ARE THE CONFLICTS BETWEEN ISRAEL AND HER NEIGHBORS OVER THE WATERS OF THE JORDAN RIVER BASIN AN OBSTACLE TO PEACE? ISRAEL-SYRIA AS A CASE STUDY

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Abstract. Are the conflicts over water resources between Syria, Lebanon and Israel who share the transboundary waters of the Jordan River Basin a major obstacle to the peace process? The Syrians and Lebanese have in the past claimed as their own all of the sources of the Jordan River which arise in their territory. International water law provides a strong legal basis to assure the water rights and continued use of water by a downstream riparian, such as Syria's use of the Euphrates which arises in Turkey and similarly, Israel's use of the Jordan River, based on prior use in an international river basin. This paper will evaluate the water security implications for Israel of a possible peace agreement with Syria and Lebanon which would involve Israel forgoing the continued use of those amounts of water from the Jordan River that were approved by the Israel Government under the so-called Johnston Plan of 1956 – 35 million m^3/yr. for Lebanon from the Hasbani Springs and 42 mm^3/yr. from the Banias Springs and Jordan River for Syria. The maximum replacement cost for that amount of water by desalination of seawater may be about \$0.70/m^3 or, some \$56,000,000 per year. This is not a great amount of money as part of the price for peace. The paper also shows that Israel does not have to hold on to the entire area of the Golan Heights to assure its water security and that a 1-3 km water security zone along the Syrian side of the international border under joint and international inspection can be an effective water security measure to assure inspection, monitoring and control of all the sources of the Jordan River and Lake Kinneret vital to Israel's water security. The scare stories published by some groups in Israel, that Syria could, after a peace agreement is signed, covertly divert essentially all of Israel's water resources derived from the sources of the Jordan River or 30% of the country's water supply are highly unrealistic. Such major works could not go undetected and Syria and the world recognize that such an act would be viewed as a *causus belli* and as an act of war by Israel. In an era of peace, development of the shared water resources of the Jordan and continuous water systems in a program of regional cooperation can bring benefits to all of the partners on the Jordan River Basin.

Keywords: international river basins, international water law, Israel, Johnston Plan, Jordan River, Lebanon, Middle East, riparian rights, Syria, transboundary water, water conflicts

1. Introduction

There is a popular perception shared by some journalists and political leaders that the issue of water security is so existential that the conflicts over water between Israel and her neighbors concerning the ultimate fate of the shared transboundary water resources of the Jordan River Basin and the Mountain

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Aquifer are so deep and intractable that they alone will be one of the major obstacles to peace between Israel, Syria, Lebanon, Jordan and the Palestinians and might even lead ultimately to exacerbation of the conflict between the countries of the region. Dr. Butrus Butrus Ghali, former Foreign Minister of Egypt and former Secretary-General of the United Nations, has said that the "next war in the Middle East will be over water." Other Middle Eastern leaders, including the late King Hussein of Jordan have in the past made public statements containing similar dire predictions about future wars over water in the Middle East. Journalists, political scientists and veteran water experts, have quoted, re-quoted and reformulated the "water wars" hypothesis so often, that it has become accepted by many layman and politicians as one of the conventional wisdoms of the Middle East geopolitics. Joyce Star's *Water Wars* (1991), Gleick's *Water, War and Peace in the Middle East* (1994) and Bulloch and Darwish's *Water Wars* (1993) are but a few examples of this apocalyptic view.

Since the reopening of peace talks between Syria and Israel in December 1999, the issues revolving about the fate of the water resources of the upper Jordan River are particularly relevant and timely.

This paper will examine the issues of the shared Jordan River Basin water resources at stake between Israel, Syria and Lebanon as a case study in an attempt to evaluate whether or not the conflicts of interests are indeed so great that they are intractable or that a basis for an accommodation is nevertheless feasible. The paper will be devoted mainly to an analysis of the past and present water conflicts between Syria and Israel who share the transboundary waters of the upper Jordan River Basin (Figure 1) based in part on an earlier study prepared for the Harvard Center for Middle Eastern Studies (Shuval, 1998).

These nations will hopefully be attempting to reach an accommodation over their conflicts in the peace process initiated by the United States and Russia at the Madrid Conference in 1992 which has assumed new momentum with the peace initiatives of Prime Minister of Israel, Ehud Barak elected in 1999 and the declarations of Syria's President Hafas El Assad that it is Syria's strategic goal to achieve peace with Israel based on the principle that "territories taken by force in war should be returned as a condition for peace". These developments have received new impetus by the initiatives of US President Bill Clinton in December 1999.

However, to provide a framework for a better understanding of the Syria-Israel case study a general evaluation of the water resources available to the five riparian nations on the Jordan River Basin – Syria, Lebanon, Jordan, Israel and the Palestinians – will be presented since they are closely interrelated.

