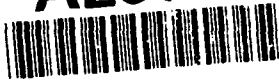


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HYDROPOLITICS IN THE MIDDLE EAST AND U.S. POLICY

by

Elizabeth A. Green

June 1993

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This paper discusses hydropolitics in the Middle East, the most critical example today of the worldwide problem of diminishing fresh water resources relative to increasing demands stemming from growing populations and development. The paper concentrates information essential to understanding regional hydropolitics, including information about past and current U.S. attempts to influence Middle Eastern hydropolitics. Technical solutions which apply to the supply-side and demand-side of regional and national water balances are discussed. Supply-side solutions are confounded by inter-state conflicts, but gross inefficiencies on the demand-side are solvable on a country-by-country basis. This paper recommends that the U.S. government limit its efforts to assisting demand-side solutions within individual friendly countries while striving for a positive outcome to the Peace Process. A successful Middle East Peace Process could culminate in effective agreements between all parties, positive momentum may be established toward regional cooperation. Cooperation in the Jordan River Basin could be a model for agreements in the basins of the Tigris-Euphrates and Nile Rivers. If the Peace Process ends in failure, cooperation may continue to be stymied, and eventually face the U.S. with military decisions as a result of a Middle East regional conflict. Effective U.S. civil-military coordination is essential for U.S. effectiveness on this issue.

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HYDROPOLITICS IN THE MIDDLE EAST AND U.S. POLICY

by

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National Security Agency

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Advanced Research.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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18 June 1993

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Faculty Research Advisor Date

Abstract of
HYDROPOLITICS IN THE MIDDLE EAST AND U.S. POLICY

This paper discusses hydropolitics in the Middle East, the most critical example today of the worldwide problem of diminishing fresh water resources relative to increasing demands stemming from growing populations and development. The paper concentrates information essential to understanding regional hydropolitics, including information about past and current U.S. attempts to influence Middle Eastern hydropolitics. Technical solutions which apply to the supply-side and demand-side of regional and national water balances are discussed. Supply-side solutions are confounded by inter-state conflicts, but gross inefficiencies on the demand-side are solvable on a country-by-country basis. This paper recommends that the U.S. government limit its efforts to assisting demand-side solutions within individual friendly countries while striving for a positive outcome to the Peace Process. A successful Middle East Peace Process could culminate in effective agreements between all parties, positive momentum may be established toward regional cooperation. Cooperation in the Jordan River Basin could be a model for agreements in the basins of the Tigris-Euphrates and Nile Rivers. If the Peace Process ends in failure, cooperation may continue to be stymied, and eventually face the U.S. with military decisions as a result of a Middle East regional conflict. Effective U.S. civil-military coordination is essential for U.S. effectiveness on this issue.

PREFACE

I thank my advisor, Dr. Mac Owens, for kindling my interest in the addictive subject of hydropolitics, and the Advanced Research Department for assisting me in this project.

I am grateful to individuals at U.S. Central Command Headquarters, at the Department of State, USAID, and others for the access and time which they generously gave to me. It was a privilege to attend a seminar on Middle East water issues at the Department of State and to hear from several illustrious experts on the subject of hydropolitics.

While the literature on the technical and political aspects of hydropolitics is extensive, it is my hope that this paper culls that literature for essential information, and offers another perspective to analysts and managers involved in monitoring, executing, and even recommending U.S. policy decisions bearing on the issue of water scarcity.

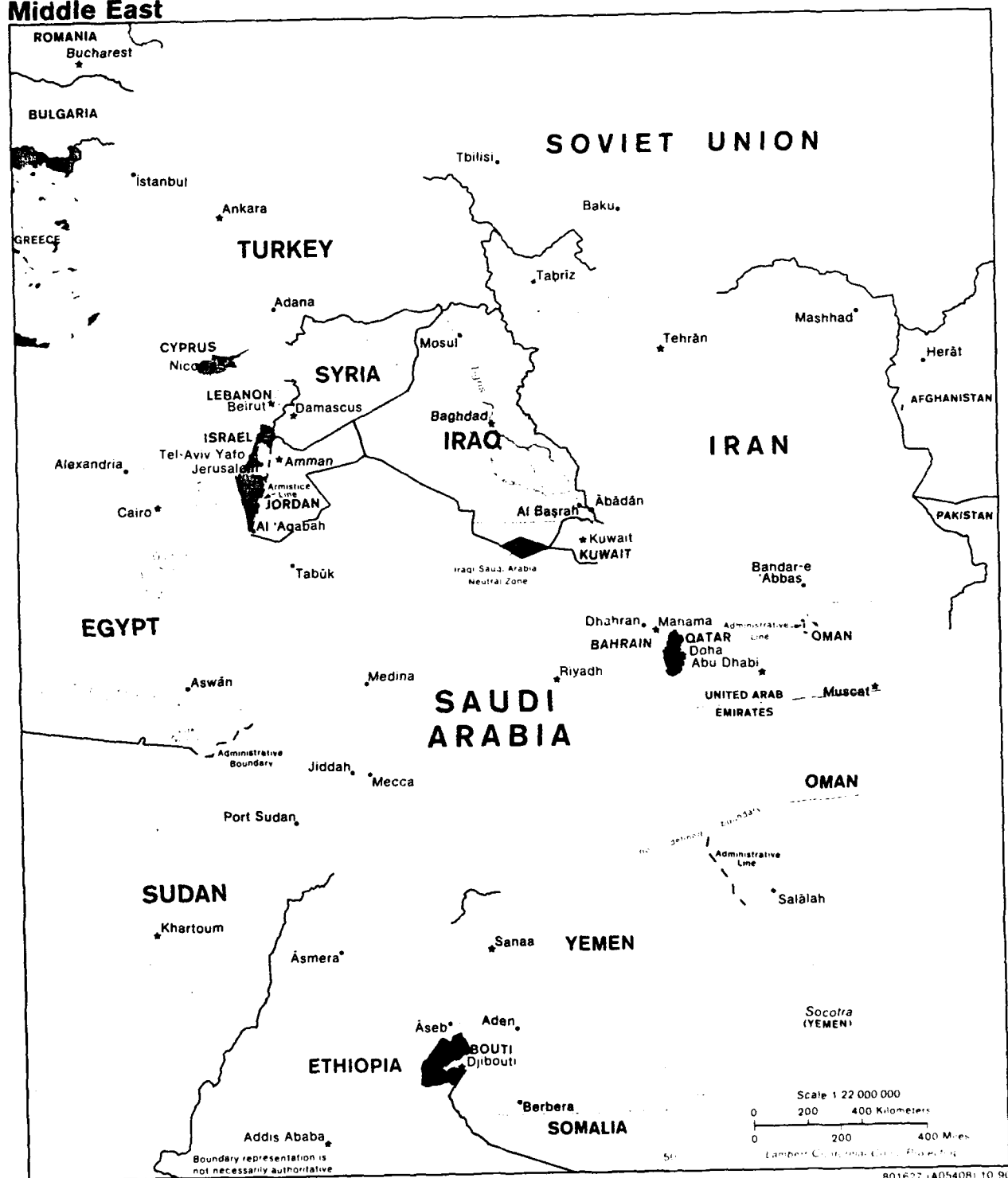
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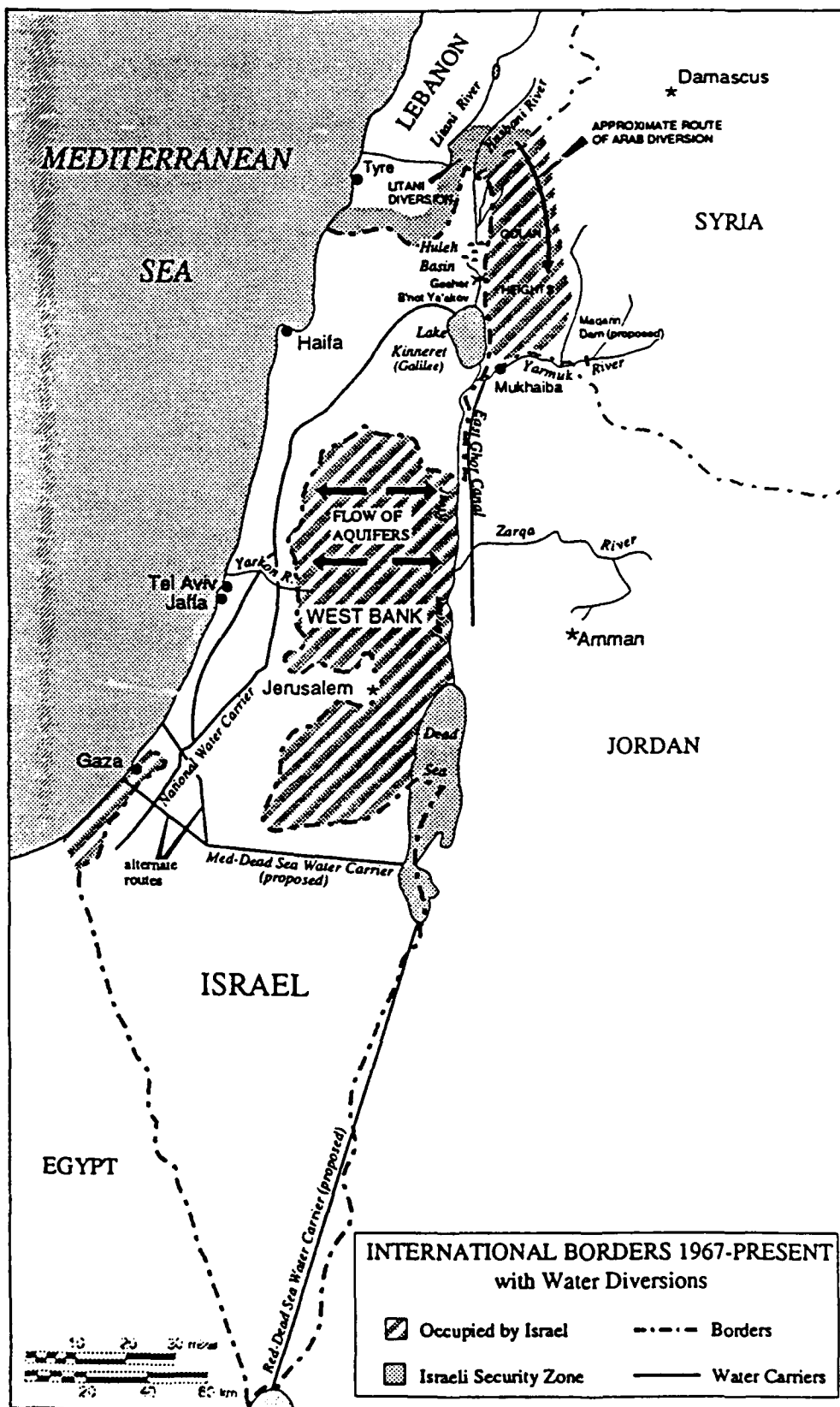


FIGURE 2

from

"Guidelines for a Water-for-Peace Plan for the Jordan River Watershed" by Aaron Wolf. A paper presented at the Department of State, April 1-2, 1993.

HYDROPOLITICS IN THE MIDDLE EAST AND U.S. POLICY

CHAPTER I

INTRODUCTION

THE WORLDWIDE PROBLEM. Water scarcity, with its root causes and complicating factors, such as population growth and industrialization, is a worldwide condition, not unique to the Middle East. The general causes and conditions of water scarcity and the political dynamics of the Middle East, making the area prone to civil instability and international conflict, combine to produce the most dramatic regional example of hydropolitics.

