

WORKSHOP IN POLITICAL THEORY
AND POLICY ANALYSIS
513 NORTH PARK
INDIANA UNIVERSITY
BLOOMINGTON, INDIANA 47405

The Jordan Basin: Political, Economic, and Institutional Issues

Thomas Naff

University of Pennsylvania

Scarcity and maldistribution constitute the two basic models of riparian problems in the Middle East that between them contain a representative typology of water issues that policy makers in governments and international agencies such as the World Bank and United Nations may expect to encounter in their attempts to devise political and economic policies.

The Jordan basin best represents the model of scarcity with attendant problems of overpopulation, insufficient financial resources, poor management, and imbalance of power among its riparians. The Euphrates represents the model of serious maldistribution, despite current sufficiency, with parallel problems of money, personnel, and power. For the political analyst and modeler, perhaps the most interesting aspect of these basins is that together they demonstrate the systemic, political, and socio-economic interconnections of water issues which, by their nature, make piecemeal planning and investment strategies less effective or counterproductive in the long run.

Moreover, in the Middle East, where aridity, scarcity, and some of the world's most atavistic rivalries exist, it is an inescapable reality that there is little hope for the resolution of water based conflict--or cooperation--until sustainable political settlements are put in place. At the crux of conflict in the region is the denial of a national state for the Palestinian people, and water is a keystone of this issue because, demonstratively, it is integral to the other crucial factors of security, ideology, and politics.

The Jordan basin drains an area of some 18,300 square kilometers. The Occupied West Bank, which figures importantly in this discussion, covers an area of 5,584 square kilometers (or 5,946 square kilometers if one includes East Jerusalem) and the Gaza Strip, an area of 360 square kilometers. Precipitation in the basin ranges from less than 50 mm/yr to over 1000 mm/yr but averages less than 200 mm/yr on both sides of the Jordan River. Although diminutive in comparison to the Euphrates or Nile basins, the Jordan is nonetheless as politically complex and more conflict prone.

While there are four riparians in the basin system--Jordan, Israel, Syria, and Lebanon--some eighty percent of the basin is situated in Jordan, Israel, and the West Bank, and it is these populations who are most dependent on its waters. From surface,

ground, and marginal sources, Israel normally has available about 1950 Mcm/yr of renewable fresh water supplies. However, owing to conditions of shortage stemming mainly from drought, Israel can presently count on only about 1600 Mcm/yr.¹ Jordan, which has usually derived about 900 Mcm/yr of useable water from all sources (including the Yarmuk but excluding the lower stem of the Jordan River because of excessive salinity) is down to 700-750 Mcm/yr for the same climatic reasons.² The Occupied Territories (the West Bank and Gaza) have a normal total water productive capacity of about 650 Mcm/yr, but the supply is currently diminished to about 450-550 Mcm/yr, again owing mainly to drought.³ In this context, because of its importance, the relationship between Israel's groundwater sources (which contribute two-thirds of Israel's water account) and the Occupied West Bank aquifers needs to be highlighted.

The pivotal issue is the location and direction-of-flow of the West Bank's aquifers together with the fact that Israel is highly dependent on them for its supply. It should be stated from the outset that Israel derived significant amounts of water from those West Bank aquifers that flow across the 1949 Armistice border (the so-called Green Line) prior to 1967 when Israel gained complete control over Territories and their water supplies.⁴

Of the major aquifer groups in the Jordan basin only one,

the Coastal Plain, which is the second most abundant with an annual average yield of about 280 Mcm/yr, lies within Israel proper, that is, within the Green Line, along the most built-up and densely populated west coast of the country. The Coastal Plain aquifer is the "most severely depleted aquifer in Israel."⁵ The other three aquifers originate in the West Bank and two of them flow across the Green Line to emerge in Israel. The most plentiful, the Yarqon-Taninim, situated in the western sector of the West Bank, runs mainly east to west and in some places southeast to northwest along the western foothills of the West Bank. Its natural recharge of 340 Mcm/yr drains an area of 1,600 square kilometers and flows in a westerly incline across the Green Line into Israel, finding its principal outlets in the Yarqon and Tanninim springs in the coastal plain. Prior to 1967 water from this aquifer was used chiefly for the Yarqon-Negev Project and as an auxiliary supply system.⁶ Aquifer groups in the northern area of the West Bank drain an area of 590 square kilometers to the north and northeast, have an annual discharge of 130-140 Mcm/yr and also cross the Green Line discharging into the Bet She'an, and Harod Valleys. (The Nablus-Jenin yields about 70 Mcm/yr and flows southwest to northwest into the Bet She'an gap and is clearly a part of the Jordan system).