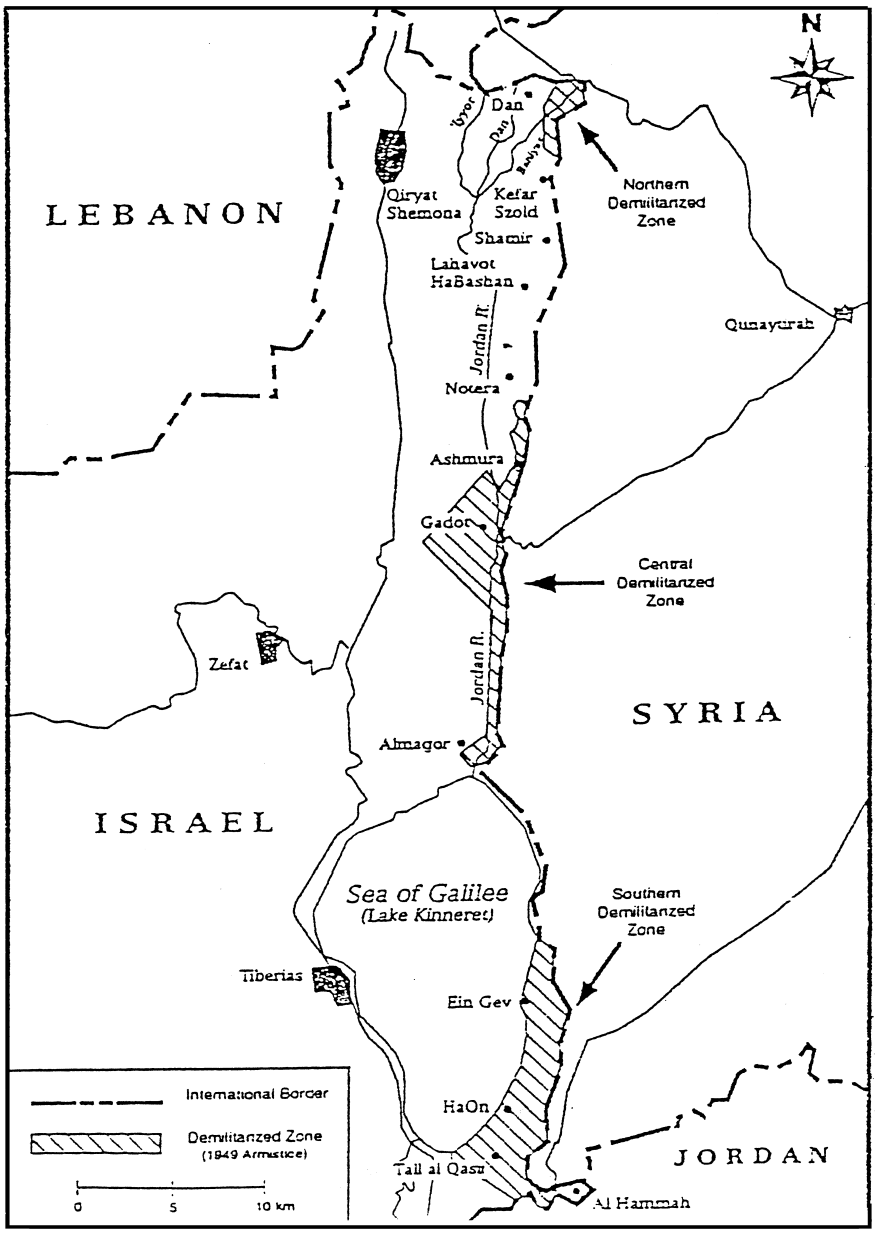

Fig. 1. Upper Jordan River Basin showing the sources of the Jordan with the 1923 International Border Between Israel and Syria and the 1949 Truce Lines and Demilitarized Zones. Source: From Peace with Security: Israel's Minimum Security Requirements in Negotiations with Syria, by Ze'ev Shiff, Policy Paper No. 34 (Washington D.C.-The Washington Institute for Near East Policy, 1993) p.8.

2. Water Scarcity Exacerbates the Problems

According to the study of the Population Action International (Engelman and LeRoy, 1993), many countries in the Middle East now face or will be facing severe water shortages as their populations grow and their water resources remain fixed. The intensity of the differences over water resources in the Jordan River Basin appear to be particularly grave since three of the five partners to the disputed waters – Jordan, the Palestinians and Israel – face serious, long term, water problems, particularly when considering the expected doubling of populations within the next thirty years or so.

It has been suggested by various researchers (Falkenmark, 1992; Gleiek, 1991) as well as by the World Bank that for a country to be considered as having sufficient water for all purposes it would be desirable to have at its disposal at least 1000 cubic meters/person/year(CM/P/Yr.). This estimate apparently assumes that this amount of water is required to assure enough water for agriculture to provide self-sufficiency in the production of most food for local consumption. On the other hand, I have estimated, that the absolute minimum water requirement (MWR*)* for essential domestic/urban/commercial and industrial needs for a truly arid country, with little or no allocation of fresh potable water for agriculture or food production, is a little more than 10% of that figure or some 100 to 125 CM/P/Yr.(Shuval, 1992).

Israel's estimated potential renewable fresh water resources for the year 2000, assuming a return to normal mean rainfall for the region after the extremely severe drought of 1998-99, are about 270 CM/P/Yr. (Israel Hydrological Service, 1998) with somewhat less for the Hashemite Kingdom of Jordan at 200 CM/P/Yr. It has also been estimated that the current figure for the year 2000 for the Palestinians in the West Bank and Gaza is about 90 CM/P/Yr.

The two upstream Jordan River riparians, Syria and Lebanon, currently have considerably more abundant water supplies at their disposal and will not face the same sort of conditions of extreme water scarcity in the future even with a doubling of the population, that will be faced by their three less fortunate downstream neighbors. The potential total water resources available to Syria on a per capita basis estimated for the year 2000 are about 900CM/P/Yr., or some three times as much as is available to Israel and some ten times as much as is available to the Palestinians on a per capita basis. While there are severe water shortages in Damascus, this is mainly a result of lack of proper water transport infrastructure within Syria which could pump available water to the capital. The estimated water resources available to Lebanon in the year 2000 are estimated at some 1200 CM/P/Yr., or four time greater than Israel and some twelve times greater than available to the Palestinians on a per capita basis.

For purposes of a graphic comparison of what is often referred to as the water stress index, Figure 2 shows the estimated annual fresh water availability in the year 2000 per capita in CM/P/Yr. for Israel, Jordan, Syria, Lebanon, and

the Palestinians as well as for Turkey – the country with the most bountiful water resources of the region.

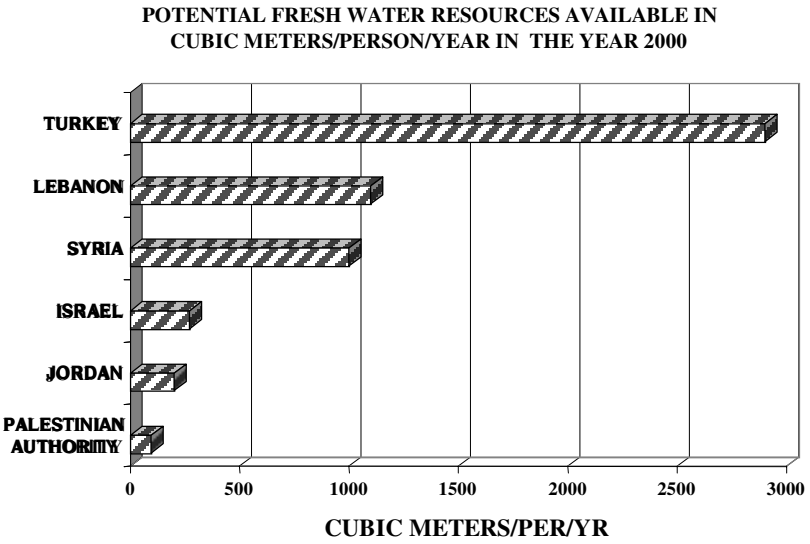

Fig. 2. Water Stress Index on the Jordan River Basin

From the above analysis, with all of its tentative and possibly inaccurate estimates of the availability of water resources some 25-30 years in the future, one thing is clear however, Jordan and Israel will have serious shortages of water and will have available to them just about the minimum of 125 CM/P/Yr., considered by many as the Minimum Water Requirement (Shuval, 1992) for human survival to meet all the needs of domestic/urban/commercial and industrial uses at a reasonable hygienic level and standard of living. The Palestinians will face a still more extreme degree of water shortage with less than half of the amount of water per person considered essential for a minimum hygienic standard of living –that is unless they achieve greater water allocations from Israel and possibly their northern neighbors in the framework of the peace agreement and programs for regional cooperation. It is noted that Lebanon and Syria are estimated still to have available to them significantly more water than the absolute minimum for survival based on the MWR concept.

3. The 1956 "Johnston Plan" Proposals for Allocation of the Jordan Waters Between Syria, Lebanon, Jordan and Israel

In order to understand one of the important background issues in the current Israel-Syrian water conflict it is essential to go back to the year 1955 when Israel started to construct its National Water Carrier (NWC). The plan was to transport water in a 108 inch pipeline, for a total of some 300 km from the Jordan River in the north to the arid south and Negev. This huge project was the flagship endeavor of the Israel water master plan to increase irrigated agriculture and food production and establish homes and farms for the hundreds of thousand of refugees who had arrived in Israel from the concentration camps in Europe after World War II and other areas where there was economic and political unrest. The Syrians objected to Israel constructing the initial diversion canal at Gesher B'not Ya'akov, a point on the Jordan River which was then in the Demilitarized Zone established in the 1949 truce between Israel and Syria. Syrian tanks fired on the Israel construction workers and equipment. In order to prevent an armed conflagration, US President Dwight Eisenhower called for a cease fire and appointed Eric Johnston as his personal envoy and roving ambassador to seek a comprehensive program to develop the Jordan River's water resources 'on a regional basis'. Johnston skillfully avoided discussions of water rights and succeeded in achieving consensus among Israeli, Jordanian, Syrian and Lebanese water experts at the technical level as to the amounts of water each of the riparians could rationally use for agricultural development schemes, with particular emphasis on promoting refugee resettlement projects for both sides.