No region of the world is immune from growing pollution and degradation of its water supply, and increased demand on its rivers. The problem of poor cooperation among nations sharing rivers is endemic, too. Competition and conflict over water sources has a long history, but the wide recognition given to the problem of water scarcity in difficult geopolitical contexts makes hydropolitics an urgent concern now and in coming decades. The Middle East may be the region closest to a water crisis, but the nearly 40% of the world's population living in river basins shared by more than three countries have their lives and environments adversely affected by the same basic dynamics. And, many of the inadequate or destructive practices in the Middle East have previously or still do exist elsewhere, including in

the United States.

In all regions of the world, solutions and improvements must address several conditions, either to change them or ameliorate their effects: population growth, industrialization, agriculture and irrigation practices, environmental degradation, urbanization, water infrastructure and (mis)management, and regional (non-)cooperation.

Poorly conceived, inefficient, poorly managed and operated water projects built to supply, use, or dispose of water are common around the world. In the less developed regions where water scarcity exists, many international organizations including the World Bank, Organization for European Community Development, United Nations Development Program, and developed countries' foreign aid-dispensing agencies have financed and otherwise supported water resource projects usually emphasizing increasing the water supply. Pressure from environmentalists and greater awareness of the adverse effects of many water supply projects are prompting a greater emphasis on more efficient supply, use, recycling and reuse, throughout the water cycle. There is growing recognition that simply increasing the supply does not protect quality or necessarily improve the quality of life of a river basin's inhabitants.

THE MIDDLE EAST PROBLEM. Before discussing the particulars of the three major Middle Eastern river basins, there are some generic conditions and practices that apply throughout the region

that deserve mention. Although the overall Middle East water balance has a surplus, maldistribution of water is characteristic within and among nations. The current quantity and the quality of water supplies throughout the region will inexorably decline without cooperative, comprehensive regional solutions. To preserve quality and a positive water balance, population growth must abate, equitable sharing and distribution must be instituted, and conservation methods and improvements must be implemented.

The overall regional surplus is primarily due to the relative abundance of water in Turkey and Lebanon. Significant scarcity and pollution of supplies exist in all other countries. Excepting Israel, the region is plagued by leaky infrastructure, poor maintenance and operation of infrastructure, and poorly trained personnel. Also largely excepting Israel, all have inefficient agricultural and irrigation practices which are very wasteful of water and overly polluting. All Middle Eastern regimes have an exaggerated emphasis on food self-sufficiency, a determination to expand agriculture to match high population growth, and a tendency to choose crop varieties without regard to their degree of thirst or world market price. These circumstances will keep water heavily devoted to agriculture (70% and more of supply). Lest we think this is unusual, we should remember that 80% of available water in the arid western United States is used in agriculture.

Current trends lead analysts to predict a Middle Eastern

regional annual water deficit early in the next century. Water is the dominant resource issue for the most constrained nations and population groups now, and will be throughout the region by the end of the decade. Despite relatively plentiful rainfall the last two winters, the basic long range condition of an arid climate and the likelihood of multi-year droughts will not change.

Additional problems with water sources are the transboundary nature of most rivers and underground sources, the overpumping and salination of aquifers, and the depletion of nonrenewable deep aquifers. Downstream riparians can expect increasingly severe shortages and worse quality in their water if current trends continue. Cooperation among riparians and common users of aquifers is almost nonexistent, a situation preventing efficiency and inviting the unilateral abuse of resources.

Ethnic, religious, and political antipathies have to be overcome in order to reverse this pattern. Over half the inhabitants of the Middle East and North Africa depend significantly on water from international rivers and aquifers. Two thirds of all Arabic speaking people in these regions depend on river water from non-Arabic speaking nations.¹

Middle Eastern rivers are termed "exotic", meaning their volume originates mostly in the mountainous areas of one upstream country, and they grow progressively smaller on the way to the sea. Downstream riparians tend to be heavily dependent on these rivers and are impacted by water-related activities in upstream

countries. Rivers in arid regions tend to vary greatly in seasonal and multi-year flows.²

All these factors make Middle Eastern river management a technical and political challenge, both domestically and internationally. The desires of each riparian simultaneously and independently to exploit the same river for hydropower, industry, irrigated agriculture, and growing populations are in mutual internal and international conflict.

River use has tended to be developed with an engineering bias toward large-scale dams and irrigation systems with little thought about social and environmental consequences within the developing country or downstream. As scarcity intensifies, unilateral diversions of water resources at the expense of others downstream is apt to lead to conflict. Only projects resulting from consensus and cooperation can end the traditional zero-sum nature of water resource management and enhance regional peace and stability. Projects have yet to involve multidisciplinary collaboration although international financing organizations are becoming more sensitive to that necessity.

The controllable factors in the water balance, including population, urbanization and pollution, distribution and consumption patterns do not show signs of wide improvement. Rational consumption patterns are dependent on cost-related pricing, which is anathema in the Middle East. Governments are reluctant to reduce water subsidies because of internal political, religious, and social resistance. Water is looked

upon as a right, a gift, which eliminates price as a rationing mechanism. This view is likely to change only as each nation enters a true crisis situation.

Pricing could also alleviate budgetary problems which are blamed for poor infrastructure maintenance and operation. Until engineers and technicians are better trained and paid, inefficient operations will be the rule throughout the water cycle from dams to irrigation systems to water treatment and sewage plants. Funds also tend not to be allocated to maintenance in favor of more glamorous new construction projects.

Water shortages inevitably mean that widely desired food security will be threatened, competition for water will sharpen, and in the worst case, will result in outright conflict. The stress that the Middle East's population growth is placing on the quantity and quality of its water supplies is tremendous. The fertility rates for individual countries have been mentioned before. The region's overall population growth rate of 2.8 percent is the highest in the world after sub-Saharan Africa. The current 237 million people are expected to become 500 million by 2030.³ This points up the futility of focusing only on supply side solutions.

Mary E. Morris, a Rand Corporation specialist on the Middle East, points out that water shortages must be considered against a backdrop of historical disputes between Arabs and Israelis, Arabs and other non-Arabs, other forces of instability, and nationalism.⁴ Middle Eastern nations recognize that water is a

critical issue of national security and they tend to be well armed. Regimes may know intellectually that water security depends on their ability to cooperate, but have not been able to act on that knowledge.

The importance of addressing Middle Eastern hydropolitics in terms of U.S. policy and involvement lies in our strategic interests in the region which revolve around Israel's national security and the stability required to ensure the industrialized nations' access to oil. This was well-recognized in 1986-1987 when the Near East Studies Program of the Center for Strategic and International Studies (CSIS) conducted a year long research project entitled "U.S. Foreign Policy on Water Resources in the Middle East: Instrument for Peace and Development." The CSIS report rightly pointed out that diplomacy is a continuing lengthy process which should be fully pursued, but should not stand in the way of technical advances which could result in significant and more timely improvements. Time and again beneficial schemes for adjusting water use and inducing basin-wide cooperation which could address the crisis have run into traditional political and cultural barriers.

Even absent regional cooperation, there are many actions, especially on the demand-side that each nation can take to improve their situation. Individual countries can improve the efficiency of irrigation, the most optimum technique being drip irrigation, they can select crops which are most tolerant of brackish and recycled water, and they can concentrate on

wastewater capture and reuse. Reforestation and savannization can reverse desertification. Low technology water harvesting can relieve localized water shortages. Israel uses all these techniques extensively, Jordan does a fair amount, but the other countries have barely begun to make these improvements.

Supply-side solutions tend to be much more expensive and/or need multi-country cooperation. Grand expensive solutions include desalination which is mostly out of reach for energy poor countries, and "peace pipelines" which are politically unattainable at present. However, Israel has found desalination of brackish water to be cheaper than of ocean water (35 cents per cubic meter vs 60 cents per cubic meter.)⁵

The research presented in this paper is necessarily far more modest than the CSIS study of 1987. Nevertheless, this review is useful in light of Middle Eastern events in the six years since the CSIS study, the record of U.S. government efforts since then, and the ongoing Arab-Israeli Peace Process. The greatest contribution the U.S. can make is to facilitate a successful outcome to the Peace Process. The research and analysis presented here will show that pending or failing the success of the Peace Process, the U.S. should confine its interventions having to do with water issues in the region to assisting improvements on the demand-side of individual countries' water balances. Just as alternatives to harmful major dam projects represent the future in this country, we should encourage salutary technology and solutions abroad.

INTERNATIONAL LAW. If we accept that regional cooperation offers the only comprehensive and equitable solution to water quantity and quality problems, we must consider how to achieve cooperation: multilateral treaty agreements through negotiation. International law will not substitute for treaties, but can offer some principles to guide the negotiating parties and facilitators. Also, international law can enable international political pressure to oppose actions which contravene generally accepted principles.

There are disagreements among riparians about legal standing in each of the river basins discussed in this paper. Turkey, over the objections of Syria and Iraq, will not accept that the Tigris and Euphrates are "international rivers." Instead, the Turks deem them "transboundary rivers" since they cross borders at an angle.⁶

In 1966 the International Law Association met in Finland and issued recommendations known as the "Helsinki Rules on the Use of the Waters of International Rivers." The most cited principle of the Helsinki Rules is that "each basin state is entitled to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin."⁷ The Helsinki Rules furthered the consideration of not only rivers but "drainage basins" and popularized use of the term "basin states" instead of riparians. Some of the factors in determining a reasonable and equitable share are: the geographic area of each basin state, hydrology - the contribution of water by each basin state,

climate, past and present utilization of basin waters, economic and social needs, population, costs of alternatives in satisfying needs, availability of other resources, avoidance of waste in water utilization, practicability of compensation to co-basin states in adjusting conflicts, and satisfying needs of one state without causing substantial injury to a co-basin state.⁸

To accept the Helsinki Rules is to accept the value of limited sovereignty, interdependence, the duty to cooperate in development, and the duty not to pollute shared waters.⁹ Later, the 1988 Report of the International Law Commission and the 1989 Belaggio Draft Treaty were built on the same principles in dealing with the problems of shared ground water such as aquifers.

These principles can be applied to the conflicts generated by the unique factors in each major river and drainage basin. Even so, the individual states are unlikely to turn to cooperation until their problems regarding water quantity and quality have reached the crisis stage.

CHAPTER II

THE JORDAN-YARMOUK RIVER BASIN

The Jordan River has headwaters in Lebanon, Syria, and Israel. Its major tributary is the Yarmouk River which rises in Syria and flows between Jordan, Syria, and the Golan Heights. The upper Jordan is fully utilized by Israel and Jordan. The Yarmouk is used by Syria, Israel, and Jordan. Although Syria has constructed several small dams on the Yarmouk lessening the river's flow, runoff which continues to reach Israel and Jordan still is not fully used because of a lack of storage.

In addition to rivers, Israel, Jordan, and the occupied territories of the West Bank and the Gaza Strip are exploiting available aquifers beyond their renewal rate. Many of the adverse conditions discussed in the Introduction - non-cooperation between riparians, rapid population increase, agricultural overuse and subsidy, environmental degradation, wasteful practices, leaky infrastructure - have been and continue to be rife in the Jordan Basin.

