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Sharif S. Elmusa

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Dividing Common Water Resources According to International Water Law: The Case of the Palestinian-Israeli Waters

It [the Bellagio Draft Treaty] is based on the proposition that water rights should be determined by mutual agreement rather than be the subject of uncontrolled, unilateral taking, and that rational conservation and protection actions require joint resource management machinery.¹ It is precisely because the water is often inadequate to satisfy the just needs of all that rules [for equitable distribution] are required.²

ABSTRACT

The present article focuses on the reallocation of water rights in the common Palestinian-Israeli water sources, a core issue of the water and general conflict between the two sides. In particular, I wish to explore how reallocation can be worked out on the basis of factors stipulated in the doctrine of "equitable apportionment" of international water law and how these factors may be made operational. I argue that those factors favor Palestinians and certainly entitle them to a much larger share than Israel permits them to tap at present. Exact shares cannot be determined except on the basis of mutually-agreed data as well as more rigorous calculations than attempted here. I also argue that reallocation is possible without causing "appreciable harm" to Israel, and that, within the context of a peaceful political settlement, is a positive-sum game. The assumption here is that the endogenous water resources of the West Bank and Gaza would be repossessed by Palestinians as part of an eventual peaceful settlement.

I. INTRODUCTION

A Swedish water expert, Malin Falkenmark, once described the behavior of water in the water cycle as that of a "Chameleon, continu-

* This article was written while the author was a Fulbright Fellow, The Applied Research Institute, Jerusalem.

1. Robert Hayton & Albert Utton, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 Nat. Resources J. 663, 664 (1989).

2. Jerome Lipper, *Equitable Utilization*, in *The Law of International Drainage Basins* 44 (A.H. Garretson et al. eds., 1966).

ously reappearing in new roles in the human environment."³ One such role is as an agent of conflict in international drainage basins. Virtually all the waters of such basins in the Middle East are contested: the Nile, the Euphrates, the Tigris and the Jordan. The central bone of contention in all of them is how much water each of the riparians is entitled to receive from those common sources. Of course, to say, as some analysts have, that the water conflicts would lead to "water wars"⁴ highly exaggerates the potential consequences of the disputes. Nevertheless, they are real and can contribute to the chronic instability in the Middle East. Furthermore, with population and economic growth and relentless urbanization, the pressure on these fixed water resources will mount, and the conflict can only sharpen.

Perhaps in recognition of this, water issues have been accorded a prominent place in the ongoing peace negotiations. They are on the agenda of the Bilateral track, in which Israel negotiates with each of the Arab parties individually, as well as the Multilateral track in which more than 35 countries participate in five working groups, one of them solely devoted to water. In the Multilaterals, the aim is to promote regional cooperation in joint management, conservation, and enhancement of supply and data availability. Another aim is to help the parties in the Bilaterals overcome some of the impediments to reaching accords on the reallocation of common waters, for regional cooperation on water is contingent upon bilateral agreements.

In the Israeli-Palestinian context, water is a central ingredient, perhaps only second to land, of the wider conflict between the two sides. It is also more difficult than other water disputes in the region as it is intimately linked to the Palestinian-Zionist conflict over the land and with the Israeli occupation of the West Bank and Gaza since 1967. At the core of the dispute is the disproportionate allocation of water rights, or allocation of water quantities among the riparians, in the common Palestinian-Israeli water resources in favor of Israel as well as the encroachment of the settlers in the Occupied Palestinian Territory (OPT) on the endogenous waters of this territory. There are other issues as well, and although they arise chiefly out of Israel's quest to maintain its and the settlers' water privilege, they also assume a life of their own. These issues include Israel's legal and institutional control over the water sector and monopoly over water-related information. The focus will be on the core issue of reallocation of water rights.

Since 1967, Israel maintained and actually increased its disproportionate exploitation of the water resources common to it and the

3. Malin Falkenmark, *New Ecological Approach to the Water Cycle: Ticket to the Future*, 13 *Ambio* 152, 154 (1984).

4. See, e.g., Joyce R. Starr, *Water Wars*, 82 *Foreign Policy* 17 (1991).

Palestinians, taking 80-85 percent of their annual recharge, as is indicated below. It did so by imposing severe limitations on Palestinian access to these. Israel has virtual control, both legal and executive, over the production, distribution, and use of water in the OPT (Occupied Palestinian Territory). At the same time, it denies the Palestinians a voice in decision-making. Since its occupation of the West Bank and Gaza, it has issued a series of Military Orders⁵ that give the Israeli "water officer," who answers to the Israeli Water Commissioner, non-negotiable powers (1) over granting licenses to drill wells or to initiate any water project, and (2) over limiting the amount of water Palestinians can draw from their wells. The process of institutional control was sealed in 1982 when Israel formally "transferred" the management of water resources in the West Bank to the parastatal Israeli water company, Mekorot. Israel has extensively used this control mechanism to suppress Palestinian water demand, downgrade the role of the Water Department, which had been in existence before 1967, to administrative functions only, supply the Israeli settlements with disproportionate amounts of water, and withhold information.

