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A Sober Approach to the Water Crisis in the Middle East

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Introduction :

Water is clearly a critical issue, and in many ways at the root of the Arab-Israeli conflict. It is this region's most valuable resource, important not only for economic growth but for survival. It is a subject that has been widely written about both for its importance in potential development and its potential for bringing about conflict. However, much of the subject is shrouded in a fog of misinformation. Erroneous data and misleading claims often lead to mistaken understandings of the conflict's roots. In such instances, factual errors serve to suggest that all parties, including Israelis, Palestinians and Jordanians, suffer from a general shortage of water affecting the region. In reality, the water crisis is not chiefly one of insufficient supply, but of uneven and unequitable distribution. There needs to be an increased awareness that the Middle East is an arid area, where water is naturally a scarce resource, and where water consumption should be appropriate to these facts of nature. While supply enhancement may become salient at some future point, allocation of existing supply is the issue that should be prioritized.

Therefore we will focus in this brief expose on current water usage in Israel and Palestine, and will propose briefly actions that should be taken to foster sustainable joint management of this precious resource.

Water Resources in Palestine :

It is important to understand, , as a basis for this discussion, that the water resources available in this region are limited in scope and time. The chief surface water resource in the region is the Jordan River drainage basin. Its headwaters are located in northern Israel and the Israeli occupied Golan Heights and southern Lebanon, which feed Lake Tiberias. The lower Jordan River is fed from springs and runoff from the West Bank and Syrian and Jordanian waters (mostly in the Yarmouk River). As a whole, these elements constitute the Jordan international drainage basin, a naturally-defined area that cannot be artificially sub-sectioned. Palestine has been denied any of the Jordan River's waters although they are full riperians. The Johnston Plan, for Middle East water allocation, while officially not ratified by all the parties but generally adhered to, proposed a West

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Ghur canal to provide the West Bank with 120 MCM to meet the needs of the Palestinians (7). Unfortunately, this project never saw the light.

However, only 30 percent of the waters in Palestine are surface water sources. The rest of the water comes from groundwater resources. The major groundwater system in the West Bank is the West Bank or "Mountain" Aquifer system, which has three major drainage basins: the Western Basin, which, while supplied and recharged from the West Bank mountains, falls almost entirely within the boundaries of Israel; the Northeastern Basin, which is located inside the West Bank near Nablus and Jenin and drains into the Eocene Aquifer and the Cenomanian-Turonian Aquifer, under the northern West Bank; the Eastern Aquifer Basin contains a number of aquifers, all of which are located within the West Bank and the springs from which represent 90 percent of spring discharge in this area (16,12,1). It is worth noting that while this aquifer system discharges approximately 600-660 MCM annually, West Bank Palestinians exploit currently a mere 115-123 MCM (17).

The Gaza Strip Aquifer, while it is part of the Coastal Aquifer, has been continuously over-pumped for quite some time, in large part to serve the high population, most of whom are refugees. In addition, Israel has been tapping this aquifer and its replenishment from outside Gaza (13). The result is that most water resources experts agree that the water situation in Gaza is in crisis. The water table has been pumped to far below the recharge rate, and there is evidence of saltwater intrusion in the groundwater severe enough that most of the water is not potable (7). (See Map -- Gaza Water)

Middle East Water in Crisis:

The heart of the water crisis is in the inequities of water's distribution in the region. Palestinians from both inside Israel and Palestine have chronic problems of access to water, both for agricultural purposes and domestic use, some areas going months at a time without water during the summer. While Arabs make up only about 18 percent of the Israel's population, they consume only about two percent of Israel's water supply. In the West Bank, Military Orders issued by the Israeli occupation authorities have effectively prohibited Palestinians from digging wells and improving their water resources since 1967, while at the same time wells have been dug by Israelis straight into the water resources underneath these wells, lowering the water level (11). Furthermore, Palestinians pay high prices for the water they receive from the Mekeroth, about $1.20 per M3, compared to the $.40 per M3 Israelis pay for domestic use and $.16 per M3 for agriculture. The problem is exemplified by the graph below showing average consumption of water in Israel, Palestine and Jordan (8). (see Graph 1)

Some of the problems with water resources in this region have been as a result of bad management practices. Resources have tended to be misallocated and used inefficiently. For example, as is evident from the graph above, 75 percent of water resources have been

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devoted to agriculture in Israel, a sectoral area that makes up less than 6 percent of the GDP. Likewise, water has been subsidized throughout Israel -- encouraging its overuse or misuse for domestic purposes (8,16).