The water resources of Israel, Jordan, and the West Bank total a mere 2.5 billion cubic meters (bcm). With such limited water resources, these entities will reach the limit of their water supply earlier than the Nile and Euphrates countries, probably within this decade. By the year 2000, Israel's water needs may exceed supply by 30%, Jordan's 20%.¹⁰

For Israel, Jordan, and the Occupied Territories to fully use the Yarmouk's resources, a dam and storage reservoir have long been sought. Negotiations through U.S. representatives in the 1950's, 1970's, and 1989-1990 failed to bring Israel into agreement with Syria and Jordan on how to allocate the stored water which would be held by the "Unity/Maqarin Dam." The additional water held by the dam would be most immediately important to Jordan. Syria would receive needed hydropower from the dam. The dam would prevent the Yarmouk from flooding in wet years and keep runoff from flowing unused to the Dead Sea. Jordan and Syria ratified an agreement to proceed with building a smaller facility but the project could not be financed and built because of the need for riparian understanding with Israel prior to construction of the dam. A perennial difference between Israel and Jordan on a scheme for allocating the water has been the reason, at least superficially, for the riparians failing to reach the agreement required for World Bank financing. Now that Syria has built small dams on the upper Yarmouk, the viability of the Unity Dam as previously conceived is in doubt, but some storage is still desired in order to save wasted runoff.

Until cooperation can be instituted in the Yarmouk-Jordan basin, individual countries can improve their situation significantly by concentrating on domestic and industrial wastewater treatment, water reuse, shifting water use priorities, and by ending water subsidies for agriculture.¹¹

Involvement by the U.S. government in Yarmouk-Jordan issues

dates from 1953-1955 when Ambassador Eric Johnston negotiated a plan for basin development with all the riparians, but could not overcome the Arab-Israeli hostility and distrust for final acceptance. All parties claim even today to follow the allocation patterns arrived at by Johnston, but, conveniently, there were several iterations of allocations to choose from.

The Johnston Plan could not prevent the riparians from settling water disputes by violence in the succeeding decades. In the 1950's Israel and Syria clashed over the building of Israel's water carrier and later Israel forcibly stopped Syria from diverting water from the Jordan River. The 1967 Six Day War was precipitated by a Syrian-Israeli dispute over the headwaters of the Jordan River. By controlling the Golan Heights, Israel secures the headwaters of the upper Jordan which provides Israel with almost one-third of its renewable water supply. Control of the West Bank of the Jordan River gives Israel access to the "mountain aquifer" which provides about 30% of its present renewable water supply.¹² Of course this reality figures heavily in the current peace process.

Each entity within the basin has some unique characteristics in water use and misuse.

ISRAEL. Israel relies upon three general sources of water: Lake Kinneret/Tiberias and the Jordan River, aquifers from the West Bank, and aquifers and streams within its boundaries.¹³ Israel currently uses about 2200 mcm annually although the average

renewable water supply is about 1950 mcm. The deficit is made up by overpumping aquifers, a practice which inevitably degrades their quality over time.¹⁴

Israelis and Palestinians differ on the quantity and equity of West Bank water use. The Palestinians claim that Israel uses, or "steals" 83% of those supplies, whereas Israel counts it differently citing the natural flow of aquifer water toward Israel. By Israeli accounting rules, only about 20% of West Bank water is used by Israelis, and water pumped within Israel should not be counted in that depletion.¹⁵ So the truth is somewhere in between, as with most statements concerning Middle Eastern water allocations and use.

Overpumping of aquifers has allowed them to be contaminated by saltwater and chemicals, especially on the coast. Israel uses desalination plants in the south to treat brackish (moderately salty) water.

Israel may expect severe shortages if new sources are not identified as population grows. Prior to the multi-year drought ending in the 1991-1992 winter, Israel devoted about 75% of its supply to irrigated agriculture. Agriculture was cutback toward the end of the drought by 30%, and the price of water increased, but some restrictions have been relaxed following two wet winters. If the tie between national security and domestic food production were broken, less water would have to go to agriculture.¹⁶

The wet winters of the last two years have pointed up the

lack of adequate storage facilities as flood damage and high runoff flowed into the Dead Sea and the Mediterranean. In response, Israelis have improved water harvesting and small-scale storage techniques using plastic-lined reservoirs and flood dams to recharge groundwater. The Jordanians are also considering such water storing techniques.¹⁷

Israel has developed and implemented technology for irrigation and sewage recycling, and, by some accounts, is using the same amount of water as in 1967, when its population was less than half the current level.¹⁸ Still, per capita, Israel reportedly uses four to five times more water than Palestinians and Jordanians.

Israel has made impressive strides in water-conserving agriculture and in wastewater reuse, but more remains to be done. Israel has the most advanced technical knowledge supporting their agricultural industry. More drought resistant crops are grown now, but there is still significant indulgence in water-intensive crops, which could be imported cheaply.

Israel has the lowest natural population growth rate (1.6%) in the region, but immigration from the Commonwealth of Independent States (414,000 since 1987) has meant a net population gain.¹⁹ Continuing high rates of immigration will add to Israel's water crunch.

JORDAN. Jordan has the most critical water supply problem of all nations in the region, already using over 100 percent of its

renewable supplies, and expecting demand to exceed its supply by 20% by the year 2000. There is already an annual deficit of about 300 million cubic meters (mcm). Shortages and rationing already are routine in Amman. Increasing scarcity can be expected to hamper

Its supply is based on diversions from the Yarmouk into the East Ghor Canal, flow from the River Zarqa, water from underground sources such as the Azraq Oasis and the Disi deep aquifer in the south. Even with the Unity Dam, Jordan would face deficits as renewable groundwater supplies are overextracted and population grows. The aquifers are increasingly saline and polluted, as is the River Zarqa, and the lower Jordan River below Lake Tiberias. But, Jordan, too, has gained a reprieve by the wet winters of 1991-1992 and 1992-1993.

Jordan's major existing water scheme is the East Ghor Canal which carries water from the Yarmouk along the east bank of the Jordan River. Jordan continues to be focused on achieving agreement on building the Unity Dam. Its objectives are more irrigated agriculture in the Jordan valley, water for municipal and industrial use in upland Jordan, and a limit to Syrian development plans in the Yarmouk basin. Jordan is disadvantaged in dealing with Israel and Syria, and hopes to gain from the Peace Process.

Other projects that interest Jordan are a (Israeli) diversion to take polluted water away from the lower Jordan by convincing the Israelis to divert polluted water away from it, and a Dead

Sea-Red Sea canal to produce desalinated water. The Jordanians also have a problem with Saudi Arabia over sharing the Qa Disi aquifer on their mutual border. The Jordanians believe the Saudis are overpumping the aquifer from their side of the border.

The Jordanians government recognizes the significant deficit to be expected by year 2005, made more likely by having one of the world's highest population growth rates (3.6%-3.8% annually), and massive repatriations due to the Gulf War. (The world average annual population growth rate is 1.8%.)²⁰

Inefficient use of water is rampant with waste through evaporation, cracks in the East Ghor Canal, broken water lines, and overuse in irrigation. Water losses throughout Jordan are estimated at 40-60%. Inefficiency, a weak economy, and a lack of capital are in a cycle delaying infrastructure improvement. Efficiency is further hampered by water management and treatment being fragmented among a number of government agencies.

Still, several projects are underway to replace old water networks in cities and to improve irrigation systems. The European Investment Bank recently loaned \$6.6 million to the Water Authority of Jordan to finance the improvement of the water distribution networks in Irbid and Ramtha. The improvements, to be completed by 1995, will reduce water losses which presently reach 40%.²¹ Losses in Amman's pipes are estimated at 20-25% making an upgrade there worthwhile, although expensive.

Jordan has cut down on evaporation losses by replacing much of the original open channel East Ghor Canal system with enclosed

pipes. Experts advocate additional steps of lining canals to prevent seepage, more rational allocation of water to agriculture, charging realistic prices to all users, recycling treated sewage, drip irrigation, crop varieties, and water saving facilities in homes. Jordan could also imitate Israel's habit of saving rainwater, increasing wastewater reuse, and modernizing additional agricultural areas.

Jordan appears to be unique in desiring a comprehensive peace treaty with Israel. This is an example of a water crisis driving cooperation instead of conflict. Jordan wants a greater share of the Yarmouk, most of which goes to Israel. While indicating some flexibility, Israel stresses more efficiency in water distribution within Jordan and finding new sources of water for both countries. Improvements in supply depend on reaching agreements in the Peace Process, and obtaining financing. Jordan's dilemma is that supply-side solutions are difficult to achieve in international politics, and demand-side improvements aggravate internal political problems.

SYRIA. Syria's hydropolitical situation is more complex, sitting as she does on both the Euphrates and Jordan basins. Historically, Syria has had ambitious strategic and ideological objectives with regard to territory in neighboring countries. Syria's interest in the Jordan basin is intensified by its failure to achieve agreement from Turkey for additional flow on the Euphrates River, its most important source of water.

Accommodation with the Peace Process and in the Jordan Basin may gain Syria some international support for renegotiating the allocation of Euphrates River water.²²

Syria's main goal in the Jordan Basin is acquiring additional hydroelectric power supply by developing two dozen or more small dams on the upper Yarmouk River. Syria's plans may exceed a 1987 agreement with Jordan which promised to ensure sufficient downstream flow (195-200 mcm) for the forestalled Unity Dam.²³ The loss of anticipated water for the dam would be a major setback for Jordan's effort to solve its water deficit.

Syria's main political goal in the Jordan Basin is the return of the Golan Heights from Israel. A settlement depends on reconciling Syrian desire for control of the Golan Heights with Israel's security goals, including water security, and Israel's demand for a full peace. To date, Syria has refused to commit to full diplomatic relations and open borders, and Israel will not pre-commit to total withdrawal from the Golan Heights. Syria wants withdrawal to include the Mount Herman springs which feed the Jordan River. Among other Golan issues, Israel does not view Syria as an upper riparian on the Jordan River with equanimity.

Syria's role in Lebanon is in part due to hydrological considerations, particularly the sources of the Orontes river which rises in Lebanon and flows to Syria. Israel's continues to occupy positions in south Lebanon near the Litani and Awali Rivers, and wants those resources to be included in a basin-wide allocation of water.

Syria's need for international economic and technological assistance could be sufficient incentive for eventual cooperation in the Peace Process and regional water issues.

PALESTINIANS, THE WEST BANK, THE GAZA STRIP. The Palestinians are demanding autonomous and ultimately sovereign control over the water supplies of the Occupied Territories. The Palestinians are negotiating from weakness, but are holding to their position. They want a larger allocation of water in general, but especially for agriculture. The Palestinians look to self-rule to eliminate the Israeli-imposed limits on economic development and water consumption, and to lower the price (taxation) on water to Palestinians. The water in the Occupied Territories is controlled by the Israeli national water company which withholds much information about the subject.