Complex as the Israeli-Palestinian water conflict may be, the key to its resolution lies in working out an equitable apportionment regime, in addition to some form of joint management, of the common water resources. This premise has been recognized in the historic Israeli-Palestinian declaration of principles, which was reached in Oslo and signed in Washington on the White House lawn on September 13, 1993. The declaration calls for the initiation of a water development program prepared by experts from both sides, which would include, among other things, recommendations 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."⁶ The purpose of the present article is to contribute to the discussion on how the equitable utilization of the common water resources can be realized on the basis of the list of "factors" of international water law. In a sense, the paper also represents an attempt to "operationalize" these factors. I do not wish to offer a plan or blueprint for a solution, but rather preliminary ideas for a realistic reallocation that addresses the chief questions that have arisen or likely to arise in future discussions. I show that, with all factors considered, Palestinians are entitled to a larger share than Israel, and

5. Israeli Military Orders are the primary legislative form for the Palestinians under Israeli occupation.

6. For the full text of the agreement, see Associated Press, *Mideast Accord: The Document*, N.Y. Times, Sept. 1, 1993, at A8. The interim period refers to the five-year period in which the Palestinians will establish self-government, with negotiations on the final status of the OPT to commence two to three years into the interim period.

certainly to a larger share than they are permitted at present. Exact shares cannot be determined except on the basis of agreed-upon data as well as more rigorous calculations than attempted here. I also examine how reallocation is possible without causing "appreciable harm" to Israel, and that, within the context of a peaceful political settlement, it is not a zero-sum game.

Before proceeding with my main topic, I wish to make two contextual remarks. First, focusing on the Israeli-Palestinian water conflict does not preclude a basin-wide (the Jordan River plus Mediterranean basins) approach for sharing and management of water resources. International water law would in likelihood be the starting point for any joint water agreements, so much of the discussion about redistribution here should be applicable to the basin at large. Moreover, there is already the precedent of the 1955 Johnston Plan which divided the waters of the Jordan River among the riparians, Israel, Jordan, Lebanon and Syria. The plan allotted approximately 209 million cubic meters per year (mcm/y) for the West Bank, which was then part of Jordan. The joint Palestinian-Israeli groundwater resources were not covered in it, but would have to be included if a new basin-wide agreement is renegotiated. Second, the remaining discussion of the text is replete with figures and facts, and, although the data conflicts are a topic in and of themselves, a caveat regarding them is unavoidable. For technical as well as political reasons, these data are in dispute among Israeli, Palestinian and outside specialists. Palestinian researchers often cite, albeit mistrustfully, Israeli statistics, for the simple reason that Israel exercises a virtual monopoly on water-related research, severely restricting their access. Until mutual agreement is reached, the data in the paper ought to be considered tentative.

The paper is organized as follows. I will briefly delineate the common water resources and give reasons as to why they need to be reallocated. Then, I demonstrate how such reallocation can be done on the basis of international water law. I conclude by illustrating how reallocation need not be a zero-sum game for Israel.

II. WHY REALLOCATION?

The need for reallocating the common water resources is predicated on: (1) the unilateral, disproportionate appropriation by Israel of the common waters; (2) the substandard level of water consumption of the Palestinians; and (3) the wide water gap between Palestinians and Israelis. These are commonly acknowledged realities and need only a brief summation. Relevant data are summarized in Tables 1, 2, and 3.

TABLE 1. Common Hydrology and Appropriation by Israel

	Recharge (mcmy)	Israel's appropriation (including settlers') (%)
West Bank		
Common:		
1. Western aquifer	340-390	94
2. Northern aquifer	120-145	85
3. Western wadis	20	~ 100
4. The Jordan River	(See text)	
Endogenous:		
1. Eastern aquifer	100-175	30-50
2. Eastern wadis	30-40	00-00
Gaza		
Common:		
1. Wadi Gaza	0.5-70 ^b	variable
"Disputably" common:^a		
1. Flow from Israel to Gaza's aquifer	50-60	00-90
Endogenous:		
1. Gaza aquifer	50-70	06-20

Sources: Abu Mayla, Y. *The Future of the Water Situation in the West Bank and Gaza and Israel* [in Arabic] (Islamic University, Gaza, photocopy, 1992); Boneh, Y. and U. Baida, *Water Sources in Judaea and Samaria and their Exploitation*, in YEHUDA VESHMORON (Absalom Shmueli eds., West Jerusalem, Keenan, 1977; [in Hebrew] translation at AMER, *supra* note 15); Bruins and Tuinhof, *supra* note 21; Friends of the Middle East, *supra* note 15; Kahan, *supra* note 24; Kolars, *supra* note 17; Naff, 1991, *supra* note 7; Orni, E. and E. Efrat, *GEOGRAPHY OF ISRAEL* [hereinafter *Geography*] (3d ed., Philadelphia, Jewish Publications Society of America, 1973); Rofe and Raffety Consulting Engineers, *WEST BANK HYDROLOGY, 1963-1965* (for the Central Water Authority, Amman, Jordan, 1965); Schwarz, J., *Water Resources in Judaea and Samaria*, in *JUDAEA, SAMARIA AND GAZA* (J. Elazar, ed., Washington, D.C., American Enterprise Institute, 1982); Shuval, *supra* note 13; Tahal, *supra* note 17.

Notes:

^aSo designated because Palestinian and Israeli specialists disagree on whether it is common.

^b*Geography*, at 45, gives the annual average flow as 30-40 mcmy, while Schwarz, *supra* note 39, as 14 mcmy and states that Israel impounds 1 mcmy and is planning 8 mcmy more.