The Role of Agriculture :

Bad agricultural policies are at least in part responsible for this water problem as well. Irrigation has tended to be the backbone of productive agriculture in Israel, with 47 percent of Israeli agricultural land irrigated. In Palestine, less than 10 percent of cultivated land is irrigated (in West Bank it is about five percent), and in Jordan about eight percent of land is irrigated. Almost totally ignored has been the traditional and endogenous non-irrigated farming sector, which recent experiments have shown to have potential for producing more than twice the current production per dunum (5,6).

Table 1. Agriculture in Israel and Palestine

	Israel	Palestine
contribution to GDP by agricultural sector (%)	6	23-29*
employment in agriculture (as % of total employment)	3.5	26.3**
cultivated land that is irrigated (%)	47	9
total water consumption (mcm)	1700	225
agricultural water use (as % of total consumption)	75	62
total annual quantity of water used for irrigation (mcm)	1275	140
1990 population (millions)	4.5596	2.0375
per capita annual quantity of water used for irrigation (cm)	280	69
* The 1st figure is for the West Bank, the 2nd for Gaza.		
** excludes Palestinians working in Israel.		

There has recently been a price increase from $0.12 to $0.16 for agricultural water, and a consequent 10 percent drop in Israeli agricultural production, a decrease which did not adversely affect Israel's GDP (2). More moves need to be made in this direction. A serious look needs to be taken at the economic cost/benefit of irrigation. It is very possible that areas such as the Negev desert should not be irrigated using ground water sources. Significantly more effort is needed to help farmers meet the cost of systems to better store and deliver irrigation water to their crops.

Environmental Considerations:

Another problem has been that little consideration has been taken of the effects on the environment of various water management schemes. The classic example is the diversion

of the waters from Lake Tiberias for the purpose feeding the Israeli National Water Carrier (Mekeroth). Little, if any, consideration has been given to the effects of this on the Jordan river and basin, which in 1953, had an average flow of 1250 MCM per year at the Allenby Bridge, and now records annual flows of just 152-203 MCM (12,15). The Jordan river basin and the Dead Sea have also clearly been effected to the negative. Likewise, what has been the effects of the tapping of upstream runoff such as that from Wadi Gaza, from which up to 20 MCM per year were said to have replenished the aquifers under Gaza (8,13). Even Israel has acknowledged that the draining of the Hula Swamps in the Galilee, part of the water works plan that also built the Mekeroth, was a mistake (14).

While these kinds of large infrastructure projects have tended to provide water quantity, not nearly enough attention has been paid to the concept of water quality. For instance, while water has been made more plentiful through the building of the Israeli Mekeroth, much of the water that is currently available in that system is said to have much higher mineral concentrations than is considered safe throughout Europe and the United States (4).

Unfortunately, Israel's proposed solutions to the riparian dispute have been directed towards mega-water projects which would increase available water in the region. Many quixotic schemes have been proposed for the enhancement of water supply, most notably the following:

Largescale desalinization projects,often linked with hydroelectric power generation:

- Red SeaDead Sea conduit;
- MediterraneanDead Sea conduit.

Water diversion projects:

- from Lebanon's Litani River to the Jordan headwaters;
- from the Nile to Israel or Gaza, with a pipeline going underneath the Suez Canal.

Water conveyance projects:

- oil tanker conveyance of Turkish or Yugoslavian waters;
- Conveyance of Turkish or Norwegian waters in enormous balloonlike "medusa bags."