Stevens (1965) reports that the following was the proposed apportionment of the Jordan River Waters under Ambassador Johnston's final proposal which later became known as the "Johnston Plan" (Table I). It must be stated at this point that there are a number of different interpretations as to the final water allocations included in the Johnston proposals. It is worthwhile noting , that the amount of water allocated by the "Johnston Plan" to Syria of up to 132 million cubic meters/year (MCM/Yr.) and Lebanon of up to 35 MCM/Yr., were exactly the amounts requested by the Technical Committee of the Arab League which under Egyptian leadership formulated the "Arab Plan" for allocation of the Jordan Basin waters.

Of the 132 MCM/Yr allocated to Syria, up to 20 MCM/Yr. was to come from the Banias and up to 22 MCM/Yr. from the main stream of the Jordan River. The Jordan water was "to be delivered by Israel" for irrigation of nearby farms along the eastern banks of the Jordan, since Israel had, according to the international border, full and sole access to the Jordan River. Up to an additional 90 MCM/Yr. was to come from the Yarmuk River which arises and flows through Syria. Those are the amounts of water that Lebanon and Syria themselves demanded and claimed that they needed, and could rationally use in

the limited agricultural areas in the vicinity of the Jordan sources. These figures proposed by the Arab League and approved fully by the Johnston Plan, are worth remembering when it comes to the discussions of the Lebanese and Syrian claims and demands in the water negotiations which are part of the peace talks that will hopefully take place. It is also worth noting that of the 480 MCM/Yr allocated by the Johnston Plan to the Hashemite Kingdom of Jordan, it was clearly understood that some 150-200 MCM/Yr. would be transferred to the West Bank of the Jordan, through a siphon under the river to the proposed West Ghor Canal for the resettlement of the Palestinian refugees in agricultural communities. This is the basis of the current Palestinian claim for an allocation of that amount of Jordan River water.

TABLE I

Volume of the Jordan River Basin's Flow Apportioned between the States in the Final Form of the "Johnston Plan" (Stevens, 1965)
(in million cubic meters/ year - MCM/Yr.)

Jordan	480 MCM/Yr
Syria	132 MCM/Yr (42MCM/Yr from Banias & Jordan)
Lebanon	35 MCM/Yr
Israel	466* MCM/Yr
Total Annual Flow	1113 MCM/Yr

* The residual flow is Israel's share of the total flow, given that the above listed amounts were claimed as necessary by the other states. Israel's share would vary according to the flow conditions of the river system.

Israel was ambivalent, at first, about the Johnston proposals since they were allocated a much smaller share of the Jordan waters than they felt they should rightfully have. Wishart (1990) quotes recently declassified internal US State Department documents which indicate that in June 1955 Israel agreed to the basic terms of the plan that Johnston had drawn up. From Brecher's (1974) study of the documents and minutes of cabinet meetings, it is revealed that in the final internal Israeli debate which approved the Johnston Plan, Foreign Minister Moshe Sharett, Levi Eshkol, head of the Israel water negotiating team and former Prime Minister, David Ben-Gurion who had just returned to the Government as Defense Minister, after his self imposed "retirement" in Sde Boker, all supported the comprehensive view that acceptance of the Johnston Plan would, in the long run bring Israel major geopolitical, economic and strategic advantages including a potential opening of cooperation, *de facto* recognition and ultimately peace agreements with her Arab neighbors –Syria, Lebanon and Jordan.

On the other hand, the technocrats, water experts, water engineers and the settlement and agricultural lobby led by Engineer Simcha Blass, Israel's veteran visionary water planner, took the narrow view and bitterly opposed the plan on the grounds that Israel was being deprived of vital water resources under the deal (Blass, 1960). The broader view of economic, strategic and security advantages of cooperating with the United States and hopefully the Arab neighbors, outweighed the disadvantages concerning the exact amount of water that might be available to Israel under the Johnston Plan and the potential limitations of security and sovereignty over the Lake Kinneret (Sea of Galilee). Without the massive financial support from the United States and the world community, Israel would not have been able to develop its water resources and it opted for potential strategic advantages and political realism rather than the narrow water technocrat/agricultural lobby view which would have led to confrontation and a stalemate.

Despite the acceptance of the Johnston Plan by Israel and the official Arab representatives at the technical level, the plan failed to win the official approval of the Arab Governments and the Arab League (Wishart, 1990). On 11 October 1955, the Technical Committee of the Arab League forwarded the Unified Johnston Plan, which it had approved, to the Political Committee of the Arab League where it failed to win approval. Brecher (1974) and Lowi (1990) cite Arab concern "that their agreement would imply indirect recognition of the Zionist state".

Wishart (1990) concludes that at the political level "the Arabs were reluctant to accept a plan that involved *de facto* recognition of Israel, acquiescence to Israel's development goals and the possibility of a United States security pact with Israel." Wishart reasons that the Arabs apparently opted to break off the water negotiations with the United States, since they did not feel a serious need to develop or utilize the waters of the Jordan River Basin or any pressure about water development in general and felt that they had more to lose politically, than they would gained economically, particularly since each one of the Arab States felt that they could eventually develop their water resources on their own and without need of any regional cooperation projects.

On the practical level, however, informal agreement to comply with the Johnston formula both by Israel and Jordan did provide the basis for the major American financial assistance to Israel in the construction of its National Water Carrier (NWC), which enabled Israel to develop important irrigation projects in the south and in the Negev, and to Jordan in the construction of the Eastern Ghor Canal (now known as the Abdullah Canal) providing for major irrigation development projects along the previously barren eastern banks of the Jordan River. Both countries have cooperated informally ever since in allocations of Yarmuk water along the lines of the Johnston proposals. It was understood that under this arrangement Jordan would eventually build the Western Ghor Canal and supply the Palestinians on the West Bank with 150-200MCM/Yr.

Israel meanwhile continued to plan and work on construction of the National Water Carrier, but shifted the point of water diversion from the controversial site in the Demilitarized Zone at Gesher B'Not Yaakov to one at Eshed-Kinerot (near Tabcha) on the shores of Lake Kinneret, thus avoiding the issue of construction in the Demilitarized Zone and a direct military confrontation with Syria. However, the issues of water allocation with Syria and Lebanon remained unresolved. The Israeli NWC was completed and put into operation in 1965.

4. The Water Issues Involved in the Current Syrian-Israel Peace Negotiations

At the time of this writing, at the early stages of the current Israel-Syrian peace negotiations, there is no clear indication that water issues per se, have been discussed directly or indirectly. However, one critical water related issue has emerged indirectly in connection with the opening Syrian and Israeli positions on the question of the final borders. The official Syrian position, as stated by President Assad and in the press, is Syria expects the peace agreement with Israel to be based on an Israeli return to the borders that existed between Israel and Syria on June 4, 1967 prior to the outbreak of the "Six Day War". This is presumably based on the cease fire lines established in the Armistice Agreement of 1949 between Israel and Syria at the end of the 1948 war, Israel's War of Independence, and additional areas occupied through military actions afterwards by the Syrian armed forces. For example, the cease fire line of the Armistice Agreement of 1949 included within Israeli control the entire 10 meter strip along the eastern fringe of Lake Kinneret as delineated by the 1923 International Border between Mandatory Palestine and Syria and the Hamat Gader (El Hama) Springs area contiguous to the Yarmuk River. The Syrian army occupied these areas by force after the Armistice Agreement. These lines were never clearly established and there are several different interpretations of them. However, the June 4th lines clearly included within Syrian control critical water resource areas on the western side of the 1923 International Border between Syria and Mandatory Palestine, never previously controlled by Syria, which were captured and occupied by the Syrian Army during its attack against the newly founded State of Israel in 1948 and in the period afterward up to 1967 (Hof, 1999).