TABLE 2. Water Consumption and Irrigated Land for Palestinians, Israel and Settlers

	Consumption		Irrigation (cm/capita/year)	
	Aggregate	Domestic ^a	Area (1,000 dunums)	Irrigated/ irrigable (%)
Palestinians:				
West Bank	125-130	25-35	100	20-30 ^b
Gaza	100-183 ^c	23-38 ^d	120	55
Israel	450-500	≥ 100	2,150	95
Settlers:				
West Bank	580-650	90-120	40	
Gaza	≥ 1,400 ^d	?	7	

1 dunum = 1,000 square meters = 0.10 hectare

Sources: based on Abu Mayla, Y., cited in table 1; Awartani, H., cited in table 1; Awartani, H., *A Projection of Water Demand in the West Bank and Gaza Strip* (Nablus, al-Najah U., Econ. Dept., 1991, photocopy); Awartani, H., and S. Juda, *Irrigated Agriculture in the Occupied Palestinian Territory* [in Arabic] (publisher and year same as in *Id.*); Benvenisti, M. and S. Khayat, *THE ATLAS OF THE WEST BANK AND GAZA* (West Jerusalem, the Jerusalem Post for the West Bank Data Project, 1988); Haddad, M., and S. Abu Ghusha, *supra* note 19; Hyatt, E. et al, *Peace Now Settlement Watch: [Excerpts from] Comprehensive Report on Settlements, January 22, 1992, March-April New Outlook 15-17 (1992, Israel)*; Kahan, *supra* note 24; State Comptroller, *supra* note 16; Tahal, *supra* note 17.

Notes:

^aFor the West Bank and Gaza domestic consumption includes small amounts of industrial consumption also.

^bTahal estimates the irrigable area at 310,000 dunums, excluding 320,000 dunums which it says have low soil classification. Awartani and Juda put the irrigable area at 535,000 dunums, of which 172,000 could be readily irrigated. Of these, about 150,000 dunums are in the Jordan Valley, which have been confiscated, enclosed or deprived of water by the Israeli authorities, or the owners of which do not have access to investment capital.

^cThe high figure is from Tahal and the low from Abu Mayla, the difference derives from Tahal's greater estimate of consumption and lower population count. Abu Mayla's are also for 1991 and Tahal's are for 1989. Awartani's estimate (Awartani, 1991b) falls between the two.

^dMuch higher figures are cited in Palestinian sources. The per capita consumption of the settlers is sensitive to the increment in the overall estimate, owing to their small number, 3,000 or more.

TABLE 3. Summary of Indices of the Israeli-Palestinian Water Gap

	Palestinian	Israeli
Consumption per capita:		
Aggregate	100	300-400
Domestic	100	300-400
Price per cubic meter:		
Absolute:		
Domestic	100 ^a	100
Agriculture	120	100
Relative to GNP/capita:		
Domestic	≥ 800	100
Irrigated agriculture:		
Land area per capita	100	400
Irrigated/cultivated	100	1,000
Irrigated/irrigable	100	400-500

Sources: Previous tables; *Tahal*, *supra* note 17.

Water in the West Bank and Gaza is available in aquifers and surface sources, with groundwater being the chief source. Insofar as the water conflict is concerned, those water sources can be divided into "endogenous" sources that commence and terminate within the boundaries of the OPT and "international," sources that flow into or out of them.

In the West Bank, the surface sources consist of two groups of wadis, or small streams, the Jordan River and numerous springs. The two groups of wadis issue from the central hills region, which is the topographic backbone of the West Bank and the predominant hydrological region. One group flows untapped east of the watershed toward the Jordan and is endogenous. The second group flows west through the West Bank and Israel toward the Mediterranean and is international; its waters are "harvested" inside Israel.

Groundwater in the West Bank is comprised of three main aquifer systems: eastern, western and northern. The eastern aquifer falls essentially within the West Bank (endogenous), while the western and northern aquifers are common to the West Bank and Israel. Perhaps as much as 95 percent of the area of the western and northern aquifers is located in the West Bank from which they also receive 70-85 percent of their annual replenishment. In other words, those aquifers are, physically speaking, primarily West Bank aquifers. They are at the center of the water dispute, because Israel appropriates, from hundreds of wells on its side of the border, more than 90 percent of their annual recharge.

In Gaza, too, the chief source of water is groundwater. There are no rivers, and the only surface water sources are wadis. The most important is Wadi Gaza with catchment areas in the West Bank, Gaza and Israel; its water is impounded by Israel before it enters Gaza. As for groundwater, there is only one exploitable aquifer in Gaza, overlain by highly permeable sand dunes near the coast and finer soil deposits inland. It is endogenous to Gaza. Part of its water, however, flows from the east from Israel. Palestinian hydrologists contend that Israel intercepts this flow through wells on eastern Gaza border leaving meager quantities for Gaza. Israel denies the claim. Until there are mutually agreed upon data, this flow should tentatively be designated "disputably" common.

In sum, and apart from the Jordan River, the aggregate volume of common Israeli-Palestinian water resources may amount to 565-655 mcmy or more, replenished primarily from the West Bank.

Israel unilaterally and through the imposition of severe administrative and legal restrictions on Palestinian access appropriates as much as 80-85 percent of the common waters (Table 1). It also has been overpumping, that is, pumping more than the rate of replenishment or safe yield, from the common aquifers and those within its borders. Such overextraction has been criticized by Israelis themselves because it

endangers the long-term viability of the aquifers. In addition, Israel significantly encroaches, through the settlers, on the endogenous waters of the OPT, particularly the West Bank's eastern aquifer. Finally, Israel has been extracting 150-200 mcmy more water from the Jordan basin than the 375-400 mcmy allotted to it in the Johnston Plan,⁷ not to mention 5-10 mcmy from the Golan Heights.