Faith in such dreamsolutions is often illfounded. All megaprojects currently under consideration are economically, environmentally and politically unsound. For example, the the Red Sea-Dead Sea or Mediterranean-Dead Sea Canals have paid lots of attention to the amount of water that could be generated, without ample attention being paid to the

quality of that water, or the environmental effects and economic feasibility of the projects (10). High rates of population growth may at some time render supply enhancement projects necessary, but there is no such need at present. And if regional consumption does outstrip demand, we should look first at issues of appropriate water utilization, internal supply enhancement and conservation.

The Need for Shared Responsibility :

Clearly the region must work towards schemes for shared responsibility of its water resources. All of the rivers within the greater Jordan basin cross international borders, thus making their management and development subject to international negotiation. This is true even for Lake Tiberias, which now sits within an area that is totally controlled by Israel. However, it drains directly into the Jordan River, making it part of the Jordan Basin. As such all other riparians have rights to the waters of Lake Tiberias, including storage and fishing rights. It is likewise the case with the groundwater under Palestine and Israel. Based on international norms, the coastal aquifer is shared by Israelis and Palestinians, as the recharge is located in the West Bank but the basin is located in the coastal plain, including Gaza. Clearly shared responsibility must be taken for this aquifer and its waters. The "West Bank" aquifer is wholly within the boundaries of the Palestine's West Bank, but arrangements have been discussed as to how the water might be shared with Israel (17).

One of the major stumbling blocks to joint management of water resources will be the development of an agreement on allocation of water resources. While it is recognized under international law that the water needs of all riparians must be taken into account in the division of water resources, Israel is currently using far more than its share of water resources to the detriment of the other parties (particularly the Palestinians) as is cited above (3). However, dealing with this issue will be essential to developing an atmosphere under which joint management will be possible. (See USIS Map, Jordan Basin Map)

Conflict Resolution Mechanisms:

Clearly the possibility for conflict is present in this region. As such, certain principles of mediation and conflict resolution should be adopted by all of the parties in the region. In particular, international law and precedent should be used as the basis to set parameters for dispute resolution. While international law tends to be vague and occasionally contradictory, certain criteria in this area have been established. The Helsinki Rules of 1966, for example, provides guidelines for "reasonable and equitable" sharing of a common waterway, the overriding principle of which is (Article IV): "Each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin." The Helsinki Rules (Article V) then goes on to define "reasonable and equitable" in eleven points. This combined with findings of the ongoing International Law Commission study on "Codification of the Law on Water

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Courses for Purposes other than Navigation," mandated in 1970 by the United Nations General Assembly could provide at least some background for discussion of water rights and allocations between Israel, Palestine and their neighbors (3).

The Peace Process and Water :

The Multilateral Working Group on Water has been stymied from the beginning in dealing with the regional water dispute by two factors. The first is that Syria and Lebanon, both important parties in the discussions about regional allocation water resources, have not participated in the talks to date. The second is that Israel has refused to discuss the issue of allocation and water rights. Given the absence of the two of these, there has been practically no progress in dealing with long term water issues realistically. The Working Group has instead focused on data, enhancing water supply, and water management, but still has failed to come to any important decisions.

The Declaration of Principles (DOP) between the PLO and Israel, signed September 13, 1993 in Washington, is vague but allows the issues to be dealt with through an Israeli-Palestinian Continuing Committee for Economic Cooperation, which will deal with, among other things, water development and management. There are two specific places that could be cited from the agreement itself. Article VII, number 4, [The interim agreement will establish a Palestinian Interim Self-Government Authority elected Council that will have under its authority, among other things] a Palestinian Water Authority." Annex III of the agreement, entitled, "Protocol on Israeli-Palestinian Cooperation in Economic and Development Programs," states that "The two sides agree to establish an Israeli-Palestinian continuing Committee for Economic Cooperation, focusing, among other things, on the following: 1) Cooperation in the field of water, including a Water Development Program prepared by experts from both sides, which will also specify the mode of cooperation in the management of water resources in the West Bank and Gaza Strip, and will include proposals for studies and plans on water rights of each party as well as on the equitable utilization of joint water resources for implementation in and beyond the interim period." In effect these are a recognition of Palestinian water rights. However, there is little clarification on whether the Palestinians or Israelis will control water resources during the interim agreement. On the other hand, the Cairo Agreement on autonomy for Palestinians in Gaza and Jericho, signed May 4, 1994, does not inspire confidence despite the first appearances. The agreement grants the Palestine Authority full control over water resources in both of these areas, with the exception of the military areas and settlements which will be served by the Mekeroth: "[a]ll water ... systems and resources in the Gaza Strip and the Jericho Area shall be operated, managed and developed (included drilling) by the Palestinian Authority ..." (Annex II, Article II [B.31,a]). However, it also states that (Annex II, Article II, B.31,a): "[t]he Palestinian Authority shall pay Mekoroth for the cost of water supplied from Israel and for the real expenses incurred in supplying water to the Palestinian Authority". It is worth noting that Gaza has been an area in water crisis for quite some time, and the