These two aquifers can be tapped from both sides of the Green Line, but only five percent of their combined recharge areas lie in Israel itself; there has been a long standing policy

of enforcing severe restrictions on extractions by Palestinians from these and the Yarqon-Tanninim aquifers. It should be pointed out that extractions from these aquifer supplies are presently enforced not only on Palestinians but on Israelis too because of current scarcities.⁷ However, in order to clarify the matter and place it in perspective, it must also be averred that the limitations imposed on the Palestinians is long-standing, pre-drought hydro-policy practiced by the Israeli governing authorities who, among other reasons, wish to insure that whatever flows across the Green Line from the West Bank is not significantly diminished by Palestinian use in the Territory. On the other hand, the restriction on Israelis is a measure of expediency required by the current shortage. Israelis on either side of the line have not been so constrained prior to the present drought, though they have generally not been allowed unbridled use. Moreover, Israelis have not been subject to other tough limitations on water use as have Palestinian West Bankers; for example, water allocations to Palestinians have remained virtually static since 1967 while those to Israeli settlers have been made on the basis of need and supply.

While the astrictive water regulations on the Palestinians continue to be implemented, the Israeli government, for its part, has reponded to the drought crisis by taking the difficult step of reducing the 1991 allocation of water for irrigation by thirty percent, although this rationing has so far not been extended to

the West Bank.⁸

Finally, to round off the discussion of supply, the smallest of the aquifer groups, with a flow of 85 to 125 Mcm/yr, forms the eastern drainage basin of the West Bank, draining an area of 2021 square kilometers to the east and southeast discharging into the Jordan Valley, and does not cross the Green Line, hence cannot be exploited outside the Territory.

The major implication of these data is that about seventy percent of the groundwater on which Israel is dependent and more than one third of its sustainable annual water yield originate in the Occupied Territories. Patently, these facts are bound to have a significant impact on the future status of the Territories and the question of Palestinian statehood (issues which are examined further below, pp. 15-17).

Before canvassing in detail the main problems of the Jordan, we need to recognize that there are certain general characteristics of water issues that are particularly salient in the Jordan basin and which frame the hydropolitics of the region, beginning with a three-part paradigm for the hydrological cycle:

- 1) Human activity is inseparable from the natural system;
- 2) Quality is integral to the entire cycle and is as much a concern as the water mass; and

- 3) The quantity of the water mass influences and is influenced by the quality of water.⁹

The obvious inference of the paradigm is the impossibility of examining the physical and chemical limitations of water resources without considering related human activities.

Implicitly, the paradigm carries its own corollary: uncertainty will always be a condition of water management and planning.

Lack of certainty stems from many physical and human variables such as climate, energy, geography, population, and political and economic events, etc. Moreover, water management and planning will also always be difficult owing to the complexities inherent in water issues. In the international arena, particularly in conditions of water scarcity as exist in the Jordan basin, those difficulties are compounded by several factors:

- 1) Relationships of power, position, and interest;
- 2) Territorial and ownership disputes;
- 3) Uncertainty about key facts;
- 4) Political and ideological rivalries;
- 5) Jurisdictional disputes stemming from the fact that watersheds and political boundaries are rarely coterminous;
- 6) The absence of effective institutional legal machinery for settling international transboundary riparian disputes;
- 7) An ingrained tendency toward inaction without the motivation of a crisis; and,

- 8) Deeply rooted cultural and social attitudes toward water that make change difficult.

As an issue of international relations, water also displays distinctive characteristics:

- 1) Water is pervasive, highly complex, and utterly vital;
- 2) Because of its complexity, water tends to be dealt with piecemeal--problem by problem rather than comprehensively, both domestically and internationally--thus tending to be fragmented as a strategic and foreign affairs issue;
- 3) Water is always a terrain security issue, especially when scarce, since all concerned parties feel compelled to control the ground on or under which water flows;
- 4) The relationship of water dependency and security is perceived as absolute, especially where two or more mutually antagonistic actors compete for the same water source;
- 5) As a zero-sum security issue, water carries a constant potential for conflict; and,
- 6) International law as a means of settling and regulating fresh water issues remains rudimentary and relatively ineffectual without prior treaty arrangements in place. (There is nothing inherently wrong with the principles international transboundary fresh water law; they have been put forward in the International Law Association's

Helsinki Rules and in various U.N. formulations, and the International Law Commission is presently working to conclude a revised set of rules. But analysts refer to these juridic guidelines as "soft law" because they lack firm institutional structures of enforcement).

In sum, then, the strategic reality of water is that under severe shortage--which is the case in the Jordan basin--water becomes "a highly symbolic, contagious, aggregated, intense, salient, complicated, zero-sum power-and-prestige-packed crisis issue, very prone to conflict and extremely difficult to resolve."¹⁰ These are the major analytic markers that are carried by all of the issues that make up the Jordan basin's hydropolitics.