A net result of Israel's unilateral action is a substandard level of consumption for Palestinians in the OPT as well as a wide water gap between them and Israelis. A few statistics starkly illustrate the situation. Palestinian consumption in the West Bank rose by a mere 20 mcmy during the period of the occupation, compared to Israel's 400 mcmy. Palestinian domestic consumption is meager, 20-30 cubic meters (cm) per person per year, or about 15-20 gallons per day. In villages and camps, consumption can be a third of this. In relative terms, the per capita aggregate water consumption in Israel is three to four times as much as in the OPT, and the same is true of domestic consumption. The low water use among Palestinians is a case of suppressed demand, not simply of different demand schedules stemming from different income levels. The domestic water supply in the West Bank and Gaza is intermittent in nearly all the towns and villages, and many villages and hamlets do not receive piped waters. Furthermore, relative to their GNP/capita, the Palestinians in the West Bank are charged about five times per unit of domestic water as in Israel.⁸

Beside the low quantities and higher prices, Palestinians obtain water of inferior quality. In central Gaza, the water's salinity can be as much as three times the 200 mg/liter chloride recommended by the World Health Organization (WHO). Water is also polluted with nitrates from the return water of human consumption and agriculture. The result has been a deleterious impact on health conditions and quality of life. Even in the West Bank, salinity of irrigation water in the Jordan Valley and Jinin areas has been a growing problem, primarily as a result of overpumping by settlers and the refusal of Israeli authorities to let

The estimates are based on John Kolars, *Water Resources of the Middle East*, Canadian J. Dev. Stud. 103-29 tbl. 8 (1992) (Sustainable Water Resources Management in Arid Countries special issue); Naff, *supra* note 8, at 15; Tahal Consulting Engineers, Ltd., *Israel Water Sector Review: Past Achievements, Current Problems and Future Options 2.4* (1990) (study submitted to the World Bank). Israel justifies its taking away of the Yarmuk by claiming that the water was allocated to the power that had sovereignty over the West Bank, thereby equating occupation with sovereignty See B.K. Nijim, *Water Resources in the History of the Palestine-Israel Conflict*, 21 *GeoJournal* 317-24 (1990).

8. The 1992 GNP per capita was \$12,351 in Israel, \$2,437 in the West Bank, and \$1,409 in Gaza. Central Bureau of Statistics, *Statistical Abstract* (1993) (Isr.). The Israeli settlers in the West Bank and Gaza receive heavy water subsidies for domestic water use that are not given to other Israelis.

Palestinian farmers extract water from the deeper aquifer.⁹

Still, the water gap between Palestinians and Israel is most apparent in agriculture. The overall irrigated area in Israel is 10 times greater than in the OPT, or nearly four times greater per person. Israel has been able to irrigate nearly one-half of its cultivated land and 95 percent of the irrigable land, while the irrigated Palestinian land on the West Bank, where considerable expansion is possible, is only five percent of the cultivated area and less than one-fourth of the irrigable. Yet, while Palestinian agriculture cannot expand because of the lack of water, Israeli farmers, for political reasons, receive heavy water subsidies that encourage profligate water consumption. For example, Israeli farmers irrigate crops, such as wheat and cotton, that would not be profitable without water and other subsidies. The subsidies may be an internal Israeli affair, and have come under the scrutiny of Israeli specialists, their impact, however, is not. Moreover, Israel has allowed the settlers in the West Bank and Gaza to irrigate 47,000 dunums of confiscated land, with water allocations per unit area nearly double that on Palestinian land. Palestinian irrigated area, meanwhile, has stagnated and water salinity in many places has lowered crop yields and quality.

Israeli and other analysts often point out that their country suffers a water stress that affects its social and economic development. Certainly, no one would suggest that geographic Palestine is a water cornucopia. But it is not so obvious that the social and economic development of Israel has been hampered by the lack of water, not when it has been able to irrigate nearly all of its irrigable land. More important, water stress is relative, and Palestinians are far more water-stressed than Israelis. To repeat the observation of Jerome Lipper: "it is precisely because the water is often inadequate to satisfy the needs of all that rules [of equitable distribution] are required."¹⁰

III. INTERNATIONAL WATER LAW AND EQUITABLE DISTRIBUTION

A mutual agreement on dividing the common waters between Israelis and Palestinians can be achieved through direct negotiations, mediation or arbitration. Because joint water management, by definition, requires cooperation, direct negotiations are preferable. Unfortunately, however, Israel's current position does not give much hope for the success of direct negotiations, as will be pointed out shortly. On the other hand, mediation could subject Palestinians to undue pressure based on

9. Hisham Awartani, *The Artesian Wells in the Occupied Palestinian Territories: Reality and Ambition* 31-39 (1992) (in Arabic).

10. Lipper, *supra* note 2, at 44.

considerations of power, rather than fairness. In the end, and unless Israel exhibits more flexibility, arbitration, to which Egypt and Israel resorted to resolve the dispute over Taba, may be the most viable Palestinian option.

Whichever procedure the two sides opt for would need a guide for devising a new sharing regime. One such guide is international law; another relies on analytical methods based on optimization and cost-benefit analysis, such as Paretian environmental analysis and cooperative game theory. I am concerned in this paper with the division of waters according to international water law. International water law serves as a better framework for clarifying many issues in the conflict, such as Israeli insistence on maintaining prior or existing use and telling Palestinians to import water instead of reallocation, or Palestinian advocacy of nature-based reallocation. Also, international water law incorporates all the "variables" of the other approach.