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autonomous area of Jericho has been drawn in such a way as to exclude three of the four springs in the area. Most of the water underneath Jericho itself is of poor quality and highly saline.

Clearly, new measures will be needed to build the confidence necessary for shared responsibility of common water resources.

Some Modest Proposals :

The failure of the peace process so far to address the riparian dispute, and the urgency of finding a solution to the conflict, render some alternative approaches necessary. Presented here, are a number of steps that will be necessary to the development of a strategy for shared responsibility of the water crisis.

A - Meeting the urgent needs for domestic water supply.

I - Provide 50 million cubic meters from the Eastern Aquifer to Gaza.

This should be done as a confidence building measure by Israel, to show that it is committed to resolving the allocation problem, rather than bypassing it. This tangible act should be accompanied by a statement of explicit recognition of Palestinian water rights, which could be the basis for real negotiation on how to proceed with joint development and management of this resource. This is an issue of human rights, that need to be addressed immediately. The water situation in the Gaza Strip is critical, and has been for quite some time, and is getting worse.

II - Raising the allocation of water for residents in the West Bank.

The water allocation for the residents of the West Bank should be raised by the Mekeroth from the current 35 M3 per capita/annum to 70-100 M3 per capita/annum as a further demonstration of these rights. This also is an issue of basic human rights as the water situation in the parts of the West Bank is becoming urgent each year during the summer months, with last year some areas going for more than two months without water.

III -Relinquishing control, and allowing development, of the Eastern Aquifer.

This aquifer comprises the eastern part of the West Bank ground water system. Palestinians need to be able to study this aquifer as a possible natural source of groundwater. This aquifer is not shared, both recharging and draining in the eastern part of the West Bank. However, while it has an anticipated potential of 150 MCM per year, Palestinians are currently using only 25 MCM because of Israeli restrictions. Untapped water from this aquifer gets mixed with saline water before it is released near the Dead Sea. There is a need to study this aquifer to identify the sites where it's waters can be

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tapped and used. Dams can be erected on the Eastern Slopes to store water and to recharge the Jordan Valley wells.

IV - Increasing attention to demand management.

With the expected increase in population will come a significant increase in water demand. While household service levels are presently far below what is required to improve service to international standards, conservation of the precious commodity must also be a primary consideration. With increases in service levels must come programs targeting conservation and awareness. Lowflush toilets, for example, can significantly reduce water volumes consumed. Dual water delivery systems need also to be put into place separating high-quality water for cooking and drinking purposes from low-quality water for everything else.

B - Adopting a more balanced, long term water allocation scheme:

I - Development a Middle East Water Charter.

This document would be developed to ensure that three issues - water equity, increasing water supplies and appropriate water utilization - will be considered within a single formula. The Charter would recognize that the water crisis is not one of insufficient supply, but of an uneven and unequitable distribution which is aggravated by inappropriate consumption practices. It would also acknowledge, however, that any resolution must necessarily consider Israeli perceptions, interests and needs, and hence the issue of supply enhancement must be included with any negotiation formula. Such a document could provide the framework for resolution of the riparian dispute.

II-Development of a regional agreement on the allocation of water resources. :

This could be done with all riparians, including Syria and Lebanon, and based on the Helsinki Rules and accepted international water law. It would serve as parameters for demands of each of the parties. The international community and financial institutions should be asked to make clear to all parties that loans for international waterway projects will not be forthcoming until the agreement is negotiated.