The West Bank and Gaza Strip depend mainly on aquifer water extracted through wells. The aquifers from which the Palestinians receive most of their water have generally lower quality and more brackish water than the aquifers heavily tapped by the Israelis. Per capita Israelis in Israel and the West Bank consume three to four times the water consumed by Palestinians. Palestinians also pay three times more for domestic water than do Israelis.²⁴

The main water potential of the West Bank is fully exploited with 4.5% going to the West Bank and 95.5% to Israel according to some reports. Allocations are projected at 137 mcm water per year to the West Bank's Arab population (approx 1 million people)

by 2000 and 100 mcm for the Jewish population (100,000 people). Palestinians accuse Israeli settlements on the West Bank of exceeding their water quotas by almost one-third.²⁵

Palestinians appeal to a rule of "equitable apportionment" under international water law to achieve redistribution of "water rights", the main thrust for Palestinians in the multilateral water talks. Israelis defend continuing the current distribution pattern by citing the international law principle of "prior or existing use." "Equitable apportionment" would consider prior or existing use as only one factor along with the other criteria of the Helsinki Rules, which the Palestinians believe favor a redistribution of water in their favor. The Palestinian view is that the Israelis can make up what they lose in a redistribution by buying water from the rightful Palestinian share and by implementation of various schemes to increase supply.²⁶

The water situation in the Gaza Strip is truly dire. The Gaza Strip aquifer, which supplies all the area's water needs, is suffering from seawater intrusion. The aquifers are also damaged by pesticides and fertilizers, and raw sewage. New sewage systems would be expensive and Israel has not invested in West Bank and Gaza Strip water and wastewater services over the last decade. Some projects have been financed by the U.N., the U.S. Agency for International Development (USAID), and others, but not under any comprehensive plan. Aid for Gaza water projects is a possible outcome of the multilateral water talks.

PROSPECTS. There are numerous appealing ideas for addressing the Jordan Basin's predicament offered by hydrologists and other experts on the region. The supply-side solutions depend on the degree of regional cooperation that can be achieved. There is no record of cooperation, so the outcome of supply-side proposals is wholly dependent on the Peace Process.

Conventional desalination remains prohibitively expensive for most uses in energy-poor countries such as Israel and Jordan. The only large scale desalination schemes that may be affordable to these countries involve canals from the Mediterranean or Red Seas to the Dead Sea, known as the Med-Dead and Red-Dead canals. Both Israel and Jordan may increase the investment in brackish water desalination which is less costly than ocean water desalination.

Other grand schemes involve water sharing from countries with surplus water via pipeline. Proposals for pipelines from the Nile to the Sinai (Egypt) and Negev (Israel), and to Saudi Arabia are dead for Egyptian internal political reasons. The late Turkish prime minister Turgut Ozal proposed pipelines to carry excess water from the Seyhan and Ceyhan rivers in southern Turkey to cities of the Middle East. This proposal received a chilly response too from the Gulf oil countries who would receive much of the water and finance the project. As shortages intensify in future decades, inter-basin transfers of water may become more attractive.

Importation's drawbacks are possible interruption of supply

by the supplier or intervening country. Lebanon and Turkey are the only two countries in the region with significant surplus supplies of water available for export. Syria holds the political key to either country supplying Israel with water, and insists that regional cooperation with Israel must wait for Israel's withdrawal from the Occupied territories. Syria would also want to see Turkey increase the flow of the Euphrates before agreeing to exports to other countries. Jordanian officials see Turkish water as a solution to their deficit, but would need Gulf state financing for implementation, which is not forthcoming.

Turkey is preparing for export by another method, either by tanker or "Medusa bag", a huge one-mcm balloon towable by barge, which has not been tested. A quasi-private Turkish entity would dispense water to all comers like a gas station, and would be politically insulated, and hence more politically palatable to the region. Still, the prime customer, Israel, has not decided to construct a receiving terminal, pending comparison of costs between importing and desalination.

Before resorting to imports, much more can be done within each country to conserve existing supplies by improving efficiency and instituting pricing based on true cost. If the agricultural lobby can be overcome and true peace comes about, technology sharing and coordination between Israeli, Palestinian, and Jordanian agriculture can save water.²⁷ Israel, Jordan, the West Bank and Gaza already have extensive drip and computerized irrigation and are increasing wastewater reclamation. Shifting

more water from agriculture to industrial use, more use of water-saving fixtures, and greater reuse of wastewater can all be done. Wastewater reclamation would allow greater allocations to agriculture and better quality water for personal use. Additional leakage and evaporation can be eliminated. Achieving these savings would require significant financial investment, which the Israelis will not make. Traditional Palestinian benefactors have become less generous since the Gulf War and Palestinian sympathy for Saddam.

Another proposal for inducing regional cooperation is to create a Jordan River Basin Compact between Israel, Jordan, Lebanon, Syria, and the West Bank.²⁸ Experience shows that cooperation can be effective below the political level by involving scientists and technical experts who can press for efficient policies. This proposal would promote another basic requirement for regional cooperation: shared information, research, and joint data collection.

Allocations will continue to be a contentious issue. Israelis prefer the status quo or to discuss only new supplies, but Arabs want allocations of existing resources changed.

THE PEACE PROCESS. The Jordan River Basin, and future regional cooperation, must be considered in the context of the overall "Middle East Peace Process" with its bilateral and multilateral negotiations. The bilaterals involve Israel and Syria, Lebanon, Jordan, and Palestinians, while the multilaterals include over 40

entities, including governmental, financial, and regional institutions from around the world.

Water is one of four subjects treated in the multilateral groupings, which are boycotted by Syria and Lebanon, but actively supported by the others. Participation is indicative of wide recognition that no overall political settlement is possible without settling the water issue. The relationship of water and peace has a chicken and egg flavor, with some saying the water issue must or can be solved first, and others saying an overall settlement has to come first. The current Peace Process is completing its second year, and obviously is a long term effort with many hopeful and discouraging turns.

Experts have offered a variety of schemes to resolve Arab-Israeli conflicts over Jordan River and the West Bank Mountain Aquifer, including: negotiating an equitable division of existing water resources; establishing policies to allow greater efficiency for regional water supply and demand; determining the availability and political viability of water imports to alleviate short term needs; and investing in large-scale regional desalination projects for long term needs.²⁹

Without assigning too much credit to hydropolitics for Israel's past military decisions, it is undeniable that water now plays in decisions to exchange "land for peace" in the Golan Heights and the West Bank, and possibly southern Lebanon. It is encouraging that hydrologists believe only a narrow westernmost band of the West Bank is necessary for continued Israeli access

to the Mountain aquifer, their prime West Bank water source.

The various proposals for an Arab-Israeli settlement entail risk, but failure to reach a settlement which provides for some degree of opportunity, self-determination, and greater share of water for Palestinians is bound to mean continued civil instability, political militance, and violence in the Occupied Territories.

The U.S. role in the Peace Process and in addressing Middle East water problems will be discussed in detail in Chapter V, Conclusions. In brief, the more active U.S. role in the Peace talks being played in May 1993, which includes offering strategies, is essential to the parties reaching an agreement. For instance, the U.S. peace team can help mediate the allocation question and help establish standards for equity.

The most recent multilateral water meetings in Geneva from April 27-29, 1993, exemplify the unpredictable nature of the Peace Process. The meetings broke up with an angry tone between Israelis and Palestinians, with both unable to reach a compromise on language establishing a framework for studying water resources in the occupied territories. Then, unexpectedly, some of the same participants had discussions while attending multilateral meetings on refugees in Oslo in mid-May. They agreed on a framework for the water study, and the Palestinians reversed their intention not to attend any events before the next full water meeting in Beijing in September 1993. Instead, they will participate in a Colorado River tour hosted by the U.S.

Geological Survey, and will attend a seminar on arid lands technology in Vienna. No parallel progress was achieved in the May 1993 bilateral talks with regard to water.

Apart from efforts in the Peace Process which is necessarily lengthy and unpredictable, U.S. agencies should continue to encourage change within each country. Actions which are not tied to peace agreements need to be pursued independently. These primarily involve encouraging public awareness, population control, and the efficiencies discussed earlier.

CHAPTER III

THE TIGRIS/EUPHRATES RIVER BASIN

The Tigris-Euphrates River basin, the relationship among the riparians, and American interests are vastly different from the example of the Jordan River Basin. The amount of water, the extent of the geographical area, and the populations are several times greater. The U.S. government has friendly relations with Turkey and shares the NATO connection, has an improved relationship with Syria since the Gulf war, and has an antagonistic relationship with Iraq, but the same obligations do not exist for the U.S. government toward these countries as obtains in the case of Israel.

Both the Tigris and Euphrates Rivers originate in the mountains of eastern Turkey. Turkey has the huge advantage over the other riparians in being the source of 98% of the flow of the Euphrates and 43% of that of the Tigris River.³⁰ To the neverending distress of Syria and Iraq, Turkey calls its shared border rivers (with Armenia and Greece) "international rivers", but calls the rivers that cross borders from Turkey at an angle "transboundary rivers."³¹ The most contentious transboundary river is the Euphrates River flowing through Syria and Iraq to the head of the Persian Gulf. The Tigris flows directly from Turkey through Iraq to the Gulf. The approximate annual discharge of the Tigris was 42 bcm and of the Euphrates 31 bcm in

the 1980's.³²

Turkey prefers to consider the Tigris and Euphrates rivers as one basin, thereby denying responsibility for downstream repercussions of flow reductions in one river or the other, as long as total minimum flow is maintained. Iraq, of course, does not have the infrastructure to shift demand from one river to the other at will, so insists on viewing the rivers and their basins as separate entities.

Interstate cooperation has been very limited and the antagonisms bitter enough to contribute to low intensity conflict between the Kurds and the Turkish military. Agreements between Turkey and Iraq to share data on the Tigris and Euphrates date from 1946. In 1980 they established the Joint Technical Committee on Regional Waters, with Syria joining in 1982. This Committee can discuss only technical matters such as data reflecting flow and rainfall. Turkey tends to term controversies as technical issues, but in a catch-22 the issues often do not fit criteria for discussion by the Committee.

The dominant issue between all three riparians is the decreasing flow from country to country and the deteriorating quality of the river water. It is difficult to interpret estimates of present use and future need in these countries, with so much secrecy and uncertainty about future development. The foremost American expert on these rivers believes there may not be enough water in the Euphrates to satisfy every demand, even under the most modest of the development scenarios which have

been advanced.³³

All three riparians on the Euphrates aim independently to have a steady supply of water on demand for irrigated agriculture regardless of annual and perennial flood and drought conditions. This results in varying flow along the main stream, in addition to seasonal and annual inconsistency. Extensive development and management of Euphrates flows for both hydropower and irrigation by Turkey, and somewhat by Syria and Iraq, are inherently conflicting. The situation is aggravated by the reluctance of riparians, especially Turkey being most upstream, to coordinate plans and actions which influence the flow.

The pattern of unilateral management has precipitated several tense situations over the years. Iraq reacted strongly in 1974 when Turkey and Syria, independently but simultaneously, filled reservoirs of new dams (the Keban in Turkey and Tabqa in Syria), in a dry year at that, cutting the Euphrates flow into Iraq to a trickle. In 1981 Turkey depleted the Keban reservoir for extra hydropower production, necessitating its eventual refilling and causing water shortages downstream. The latest similar instance was in 1990 when Turkey partially filled the new Ataturk Dam reservoir reducing flows for 27 days.

The most egregious example of unilateral river development has been Turkey's mammoth 21-dam, hydropower, and irrigation project, the Southeast Anatolia Project (GAP being the Turkish acronym), which was designed without much consultation with the Syrians and Iraqis. The GAP increasingly will affect the

Euphrates flow into Syria and Iraq and is thus of immediate concern to both. Turkey just recently agreed to high level negotiations on water allocation and use. The change of heart may be a result of the World Bank's refusal to support GAP until a cooperative water-sharing agreement is secured.