The pertinent aspect of international water law is the "factors" of the doctrine of "equitable apportionment." I will consider five factors common to the 1966 Helsinki Rules of the International Law Association (ILA), the 1988 Report of the International Law Commission (ILC) of the United Nations and the 1989 Bellagio Draft treaty,¹¹ which Palestinians and Israelis may wish to consider as a model. Those factors are: (1) the natural attributes of the water source; (2) prior or existing use; (3) social and economic needs; (4) alternative resources and their comparative costs; and (5) avoidance of appreciable harm.

It has been often pointed out that international water law is nonbinding and lacks enforcement mechanisms. This is true, but it may also be the "best we've got" as a guide for negotiations. The factors it stipulates are based on treaties and conventions ratified by governments,

11. The treaty is wide-ranging and sensitive to the commonality as well as divergence of interests among the parties concerned, and recognizes both their rights and responsibilities. It contains articles on joint management; establishment of a joint commission; enforcement and oversight responsibilities; unified database; the inclusive notion of "underground environment" protection; conservation areas; emergency situations, such as droughts; dispute resolution; and so on. Some of the treaty's provisions would not be terribly relevant (such as the planned depletion) because of the absence of joint fossil aquifers and the scarcity of water supply; many of them, however, are significant to the joint Israeli-Palestinian situation. The joint commission and the unified database would be necessary because of the intensive hydrological interdependence. The commission's ability to declare emergencies, especially droughts, is also important as droughts are common. The treaty is also sensitive to countries' jealousies about sovereignty and does not endow the joint commission with powers that may be considered a serious transgression on it. Also, regarding sovereignty, the notion of "conservation area" avoids making all the common groundwater area such a zone and is especially applicable to the Israeli-Palestinian situation because the groundwater boundaries extend over nearly all the political boundaries that are expected to be designated between them.

custom, generally accepted principles, decisions in the judiciary, and the opinions of qualified persons (publicists). They would, if approached in good faith, balance the interests of both sides within the constraints of the available resources. For instance, the natural attributes of the joint sources favor the Palestinians while prior use serves the Israelis. In addition, the factors take into account the capabilities and water requirements of each party by specifying the social and economic needs and the costs of alternative resources as criteria for apportionment. Finally, by stipulating that "appreciable harm" ought to be avoided, the doctrine of equitable apportionment encourages the parties not to cause each other "appreciable harm" and to seek allocation schedules and other mechanisms commensurate with this goal.

One assumes that both Palestinians and Israelis would wish to abide by international water law if their recent accommodation is to move forward. So far, they have agreed in the Oslo declaration of principles, noted above, that the final settlement of the political conflict will be based on the implementation of the United Nations' Security Council resolutions 242 and 338. Also, in the statement cooperation between the two sides in the water field in the same declaration, they employed, albeit without specific reference to international water law, two principles often invoked by this law, namely, the equitable utilization as well as the joint management, of the common water resources. The problems that the negotiations are likely to run into are likely to stem more from how each party will interpret international water law to gain advantage rather than from a refusal to acknowledge it.

1. Prior Use versus Natural Attributes

Israelis usually insist on considering one factor: prior or existing use. Prior use means maintaining the status quo, or extracting 80-90 percent of the common waters. Many Israelis have in fact convinced themselves that the common waters are theirs. The following statement by Elisha Kally exemplifies the Israeli stance:

Palestinian claims to water presently under Israeli control—particularly the Yarkon Taninim aquifer [the Israeli term for the western aquifer]—will not be practical because of Israel's own water shortages and because they will not have any standing in international law (due to the legal preference for existing and historical consumption over new claims).

There is no doubt that Israel's dominant military power and present control of the headwaters represent the backdrop of this stance. International water law authorities stress that all factors must be weighed and prior use is not paramount. For instance, Hayton and Utton, two

prominent members of the group that drafted the Bellagio Draft Treaty, state: "This language [weighing all the different factors] has become accepted virtually universally."¹² Not so universally, it would seem.

Other arguments could be marshaled against Israel's prior use claim. It may be said that it was lucky for Israel that prevailing social and economic conditions before 1967 did not permit Palestinians to extract larger amounts from the common aquifers. Now that Israel has exploited that very water successfully to spur its own economic development, it is time that Palestinians be given the chance to develop their own economy, a process hamstrung by, among other things, lack of water. In fact, in some of the rules of equitable distribution the "stage of economic development" is deemed as one of the factors to be weighed. In any case, prior use remains a *de facto* condition and does not acquire legitimacy or become *de jure*, unless the co-riparian agrees to it. Israel had not given "prior notification," as international water law requires, to Jordan, then the co-riparian, when it began in the early 1960s to extract substantial quantities of water from the common aquifers and to modify the hydrology of the basin by extracting water from hundreds of wells and letting the spring discharge diminish. In fact, Joshua Schwarz, a high level manager at Tahal, the parastatal Israeli water planning company, told the author that Israel was not obligated to notify Jordan because the water from the aquifers "had always been flowing to the springs emerging in Israel, and nobody except Israel's Water Commission has to be notified on their use."¹³ This stance may be faulted on two grounds. First, Israel was not using the springs themselves, thus altering the natural character of the aquifer. Second, and more important, is that Israel was unilaterally establishing a prior use level which it would subsequently claim as its legitimate share of the common aquifers, when in fact it should have been established by mutual agreement with Jordan. Be that as it may, Palestinians today cannot be expected to accept a grossly unfair status quo.