The stated policy of the Israel Government under Prime Ministers Rabin and Peres, and repeated by Prime Minister Ehud Barak after his election in 1999, concerning the Golan Heights is that "the depth of the peace will determine the depth of withdrawal". President Assad and the Syrian press have stated on many occasions that they base their demand to restart the negotiation at the point they were left off by the late Prime Minister Yitchak Rabin, whom they claim informed them unofficially through the American Secretary of State at the time,

Warren Christopher, that Israel would be prepared to withdraw from the *entire* Golan in exchange for all of the security arrangements they demanded. Israel officially denies that such a commitment was ever made and in November 1999 the US State Department spokesman Mr. Rubin, officially denied that the Americans ever passed on such as commitment to President Assad (Ha'Aretz, November 7, 1999). However, press reports, have suggested unofficially, that based on the precedent of its peace agreements with Egypt and Jordan, where a return to the recognized international borders provided the basis for the agreement, Prime Minister Ehud Barak of Israel might be prepared to consider that in the case of Syria as well, the 1923 international borders that existed between Syria and Mandatory Palestine in 1948 before the war, might provide the point of departure for the negotiations with some minor adjustments (Ha'aretz, November 10,1999).

The Israelis point out that the cease fire lines of 1949 and latter Syrian armed occupation of critical water sensitive areas along the Jordan and Lake Kinneret where the result of aggression and military conquest and that Syria cannot logically demand from Israel to give up the Golan Heights captured during the 1967 war while allowing Syria to hold strategically important areas on the western side of the international border, that it captured in the 1948 war and afterwards. Israelis point out that the very same international border of Mandatory Palestine provided the basis for the peace agreements with Jordan and Egypt and that only by a return to the international border with Syria will there be symmetry and the principle that land taken in war by either side should be returned as part of the peace agreement. While there are other important strategic considerations in the debate about the return to the international border, the water issue is one of the most critical.

5. The Issue of the Borders with Syria Based on Strategic "Water Security" Considerations

There are a number of groups in Israel who oppose giving up part or all of the Golan Heights to Syria and the withdrawal from most of the areas of the West Bank and Gaza to the Palestinians in return for peace. They differ greatly in motivation and ideology. With some, security considerations are of uppermost importance, while with others religious/nationalist/ideological and personal considerations as home owners, farmers and settlers dominate.

Another approach has been inspired by concerns over "water security" and protecting Israel's water sources which arise in the Golan. This approach motivated a study of the possible alternative borders with Syria which would provide Israel with complete control over its current water resources, thus assuring Israel of "water security" on its border with Syria and Lebanon. These resources, which total some 330 MCM/Yr., include the flow of the Banias of

about 120 MCM/Yr. and surface flow to the Jordan from the side wadis of the Golan Heights which can contribute some 30-40 MCM/Yr. in rainy years as well as the flow of the Hasbani of 150MCM/Yr. which arises in Lebanon.

In 1991 a study was made on this question by the Jaffe Center for Strategic Studies of Tel Aviv University, under the direction of the late General (Reserves) Aaron Yariv, former head of Israel Defense Army's Intelligence in cooperation with Tahal-Water Planning for Israel, Israel's leading quasi-governmental water resources planning agency.

The study was never released to the public, for what was originally claimed as security considerations, but which according to Shiff (1993) apparently were mainly politically motivated. A fairly detailed report, leaked to the press by Shiff, has revealed that the Jaffe Center/Tahal study evaluated the possibility of drawing up *water security borders* with Syria which would assure that all the strategic water elements, both ground water and surface water, that Israel is currently utilizing would remain in Israel control. Figure 3. shows these proposed water security borders which are based on the newspaper reported version of the Jaffe Center/Tahal map (Shiff, 1993). This water security map would include within the borders of Israel the key water security areas of importance to Israel in both Syria and Lebanon.

This would include the water tributaries of the Jordan River – the Banias and Hasbani, the El Hama (Hamat Gader) springs, the side wadis of the Golan Heights which can be dammed up for water storage and could divert water from the Jordan water basin, as well as the entire area contiguous to the Jordan River and Lake Kinneret. According to this map, Israel would not have to hold on to most of the Golan from a water security point of view.

Another, possibly more feasible alternative arrangement that has been suggested, which I personally view as promising and that might achieve the same goals, would be for Israel to agree that the areas to be formally returned to official Syrian sovereignty would be up to the international border of 1923. However, as a condition for a peace agreement, a special status water security zone under joint and/or international management, inspection and control should be established. This water security zone would include a strip of some 1-3 kilometers in width all along the entire eastern side of the border within Syria which would include all the main water sources and assure that there would be no direct Syrian access to the Jordan River, the Banias Springs, El Hama (Hamat Gader) or to the shores of Lake Kinneret. Except for the amount of water which would be allocated under agreement to Syria, the remainder of the water from these sources would continue to flow freely into the Jordan River for Israeli use as in the past (Figure 4).

The justification for either of the above arrangements is Israel's legitimate concern that Syria and Lebanon might once again attempt to divert the sources of the Jordan River in order to prevent Israel's use of the Jordan water as they did in 1965. International Law gives special weight to the fact that once one of

the partners to a dispute has made a serious violation of international water law which gravely threatens a country's main source of water, there is a strong case in support for requiring special arrangements and assurances in a peace treaty to guarantee that such a violation will not be repeated.