III - Economic optimization of water use.

Water should be both fairly and efficiently priced. While water for household use should be available to all, its pricing should reflect its value as a limited resource to be utilized carefully. The availability and market value of water will be the determinant of price and consumption rather than a government policy to provide lower prices for encouragement of agricultural production.

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IV - Outline a Middle East joint management project.

Based on the principles and tools mentioned above, all riparians should work together with the international financial and development institutions to develop a Middle East Joint Water Management Project. This project could provide the necessary structure under which management and development of this region's most precious and valuable resource could be sustainably and equitably distributed, managed and developed.

In my opinion, the development of a joint strategy on water resources must include following the above stated plan in order and in its entirety. Through this course our region can be led to constructive cooperation rather than conflict over its water resources.

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References :

1. Beida, U. "The Yarkon-Taninim Basin and the Mountain Aquifer" Proceedings of the Israeli Association Hydrology Conference on Quantity and Quality Problems in the Present Israeli Water Balance. pp 51-57. Israel. 1986.
2. Berck, P. and Lipow, J. "Water and an Israeli-Palestinian peace settlement." Presented at Eurames Conference, Warwick University, England. 1993.
3. Bingham, Gail, Aaron Wolf, Tim Wohlgenant. Resolving Water Disputes: Conflict and Cooperation in the United States, the Near East, and Asia, International Support Project for Asia and the Near East, USAID. Washington, DC. November 1994.
4. Gobbay, Shoshanna. "Focus: The Impending Water Crisis." Israel Environment Bulletin, Vol.14, no. 2, pp. 2-11, Spring 1991.
5. Hrimat, Nader, Jad Isaac. "Results of Wheat Experiments in Palestine," [in press.] ARIJ. Bethlehem. 1994.
6. Isaac, J., et al. "Optimization of Water in Palestinian Agriculture: Status and Potential for Development." Presented at conference Optimization of Water Usage in Horticulture in the Middle East. sponsored by the French Foreign Ministry. Amman. October, 1994.
7. Isaac, J. et al. "Core Issues in the Israeli-Palestinian Water Dispute." [in press.] ARIJ. Bethlehem. November, 1994.
8. Isaac, J. et al. "Water supply and demand in Palestine." ARIJ/Harvard University Middle East Development Project [in press.] 1994.
9. Isaac, J., E. Miller. "Environment in Palestine: Between the Anvil of Socioeconomic Growth and the Hammer of Occupation." ARIJ. Bethlehem, Palestine. 1992.
10. Jayyousi, Anan. "Two Seas Canal." (in press) Applied Research Institute, Jerusalem. Bethlehem. 1995.
11. JMCC. Water: The Red Line. Jerusalem Media and Communication Center. Jerusalem. May 1994.
12. Main, C. "The unified development of the water resources of the Jordan Valley Region". Tennessee Valley Authority. 1953.
13. Shawa, Isam R. "Water Situation in the Gaza Strip." Water and Peace in the Middle East. Edited by J. Isaac & H. Shuval. Elsevier Science, B.V., Amsterdam. 1994.
14. State of Israel: Ministry of the Environment. The Environment in Israel. Edited by Shoshanna Goday. Custom Graphics and Publishing, Ltd. Jerusalem. 1992.
15. Soffer, A. "The relevance of Johnston Plan to the reality of 1993 and beyond", in Isaac, J. and Shuval, H., 1994, Water and Peace in the Middle East. Amsterdam: Elsevier.

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16. Tahal Consulting Engineers, Ltd. "Israeli Water Sector Review: Past Achievements, Current Problems and Future Options". (Report submitted to the World Bank) Tel Aviv-Washington. 1990.
17. Zarour, H, Jad Isaac. "Nature's Apportionment and the Open Market: a Promising Solution to the Arab-Israeli Water Conflict." Water International, 18, 1993.
18. Zarour, H, Jad Isaac. "The Water Crisis in the Occupied Territories." Presented at the VII World Congress on Water, Rabat, Morocco, 12-16 May 1991.