Very serious problems of scarcity and quality exist in the Jordan River basin. The basin's principal riparians, Jordan, and Israel, have been consuming about 108% of their total useable water stocks. The prognosis is for continuing water shortages and the tendency to overexploit through the years 2015-2020 unless immediate drastic remedial actions are taken basin-wide, actions that involve economic restructuring, basin-wide administration and sharing, reduction of irrigated agriculture, alterations in crop patterns, controlled population growth, and greater efficiency through more application of water technologies and conservation. These essential steps will be politically and

economically difficult without considerable outside mediatory and financial assistance.¹¹

Underlying this picture are projected supply, demand, and population growth patterns through the year 2020. (It should be borne in mind that exact figures are difficult to come by and therefore the following data are best estimates, but the order of magnitude is almost certainly correct.) Jordan's birth rate is increasing at about 3.8 percent per annum while that of Israel grows at about 2 percent. This translates into a population rise from 2.7 million to 7 million in Jordan and from 4.4 million in Israel to about 6.4 million. The immigration of Soviet Jews will add in absolute numbers another one million or so Israelis in this decade, but over the long term, the Soviet emigres are not expected to reproduce at a higher rate than other Israeli Jews. The West Bank and Gaza together have a population of about 2 million growing at a rate of 3.8 percent a year and projected to reach about 4.2 million if present conditions were to prevail through 2020.

Israel's present consumption for all purposes (including settlements in the Occupied Territories and the Golan) of about 2100-2200 Mcm/yr produces an annual deficit of 150-200 Mcm/yr, or, using Schwarz's figures of 1820 Mcm/yr of consumption (1985 data which does not indicate whether the Occupied Territories are included) and 1600 Mcm/yr of supply, yields an annual deficit of

220 Mcm/yr; current consumption rates are expected to rise roughly to 2800-2900 Mcm/yr sometime around 2015-2020. Jordan's present yearly demand for all purposes of about 800 Mcm, representing an annual deficit of 100 Mcm, is anticipated to increase to about 1600-1800 Mcm/yr by 2015-2020.

If Israel maintains present levels of control over the Territories, plans call for the maintenance of current ratios of consumption. Of the approximately 600 Mcm/yr supply in normal times in the West Bank, Palestinians consume about 113 Mcm/yr for all purposes (90-100 Mcm for agriculture).¹² According to Schwarz, the normal annual supply of 90 Mcm of water in Gaza is consumed entirely by Palestinians. I believe that is probably so in the present climatic conditions, but has not usually been the case as attested by the Israeli Water Commissioner, Zemach Ishai, in a 1988 interview: Israeli settlers in Gaza have also used the local water supplies. Israel has for several years overdrawn the sustainable annual yield in the Occupied Territories by somewhat more than 100 Mcm/yr.¹³

There are too many variables at this juncture to estimate supply and demand and population growth should the Occupied Territories become an independent Palestinian state. But what is known at present is that the great bulk of the Occupied Territories' water, some 87 percent, is consumed by Israelis on both sides of the Green Line.

Most Israelis, including Schwarz, disagree with that statement because they do not consider most of the groundwater systems that flow across the Green Line to be a part of the Jordan basin system or to belong to the West Bank. That is a point of view that deserves to be reckoned with just as does its opposite, to wit, that there is a legitimate connection between a source of water and the locale of its origin (irrespective of the direction of its flow), in this instance the West Bank; that the West Bank and Gaza are occupied territories whose final disposition has not been determined and therefore the situation cannot be, *de jure*, a *fait accompli*, and analysts must work with that reality; that the indigenous population of West Bank Palestinians have legitimate claims at least to some of the waters that rise or pass through the Territory--claims that must be part of any negotiations for a final political settlement of the Occupied Territories' status.

Israelis, Palestinians, Jordanians, Syrians, and Lebanese all legitimately invoke a variety of legal principles to establish their claims: first-in-use-first-in right, customary or equitable utilization, absolute sovereignty (or the Harmon Doctrine), beneficial use, basic justice and fairness (*ex aequo et bono*), good neighborliness, prior use, etc., to name a few.¹⁴ But the reality, historic and contemporary, is that the Jordan basin's actors do not resort to law to settle water disputes;

these issues are determined by the relative power relationships in the basin at any given time. Only if the hegemonic power--at present Israel--chooses law as a means of introducing change and settlement will law play such a role. The fact is, only with political settlements in place can there be created an adequate array of effective legal instruments for solving international disputes such as exist in the Jordan and other Middle Eastern basins over shared water resources. This is another reality with which analysts must work. However, while law cannot provide all the needed answers, and must await political settlements, law is nevertheless essential to the stable maintenance of solutions--if legitimate, stable solutions can be found.

The effects of ongoing water deficits, already exigent in the Jordan basin, are cumulative and can quickly become irreversible. Both Jordan and Israel have already accumulated a water debit equivalent to at least one full year's supply. Neither known natural sources nor water technologies available now or by the end of the decade have the capacity to generate new useable water in needed quantities at an affordable cost. Failing a solution for this scarcity, both Israel and Jordan will have to curtail their social and economic development. The result will likely be heightened competition among riparians and among domestic sectors within each country for decreasing amounts of degraded water with concomitant destabilizing internal and regional repercussions. One must also bear in mind the

despoiling effects of scarcity and pollution on other water related resources in the basin.