TURKEY. Including the resources of the Tigris and Euphrates rivers, Turkey has 26 river basins with total annual runoff estimated at triple the estimated annual consumption after 2000. But, not all the water will be usable, due to degraded quality and the need to keep rivers flowing to their outlet.³⁴

Turkey, with all its abundance, still has water shortages in its major cities because of an inadequate distribution system. Istanbul's water problems stem from huge population growth and a leaky infrastructure wasting 40% of its water supply. The city plans to invest \$14 billion to upgrade water systems.³⁵

The GAP is the largest project envisioned in the Middle East incorporating 21 dams and 19 hydropower plants on the Euphrates and Tigris Rivers.³⁶ Turkey needs additional electrical production and her rivers are her most abundant source of additional energy. Turkish average per capita consumption of energy is less than half the world average of 2200 kWh.³⁷

The GAP title for development of the Tigris-Euphrates dates from 1977, and in 1989 achieved its current status directly under the Prime Minister. Turkey's leadership has had deep personal ties to GAP. Prime Minister, Suleiman Demirel, has been

associated with forerunners of GAP since the 1950's as a hydrological engineer and director of the State Hydraulic Works (DSI) known as "the King of the Dams." Turgut Ozal, the late President, started his engineering career on the Keban Dam in the early 1960's. Ozal and Demirel had serious differences, but were united in vigorous defense of GAP.³⁸

Turkey expects GAP to help pacify the Kurds, supply electricity throughout Turkey, and produce export income from agriculture. At the same time, GAP is advertized as providing flood control and stability for the downstream riparians a, at no cost to them. It is true that water storage is most efficiently done near the headwaters for flood control and to lessen evaporation. The Turks maintain that GAP enables them to guarantee the 500 cubic meters per second (cms) at the Syrian border agreed to in July 1987. But, the Syrians and Iraqis cannot ignore the negative impacts which they expect from GAP: the depletion, detouring, and pollution of downstream flow.³⁹ GAP is huge and hugely contentious, and may produce endless confrontation between the three countries, whatever Turkey's intentions.

The current master plan, produced in 1989 with Japanese contractor help, focuses on implementing only priority irrigation and hydropower schemes by 2005, instead of maximizing either type of water development. Further investment and development will depend on financing and the pace of agricultural and social adjustment. Efficiency depends on farm worker training and the

performance of farm managers in irrigation and crop decisions. Agriculture increasingly will affect the downstream environment in reduced stream flow and higher pollution. Some experts say that the master plan underestimates the effect downstream of the pollution of rivers by the return flow from irrigated fields. Turkey's perturbations to the rivers may not heavily impact Syria, but the cumulative effect of upstream development by both countries likely will be serious in Iraq.

The Ataturk Dam and the associated Urfa Irrigation Tunnels are the centerpieces of GAP. Ataturk is operating and is expected to run eight turbines by the end of 1993 to supply nearly one tenth of Turkey's entire current electricity output.⁴⁰ The Urfa Tunnels may detract from the flow into Lake Assad impacting Syria's hydropower production and irrigation projects. Return flow from irrigation would enter through tributaries below the Tabqa Dam hydropower facility. The one million ha Euphrates irrigation project will begin to come on line next year, but the critical effect may not be felt for a decade.⁴¹

SYRIA. If one million ha of Turkish land is irrigated after 2005 as planned, flow of the Euphrates into Syria may decrease to an average of 360 cms instead of the agreed upon 500 cms, setting the stage for conflict, even as Syria is requesting 700 cms.⁴² The recently reported average, annual flow of the Euphrates across the Turkish/Syrian border is 29.8 bcm, down nearly two

billion from the estimated pre-development flow.⁴³

Even if Turkey preserves the promised 500 cms flow into Syria, Syria's use will likely decrease Iraq's share below its stated identical minimum requirement of 500 cms. Additionally, the quality of the water which arrives in Syria via the Euphrates, the Balikh, and Khabour rivers will be much degraded after irrigating Turkish fields.

Conditions in Syria have been difficult for outside experts to quantify, because data related to Syrian water projects are tightly controlled by the government. But, experts believe the country could face a general deficit as high as one billion cubic meters (bcm) by the year 2000 if present patterns of consumption continue.

Syria's population is growing at 3.8% which would double it around 2010. Severe water shortages will accompany continued rapid urban growth. Problems are compounded by the geographic location of Syria's large population centers which are situated away from major river basins.

For economic development, Syria also needs increased electrical power, but low water levels the Tabqa Dam main hydropower facility have cut electricity production. Because of its (Russian) design, Tabqa's eight turbines require a high water level in the reservoir in order to generate hydropower. Whereas the dam provided 60 percent of Syria's electricity in 1979, low water levels have generally idled 6 of the 8 turbines, resulting in blackouts. Major cities like Damascus and Aleppo suffer from

constant water and electricity shortages especially during the summer months.

Syrian river managers are faced with responding to Turkish manipulation of the river upstream and balancing their own internal priorities. Keeping Lake Assad full for hydropower conflicts with demands for water for Aleppo and for irrigation projects. Adding to the difficulty, Lake Assad loses an estimated one bcm of water per year to evaporation.⁴⁴

Agriculture is estimated to use more than 90% of Syria's water supply. Efforts to increase irrigated acreage by the Tabqa Dam were set back from 650 thousand ha to 240 thousand ha due to salinization problems.⁴⁵ This came after sacrificing fertile valley land to Lake Assad. Continuation of unwise agricultural practices will mean reduced flow in the Euphrates, low productivity, and contamination by pesticides, fertilizers, and salt.⁴⁶ There is enormous room for conservation and recycling in place of gross inefficiencies in urban sectors paralleling the agricultural situation.

The Syrian government has sharply increased the budget for water and hydroelectric projects, including badly needed water and sewage systems in Damascus, Aleppo, Homs, and Hama. In 1992 Damascus reportedly was losing as much as 30% of its water supply as a result of old pipes, and is without water most nights.⁴⁷ Syria, with Egypt, is most lacking in the region in skilled technicians to maintain and operate equipment, so existing water facilities operate well below peak efficiency.

The Kurdish Workers Party (PKK) has been an effective weapon against Turkey from bases in the Syrian-controlled Beka'a Valley. Until recently, the Turks would refuse to discuss water differences until Syria withdrew support from the PKK. Syria would then object to linking water with other political issues. Should the PKK re-erupt, Turkey will continue to insist on linkage between water and terrorism.⁴⁸

IRAQ. Iraq's future depends on the condition of the Tigris and Euphrates rivers and their ability to supply water to urban and farming areas. Because of secrecy, relatively little is known about river management in Iraq. Comprehensive planning for river use in Iraq often has been interrupted by turmoil and wars, but several major facilities are in operation.

Facilities on the Euphrates include the Haditha (Qadisiya) Dam, completed in 1987, for hydropower and to provide water for uncompleted irrigation projects; the Baghdadi Dam to regulate flow from the Haditha; and barrages downstream to divert water to reservoirs and for irrigation.

Tigris River facilities include the Mosul (Saddam) Dam for hydropower, irrigation and flood control, and two barrages downstream for flood control and irrigation. Three other dams are in the planning or construction stage.⁴⁹

Iraq has completed a major water project called variously the Saddam River, the Third River, or the Main Outfall Drain. The project dates from the 1950's, but was accelerated after the

Gulf war. The hydrologic purpose is to divert saline runoff to the Persian Gulf, and to permit reclaiming farmland between the rivers, but there is international interest in the project, because draining the marshes makes Shi'ite rebels more accessible to the Iraqi army.

Iraq's population was 18.8 million in 1990 with a state-encouraged growth rate of 3.9%, but Iraq is intent still on becoming self-sufficient in food. The country has traditionally imported 70% of its food, but the Gulf war related economic embargo provided an impetus for lessening dependence on food imports. The impact of Iraq's move in April 1993 to set up separate agriculture and irrigation ministries is still unknown. It does separate responsibility for self-sufficiency in agriculture from water resource development including irrigation, soil desalination, and land reclamation.

Iraq has a reputation for wasteful irrigation practices, but post-war politics and other priorities weigh against improvement through technical and pricing mechanisms.

Water-related infrastructure in southern Iraq including sewers is still war-torn, and drinking water is often provided by trucks. The war's effects have slowed development efforts and even suspended several major projects. With the infrastructure costs of Iraq's last war at \$256 billion and counting, war over water would not seem an option, but there have been several past water related incidents.

In 1974-75 and 1980-81 upstream diversions by Turkey and

Syria, and in 1990 by Turkey, caused saber rattling by Iraq. The 1974 incident was a perfect example of non-coordination as Turkey filled the Keban Dam reservoir, while Syria independently filled Lake Assad behind the Tabqa, all in the midst of a major drought.⁵⁰ In 1990 Turkey cut the flow to fill Ataturk Dam reservoir and complete construction on the river bed in front of the dam. Prior statements by then Prime Minister Ozal implied a reprisal for PKK incursions into Turkey from Syria and Iraq. Turkey later called the water issue a technical matter, while to the Iraqis it was political. The issue died as attention turned to the Gulf War in August 1990.

The conflicts resulting from these blockages to Euphrates water were successfully mediated, but upstream demographics and development could reduce the flow to Iraq sufficiently to prompt future military reaction.

Iraq is still concerned that GAP and Syrian development could eventually reduce its Euphrates supply below the stated annual requirement of 15 bcm. Also, Iraq, being farthest downstream, is most harmed by increased pollution from upstream development.

Legal and diplomatic channels for influencing Turkish actions have not been exhausted. In March 1993, Iraq threatened to sue nine companies building a dam in Turkey on the Euphrates saying the project "violated Iraq's right to use the water." Iraq claims the project will harm Iraqi agriculture which is needed because of the United Nations trade sanctions. Iraq

continues to press for trilateral coordination of projects.⁵¹ Iraq and Syria can clearly see they need a Tigris-Euphrates-wide joint plan with Turkey to de-conflict all three national interests.

PROSPECTS. Turkey continues to prefer to treat water-related issues as domestic political concerns, but has not been totally impervious to international pressure. Turkey may not build the Karkamis Dam near the Syrian border in order to allow a small Syrian Dam and reservoir to occupy the site.⁵²

The death of Premier Turgut Ozal in April 1993 means the loss of a relatively moderate voice in government policy on the water and Kurdish issues. During the Gulf War, Ozal announced that Turkey would not use water as a weapon.

In a more nationalistic tone in July 1992, Prime Minister Demirel related water to sovereignty, as he was quoted saying, "The waters spring in Turkey. This is a matter of sovereignty. Water resources are Turkey's, and oil is theirs. Since we don't tell them, 'Look we have a right to half your oil', they cannot lay claim to what's ours."⁵³

In October 1992 trilateral talks broke down, but in January 1993 Turkey agreed to discuss raising the 500 cms flow level to Syria. The Syrians have argued for 700 cms. Iraq believes that its current share of 58% of the 500 cms flowing into Syria under a 1987 protocol is insufficient by half. Syria wants a new protocol once the Ataturk Dam reservoir is full, but disagrees

with Turkey about what constitutes "full".⁵⁴

Before recently favoring new talks, Turkey has argued for a criteria of "optimal use", rather than a strict equal sharing as a basis for the usage of the rivers. They point to GAP's use of modern irrigation techniques as superior to Syrian and Iraqi open canals with huge losses of water due to evaporation. Turkey has called for "joint projects to determine plans for fair and rational use" of shared water.⁵⁵

Turkey's decision to reopen talks reflects a funding pinch for GAP projects, since the World Bank and Japan will not invest in projects until there is an agreement.⁵⁶ The new interest in talking also followed a December 1992 Syrian appeal to Arab unity casting Turkey as a non-Arab state harming Arab water interests.