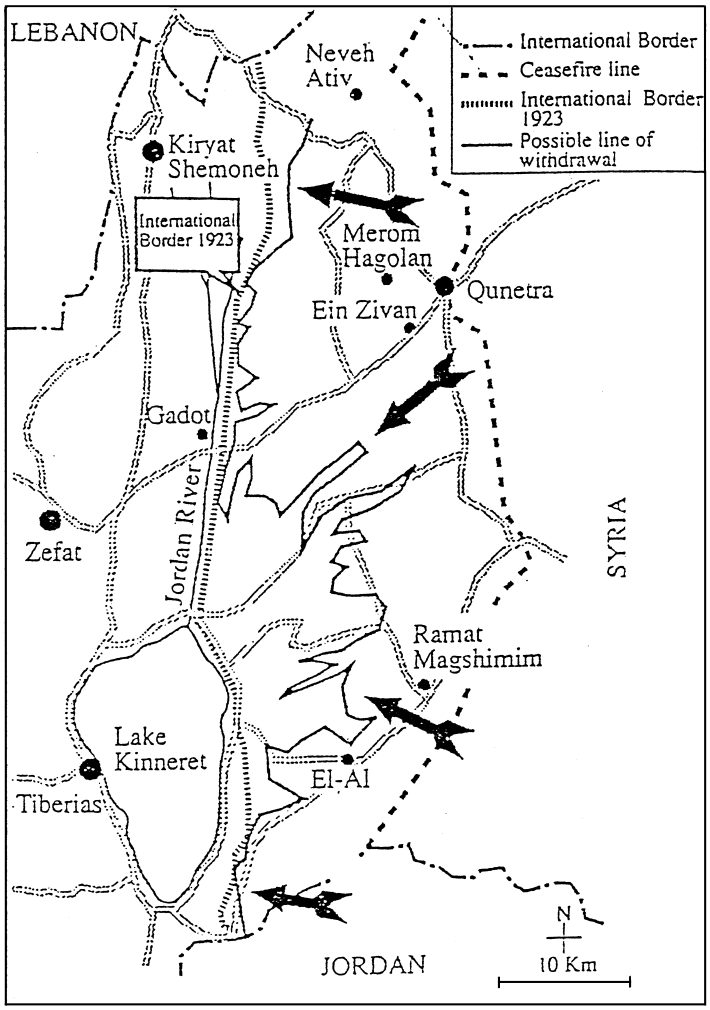

Fig. 3. Suggested Possible Lines of Israeli Withdrawal from the Golan Heights Based on Water Security Considerations. After the Report by the Jaffe Institute of Strategic Studies of Tel Aviv University and Tahal-Water Planning for Israel. Source : Ha'aretz Daily Newspaper Ltd. October 8, 1993 , part 2.

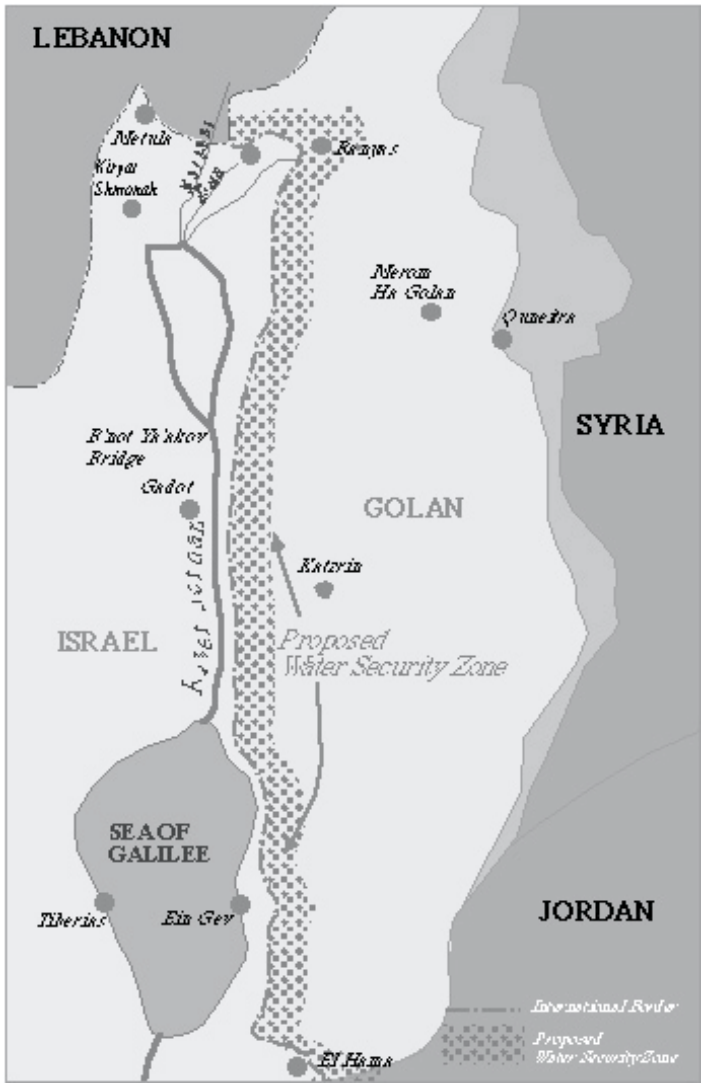

Fig. 4. The Proposed Water Security Zone: The Golan Heights, the Upper Jordan River and Lake Kinneret showing the 1923 International Border between Israel and Syria. A Schematic Presentation of the Proposed Water Security Zone (hatched area) along the Eastern Side of the International Border with Syria which could be under Syrian sovereignty but with joint and/or international inspection, control and patrols which would assure Israel's water security without the need to hold on to the Golan.

In spite of the above, it should be pointed out that the official international Syrian/Palestine (Israel) borders of 1923, which according to press reports are apparently the basis for the point of departure for the discussion of borders proposed by Prime Minister Ehud Barak's government as a basis for an agreement, covers a good part of these water security zones that are of special importance and interest to Israel including no direct contiguous border between Syria and Lake Kinneret and the Jordan River. However, the actual Banias sources and the drainage areas of the side wadis in the Golan are on the Syrian side of the international border. The sources of the Hasbani River are in Lebanon. These Golan Heights side wadis, however, at best would yield some 30 MCM/Yr. in good years and little or nothing in draught years. They are hardly worth arguing over.

6. Size and Scope of the Water Dispute between Israel, Syria and Lebanon

As of the time of writing this paper, press reports do not provide a clear picture on Syrian expectations or demands for a settlement concerning water. According the Johnston Plan, Syria was to be allocated only 20 MCM/year from the Banias, 22 MCM/Yr. from the Jordan River and 90 MCM/Yr. from the Yarmuk for a total of 132 MCM/Yr. (Brecher, 1974).

Lebanon was also allocated an additional 35MCM/Yr. from the Hasbani. These figures were based on an independent Arab League evaluation of the amount of agricultural land that Syria and Lebanon could economically irrigate with waters taken at those low elevations. At the time of the Johnston negotiations in 1955, Syria demanded that those amounts of water be allocated for its use. Johnston included the Syrian demands in full in his final plan which was apparently approved by the Government of Israel. While prior to 1967, Syria had not utilized the flow of the Banias or the Jordan to any great extent, it has during the period of 1974-1987 diverted far more from the Yarmuk and its groundwater sources than the amount allocated under the Johnston Plan.

As a first rough estimate of possible Syrian and Lebanese demands, it could be assumed that the minimum amount of water that Syria could claim that it could usefully divert from the Jordan sources and economically utilize for agricultural purposes within the lower reaches of the Golan Heights would be the 42 MCM/Yr. requested by Syria in 1955 and included in the Johnston Unified Plan. That would be enough water to irrigate some 5,000-10,000 ha. There is, however, a serious question whether that much flat irrigable agricultural land is actually available in the lower Golan or area contiguous to the Jordan River on the Syrian side. Lebanon might also be expected to demand the 35 MCM/Yr. allocated to it under the Johnston Plan although here too, it is

questionable if it could effectively use the water without major pumping to other more distant areas. This is a total of close to 80MCM/Yr.

One scenario assumes that under a peace agreement, Israel will return all or most of the area of the Golan Heights to Syria, in exchange for adequate security arrangements including demilitarization of the Golan, full diplomatic relations, an agreement on water and peaceful cooperation. While there was only very limited Syrian irrigated agriculture on the Golan prior to its occupation in 1967, Israeli settlements with the help of the "Mei Golan" Water Cooperative and the Mekorot Water Company have meanwhile developed irrigated agriculture on the Golan, mainly through the construction of some 15 small dams which can supply some 30 MCM/Yr. of water in good years. Practically no water is collected by these dams in drought years. Prior to the Israeli occupation of the Golan in 1967, most of this water would normally have drained into Lake Kinneret and become available for use by the Israel National Water Carrier. In addition a well field pumping some 6.5 MCM/Yr. has been developed at Alonie Bashan in the central Golan at an elevation of 600 m above sea level (Amon, 1994). It can be assumed that under a peace agreement which returns all or most of the Golan to Syria, these waterworks in the Golan Heights would revert to Syria and that Israel would view the 40-45 MCM/Yr. of Golan water as part of the Jordan River Basin waters allocated to Syria under the original Johnston Plan. This could be seen as meeting the full allocation assured Syria under the Johnston Plan.