A further complicating variable in the picture is the relationship that links energy, water , and oil. Significant amounts of energy are needed to extract and move water in the Jordan basin. For example, Israel uses about 18 percent of its total national energy supply to pump and transport water, and Jordan's water-energy ratio of about 9 percent is proportionately not far behind. In both countries oil is the principal source of energy, thus linking water issues with petroleum.

Because of the current disparity of power among the Jordan basin's riparians--Jordan, Israel, Syria, and Lebanon--there appears to be no immediate prospect of a water war; however, water-based hostilities are possible. Water issues are central to the strategic planning of all the basin's riparians and water problems contribute importantly to the basin's inter-riparian tensions. The potential for open conflict over the basin's diminishing water stocks are rising.

If current policies and patterns of consumption in Jordan and Israel persist, a mounting series of water crises could be touched off before the end of the decade, particularly if economic conditions deteriorate further or present drought conditions persist or worsen (which is a distinct possibility,

given the drought history of the basin). A condition could be reached sometime between 1995 and 2005 when Israel, Jordan, and the Occupied Territories would begin to experience such acute and progressively worsening perennial water shortages and degradation of quality that the effect could be likened to a situation in which the three areas were to run out of renewable sources of fresh water. Consequently, rather than outright warfare among the riparians (which is possible), internal civil disorders, regime changes, political radicalization, and instability, are more likely to ensue, particularly where there is a combination of water and economic problems as exist in Jordan and Syria, and to a lesser extent potentially in Israel.

Whatever strategies planners, investors, or diplomats devise for alleviating the crisis of the Jordan River, all quickly encounter the basin's Gordian Knot: the Occupied Territories. The waters of the Occupied Territories are now so integral to Israel's water needs that the delicate balance of Israel's water system has become dependent on the water system of the Territories. Israel satisfies up to 40 percent of its water requirements from the West Bank. As indicated, 87 percent of the Territories' water supply is consumed by Israelis. It is inconceivable that an Israeli government would ever give up any part of the Occupied Territories without an effective plan, replete with a full array of guarantees and inducements, that would give Israel secure permanent access to sufficient

quantities of the Territories' waters or guaranteed access to other comparable sources in the area, probably the Litani River in Lebanon, judging by a May 11, 1991 official declaration by the Israeli government that Israel will not withdraw from Lebanon without assurances of its "share" of the Litani River.

It might eventually be possible to overcome Israel's security reasons for retention of the Territories, and maybe even its ideological premise could be softened, but not its hydrological arguments, which will persist unless the water issue is settled. It is water, which is constituent to security, political, and ideological factors, that will in the final analysis determine the future of the Occupied Territories, and by extension, the issue of conflict or peace in the region.

Israel's water needs have been potentially exacerbated by the massive influx of Soviet Jews who must be absorbed without dislocating Israeli Jews and Arabs, without pauperizing the country, and without displacing Palestinians in the Occupied Territories. The Israeli government estimates the cost of settling the new immigrants will be upward of \$38 billion, a sum that will clearly place a staggering burden on Israel's fragile economy. At the same time, the Soviet Jewish immigration could severely aggravate water shortage problems in Israel and the Territories.¹⁵

Israelis presently consume about 280 liters per-capita-per day (l/c/d), a rate that is four times the consumption of their neighbors. At this rate there simply will not be enough water in either Israel or the Occupied Territories (where, it must be recalled, water is already being overused) for another million Israelis without dangerously over-exploiting future stocks, at least in the short term. Nor, without the creation of significant new supplies of water in tandem with all-out conservation programs, will the Israeli economy be able to expand sufficiently and rapidly enough to provide an adequate livelihood for both the new immigrants and native born Israeli Jews and Arabs.

The necessary new supplies of water are not known to exist within Israel. A massive crash effort at desalination of sufficient quantities of sea water (1) would cost hundred of millions or even billions of dollars, depending on the technology and capacity adopted, that Israel does not possess, (2) would not produce enough water before the turn of the century to meet needs already urgent, and (3) would be quite expensive for all consumers unless heavily subsidized (Israel already provides off-budget water subsidies of \$250 million a year). In these circumstances, accessible sources of water outside Israel--such as the Litani in Lebanon or the costly importation of water from Turkey--take on very serious economic, strategic, and legal implications.

Water scarcity, the Jordan basin's bedrock hydraulic reality, also precludes any form of the "Jordan-is-Palestine" solution for several obvious reasons: (1) The Hashemite Kingdom is already unable to supply water to its own burgeoning population without rationing; (2) There is already a serious problem of water quality; (3) Jordan lacks a sufficient sea frontage to allow relief from desalination; and, (4) There are not any known new sources of significant quantities of water within the Kingdom. Thus, there would not be enough water to absorb two million more Palestinians expelled (or "transferred") from the Occupied Territories--not to mention the devastating impact such an influx would have on Jordan's failing economy. The situation would be inhumane and would crush the regime.