Their non-Arab identity is also used in arguments against Turkish ideas for "peace pipelines" and tanker/balloon export of non-Tigris/Euphrates water. Their proposals for exchanging water and hydroelectric power for oil and gas with neighbors is better received and could promote cooperation and interdependence.⁵⁷

A major problem is posed by the expected rise in the combined population of Turkey, Syria, and Iraq of 91 million in 1992 to nearly 141 million in 2010.⁵⁸ The Iraqi and Syrian governments encourage high birth rates, but Turkey favors a lower rate, which is falling as society modernizes and the status of women improves. The large downstream populations will be vulnerable to water shortages and ever poorer quality by 2010, if upstream development approaches announced plans.

U.S. INFLUENCE. Both Turkey and Syria joined the U.S.-led coalition opposing Iraq in the Gulf war. The post-Gulf war situation also probably heightened the importance of Turkey to U.S. interests, because of the need to use Turkish territory for enforcement of the no-fly zone and to pursue operation Provide Comfort for relief to the Iraqi Kurds. Apart from the outstanding postwar issues with Iraq, eventual progress in regional cooperation on water issues is essential to long term stability.

Some initiatives offered by experts parallel those mentioned for the Jordan Basin: a basin-wide regional compact, a jointly gathered detailed inventory of hydrologic information and exchange of data; a joint inventory of all arable lands; joint optimization of agricultural development as to crops and amount of water needed. U.S. agencies and the World Bank can continue to exert pressure for regional cooperation.

U.S. entities and international groups also can perform environmental advocacy for the rivers themselves and concerning the impact of development on the Persian Gulf. Environmentalists will remain concerned about the effects of agriculture and industrial development on the ecology of the Persian Gulf. Higher salinities might create additional problems for the desalination plants of the Gulf States. On this issue Turkey, Syria, and Iraq may be drawn into river-associated interdependency with the Gulf countries.⁵⁹

CHAPTER IV

THE NILE RIVER BASIN

The Nile is not just the longest of the major rivers discussed in this study; it is the longest river in the world. The Nile has nine nations in its watershed: Burundi, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda, and Zaire. But, only three - Egypt, Sudan, and Ethiopia - will be discussed for their conflict potential. Egypt, by far the heaviest user of the Nile and the most downstream riparian, depends on the Nile for over 90% (some say 95%) of its water needs. Ethiopia's headwaters of the Blue Nile account for 60% to 85% of the Nile's water. The rest comes from the White Nile in Uganda and Sudan. The average annual discharge of the Nile has been put variously from 84 bcm to 92 bcm.⁶⁰

Egypt's dependence is clear in an often-quoted 1987 statement by Boutros Boutros-Ghali, then the Egyptian Foreign Minister: "The national security of Egypt is in the hands of the eight other African countries in the Nile basin."⁶¹ He is also quoted as saying the next war in the Middle East would not be over politics, but over the waters of the Nile.⁶²

The problems faced by the Nile riparians include periodic drought, deteriorating water quality, and starvation in some upstream areas. Historically, cooperation among the Nile's nine riparians on resource management and development has been sparse.

But the Undugu Group has existed as a consultative body since 1983 to increase cooperation among Nile riparians. Kenya and Ethiopia would not join, Ethiopia preferring the option of bilateral agreements.

There are no agreements binding all Nile riparians. The one binding treaty on allocation is the Nile Waters Agreement signed in 1959 by Egypt and Sudan. The agreement allocates 55.5 bcm to Egypt and 18.5 bcm to Sudan. Sudan does not use its full allocation allowing Egypt to "borrow" Sudan's water. Therefore, the agreement has not really been tested, and eventual political stabilization, development, and greater water demand in upper riparians could increase conflict with Egypt.⁶³ The 1959 agreement raised the water allotment to Sudan above the limits of a 1929 agreement.⁶⁴

EGYPT. Egypt, with its near total reliance on Nile water, is ever aware of the effect of upstream extractions on its water supply and hydropower production at Aswan Dam. Egypt monitors the development plans of the upper riparians, but has not exercised influence on upstream project planning and operation.

Although Egypt has gathered data on the Nile over a long period of time, as in most nations of the Middle East, hydrological information is restricted, and accurate data on Egyptian water use, and the seasonal flows of the Nile, are sparse for outsiders.

According to John Waterbury of Princeton University, Egypt

has an average annual supply of approximately 68.9 bcm, yet could experience a critical water shortfall by the turn of the century. Egypt uses 97% of its annual renewable water supply, with a scandalous percentage being wasted. Up to two-thirds of the water allocated to non-agricultural use in cities and towns is currently lost, while farmers in the Nile Delta use twice as much water as necessary because of poor irrigation techniques.⁶⁵ This harms the land bringing soil salinization, waterlogging, and declining productivity. Concentrating on increasing supply is ludicrous in the face of such destructive inefficiency

Increased pollution is a critical problem in the Nile delta and in coastal areas. The Aswan High Dam has prevented flooding since 1964, having the effect along with heavy irrigation of turning the delta into a major ecological disaster. Water quality is deteriorating rapidly due to increasing discharge of untreated urban and industrial wastewater and the presence of solid wastes. Egypt recognizes its problem with waste, drainage, agricultural chemical overuse, but faces grave difficulty in reforming while coping with rising demographic pressures. Only politically unpopular changes can bring needed conservation.

At the current booming growth rate, more than 1.5 million new Egyptians are born annually. The population is expected to double to more than 100 million in 30 years. The Egyptian government has been promoting family planning, but rates will have to continue to fall drastically to change the demographic picture. The Grand Mufti has been cooperative to the effort, but

Islamic fundamentalist leaders argue against contraception.⁶⁶

Agricultural land is expected to be lost due to land erosion and saltwater intrusion in the delta in coming years. Egypt is seeking international funds for environmental training and afforestation and reversing desertification. Climactic changes are also a problem causing a drop in the flow of the Nile and the water level in Lake Nasser. Illustrating the purely hydrological advantage of impounding water farther upstream in mountainous area is the fact that Lake Nasser loses ten bcm per year to evaporation and seepage.⁶⁷

The Egyptian peace with Israel has been called a cold peace, with limited normalization beyond diplomatic relations. This may explain the failure to benefit from Israeli technology and expertise, which Palestinians and Jordanians have done significantly.

Egypt's policy concerning its neighbors to the south are described as: to assure that 84% of the Nile waters flow into Egypt; to secure the southern borders of Egypt; and to secure the southern entrance to the Red Sea and to eliminate Israeli influence from the Horn of Africa.⁶⁸ There is more potential for conflict than cooperation along the Nile.

ETHIOPIA. Ethiopia is the source of up to 85% of Nile water. Its position on the Nile raises concern in Egypt and Sudan about any plans for dams and irrigation schemes in the Blue Nile Basin and the Baro. There have been long-standing plans for projects

gathering dust because of prolonged civil war. Although reservoirs upstream could benefit Egypt by having lower evaporation rates than Lake Nasser, Egypt would oppose new facilities in the absence of an agreement. Egypt and Ethiopia have a history of sensitive relations, especially over water, and the historic links between Israel and Ethiopia.

With the acceptance of Eritrea's independence and the end of civil war, Ethiopia may be ready to embark on a development plan. Ethiopia has a provisional government in place with general elections planned at the end of 1993 toward establishing a Federal Republic of Ethiopia. The government has been trying to obtain economic assistance from Israel for economic recovery from the civil war. Land reclamation is expected to take priority, but industrialization will be encouraged, too. Any development will have implications for the Nile and Egypt.

Despite being the source of so much Nile water, Ethiopia has great difficulty providing drinkable water to Addis Ababa or rural areas. The U.S. recently committed to an aid program partly to provide clean water.

SUDAN. Sudan, the largest country in Africa, is, like Egypt, nearly totally dependent on the Nile for water. The White Nile and Blue Nile join near Khartoum. Egypt and Sudan have clashed previously over water issues. The two countries also have other mutual antagonisms: Sudan is a base for Islamic fundamentalism which President Mubarak blames for terrorist incidents in Egypt.

Also, their border in the Shalatayn-Halaib triangle is in dispute, and a potential flashpoint for conflict. Sudan's sympathy for Iraq during the Gulf War contributed to further alienation from Egypt. Before Iraq's invasion of Kuwait, President Mubarak accused Sudan of stationing Iraqi missiles in Sudan aimed at the Aswan High Dam. Sudan denied the action.⁶⁹

Egypt has publicly denounced any attempt by Sudan to impinge on Egypt's access to Nile water. Whatever its desires, Sudan, like Ethiopia, has been in disarray from internal conflict and unable to initiate any recent major projects on the Nile. Famine has plagued Sudan since the 1980's due to drought and civil war. Southern Sudan is in a war-driven famine that could kill 250,000 people by the end of 1993.⁷⁰ The U.N. and other agencies place death totals from 350,000 to one million.

The civil war has delayed the plan to build the Jonglei Canal to drain the Sudd swamps in southern Sudan. The project would be an ecological disaster, but would lower the amount of water lost to evaporation, develop agriculture, and make more water available to irrigation in Sudan and Egypt. Sudan irrigates only 2 million hectares of 84 million that are potentially arable.⁷¹ Settlement of the civil war could mean completion of the project but also greater demand for water, and conflict with Egypt.

Continuing tension between Sudan and Egypt was reflected by a recent threat by Sudan to eject an Egyptian water management team which is based in Sudan to check on the flow of the Nile.⁷²

UGANDA. Uganda is the third perennially unstable upper riparian whose future economic development could impact on the Nile water currently available to Egypt. Uganda's Lake Victoria, the second largest freshwater lake in area in the world feeds the upper Nile River (the Victoria Nile).

The country has been afflicted with instability and civil war for over 20 years. Uganda has a population estimated at 16.9 million and a growth rate of 3.2 percent, but growth is affected by the number of AIDS cases, the third highest worldwide.

U.S. INFLUENCE. The close American-Egyptian relationship was apparent in Egypt's support for the U.S. position in the Gulf war, and in massive American support to Egypt. Egypt receives more than \$2 billion annually in U.S. aid as a result of its peace with Israel. American wheat constitutes a large part of the 70% of Egypt's food which is imported each year.⁷³ The U.S. government also wrote off \$7 billion in military loans after the Gulf war as a result of Egypt's role in the coalition.⁷⁴

The best U.S. investment is probably in the form of contraceptive devices from USAID. Some proportion of U.S. aid should be devoted to improvements on the demand side of Egypt's water balance. The opportunity for improvement is limitless. The cold peace with Israel and failure to gain from Israeli technology and expertise represents a lost opportunity to have more efficient, less environmentally damaging agriculture.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Many recommendations in the 1987 CSIS study on U.S. foreign policy and Middle East water issues are still relevant. The major recommendations then were: to develop advanced water technologies; to encourage more efficient resource management and conservation strategies; to improve coordination among U.S. agencies dealing with water issues; and to give attention to long range research and planning.⁷⁵

The 1987 study received widespread attention, but its effect in U.S. government operations was limited.⁷⁶ Some specific recommended actions, such as increasing staffing, are not possible in an austere fiscal environment. But the recommendations to improve planning and coordination are still valid, and cost little. At this juncture, much has been done in American and elsewhere to develop water technologies, and many studies that contribute to long range planning have been done. The most urgent need is to put existing water technology into action along with improved management and conservation. Additional research and study must not be an excuse to delay action.