Pumping water up from the Lake Kinneret, which is at minus 210 meters below sea level or from the Banias Springs at plus 350 meters to the agricultural areas on the central Golan Heights at levels ranging from up to 800-1000 meters above sea level is expensive. It has been estimated that the energy cost alone is about $\$0.20/m^3$ on average (Amon, 1994). Including capital cost the total cost of the water might come to about \$0.25-0.30/CM. While water at this price is too expensive and totally unfeasible for Syrian agriculture, it might eventually be feasible for urban use. The Syrian press has reported on plans to resettle the Golan with some 400,000 refugees after its return to Syria under a peace agreement with Israel. It not possible at this time to validate how realistic such plans may be, but it is questionable that there is an economic basis for settling that many people based on the limited agricultural resources of the Golan.

There are at this time little if any other uses for water in southern Syria other than simple gravity flow irrigation and labor intensive agriculture. Most of the cultivable land in southern Syria that might use the disputed waters of the Jordan sources is at an elevation some 500-1000 meters above the water sources of the Jordan and Lake Kinneret. Pumping water up some 500- 1000 m from the lake or Jordan sources, to the upper Golan Heights and to southern Syria would be out of the question from an economic point of view for normal agricultural uses.

However, the Syrians may have in mind a project supplying Jordan water for domestic purposes to Damascus which suffers from serious water shortages. Considering the distance and height to which the water would have to be pumped, the cost would be considerable and most likely more expensive than closer alternative sources that do not require lifting the water to such heights, that could supply water for Damascus.

At one stage in the early water conflicts between Israel and Syria in the 1950s Syria claimed that all of the water of the Jordan River is derived from rainfall in Syria and Lebanon and thus is "Arab Water" that belongs to those two upstream countries. Under such a rationale the Syrian maximum claim might include the entire flow of the Banias of 120 MCM/Yr. and the flow of 30-40 MCM/Yr. from the Golan side wadis for themselves and the entire flow of the Hasbani, of 150 MCM/Yr. for the Lebanese, for a total of some 300 MCM/Yr. They might justify these claims based on the argument that the sources of these tributaries to the Jordan River arise in Syria and Lebanon and thus are fully their property. However, prior to the occupation of the Golan in 1967 and prior to the establishment of Israel in 1948, neither Syria nor Lebanon actually used much water from those sources, which have always flowed naturally downstream in the Jordan River and for the past 40 years or so have been fully exploited by Israel.

The Syrians would have difficulty in justifying such a claim under modern precepts of international water law which does not recognize upstream, source countries, as the sole and absolute owners of all water flows on an international river basin. Just the opposite, international law gives considerable weight to the rights of downstream users to continue their use of that portion of an international water basin which they have previously used for human uses and economically productive purposes (Caponera,1992). The UN approved version of the International Law Commission report gives priority to the rights of historical or prior use and considers depriving a downstream riparian that currently uses the water for economic and social uses as unacceptable since it will result in "appreciable damage" to the current user.

An outstanding example of such a situation, with which Syria is fully familiar, are the undeniable historic rights of Syria itself, which derives much of its waters from the Euphrates river that emanates in the territory of its upstream neighbor – Turkey. Another well know example is that of Egypt. International water law fully recognizes the historic rights of Egypt to the use of the waters of the Nile River, which it currently uses and has used for thousands of years, despite the fact that essentially 100% of its flow emanates from upstream countries.

Another factor in international water law that would weigh heavily against such a Syrian claim would be the fact that the Syrian overall water resources potential per capita is estimated for the year 2000 to be some 900 CM/P/Yr. or more than three times that of Israel's 270 CM/P/Yr. Syria would have a difficult

time proving that it has an overriding objective need for the additional allocation of water resources it never, in fact, used, as compared to its water poor downstream neighbors. As pointed out previously, even the 1955 Arab League water plan accepted by Syria, Lebanon and Ambassador Johnston only claimed 20 MCM/Yr. for Syria from the Banias and 22MCM/Yr. from the upper Jordan with only 35 MCM/Yr. for Lebanon from the Hasbani.

7. What Will Be the Basis for an Agreement on the Water Issues?

It is beyond the scope of this paper to anticipate the outcome of the direct negotiations between Israel, Syria and Lebanon on the peace agreement in general, and the issue of borders and water agreements, in particular. However, it would not be unreasonable to assume, as suggested above, that Syria and Lebanon will, in the first instance stake a maximum claim to the full estimated 300 MCM/Yr. from the upper Jordan headwaters which are derived from sources in Syria and Lebanon (150MCM/Yr. from the Banias and side wadis of the Golan and 150 MCM/Yr. from the Hasbani), even though they never used significant amounts of those waters themselves.

While such a maximalist water claim may be used to gain leverage on other points in the negotiations, the economic motivation and objective needs for Lebanon and Syria to gain major water allocations at the sources of the Jordan would apparently not be great. A pragmatic "compromise" proposal on the Syrian/Lebanese side would not be so unlikely if this analysis is correct. Such a Syrian/Lebanese compromise might be the demand that they be allocated their share of Jordan water as defined under the Johnston Plan, which was approved by the Israel Government in 1955 - that is 35MCM/Yr. for Lebanon and 42 MCM/Yr. for Syria. The Syrians have already taken more than their share of the Yarmuk. as defined by the Johnston Plan. It should be pointed out that the Jordan - Israel agreement used the allocations of the Johnston Plan as the point of departure for their negotiations.

8. Agricultural, Social and Economic Implications of a Compromise on Water Based on the "Johnston Plan"

Although I take no position on the feasibility or justification of such a proposal, it is presented here as one possible example and illustration in order to examine the water resources, agricultural, social and economic implications for Israel of a possible Syrian-Lebanese proposal for a compromise settlement. Let us assume that Syria and Lebanon propose to reduce Israel's use of the headwaters of the Jordan River sources by about 80 MCM/Yr., which are the volumes of water that theoretically would have been allocated to them under the Johnston

Plan. This represents some 5% of Israel's current annual renewable fresh water resources of some 1600 MCM/Yr. This would, in the first instant, result in a direct reduction of the highly subsidized water allocation to agriculture in Israel, leading to about a 10% reduction in the supply of fresh water of good potable quality to the agricultural sector. With Israel's deep ideological commitment to support its agricultural base such a reduction of the water allocation to agriculture would be painful indeed and would most likely be opposed by the water and agricultural lobbies as well as raise questions in the minds of part of the Israeli public as to the potential threat to Israel's water and food security.