Jordan, more than Israel, suffers the debilitating effects of scarcity because the kingdom does not have the economic resources or access to outside financial assistance, as does Israel, to deal with the problem--especially since the Gulf War which has decimated Jordan's economy. Jordan's Unity Dam project is typical of the central role water plays in the basin's development and of the complicated, interlaced water borne problems that infect most of its transboundary projects.

Unity Dam is planned to regulate the flow of the Yarmuk River, further develop the Jordan Valley, but mainly enable

Jordan to increase significantly industrial and domestic consumption by capturing about 195 Mcm/yr of water behind the dam. The site of Unity is close to the previously planned Maqarin Dam, which was never built. Like the Maqarin, Unity would have one base in Syria, thus the necessity of an agreement with Damascus whereby Syria will get almost all of the hydroelectricity generated at no cost. In return, Syria has promised not to build a large network of hydroelectric and irrigation projects that would have used up much of the sources of the Yarmuk.

Construction of the dam constitutes Jordan's main hope for a viable socio-economic and thus politically stable future. Despite Unity's limitations, there is no other comparable option for Jordan. Therefore, Jordan must negotiate with Israel, which has so far blocked progress on the project, until a workable arrangement is reached. Military action, except in extremis, is not a choice. Should the presently moribund talks resume, if the Israelis and the U.S. mediators play their hand badly, they will lose much. Creating a water-based economic or political crisis would destabilize Jordan, topple King Hussein's regime, and radicalize the government with all the concomitant problems for everyone. On the other hand, a reasonable apportionment agreement on the Yarmuk would probably assure Israel an average 60 to 70 Mcm/yr of water--about three times as much as allocated under the 1955 Johnston Plan--without the current political tensions.

However, owing to Israel's critical water shortage, the Soviet Jewish ingathering makes it far less likely that Israel will accept less than 100 Mcm that it has been drawing out of the Yarmuk River for the past six years or longer. Moreover, being the upper and hegemonic riparian power, Israel appears to exhibit little interest in changing the present arrangement. Consequently, the best that Jordan can hope for after the combined Israeli-Syrian extractions (the latter takes about 96-100 Mcm/yr) would be only about 170 Mcm/yr for the dam, less than the planned and projected need of at least 195 Mcm/yr--unless Jordan opts for a very slow fill-time and long carry-over from year-to-year, a decision that carries distinct handicaps to its hydroelectric and economic needs.

Despite the generally gloomy picture that emerges from this brief survey, there are nevertheless opportunities for fresh thinking about old situations. But whatever thinking is done, it must be firmly based in the hydrological and political realities of the region. Since rivalry is the primary obstacle to more effective transboundary water resource use, cooperation may therefore be the primary goal for policy and investment. The trick will be to find effective means to implement the new ideas. In this regard, it is useful to recall that the unique importance of water for human life can lead either to severe conflict or solid cooperation. If the participants in a water rivalry can be

made to see themselves as confronting a common fate, resolvable only through their cooperation, thus being responsible to and for one another, then a positive interaction very different from familiar hostility may occur. Clearly, water issues merit the keenest attention.

Obviously, the most definitive and effective action that could be taken toward solving the basin's hydropolitical and economic problems, and toward promoting cooperation among its users would be to solve the Israeli-Palestinian conflict equitably and in conformity with the principles of law. That happy solution is not likely to occur in time to stave off a major water driven crisis. Therefore, recognizing that in the absence of firm political settlement, basin-wide cooperative arrangements for sharing the basin's waters are unlikely, there are still certain hydrological incentives for taking some positive conflict or crisis avoidance actions short of full blown treaty agreements. Chief among these incentives is the fact that unless the current situation is eased, the basin's states seriously risk destabilization, radicalization, and conflict, the effects of which could be devastating and spill out beyond the confines of the basin to other key regional actors.

Within this context several practical steps may be assayed for both the short and longer term. The following suggestions are not meant to be comprehensive (I have offered a fuller list of

proposals elsewhere), and for reasons of time and space, focus on what might be done as opposed to how to implement the proposals.

- (1) Water must be given the priority it deserves by all policy makers.
- (2) Revive the negotiations over the Unity Dam Project, provide as many incentives for a fair agreement as necessary, and financial assistance to Jordan to complete the dam as quickly as possible.
- (3) Give Israel every incentive necessary to reverse its hydropolitical policies in the Occupied Territories as quickly as possible, otherwise, as the evidence suggests, within a very few years the condition of Palestinian agriculture, particularly citrus fruits, could deteriorate irreparably.¹⁶ Beyond that action, a reconsideration of water allocation could be undertaken with the assistance of an acceptable international group of experts for the purpose of evaluating accurately the hydrological condition of the Territories.
- (4) Divert the saline waters in the area of Lake Kinneret into the Dead Sea so as to raise the quality of the lower stem of the Jordan River to useable levels.
- (5) All parties in the basin should be encouraged in every possible way to acquire the most suitable water and agricultural conservation technologies, to improve

efficiencies, and to conserve water in all sectors.