The U.S. government (USG) should suppress the urge to conduct many more studies. Valuable as they are, many studies have been produced at this point, so only ones which directly

support an action project should be done. Instead of supporting more studies, the USG should look for ways to leverage its personnel, expertise, and funds to produce action and results in the Middle East. U.S. help should be offered to all countries which face up to the problems of population growth and excessive waste in the use of water and other resources.

It makes sense to earmark a percentage of both civilian and military aid programs in the Middle East to apply to the water problem, in the same way a percentage of aid programs, by U.N. agreement, are supposed to support population control. All U.S. aid recipients in the region recognize that water is a national security issue. Funds applied to improving the water balance would contribute to U.S. objectives in the area, especially regional stability, whereas traditional military aid in the form of weapons is more often destabilizing.

SUPPLY-SIDE SOLUTIONS. The USG should abide by the World Bank requirement of a prior agreement among all riparians of a river basin before supporting any project meant to enhance supply. Until a spirit of cooperation develops, we can expect few supply-side solutions to meet strict criteria for riparian agreement and environmental impact.

All supply-side aid should be predicated on the project being regionally and cooperatively conceived, planned, and managed. The U.S. government should apply all possible civil and peacetime military leverage to induce cooperation. Any project

which is not founded on end-to-end cooperation should not be supported.

The optimists' refrain is that water shortages produce the opportunity for cooperation. They see supply-side solutions as a way to reduce certain regional conflicts; but that assumes the political conflicts can be set aside to implement hydrological solutions. In the present political climate, it is more reasonable for the U.S. government to take a realistic or pessimistic view and to concentrate on the achievable demand-side steps toward a positive water balance.

Supply-side solutions generally involve storing and moving water from one location to another with large economic, social, and ecological effect. They should only become eligible for consideration after exhaustive efforts to maximize the efficient use of current resources. Much remains to be accomplished on the demand side, before expending effort and money on the supply side.

Neither the aiding nor the aided countries should count on a technological or scientific silver bullet to rescue the region from the effects of an unfavorable water balance.

DEMAND-SIDE SOLUTIONS. Unlike the supply-side problem which requires inter-riparian cooperation, the demand side offers U.S. agencies the opportunity to offer effective assistance by working with countries bilaterally. The results can benefit not just the primary country receiving aid, but any downstream riparians, and

reduce the potential for conflict. Demand-side assistance can improve water quality as well as quantity, and reverse the trend of thousands of years of harmful irrigation practices.

Projects can run the gamut of water conservation techniques, improving efficiency in irrigation, wastewater recycling, elimination of leakage in systems, installing water meters, public awareness, providing safe drinking water, and more. These are urgent needs which can be addressed bilaterally, some at low cost. Investments in wastewater treatment and solid waste management should lead to significant improvement in water quality which is as important as quantity.

The urban sector is in dire need of reform. All Middle Eastern countries, along with a relatively high population growth, are experiencing a steep increase in urbanization. This, with a concomitant expansion of industry, has meant a much higher urban demand for water and greater volumes of wastewater with inadequate infrastructure. The potential for effectively increasing the water supply by tightening up the infrastructure and increasing the treatment and reuse of wastewater is tremendous. Israel, and to some extent Jordan, are the only countries currently making extensive use of the wastewater resource.

Observers have noted a tendency in Middle Eastern countries and bureaucracies to rely on new technology and high visibility construction projects instead of on efficient management of both old and new facilities to address their problems. This suggests

that U.S. agencies could make a difference by training facility operators and managers and helping to establish on-site operating standards and procedures. Change and solutions are not easy and the human element can be resistant and cannot be ignored. But, approached correctly with grass roots involvement, people can be shown, and convinced to adopt, the benefits of changes. Change should not be imposed, but new mechanisms and operations jointly arrived at must meet certain criteria for improving efficiency. Persistence in pursuing demand-side reform, and closing off traditional supply-side answers, are key to lasting improvement. It has been pointed out that a multidisciplinary approach involving not only scientists, hydrologists, policy makers, but also representatives of local political, business, and social groups makes sense.⁷⁷

The near-term U.S. government fiscal environment rules out large scale projects to assist the Middle East water situation. But, there are small dollar demand-side projects that are just as affordable, or deserve to replace some questionable lines in the current budget. Some are: \$3 million to study marijuana's relationship to syphilis in rabbits or legionnaires disease in mice; \$1 million (per dolphin) to train dolphins to attack enemy divers; and \$1.3 million to prove young primates need their mothers to avoid stress.⁷⁸ Multilateral funding may also become available as a result of the Peace Process, which will be discussed further below.

REGIONAL COOPERATION. Because of the complex interrelationships and hostilities in each hydrological basin and throughout the Middle East, and the resulting political culture, every event or action having to do with water or myriad other issues has multiple and rippling political effect. Cooperation is unusual, so it must be attempted first on a modest geographical and political scale.

It is most likely that a start toward mutual confidence building measures will be made in one river basin. The best prospect is the Jordan basin which is relatively small in terms of populations and the volume of water resources, but very important politically to the U.S. and for regional stability.⁷⁹

U.S. agencies should continue to concentrate efforts on building basin-wide and region-wide cooperation in the Jordan Basin. This is the area which costs the U.S. treasury most heavily, where U.S. relationships with all the entities are now somewhat positive, and the near-term water situation is most critical. Israel receives about \$3 billion per year from the U.S. for weapons and interest on loans for weapons.⁸⁰ The U.S. Congressional Budget Office reported that limits on weapons sales to the Middle East could save the U.S. government \$10 billion a year, while costing U.S. arms manufacturers \$3 billion a year.⁸¹ Those figures add up to a successful Peace Process bringing a peace dividend, some of which could be used to improve the water balance for the Jordan River riparians. The Jordan Basin's riparians are near enough to a real water crisis that they may

see cooperation and peace as a way to solve their water situation. Conversely, they should see conflict as the way to worse crises and economic ruin.

A compact has been suggested as the first step in reaching the prerequisite agreement between riparians in order to implement supply-side solutions. While each nation is making independent reforms in the use of water, the compact can have its beginnings in exchanging data. As efficiencies are instituted each nation can show improvement which would encourage data sharing. Eventually, data about the available resources may become complete and accurate.

The creation of sustainable data collection systems for entire basins can be encouraged by linkage to a desired project, such as the Unity Dam. Each riparian state could control its own information base, but consistent data needs to be collected and presented in standardized form to facilitate efficient project planning.⁸²

If water allocations must be established before the data gathering system matures, those allocations can be based on the available data with the proviso that reallocation will follow a certain formula if resources are found to be greater or less than originally calculated. Faulty data would then not stand in the way of immediate progress and not lock entities into an unfair allocation. Future data can be gathered by teams involving all entities to guarantee accuracy.

Once two or more entities take the first step in cooperative

management of a water resource, they can begin to address sensitive related issues jointly one by one. Agriculture, with its historical, cultural, and security baggage in the Middle East is an example. Each entity is adept at rationalizing its own overextension in agriculture, that sector's disproportional consumption of water resources, and the concomitant effect on water quality. But, each entity can probably see the fallacy of his neighbor's agricultural program, and recommend restraint. Once neighbors engage in joint water management, perhaps they can take the next step and jointly plan agricultural priorities, water use, and efficiency improvements.

Amid the shortages and conflicts, it should be remembered that there is enough water in the Middle East to go around, but only if efficiency improves, population growth slackens, and cooperation replaces conflict.

THE PEACE PROCESS. The ongoing Peace Process holds out the best hope for beginning real Jordan Basin-wide cooperation at least superficially, and with deeper cooperation possible between Israelis and Palestinians, and Israelis and Jordanians. An outcome producing a political settlement and treaty agreement between the Israelis and the various Arab entities would offer a framework for cooperation on water issues.

The challenge for Israel is to preserve its water security through means other than the military power and territorial control on which it depends today. Otherwise, Israel cannot

relinquish control of the Golan Heights and the Occupied Territories, and conversely, the Arabs cannot make peace. Israel is looking for assurance that it will continue to receive sufficient quantities of water from sources that it now controls. A way must be found to reconcile eventual Palestinian sovereignty in the West Bank with Israeli hydrological and national security. Today's low intensity conflict between Palestinians and Israelis is unlikely to end without Palestinian independence, whatever the Palestinian negotiators agree to in Washington peace talks.

The principal concerns for Palestinians are the definition of their authority in an interim period leading to independence, and the issues of land and water. The Israelis have favored a Palestinian administrative council, while the Palestinians want a legislative assembly whose laws would supersede the mishmash of British Emergency Rules, Jordanian laws, and Israeli military orders in place now.

The issue of water is imbedded in the Palestinians demand for control of resources and territory, and in the Israeli position favoring Palestinian functional control, but not over land and resources. Israelis want Palestinian control exercised only over Palestinians and not over Israelis in the Occupied Territories. And just as importantly, the Israelis want to retain some control over how much water is pumped for Palestinian use.

The Jordanians and Israelis have no issues which would block agreement, but the Jordanians have promised not to make a

separate peace. The Jordanians are anxious to get on with cooperative ventures to such as the Fed-Dead Sea canal to desalinate water and to generate hydropower.

In an age of missiles and airpower, the Golan Heights and West Bank have lost much of their value for strategic depth relative to their value for water security. But, Israel, Syria, and the Palestinians are unlikely to budge far from their positions on territorial issues and others, unless the U.S. peace team can foster a conditional agreement that culminates in the endstate desired by each party, by establishing gradual steps toward the endstate which have to be taken by all sides in order to progress continually toward the endstate.

Israel has to concede an endstate of Palestinian sovereignty in Gaza and the biggest share of the West Bank; Syria has to concede real peace with Israel; Israel has to concede the Golan Heights to Syria. But there have to be many small steps to be taken by all sides in order for those endstates to be realized. Water security in the form of a Jordan River Basin Compact and Unity Dam agreement (including a specified flow rate from Syria), joint security of Jordan and Yarmouk River sources, and joint data gathering and sharing, can all be part of the steps to be taken to achieve the endstates. A federation or confederation of Palestinian and Israeli entities is unacceptable to Palestinians, but eventually joint Israeli-Arab constructs in the interest of confidence building, water and physical security, and achievement of the desired endstate conditions are necessary.

Only a scenario involving gradual steps toward peace can overcome Israeli-Syrian hostility. Even if the final agreement reflects a full peace, it will be a non-belligerency agreement in reality. But it could be enough to support joint security of water sources and perhaps to move ahead with the Unity Dam or a substitute water storage facility. The incentives to Syria in terms of easing the regional arms race and the benefits of rapprochement with the United States should justify such a deal in Syrian eyes.

Even if the peace process fails, the U.S. relationship to the entities involved is unlikely to change in important respects. The U.S. government may take short term actions which are unfavorable to Israel, but will still be committed to Israel's security vis-a-vis her Arab neighbors. The U.S. objective of regional stability in the Middle East would not be achieved by permitting Israel to be militarily vulnerable. Manipulating a regional arms race is not the optimal way of achieving stability, but without peace may be the only option.