And if it is a matter of selective interpretation of international water law, Palestinians could insist that the only factor to weigh is the natural attributes of the water sources. Some Palestinian authors and specialists indeed call the western and northern aquifers "Palestinian waters."¹⁴ More concretely, Jad Isaac and Hisham Zarour have proposed that "nature's-apportionment" be the sole criterion for dividing common waters and devised a mathematical formula for this purpose. The formula

12. Hayton & Utton, *supra* note 1, at 669.

13. Letter from Joshua Schwartz, Tahal Consulting Engineers, Ltd., to author (Feb. 23, 1993) (on file with author).

14. See, e.g., Ali al-Jirbawi, & Rami Abd al-Hadi, *The Waters of the Palestinian State: From Taking Away to Restoration*, 4 *Majallat al-Dirasat al-Filastiniyya* 84 (1990) (in Arabic).

incorporates only those variables that pertain to the natural properties of the shared water bodies, to the exclusion of other factors. Nature-based apportionment is the way shared mineral resources are divided,¹⁵ and it can be argued, as Zarour and Isaac argue, that it ought to be applicable to water as well. On the other hand, the history of water allocation among individuals and countries differs from that of other natural resources. For example, Egypt itself (the gift of the Nile) exists as a country today because Egyptians for millennia harnessed the Nile's waters, in spite of the fact that Egypt contributes almost no water to the river. To suggest that such waters be divided now according to the natural characteristics of the Nile would seem precipitous. Elsewhere, use of this factor as the sole criterion for apportionment could be wielded by powerful upstream riparians to deny those in the downstream water they may be entitled to on other grounds. For our case study, were the formula of Zarour and Isaac to be applied to the common Palestinian-Israeli waters the Palestinian share would perhaps be 80 percent or more, the exact opposite of the present distribution. Obviously, Israel would reject such an outcome. Even more, it could use such a proposition as an extra excuse to retain the headwaters.

Briefly, it would seem then that selectively invoking factors based on prior use and hydrology leads to irreconcilable claims. A realistic reallocation would give each party less than the 80 percent they now demand. How much each party should be allotted would be calculated by weighing the rest of the factors as well.

2. *Social and Economic Needs*

Assessing how water division can be based on the social and economic needs of both sides helps us to view water as a means rather than an end. This has a precedent in the Johnston Plan where the division of water was based on irrigation water requirements. The region has changed since the plan, and the substantial population growth in the interim and that expected in the coming years have led many analysts to argue that securing fresh water for drinking ought to top the hierarchy of needs.

In order to estimate the needs, I use the "baseline," or basic-needs, approach employed by Shuval. The author posits that baseline fresh water requirements per person would be: 100 cmy for municipal (domestic, commercial and industrial), and 25 cmy for agriculture. He assumes 65 percent of municipal waste water would be treated and

15. Julio Barberis, *The Development of International Law of Transboundary Groundwater*, 31 Nat. Resources J. 177-78 (1991).

reused in industry and agriculture, which means the gross per capita agricultural water requirements would be nearly 90 cm³. Based on these assumptions, and a "hypothetical" population in the year 2022 of five million Palestinians and 10 million Israelis, the baseline requirements would total 625 mcm³ and 1,250 mcm³ for the two sides, respectively.

Shuval does not examine the implications of his estimate of needs for the reallocation of the common waters. Estimating the needs requires the inclusion of population as a variable. Furthermore, after determining the water needs it is necessary to check them against the water each side possesses, apart from the common waters, and then divide the common water accordingly. In effect, splitting the common waters according to the needs factor amounts to splitting the water sources within the boundaries of Mandate Palestine according to population ratios. If we take Shuval's estimates at face value and keep in mind the data difficulties, the shares would be 74 percent for Palestinians and 26 percent for Israel.

3. *Comparative Costs of Alternative Resources*

Alternative water resources refer specifically to potential sources—such as desalination of brackish groundwater, seawater and imported water—not sources presently exploited or those comparable to them. Those sources, by increasing the size of the "bucket," could facilitate an equitable sharing agreement. They are not an alternative to equitable distribution, as, for example, many of their Israeli advocates seem to suggest. They are one factor among others to consider in the determination of shares. How they affect the equation of equitable apportionment depends on their availability and comparative costs of harnessing them. Naturally, the relative availability of alternative resources must be assessed first, for a riparian without alternative sources, comparative costs are an academic question. The comparative costs are a yardstick of the parties' ability to harness alternative resources. The party that is more able would be entitled to a smaller share of the common sources (just within the confines of this factor).

There are potentially two alternative ways of obtaining water for Israelis and Palestinians: Importation and desalination of brackish and saline water. Regarding importation, numerous schemes have been proposed for transporting water via pipelines or canals from the "water-rich" countries in the Middle East to the poorly endowed. Those schemes require a separate treatment. All that can be said here is that they are last-resort, long-run options to be taken after a discernible stabilization of regional politics. Under present conditions, such schemes would, strategically, increase the vulnerability of Israel, but more so of the Palestinians since Israel could project its military power far afield to protect the water conduits, whereas the Palestinians lack such an option.

At the risk of dramatization, a limited defense force and water from Turkey, for example, would put the Palestinians' very survival at the mercy of the unstable political winds of the region. Be that as it may, the procedure of estimating comparative costs, which I will discuss only in regard to desalination, is applicable to the importation schemes as well.