(6) Investment in manpower training for the water sector and associated fields--not only in science and technology but in relevant social sciences as well-- must be immediately encouraged and assisted.

For the longer term, but not necessarily waiting on a comprehensive peace settlement to get started, other actions which apply to all the region's basins may be fruitfully undertaken.

Economic Restructuring

One of the most effective ways to alleviate the binary problem of water scarcity and overpopulation is through the restructuring of an economy away from heavily irrigated agriculture toward other sectors, such as service and industry--a difficult but not impossible task given proper incentives and dedicated assistance. For example, if Jordan and Israel were to reduce their irrigated farming by about 40 percent, they would at the very least roughly break even in water supply and demand, assuming simultaneous improvements in efficiencies and conservation. That might give a country like Jordan a fighting chance to do something about its population growth rate. As indicated, Israel has already reduced irrigated agriculture by 30 percent in 1991. Some Israeli experts would like to see this reduction become permanent, but concede that in the present

political climate that action is unlikely to happen.

Typically, 75 percent of all water supplies are used for irrigation in most parts of the Middle East (and other arid regions of the globe). In the United States ten calories of fossil fuel are expended for every calorie of food delivered to an American household. All of Southwest Asia uses 1/20 the U.S. caloric expenditure of fossil fuels per calorie of food. However, in some countries of the Middle East the fossil fuel per calorie of food ratio is actually greater than that of the U.S. because of the high consumption of water for irrigation combined with poor soil quality.

Experts (including myself) have for some time cogently argued that Middle Eastern governments should realize that their energy resources would serve them better if they were exchanged, by whatever market situation is deemed most appropriate, for foodstuffs produced at far lower energy and water subsidies in locales with climates better suited for agriculture. This strategy would enable Middle Eastern water authorities to transfer enormous quantities of water from inefficient agriculture to far less consumptive industrial applications which presumably could, at the same time, increase GNP. Interestingly, by comparison, the yield from light industry to GNP is about thirty times greater per unit of water used than the yield from agriculture.¹⁷

Under present patterns, the growing energy subsidies (including water) of Middle eastern agriculture are largely fixed by the huge cost of carrying on intensive agriculture in a climate which is for the most part highly unsuited to such exploitation. The U.S., E.C., other governments, and the World Bank could provide incentives to planning and implementation of economic restructuring and to cushioning the attendant hardships.

Transition Support

One of the most difficult problems, aside from its political dimensions, is understanding and easing the transition from agriculture into light industry. The switch from farming to industry (or, e.g., transportation or service) is so extremely difficult because agriculture is culturally embedded, highly symbolic, and significant for military purposes, etc. Investment in research and practice oriented to encouraging and enabling the smooth transition would yield high dividends.

Technical Resources

Important technical developments, such as new methods of desalination; "Medusa bags" for transporting water overseas by towing them behind ships; technologies that improve purification, efficiency, and conservation; and arboreal solutions (such as the Finnish suggestion to use Eucalyptus trees to reforest and establish a paper industry in the Middle East) constantly appear

in unpredictable fashion. Seeking out and winnowing such new ideas needs to be done constantly and systematically. Investment in new, promising developments, particularly those that are unlikely to be funded by standard sources, should have a high priority.

Demonstration Models

Perhaps the best way to initiate economic restructuring might be to provide incentives for one country to act as a demonstration model for others, not only in the Middle East, but in other parts of the world as well. Jordan might be a good candidate because of the urgency of its problems, financial need, and its willingness to be innovative. Obviously the program would have to be phased, with built-in measures for easing transitional hardships, rigorous periodic evaluations, and flexible planning. Should this endeavour enjoy even mild success without exorbitant cost, it could be irresistible to other basin actors and its impact would be region-wide or even global. Indeed, a positive impact would result even from the success of the early stages of the project. This is a project that lends itself to collective endeavor so many governments and agencies could act jointly and spread the risks.

Creating an Infrastructure for Cooperation

In the Middle East, indeed, in many industrialized western nations, the issue of transboundary fresh water use, allocation,

and preservation suffers badly from lack of intra-basin cooperation, poor data, and uncoordinated, piecemeal approaches which result in fragmented policies and action. Since it is unlikely that cooperation can be coerced or induced at the highest political levels, another approach must be found. The most promising seems to be encouraging cooperation--at a lower but still significant level--among officials and technical experts. If officials and scientists in the region communicate sufficiently to develop shared understandings of the facts of the water situation, or available technologies, and potential solutions, they can become a strong force for cooperation--a community of informed officials and experts throughout the region to press for and guide effective water policies.

Another possibility would be to promote cooperative desalination on basin or regional levels. Such arrangements, while requiring considerable political agreement, would yield great economic, political, and social benefits, especially to such land-locked countries as Jordan.