Let us examine if indeed, a 10% a cut in the water allocation to agriculture would be, in reality, a threat to Israel's food security? The Food and Agriculture Organization of the UN (1989) has estimated that it takes some 1000 tons or m^3 of water to produce 1 ton of wheat or grain and some 16,000 tons of water to produce one ton of meat. Thus, the import of these products can be considered the import of "virtual water" – the huge amounts of water which are imbedded within such food staples (Allan, 1995). The FAO has reported that the amount of water required to grow all of the basic food required for an individual is somewhere between 1000-2000 CM/P/Yr. In Israel, after allocating some 125 CM/P/Yr. to the urban/commercial/ industrial sector, the remaining 145 CM/P/Yr. goes to Israel's agriculture sector. This amount of water is only about 10% of what the FAO estimates is needed to grow all of the food needs of an individual. Thus, it can be seen that today Israeli agriculture can produce only a very small percent of the basic food needs of the country, even if it devoted all of the current available agricultural water for that purpose. However, since Israeli agriculture naturally attempts to optimize profits by growing crops with the highest economic return, it in fact exports a high portion of its high value agricultural production including flowers and exotic high quality vegetables and fruit. Israel's food security for the past 20-30 years or so has not been based on its limited water resources and local agricultural production, but on the ability of its commerce, tourism and industry to earn enough money for the national economy to allow for the unrestricted import of inexpensive "virtual water" in the form of food staples which provide a high percent-about 85-90% of the calories intake and food needs consumed by the country's population. Since today Israel's agriculture plays only a minimal role in the country's food security, a 10% reduction of water to agriculture is primarily a financial issue for farmers, not a food security issue for the country.

At this point we must ask what will be the real economic and social impact of such a reallocation of water resources to Syria and Lebanon as part of the price of peace? The Harvard Middle East Water Project (HMEWP) (Fisher,1996; Shuval,1995) has made an evaluation of the value of water to the Israel economy and has developed the concept of water markets for the Israeli, Palestinian and Jordanian economies. In our work on this project we have, among other things, evaluated the economic value of the water involved in the

water disputes between Israel and the Palestinians. In other word, we have monitized the size of the water in dispute and found that it was not great. As Professor Fisher puts it, when the water dispute is viewed in monitory terms it is easier to see that, "Such a sum of money is small enough for countries to negotiate over rather than to go to war over" (Fisher, 1996).

However, the HMEWP has not made a study of the economics of water disputes between Israel, Lebanon and Syria, so that my own very tentative analysis presented here can only be considered as a most preliminary attempt to illustrate the type of thinking involved. The earlier stages of the studies by the HMEWP in which the author participated have shown that the maximum current value of the Jordan River water for Israeli agriculture has been estimated roughly at about $\$0.20/M^3$ (Fisher, 1996). Thus, it can be estimated that the net current loss to Israel of forgoing 80 MCM/Yr. of Jordan water for agricultural use in the central or southern regions of Israel would be about $16 million/year. This is a relatively small amount of money or about 0.0016% of the Israeli Gross Domestic Product (GDP) of about $100 billion/year in 1999. This would have little or no economic or social impact on the overall strength of the Israel economy.

Let us, however, assume that at some time in the future, say in the year 2010, the 80 MCM/Yr. of water that hypothetically Syria and Lebanon demand and divert, would be needed for domestic/urban/industrial use along the coast of Israel at Tel Aviv and would have to be replaced by seawater desalination in the south of Israel. It is not unreasonable to assume that with technological improvements already on the horizon, there will be a significant reduction in the cost of desalination. Thus the predicted replacement cost for that amount of water for Israel by desalination along the Mediterranean coast by that time would be about $\$.70/M^3$ or some $56,000,000 per year. Some experts predict that desalination costs will be even lower than that. However, these optimistic estimates neglect to include additional costs such as transport of the desalinated water from the plant to the distribution system, operational storage, and mixing and treatment facilities. In any event, even this amount of money, that might be forfeited at some distant date in the future, is not great.

However, by increasing the total available fresh water resources by seawater desalination for domestic/urban/industrial use, there will be a proportional increase in wastewater flow from urban areas and the increased potential for recycling and reuse of some 65% of that additional flow. This might provide an additional 50 MCM/Yr. for agricultural use. Thus, the total reduction of water to Israeli agriculture will be only about 30 MCM/Yr. This is indeed an insignificant cost as part of the price of peace which would make little or no economic impact on the Israeli economy or agriculture.

In this way, using the Harvard approach, the approximate size of the dispute in monetary terms can be estimated. Of course there are many necessary refinements in the actual economic simulation model used by the HMEWP in

order to obtain a more accurate estimate, but as a rough first look, Professor Fisher agrees that the above figure is not far off.

While Israel's water and agricultural lobby may well see such a compromise and the agricultural and economic implications involved as unacceptable, it can be pointed out that such a price for an accommodation on the water issue would be only a small part of the total expense of reaching a comprehensive peace agreement with Syria involving withdrawal from most or all of the Golan Heights. These costs will include many billions of dollars in compensation for the settlers and investors who built homes, farms and factories on the Golan and who must be moved and resettled in other areas, the relocation of army bases and the construction of special security and early warning arrangements included in the peace agreement. It is beyond the scope of this paper to discuss the geopolitical, economic and social advantages for Israel and the region at large of reaching a peace agreement with Syria and Lebanon which are obviously very great , but one thing is clear – reaching a reasonable compromise on the water issue will have very little strategic or economic impact on Israel as compared to the other issues associated with the peace process.

In conclusion, this approach would suggest that in rational social and economic terms, when the water dispute is converted to financial terms, such a dispute between the three countries over such a small annual amount of money is hardly enough to justify an end to the peace negotiation or starting a "Water War". It might be argued that that would be a relatively small price to pay to achieve an overall peace and security settlement. It must be emphasized that water is, after all, an economic good which can be replaced and purchased in unlimited quantities by seawater desalination at a price which is, more or less, the price that Israelis now pay for urban water supply.

9. Regional Cooperation in Developing Additional Water Resources

Various studies have shown that on complex multinational watersheds regional cooperation is essential in optimizing the development of the water resources for the benefit of all of the riparians. Rogers (1993) has shown, based on the experience in the India-Pakistan water dispute and others, that in most situations cooperation by the riparians in the development of the water resources can benefit all the partners to the river basin dispute. He proposes approaches based on game theory concepts which provide solutions for economic cooperation on international river basins "based on maximizing the total net benefits that could be derived from the utilization of the basin, given the total resources available for the development".

It is beyond the scope of this paper to discuss in detail possible advantages that can be gained by all partners, through the development of regional water projects under conditions of peace in the region. Some of these have been

described elsewhere (Shuval, 1992; Kally in Assaf *et al.*, 1993 and Kally, 1990). They might include the following:

9.1. PURCHASE OF WATER FROM LEBANON

Purchase of water from Lebanon and the construction of pipelines from the Litani and Awali rivers could supply water directly or indirectly to Jordan, The Palestine Authority (PA) and Israel. A simple 10 km tunnel from the Litani could deliver the flow of the Litani River in Lebanon directly to the Jordan River which could transport it to downstream users. The water of the Awali River might be diverted in a similar manner. Lebanon might be able to supply as much as 500 MCM/Yr. from these sources for a period up to 25-30 years, which would cover the economic life of the projects which would bring a reasonable profit to Lebanon and relatively cheap water to the downstream partners. At the moment, most of this water flows to the sea, since there is little suitable land for agricultural utilization in the proximity of those two rivers. Estimates indicate that the cost of water from such a project would be about one third the cost of desalination of seawater. An alternative alignment for a relatively inexpensive Awali/Litani pipeline would be along the Lebanese coast directly to Israel where it could be pumped up to the West Bank for Palestinian use or used directly by Israel which would in exchange transfer water from the mountain aquifer for Palestinian use. Water projects such as these from Lebanon may well be the least expensive and most feasible both from and engineering and geopolitical point of view in an era of peace.