While recognizing that peace is achievable only if the regional parties truly want it, the U.S. can offer strategies that make difficult steps possible to take. Although Arabs, Israelis, and all Middle Easterners have ample reason to realize the futility of armed conflict, it cannot be ruled out as a future possibility. Where peace and cooperation are stymied, war is an alternative. The Israelis have the air superiority and nuclear threat for credible deterrence. But true peace has to be

more attractive than deterrence, because Israel is still vulnerable, especially to missile attacks. Israel cannot fully prevent significant damage to her people and environment using the strategies of her past wars.

ROLE OF U.S. GOVERNMENT CIVIL AGENCIES. The 1987 CSIS study noted that the USG policy structure on water resources is hampered by bureaucratic divisions and lines of authority which are based on geographic considerations. Different countries in the same hydrological basin fall under separate bureaus, divisions, or offices impeding comprehensive regional planning and problem solving.⁸³ This situation persists.

USG has undertaken extensive technical assistance programs and development projects in the Middle East. Projects for every conceivable purpose have been designed and implemented including wastewater treatment plants, feasibility studies for dams, training programs for regional experts, and others.⁸⁴

U.S. Department of State. The Department of State (DOS) conducts diplomacy bearing on water issues and monitors how the issue is playing out in each region. DOS has conducted several major efforts to facilitate cooperation in the Jordan Basin. In the case of the Johnston mission in 1953-1955, the U.S. advocated certain agreements and solutions, including allocation schemes and the Unity Dam, but could not get them finalized. In 1979-1980 Ambassador Philip Habib tried again to strike an agreement for the Unity Dam. Then, from September 1989 to August 1990

Ambassador Richard Armitage negotiated separately with Israel, Jordan, and Syria to revive the Unity Dam project. Again the issue of water allocations was the sticking point, and the effort lapsed with the effects of Iraq's invasion of Kuwait. This type of negotiation is very difficult in the absence of diplomatic relations between the parties. The issue of the Unity Dam is now folded into the current peace process.⁸⁵

The DOS currently is supporting the Peace Process on two tracks in bilateral talks between the Israelis and each Arab entity, and in the multilateral working groups on five specific issues: water, economic development, refugees, arms control and regional security, and the environment.

Multilateral water talks have been held in Vienna in May 1992, in Washington in September 1992, and in Geneva in April 1993. The main thrust of the multilateral water talks is regional cooperation in making the best use of the water resources in the region, along with enhancing water data, increasing conservation, and enhancing water supply. The talks pertain to Israel, Jordan, Palestinians, Syria, and Lebanon, but involve 40 nations or groups around the world. Syria and Lebanon refuse to participate, but many Arab nations are, along with the U.N., the World Bank, the European Community, and Japan. The international participants play an important role in the talks because outsiders can say things that the U.S. team cannot, and regional participants will not (throwing the proverbial dead skunk on the table.) For instance, the World Bank can harp on

the need to price water according to its real cost. Also, the international participants are important to the U.S. in order to spread the financial cost which will accompany any final settlements in the bilateral talks.

To prepare for the April 1993 talks the Bureau of Near Eastern Affairs convened a seminar held April 1-2. Academic experts discussed the principles of regional water cooperation, confidence building measures, alternative water futures, data banks and data exchanges, and dispute resolution techniques.

The September 1992 conference set the agenda for Geneva: Israeli and Arab reports on regional cooperation in fairly distributing water resources; a Japanese study to help set up water desalination projects in the region; a Canadian survey of the technologies used by regional states in use of water resources.⁸⁶

The April conference ended with the Palestinian delegation refusing to take part in any activity of the conference until the next scheduled meeting in September 1993 in Beijing. The Palestinians wanted a neutral mission set up by the conference to study water rights in the Occupied Territories. Their objective is the recognition of water rights, which they call the only basis of cooperation. The Israelis would not agree to the mission on water rights, since they will discuss rights only in the bilateral talks, and will only focus on increasing the amount of water available to all at the multilateral talks.

Until the 1993 round of talks, the U.S. role at the talks

had been quite passive. The latest round reflects the more active U.S. role promised by Secretary of State Warren Christopher. According to the ground rules, U.S. representatives at the bilateral talks do not "sit at the table", but can offer ideas and views to facilitate progress. At the previous bilateral sessions the Americans were not in the room with the negotiators, but now will try to help resolve differences. The U.S. peace team now has more people involved in preparing, conducting, and monitoring the current bilateral and multilateral negotiations than have participated in previous peace efforts.⁸⁷

All parties at the current sessions speak favorably of the more active U.S. role. The U.S. representatives remind the principals to put ideology aside and "get back to the table" when discussions falter because of the long history of hostility. The U.S. team does not arbitrate offering judgements, but suggests different ways of presenting a proposal privately with each delegation.

U.S. Agency for International Development. USAID has expertise in both the technical and social facets of water management. Its assistance can range from funding, to studies, to implementation of infrastructure projects and training. USAID would serve well by concentrating efforts in areas which appear to be ignored by other entities, such as in training and management techniques. After all, missionary work costs less than construction projects.

An idiosyncrasy of U.S aid is that it is often granted in response to domestic forces which benefit from the foreign aid,

and much of the aid consists of in-kind transfers of such things as agricultural and manufactured goods.⁸⁸ Within the limitations of the USAID program, it is possible to concentrate on some actions that would show actual improvement in aspects of the Middle East water problem.

Israel has the highest aid level and highest income level of recipients of U.S. aid, both in the region and the world.⁸⁹ That status helps explain Israel's uniqueness in being both a recipient of U.S. aid and an agent; Israel works with USAID to foster the use of efficient water technology and practices in the region. Israel is a prime developer and user of efficient agricultural and irrigation technology which is severely lacking in the other countries in the region.⁹⁰ Israel's help is unavailable to its neighbors while in a technical state of war. The potential of Israel's help is shown by her newly established relations with the largely Muslim republics of the former Soviet Union. Israel is teaching better farming and irrigation techniques which they claim has multiplied yields while reducing water consumption by two thirds. Reportedly, aid programs are being run jointly, with the U.S. supplying money and the Israelis the expertise.⁹¹

Even absent an Israeli-Arab peace treaty U.S. agencies and policy can encourage technical level cooperation between Israel and its least hostile neighbors. Israeli agricultural productivity far surpasses other Middle Eastern countries while using water-conservation expertise which should be spread

throughout the region. Jordan has already incorporated these methods to an extent.

Other Civil Agencies. The U.S. Geological Survey, Bureau of Reclamation, and U.S. Department of Agriculture also continue to do valuable work in the area and are a great source of expertise for Middle Eastern countries. The 1987 CSIS report more fully describes their role. They provide advice to the State Department's team supporting the multilateral water talks.

ROLE OF U.S. DEPARTMENT OF DEFENSE AND MILITARY. Various agencies of the Department of Defense (DoD) monitor Middle Eastern regional water issues, especially where they represent potential conflict points. It is recognized that Middle Eastern nations may not engage in a major conflict over water rights, but tensions related to water resources will certainly recur. DoD cannot dismiss the possibility of armed conflict in the most heavily armed region of the world, especially in light of the continuing U.S. commitment to Israel's security.

Both the U.S. European Command (USEURCOM) and the U.S. Central Command (USCENTCOM), who split geographical responsibility for the Middle East, are acutely aware of the potential of hydropolitical conflict. In 1992 USCENTCOM produced an excellent classified assessment of the "Central Region" as the command refers to its area of interest. As part of the effort to update their understanding of the Central Region and its effect on U.S. interests, USCENTCOM hosted a two-day symposium in May

1993 with speakers and guests from government and academic institutions with unique expertise in the region.

The countries of the Jordan-Yarmouk Basin and the Tigris-Euphrates Basin are split between the areas of responsibility of USCENTCOM and USEURCOM. Therefore, direct liaison between the commands on many overlapping issues would seem highly beneficial. Overreliance on communicating through Washington can be a danger. Personnel at both Command headquarters, especially on the intelligence staffs, are knowledgeable about water issues, but both Commands are necessarily focused on immediate events, such as no-fly zones in Iraq, relief missions supporting Kurds in Iraq, and peacekeeping in Somalia.

The division of the region between two regional commands is disadvantageous to unity of effort and consolidation of responsibility. Whenever regional commands are reorganized and it becomes politically acceptable in the Central Region, the area should be the responsibility of one command.

Since an Israeli-Syrian peace and Israeli-Jordanian peace would depend partially on security arrangements to compensate for Israel giving up control of Golan Heights and the West Bank, bridging proposals by the U.S. to satisfy both sides' concerns could make a difference. The quality of interaction between the DOS and DoD may decide whether viable proposals are surfaced in the Peace Process.

Proposals for multilateral forces are mentioned frequently as prerequisites for Israeli withdrawal from the Golan Heights,

the West Bank and southern Lebanon. American participation in those forces would be an additional incentive for Arab-Israeli agreement.⁹² Intelligence sharing between the U.S. and Israel, especially to ensure demilitarization in the Golan Heights has also been proposed. For such proposals to advance beyond the idea stage into reality, close and continuing coordination between DOS and DoD are essential. Both departments need to collaborate for a clear understanding of any security role devolving to Americans.

The DoD must be active in pursuit of effective Middle East arms control. President Bush offered an initiative on 29 May 1991 addressing non-conventional armaments, surface-surface missiles and chemical, biological, and nuclear weapons. But, in addition to the problem of weapons of mass destruction, the conventional arms race needs to deescalate. For deescalation to occur, the Peace Process has to defuse the driving factors of Arab numerical superiority, Israel's shallow strategic depth, the possibility of an Arab coalition against Israel, and Israel's technological edge.⁹³

Other Department of Defense Agencies. Again, the 1987 CSIS report offers a good overview of other DoD activities relating to the region and the issue of water.

Since then the U.S. Army Corps of Engineers produced a study "Water in the Sand" which was published in draft form in 1991. The study's value is clear in that it is cited in many articles by hydrologists and political observers of the Middle East.

POSTSCRIPT. Lest anyone doubt that water can be both a potent reason and weapon in an armed conflict resulting from other Middle East regional issues, it should be kept in mind that the protection of water resources is a priority for all nations in the region. Although the Gulf War was fought over oil and oil economics, water resources were a serious concern. The war offered several examples of defensive and offensive actions related to water. The Turks reportedly placed surface-to-air missiles near Ataturk Dam to deter potential Iraqi attacks. Iraq positioned some "human shields" at its own dam facilities. The Gulf states tightened security at desalination plants to prevent possible terrorist attacks or sabotage. Iraq destroyed all of Kuwait's desalination plants, and created an oil slick which endangered Saudi Arabia's largest desalination plant.⁹⁴ Awareness of these actions throughout the region heightens concerns about vulnerability and interdependency which cooperative agreements will need to mitigate.

In U.S. officialdom one can find predictions of cooperation or conflict. Generally, State is in the business of predicting peace and Defense is in the conflict business. In any event, hydropolitics in the Middle East will continue to receive attention, because water cannot be separated from politics. In the event of war, water will not be separate from war. Until cooperation becomes the dominant trend instead of competition and conflict, everyone's supplies whether scarce or plentiful will be vulnerable.

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