Technical Infrastructure

The key to achieving these goals--and, in some respects, a prerequisite to successful economic restructuring--would be the establishment of a technical infrastructure for hydropolicy that would address the problem at three levels: basin, regional, and global. Specifically, this would involve the establishment of

three interrelated types of water institutes: (1) an institute for each of the three major river basins in the region-- Euphrates-Tigris, Jordan, and Nile; (2) a comprehensive Middle East regional water institute; and, (3) a global water institute located at the World Bank in Washington, D.C. (or elsewhere).

These institutes, which would include staff, fellows, trainees, and other personnel from all the states in the basin, all basins in the region, and possibly from other major basins in the world, would perform several critical functions: (1) they would provide the expertise, research, education, and data necessary to supply the entrepreneurial, human, and technical resources presently lacking; (2) they would develop databases and hydrological, economic, and other social scientific analytical tools; (3) they would act as conference centers; and, (4) they would be centers for accurate record keeping and dissemination of information.

In addition to their manifest mission, these institutes would create common understanding of the basin situation and foster ongoing interaction among specialists from the nations of the basin or region who are involved in their respective water establishments at a technical or policy making level. To enjoy the benefits of an institute, a nation would have to participate in the types of research and educational efforts it pursued. Common databases, trained and interactive personnel, and

professional outlooks would be stressed. A stint in an institute should become a requirement for the career of any ambitious official or expert involved with water policy in the relevant nations. It would be essential to endow the institutes with as much independence as circumstances allow. The regional institutes could coordinate the work of those at the basin level and otherwise have the same underlying purpose.

These institutes could also be established in phases, starting with a single demonstration model, with periodic evaluations. Its success would have ramifications across the region and make others possible. This too is an undertaking that affords an opportunity to organize an international cooperative venture.

Whatever the Bank's current hydropolicies, the planet's water problems are inexorably going to assert themselves increasingly into the Bank's business. The creation of a World Bank Global Water Institute is clearly a practical necessity. The Bank could begin by mobilizing and utilizing the in-house expertise and resources it already possesses in organizing an institute devoted to international fresh water issues.

This unit would serve the functions of coordination, data collection, project and policy assessment, economic and technology review and assessment, cost assessments, education,

and centralization of data. The staff could serve as a reservoir of international expertise. Like the basin and regional institutes, this one would also be expected to produce publications as a means of disseminating information. Its purview should include the hydrological, technological, socio-economic, and legal dimensions of transboundary fresh water issues. It should be given authority to recommend as well as review projects and policies, that is, to be proactive as well as reactive.

By establishing a Global Institute within or under its auspices, the World Bank would not only be better able to fulfill its own purposes but to serve riparian nations worldwide more effectively in a timely fashion.

No substance on earth is more essential to life than water or carries a greater potential for conflict and disaster when scarce or poorly distributed. Thus, approaches, concepts, and actions must be commensurate with the magnitude of the problem--and where water is concerned, the problem is survival. By far the greatest risk for all concerned actors would be to avoid taking risks.

ENDNOTES

- 1) This figure comes in a July 1991 communication from Jehoshua Schwarz of TAHAL, Israel's water planning agency. I have included in the text and endnotes of my paper comments by Mr. Schwarz, a fellow conferee and colleague, because I respect Mr. Schwarz's expertise on Israel's water situation sufficiently to feel that his observations, even those with which I disagree, would have a useful place in my analysis.
- 2) This estimate is derived from data supplied by the Water Research and Study Center (WRSC) of Jordan University in July 1991.
- 3) This is my estimate drawn from data provided by Jehoshua Schwarz, in July 1991; Elias Salameh, Director of the WRSC, July 1991; and in June and July 1991, from Drs. Jad Isaac and Kemal Abdulfattah, both professional hydrologists active in the Occupied Territories. Schwarz's estimate for water production in the West Bank and Gaza is 200 Mcm/yr, but this figure appears to be based only on groundwater sources that do not flow from the Occupied Territories across the border into Israel. Water sources that originate in the West Bank and flow from there into Israel, are not recognized as being part of the West Bank water account. My figures include all sources that originate in the Occupied Territories.
- 4) This brief discussion of the Occupied Territories is based in part on an analysis by Miriam Lowi, "West Bank Water Resources and the Resolution of Conflict in the Middle East," an unpublished paper presented to the Workshop on Environmental Change and Acute Conflict, Toronto and Ottawa, June 1991; the sources cited in note #3; and the U.S. Army Corps of Engineers, *Water in the Sand. A Survey of Middle East Water Issues*, Washington, D.C., June 1991, 1-13; and the AMER database.
- 5) Jehoshua Schwarz in a July 1991 communication.

