possible solution that will do no damage to the groundwater system is to import desalinated water from Israel".[20] The plan calls for supplying a total of 150 Mm^3/year desalinated water to the West Bank in three 50Mm^3/year stages. The desalination plant will be built in the area of Hadera/Caesarea on Israel's Mediterranean Coast.

The second major plan to import desalinated water into parts of Palestine, Jordan and Israel is the Red Sea-Dead Sea proposal to construct a 200 kilometer canal from the Red Sea to the Dead Sea for the purposes of supplying not only desalinated water but also hydro-electric power to the region and to re-vitalize the now-expiring Dead Sea. The project calls for draining 650 Mm^3/annually into the Dead Sea to create, in the words of Vice-Premier Shimon Peres, a "Peace Valley"[21] which would serve to promote joint agricultural projects, tourism and the construction of two lakes. The major beneficiary of desalinated water of this canal would be Jordan. The three major stakeholders who form a tri-lateral commission on the feasibility of the project are Israel, Jordan and the Palestinian Authority. While donor financing has been obtained to finance the final feasibility study, the tri-lateral meetings have been postponed by Israel subsequent to the Palestinian elections.

[20] Water Commission; Planning Division, "Location of Desalination Plant for Palestinians", Tahal Engineering, January, 2007 (in Hebrew), p. 6

[21]" Ha-aretz", July 11, 2006. Available on line at http://www.haaretz.com/hasen/pages/ShArt.jhtml?itemNo=784930&contrassID=1&subContrassID=1.

Figure 6. The Proposed Red Sea/Dead Sea Canal

Conclusion

Since the early 1990's a tradition of cooperation on water resource management among Israelis and Palestinians has been established. Non-governmental organizations, academicians and local communities have worked toward establishing local water regimes responsive to the needs of resident stakeholders. Models have been tested for trans-boundary water management. However, the state of Israel maintains it hegemony in the region and appears to be engaging in a unilateral fashion to supply Palestinians with a new Israeli-constructed and owned, water infrastructure. This desalinated water plant will supplant, not augment, water from the Mountain Aquifer. While the Mountain Aquifer is recharged, inconsistently, with precipitation, it is consistently, highly charged with political symbolism and fervor. Securitization continues to drive Israel's water policy now further entrenched and manifested in a new doctrine of unilateralism while seeking legitimization of water rights pre-occupies Palestinians. A unilateral water policy that reduces the only water source resident within the boundaries of Palestine to an aquifer to serve Israel will not engender Palestinian cooperation and, thus, is unlikely to improve Israel's sense of security.

The alternative to unilateralism is joint management. It is extremely challenging for Israel and Palestine to engage in a trans-boundary, joint management program for the region for several reasons. Chief among these obstacles is the fact that neither Israel nor the elected government of the Palestinian Authority recognizes the political rights of the

other. Should the two sides recognize each other the next serious obstacle to overcome would be to create a model of trans-boundary management in conditions of institutional asymmetry. The military, political, economic, environmental, educational, health, transportation and infrastructure disparities between Israel and Palestine are dramatic. "The partially-formed, occupied state of Palestine enjoys little effective political support, has no armed military and has an economy that is either completely contained by or client to Israel's"[22]. The average Israeli per capita, per annum salary is above $20,000 while the average Palestinian annual salary is about $700.

There are few precedents in international law relating to trans-boundary groundwater management. While the Helsinki treaty of 1966 prescribed (in a non-binding fashion) a doctrine of 'hydrologic unity', i.e., users need to be reasonable and equitable when drawing groundwater, the Bellagio treaty of 1989 provided some guidelines to protect groundwater from excessive 'drawdown' and the Harmon Doctrine provided for some measure of water 'rights', for the most part, the vast history of legal decisions regarding water management relate to surface water. Moreover, the majority of legal renderings deal with water 'needs' and not 'rights'. (Wolf, 2003). It is very unlikely that, should Israel meet the minimum allocations of potable water to the Palestinians, legal redress will be a viable option.

Water resource management is an indirect variable of the peace process; albeit a critical vector with a great deal of potential for "spill over". Water resource management, on the other hand, is a direct and vital variable for economic sustainability. Israel may achieve economic sustainability for the short duration should it continue to concentrate on increasing water supply (while admirably reducing demand in the agricultural sector) but if the region is to achieve sustainable and *equitable* water resource management in the long term a process of joint water resource management must be made the center piece of any water policy.

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