9.2. DAMS ON THE YARMUK

The construction of a dam or dams on the Yarmuk could supply electrical power to Syria and Jordan and water to Jordan and the PA. This project might make possible the construction of the Western Ghor Canal which was originally planned by Jordan to transport Yarmuk water across the Jordan River for the benefit of the water-short Palestinians on the West Bank. While not inexpensive it might be feasible from a geopolitical point of view since it would not require direct Israeli participation, but would require Israeli agreement as the downstream riparian on the Yarmuk.

9.3. TRANSPORT OF WATER FROM TURKEY

Such a project would involve purchase of water from Turkey, which could be supplied to Syria, Jordan, the PA and Israel through a regional overland or undersea pipeline system or alternatively by sea transport, in refurbished oil tankers or with special large plastic bag/tankers called “Medusa Bags”. About 1000-2000 MCM/Yr. or more might be supplied to the area by Turkey through

such projects. Of course, a project involving Syrian cooperation would require that Turkey, Syria and Iraq reach an accommodation over their long standing disputes over the Tigris and Euphrates Rivers. The concept of an under-sea pipeline from Turkey is not as far fetched technically as might appear at first hand, since there are numerous successful examples of such sea bottom pipelines for gas, oil and water. Such a pipeline which would pass through international waters would overcome most of the geopolitical objections to such a project. The undersea pipeline would be attractive to Turkey since, with it, it could supply water to the Turkish Zone in Northern Cyprus, which suffers from a severe water shortage.

Another attractive low cost alternative, first proposed by us in 1993 (Assaf *et al.,* 1993) would be based on an agreement between Turkey and Syria for the purchase of an increased supply to Syria through the natural river systems. Syria could then increase the flow of the Yarmuk to Jordan which would transport a portion to the Palestinians through a pipe under the Jordan River as envisioned in the original Western Ghor Canal. Another option would be for Syria to transport the Euphrates water in a new pipeline which could also supply water-short Damascus, to the headwaters of the Hasbani in Lebanon for release into the Jordan River system with the understanding that this would also lead to an increased allocation for the Jordanians and Palestinians. This option would not involve any major pipeline construction work and might be reasonably economical. Of course all of the beneficiaries would have to share in the costs and the payments to Turkey for the water sold to the project. All of these projects could only be considered in an era of stable peace and mutual trust.

9.4. ECONOMIC COOPERATION THROUGH WATER MARKETS

The approach developed in the early stage of the HMEWP has clearly shown that in the case of Israel, Jordan and the Palestinians, economic cooperation within the context of a limited water market approach, among the riparians sharing the water resources, is more beneficial to all of partners than going it alone (Fisher, 1996). Other studies on the economic approach have reached similar conclusions.

While the engineering feasibility and price of water from the Litani and Awali has been estimated to be promising, the geopolitical aspects and economics of the other two water import projects are less clear and require further study (Kally in Assaf *et al.,* 1993). While they undoubtedly will be more expensive they still may possibly prove to be less expensive than desalination. Another factor that might weigh in favor of water transport or pipeline projects is that once the capital investment has been made, the pumping and other operational costs and energy requirements are relatively low. Desalination, on the other hand, has very high energy demands and would result in a very heavy long term commitment to import fuel which is not naturally available to Israel,

the Palestinians or Jordan. This is in itself a serious security factor that must be considered. It must also take into consideration that, in the long run, the costs of imported fuel may well increase significantly which could, with time, change the optimistic estimates of the cost of seawater desalination.

10. Conclusions

In this paper, we have shown that it may be possible to reach a reasonable accommodation with Syria and Lebanon over their water conflicts with Israel which would take into consideration both realistic Syrian needs and interests and Israel's water needs and deep water security concerns, without resulting in a serious negative agricultural or economic impact on Israel. We have also shown that it is not necessary for Israel to hold onto the entire area of the Golan Heights since a 1-3 km water security zone under joint and/or international inspection and control on the Syrian side of the border would ensure Israel's water security needs.

It is not clear that Israel's agriculturally-oriented water establishment and water negotiators are ready at this stage to accept the pragmatic economic and geopolitical approach as presented in this article. Some may oppose an accommodation with Syria that involves any reduction of Israel's absolute control over its water resources on the Golan or any commitment to share the water sources of the Jordan River system with Syria and Lebanon. There are groups in Israel that claim that a country must physically maintain an absolute hold over all of its water sources to assure its water security. The term "control over the water sources" is essentially a code word for some of these groups, who want to maintain full political control over all or most of the Golan.

However, experts in international water law would hold that the claims that only by physical occupation of the territories, which serve as a source of its water resources, can a country assure its water rights, is not generally supported by the normal practice of peaceful nations or international water law. If this were so, Iraq and Syria would be justified in taking over the vast water sources in Turkey to assure the continued flow of the Tigris and Euphrates Rivers. Egypt would have to occupy most of Sudan, Ethiopia and some eight other African countries which are the source of the Nile. Holland would have to take over much of Germany and France to assure its control over the Rhine River, its major source of water. There are numerous examples of agreements between nations living in peace on international rivers and transboundary water sources who have achieved agreed upon modes for joint inspection, monitoring and environmental control which assure the water rights and the protection of the environment for each partner through joint management and cooperation. Even long term enemies such as India and Pakistan have reached peaceful accommodations over their bitter water conflicts.

However, whatever final agreement is reached on the division of the waters of the Jordan River Basin, and the fate of the Golan Heights, it will be essential to establish a joint Jordan River Management Board (JRMB) which will have the task of assuring mutual inspection, monitoring and control on both sides of the final borders to assure that all parties to the agreement take no more than their agreed upon share and that agreed upon pollution control measures to protect the quality of the water sources be strictly enforced. The JRMB would hopefully also be given the task of developing joint regional cooperation projects and their management. The peace agreement must also include methods of resolving disagreements and disputes at various levels and stages mainly by direct negotiations, but including additional procedures for conflict resolution such as facilitation, mediation, arbitration and if all of those fail to resolve the dispute, there should be a final obligation to resort to binding arbitration or adjudication before an agreed upon court.

Those in Israel who are prepared to accept a major territorial compromise with Syria on the Golan Heights, in return for full peace with adequate security arrangements and diplomatic, economic and social normalization, have accepted the reality that it will most likely be necessary to reach an agreement which could formally return to Syrian sovereignty most or even all of the Golan up to the recognized Syrian-Israel international borders of 1923. However, a reasonably high degree of water security for Israel could be assured if this peace agreement would contain a special proviso that would assure that there be special areas –water security zones – of joint and/or international management and control. These areas – a 1-3 km wide strip along the Syrian side of the international border, for special joint and/or international inspection and control – would include critically sensitive water source areas such as the Hasbani, El Hama and Banias Springs which are the main tributaries of the Jordan River. These special water security zones should include as well a sufficiently wide strip of land contiguous to the eastern banks of Lake Kinneret and Jordan River to be monitored and patrolled by Israel and/or an international force, in which there would in effect be no Syrian activity. The area involved is a relatively minor portion of the total area of the Golan Heights. In this way Israel will be able to assure monitoring and control of most of the important water sources and assure that there will be no direct Syrian access to the Jordan River and Lake Kinneret.

Hopefully, the sides to the water conflicts on the Jordan can achieve an agreement over water which assures each of them their appropriate water rights, national interests and needs based on a reasonable degree of water sharing coupled with strict joint inspection, monitoring, control and management of critically sensitive water sources.

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