Desalination technology can be used to extract fresh water from either brackish or saline water. In the West Bank, Palestinians could tap brackish water mainly from the eastern aquifer, perhaps less than 50 mcm. More than one-half of Gaza's aquifer, which I have been counting as a "mainstream" source, has become for all practical purposes an "alternative" source in that it requires desalination to make it fit for drinking, even for irrigation; it may have to be considered as such in calculating the water shares from common resources. There is much less brackish water in the OPT than in Israel where there are scattered brackish water sources throughout; more crucial than these sources, however, is the tremendous brackish-saline aquifer underlying the Negev. That aquifer might suffice the water needs of the Negev region, which was allocated about 20 percent of the water by the late 1970s, for perhaps a century. It could even be used to irrigate crops in the central coastal area.

Other than ground brackish-saline water, there is sea water. The West Bank is a landlocked territory and does not have a sea front, while Gaza has a modest front which may be able to support a major desalination plant. Israel, on the other hand, enjoys a broad sea front extending from the Lebanese border to Gaza's, which gives it flexibility in plant location.

Desalination technology, both of brackish and sea water is available and represents a viable option, particularly for Israel. As for costs, it is reasonable to suppose that the absolute, micro-costs of desalination (plant and operation costs) would be comparable in both the West Bank and Gaza and Israel. Comparative costs would have then to be evaluated with reference to the size of investment relative to the size of the macroeconomy as well as consumer prices.

Measured in Gross Domestic Product (GDP), Israel's economy in 1992 was, by official accounts, more than 25 times larger than that of the West Bank and Gaza, and its GNP per capita six times higher. The gap has widened after the battering of the Palestinian economy during the intifada. Furthermore, Israel already possesses the industry and technology of desalination, while Palestinians would have to import it. All of this makes Israel more capable of tapping the desalination alternative than Palestinians in the OPT.

The other aspect of comparative costs is the relative ability of the consumer to pay for the desalinated water. Based on the present consumer prices in Israel and the OPT as well as on various estimates of

desalination costs,¹⁶ the following can be inferred. In Israel, desalinated brackish and saline water, is affordable for municipal use and economical for agriculture, while desalinated seawater is affordable for domestic use and may be economical for some crops. In the West Bank, desalinated brackish water might be affordable for municipal use, even for agriculture in the Jordan Valley. Gaza consumers, conversely, would be heavily burdened by the costs of desalinated water, even of the brackish type.

All in all, the OPT have limited brackish water, and only Gaza has access to seawater. Israel, on the other hand, possesses huge quantities of brackish water and practically limitless amounts of sea water. Also, the comparative costs both to the national economy and to consumers are far more favorable to Israel. The situation could be tipped even further in favor of Israel if plant operations costs are lowered by implementing some of the "megaprojects," such as the "Med-Dead" and "Red-Dead" projects that would generate hydropower by harnessing the differential head between the Jordan Rift and the Mediterranean and Red Seas, on the one hand, and the Dead Sea on the other. This reasoning would suggest that, from the standpoint of alternative sources, Palestinians in the West Bank and Gaza would be entitled to a larger portion of the common waters than Israel.

4. *Avoidance of Appreciable Harm*

Appreciable harm refers to costs that can be objectively measured as a result of denial of water rights. For appreciable harm to exist, "There must be," according to the 1988 Report of the ILC, "a real impairment of use, i.e., a detrimental impact of some consequence upon, for example, public health, industry, property, agriculture or the environment."¹⁷ The implication of this factor is obvious: no riparian can deny water to a co-riparian if that denial causes appreciable harm, and water must be reallocated in order to stop the infringement. The riparian causing the infringement would in all likelihood contend that it would be appreciably

16. The costs of desalinated brackish water may amount to 30-40 cents/cm; seawater, 60-80 cents/cm. The costs are driven by the price of energy and would change in accordance with the price of oil. In Israel, average costs of production of regular water ran to about 26 cents/cm in the late 1980s; domestic consumers in that country paid a progressive rate averaging 90 cents/cm, whereas, farmers paid a subsidized rate of about 15 cents/cm. Palestinians in the West Bank paid more than \$1.0/cm for domestic water and 35 cents/cm for irrigation water from wells (irrigation water from springs is free). In Gaza, the price averaged 20 cents/cm for irrigation water and 14 cents/cm for domestic water because the water table is much shallower, rendering production costs lower. See Awartani, *supra* note 23; Keenan, *supra* note 57, at 20-23; Tahal Consulting Engineers, Ltd., *supra* note 18, at 9.2, 9.3.

17. Goldberg, *supra* note 32, at 72 (citing Report of the ILC (1988)).

harmed by reallocation. In that case, both claims must be examined and ways found to balance the relative harm incurred by each of the co-riparians.

Palestinians have undoubtedly sustained appreciable harm, and the case for reallocation has been implicitly argued essentially on those grounds. The impact of reallocation on Israel depends on how much water it would have to give up, or rather, give back. The sector most likely to be affected directly is agriculture. Israeli agriculture's share in 1992 was nearly three percent both of GDP and of employment,¹⁸ suggesting that appreciable harm may not result from the reduction of water allocation to that sector. Those indicators cannot by themselves serve as reliable predictors, and more detailed impact analysis would be required. Nevertheless, an estimate by a study group at the Jaffee Center for Strategic Studies at Tel Aviv University shows that a reduction in the amount of available water by 100-200 mcm³ and its replacement by desalinated water would cost the Israeli economy \$30-90 million, and an input/output impact analysis by G. Fishelson finds that cutting irrigation water usage in Israel by one-half would reduce the GDP by two percent.¹⁹ G. Fishelson's estimate was for 1982-1983 when agriculture contributed six percent of the GDP. Today, the impact is likely to be even smaller as agriculture's share of the GDP has diminished to less than three percent. Even if the costs were to prove appreciable, the cuts could be phased without causing "shocks" to the Israeli economy while at the same time not unduly hampering the growth of the Palestinian economy: Palestinian water demand is not likely to rise substantially overnight. Also, part of the increase could be satisfied first from untapped portions of the eastern aquifer and flood run-off, spring rehabilitation, and phasing out the irrigated agriculture of the settlements. At the same time, the Palestinians would agree to sell Israel what remains of their share, reducing the amount over time according to the growth of their consumption—until each party receives its agreed share. This would leave Israel time to make the necessary adjustments in its economic structure and investment in alternative water sources.