- 6) This last statement is from Jehoshua Schwarz.
- 7) This has been confirmed by Jehoshua Schwarz, July 1991.
- 8) Schwarz, July 1991.
- 9) N.C. Matalas, J.M. Landwehr, and G.M. Wolman, "Prediction in Water Management," *Scientific Basis of Water Resources Management: Studies in Geophysics*, National Academy of Science, Washington, D.C., 1982, 118-27; E.A. Engelbert with A.F. Scheuring, *Water Scarcity. Impacts on Western Agriculture*, Berkeley, 1984, 18.
- 10) Frederick Frey and Thomas Naff, "Water: An Emerging Issue in the Middle East?," *Annals*, 482, 1985, 178.
- 11) Schwarz states (July 1991): "There are no long term water deficits in the Jordan Basin. The present low water yields result mainly from extreme climatic conditions." The question of projected long-term deficits for the whole basin is differently answered by a variety of specialists, depending on what data is used, how it is read, extrapolated, and projected. It is not clear whether Mr. Schwarz intended his statement to cover only Israel or all of the basin and river system (as I have done). I and other experts disagree with Mr. Schwarz, not only on the basis of data, but on the basis of our own analysis of many other factors--hydrological, economic, price, demographic, political, strategic, ideological, behavioral, attitudinal, etc.--all of which bear on questions of demand and consumption and are essential to the analysis and interpretation of water issues. If analyses are to be commensurate with the complexities of water problems, they must perforce be comprehensive in approach. In the circumstances, honest disagreements such as those few between Jehoshua Schwarz and myself are unavoidable (and probably healthy). The truth is, I sincerely hope Mr. Schwarz is right and I am wrong, but what evidence is adduced does not convince me that he is.
- 12) Schwarz gives a figure of 110 Mcm for the current supply in the West Bank; but, again, this number appears to exclude those sources that rise in the West Bank but flow across the Green Line and are thus not recognized as a West Bank supply--see note #3.
- 13) See, e.g., USACE, *Water in the Sand*, 8-9; R. Pedatzur, "Strategic Planning in Water Resources Urged," and "Water Supply Problem Seen as an Obstacle to Peace," *Ha Aretz*, April 22 and May 3, 1989. Schwarz disagrees with this statement. He contends that Palestinians are responsible for current and past overdrawing in Gaza, and that withdrawals from the Yarqon-Tanninim aquifer has no effect on water tables in the West Bank (he does not mention other West Bank aquifers specifically), and

that "water flow to Israel is governed only by abstraction upstream in the West Bank and not downstream in Israel." Palestinian hydrologists interviewed in the West Bank dispute this statement citing, among other evidence the drop in West Bank water tables and the severely restricted allocations to Palestinians in both parts of the Territories since 1967. Palestinians interviewed in Gaza insist that overutilization has been caused in significant part by Israeli water policies. However, the record shows that the Gaza aquifer has a long history of overpumping, to the point where Mediterranean Sea water has been encroaching and the aquifer is in danger of permanent damage. See also R. Nativ, "Problems of an Over-Developed Water System: The Israeli Case," *Water Quality Bulletin*, vol. 13, October 1988, 126-31.

14) Schwarz has argued the primacy of status quo legal principles, such as prior use and rights, which are advantageous to Israel. Typically, each riparian in the basin is highly selective in its choice of legal principles and arguments intended to buttress its claims.

15) Schwarz disagrees arguing that an "additional population of 1 million will increase domestic and municipal supplies, after full development of infrastructure and households, by 90 Mcm/yr...The envisaged solution for this problem is initial reduction of irrigation with fresh water, followed by sea water desalination." Mr. Schwarz does not make clear how a million new Israelis consuming 280 l/c/d will increase supplies by 90 Mcm/yr, but I am willing to suspend temporarily my serious doubts and assume Jehoshua knows what he is talking about. But there remain significant problems. He is obviously making a complicated set of assumptions about a complicated set of variables--any one of which could scuttle the plan--all of which must fall precisely into place at the right time, i.e. in time to avoid a shortage crisis. Chief among these assumptions is sufficient funding for the settlement of the emigres and development of the essential infrastructure without economic, social, and political dislocation of Israeli Jews and Arabs, and Palestinians in the Territories. It must also be predicated on significant increases in American financial aid, including the availability, in addition to money for everything else, of very large sums for desalination plants in such a timely fashion as to avoid a crisis. Also assumed is the ability of the government to make a significant reduction of irrigation permanent. He also does not appear to take into account the fact that Palestinians, Jordanians, and Syrians perceive their interests to be seriously threatened by so large an influx of Russian Jews. Whether or not the threat is real, the Arabs will behave on the basis of their perception, which could cause considerable difficulties in regard to the availability and timing of funding for solving the problem. In the meantime, the situation is unlikely to improve, rather it is likely to deteriorate.

16) Hisham Zarour, and Jad Isaac, "The Water Crisis in the Occupied Territories," unpublished paper presented to the VII World Congress on Water, Rabat, Morocco, May 12-16, 1991.

17) Thomas Naff and Ruth Matson, eds., *Water in the Middle East: Conflict or Cooperation?*, Boulder, 1984, 195.