Moreover, ways might be found to effect an exchange of various types of water that would reduce the harm even further, if not result in net benefits to both sides, and increase the efficiency of water use. Aquifers are functionally less versatile than rivers. For example, they

18. This was the case in 1992. See Central Bureau of Statistics, *supra* note 21.

19. Jaffee Center for Strategic Studies (JCSS), *The West Bank And Gaza: Israel's Options For Peace* 219-29 (The Jerusalem Post for Tel Aviv U., West Jerusalem, 1989). G. Fishelson, *Allocation and Marginal Value Product of water in Israeli Agriculture*, (a revised version of a paper with same title presented at the First Israeli-Palestinian International Academic conference on Water, Zurich, Switzerland, Dec. 13-16, 1992, photocopy).

cannot be dammed, generate hydroelectric power or be used for recreation and navigation. This confines the "basket of goods" that can be traded among the conflicting riparians essentially to water and makes the division appear to be a zero-sum game: one side's gain is the other side's loss.

Nonetheless, the water is not all the same. It is differentiated according to several attributes: freshness-salinity, location, renewable-fossil, shallow-deep, upstream-downstream. One side may be willing to exchange a larger quantity of brackish water in one location for a smaller quantity of fresh water from another, or a smaller quantity of the same type of water from a shallow well for a larger one from a deep well, and so on. D. Yaron and A. Ratner²⁰ have done a study for regional water exchanges within Israel based on this premise. It goes without saying that the institutional and political context of international cooperation complicates such a possibility and may render it impractical. Nevertheless, the parties may wish to explore further the distinctions among types of water in expanding the realms of costs and benefits. They may be able thus to enhance the efficiency of water use, as well as reach a more ambiguous deal easier to accept politically. And it is here that analytical approaches from welfare economics and cooperative game theory, which I have mentioned earlier, may fruitfully supplement considerations of international water law.

Finally, Israel would be able to capture even greater benefits from regional cooperation in the wake of a peaceful settlement. The benefits would transcend the water sector; but even in the water sector alone and in water-related technology trade Israel could profit. I have already indicated that Israel possesses desalination technology of brackish and sea water. It also runs an advanced research and development (R&D) desalination program. The largest desalination market is in the Middle East, owing in part to the paucity of water and abundance of energy resources. One would expect that Israel would be keenly interested in such market. A second area is hydroelectric power generation. I am referring here to megaprojects such as the aforementioned Med-Dead and Red-Dead canals. These projects require large capital outlays, and no multilateral aid agency, such as the World Bank, would be in a position to assist without the approval of the Arab parties.

In short, Israel not only does not have to sustain appreciable harm as a consequence of reallocation; it also stands to gain in the context of a peaceful settlement through selling desalination technology and tapping hydroelectric power.

20. D. Yaron and A. Ratner, *Regional Cooperation In The Use of Irrigation Water: Efficiency and Income Distribution*, 4 *Agricultural Economics* 45-58 (1990).

IV. CONCLUSION

Israel's unilateral, disproportionate appropriation of the common Palestinian-Israeli has left Palestinians in the West Bank and Gaza with a substandard level of consumption and created a wide water gap between them and Israelis. It runs counter to the international water law doctrine of equitable distribution. Examination of the factors stipulated in the doctrine as a basis for an equitable distribution with respect to the Israeli-Palestinian common waters reveals several important conclusions. First, Israel's insistence on maintaining prior use and Palestinian demand that water be split according to natural attributes of the water sources lead to irreconcilable claims. Second, Israel's refusal to reach an equitable distribution on the basis of the availability to Palestinians of alternative water resources is untenable. On the contrary, brackish and saline water resources and the economic and technical capability to tap them are far more available to Israel than to Palestinians. Importing water from other countries is also more viable for Israel than for Palestinians: Israel could project its military power to protect the water conduits, whereas the Palestinians could not. Third, the possibility of Israel sustaining appreciable harm can be avoided through an agreement by Palestinians to sell to it, in a phased manner, the part of their water share in excess of their water needs. Nor is it a zero-sum game. In the wake of a peaceful settlement, Israel can greatly profit from selling desalination technology in the principal Middle East market, as well as generating hydroelectric power from projects that require approval of the Arab side. Fourth, the two sides may wish to simplify the negotiations, and thereby reduce the "transactions costs" and speed up reaping the "peace dividend," by agreeing to consider the social and economic needs as the core factor. This has a precedent in the Johnston Plan. It would mean dividing the legitimate water of geographic Palestine among the two parties according to population size. Finally, reaching an equitable sharing regime is possible, and would offer an example, and perhaps hope, for the rest of the region that water can become a chameleon of cooperation rather than a chameleon of conflict.