

OP98.02

NATURAL RESOURCES IN THE MIDDLE EAST

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Resources are the foundation of wealth and power because people are material-using animals.

Everything we use, from the food we eat to keep us alive to the objects we manufacture, comes from substances found on this planet. Our concern over resources, however, is nothing new. The hunger for land, water, mineral supplies is as old as the ages. (Larkin et al., 1981).

All over the globe, in first-world societies and in third-world societies, we encounter rising exploitation of natural resources to the point where it threatens our existence. Human beings are increasing their use of water (later we shall expand on this issue regarding the Middle East), burning the earth's forests at an ever-faster rate to clear land for agriculture, using up the minerals that serve for building and industry, and of course are widely exploiting energy sources, particularly oil, gas and coal. The sea shores should be considered a resource in its own right, and it is dwindling through erosion, construction, pollution, and crowding of bathers, marinas, and the like.

The intensive exploitation of natural resources affects other resources: in several extreme cases, for example Athens and Mexico City, air pollution has become critical. River water, groundwater, seawater and ocean water is polluted. We witness pollution of lakes (such as Lake Baikal, the Caspian Sea, the Black Sea and the Mediterranean) or their disappearance (such as the Aral sea and the Dead Sea).

We are also watching processes that change the weather, desertification, and destruction of drainage systems.

In the following we shall focus on the water resource. It has special importance in the Middle East and the Mediterranean countries because these are arid or semi-arid zones.

Water resources in the Middle East are depleting day by day (this refers to ground water, rain water, and river water). This fact when combined with other factors create the threat of water shortage over a considerable part of the states in the area.

This article will concentrate mainly on the Nile, the Euphrates, the Tigris, the Jordan Rivers and groundwater. The following countries are connected to the drainage basins of these rivers: Egypt, Sudan, and Ethiopia with the Nile (omitted are Kenya, Uganda, and Zaire, which have a common drainage basin in the White Nile); Turkey, Syria, and Iraq, with the Euphrates and Tigris; Lebanon, Israel, the Palestinians, Syria, and Jordan, which are partners to the Jordan and Yarmukh. Israel and the Palestinians or Israel and Jordan, which are partners to the groundwater aquifers.

Causes of Water Shortage

Population Explosion

The population explosion is perhaps the toughest blow of all. The Third World in general and the Islam countries in this context in particular, find themselves in a process of continual population growth owing to natural increase, a process that threatens to bring them to the point of economic, social, and ecological collapse indeed to the brink of ruin. The problem is that even if the governments succeed in bringing about an immediate halt to the process in their states, some 15-20 years will have to pass until high natural increase ceases in these countries (as results of the

“demographic momentum”), and the deterioration might in the meantime lead them to the edge of an abyss.

Within a decade, the population of the states of the Nile Valley will grow by 50 million souls, this addition coming into an area that already has a water shortage. A similar picture may be depicted for the other basins. The population of the Tigris-Euphrates basin will grow by 25-30 million; that of the Jordan basin by 6-7 million (Population Reference Bureau, 1996).

Each additional person needs water - for drinking, for food, for bathing - and the shortage can only worsen. In other words, water is a more or less fixed resource, but its consumers are increasing. Even today, a state like Egypt cannot support its inhabitants with its own water resources by becoming one of the world's largest wheat importer. This is the same Egypt that once was the “bread basket of the Roman Empire”, and even in our own times was a world famous exporter of cotton.

Efforts to Raise the Standard of Living

There is a world-wide effort to raise the standard of living of the inhabitants of the globe, to increase per-capita income, and to improve the quality of life. All this necessitates (even if natural increase were to stand at a 0 percent level) utilizing more water for industry, for private cars, for food, for tourism (which consumes a relatively large quantity of water), while exploiting a resource that is, as mentioned, fixed.

On the other hand, the improvement in the standard of living is related to improvements in education, and these in turn may lead to a savings in water through the transference of manpower from agricultural employment to industrial occupations (which consume less water than does agriculture). This may be expected, too, because intelligent farmers will employ more economical irrigation techniques (droplets instead of flooding, pipes instead of canals). Such improvements can save millions of cubic meters of water.

Local and Global Droughts

The issue of droughts has to be discussed cautiously. Proof exists that Northern Ethiopia and Sudan were hard hit by a difficult, prolonged drought of at least ten years. There is also proof that the Nile discharge has very slowly been going down over the past 100 years. In light of this trend, very serious concern arises over the future of the Nile basin people (Howell and Allan, 1990).

Signs exist in various regions of the world that point as it were to global processes that perhaps are leading to a warming and drying up of the planet. What is happening in the Nile basin is, perhaps, part of this threatening process. Despite these fears, proof may also be brought of the cyclical nature of the “seven good years” following “seven bad years,” which is well known from the history of this region. If this is so, then perhaps all the talk is just over a passing climatic crisis. Whether it is this or not, the past two decades has seen the drying up of the Blue Nile basin; the quantity of water contained in it has so diminished as to bring about tragedy in Ethiopia and Sudan, and almost of national dimensions, too, in Egypt in summer 1988, when the water of Lake Nasser nearly reached the level of the sluices of the Aswan Dam (Howell and Allan, 1990).

Is the Middle East really in a water crisis?

We can answer this question by comparing water supply in the various countries (based on average many-year data) with the present demand for water, and also by comparing water demand forecasts in the near future. Such a comparison will give us the best indication of the magnitude of the approaching crisis. The issue of water demand in the

near future is not simple: it is contingent on the strategy to be adopted by the states of the region. This can be one of two strategies, the first of which we may term "business as usual". This views water as a vital resource for the existence of millions of farmers in the region, who will continue to grow their usual crops, even if they are "water guzzles" such as rice, sugar-cane, avocado, bananas, etc. They will go on with the same irrigation methods as in the past, usually flood irrigation. By this strategy water prices will continue to be close to zero and the same for all users, as is the case nowadays in most of the Arab states.

The second strategy may be termed "economic" or "rational". It sees water as a production element and agriculture as driven by market forces. Water has a price, so presumably it will not be used to grow tropical water-thirsty crops in the desert, and an effort will be made to reduce the number of those who live off agriculture. This strategy will prevent a water crisis.

Israel and perhaps the Jordanian kingdom and the Palestinians are the only countries whose governments are already able to decide which strategy to choose, and even then implementation has to be slow and cautious to prevent shocks on the economy and in society.

Egypt, Sudan, Ethiopia, Turkey, Syria and Iraq are unable to adopt the second strategy in the foreseeable future because of their large populations and high natural increase rates. These populations are incapable of making the required change in the water economy. All these states must therefore continue with the first strategy, at least for the time being, and try to move gradually over to the second.

In our considerations of future demand for water we shall rely on the data of the various states as they themselves plan their water consumption in the next one or two decades.

Tables 1-6 show the water supply and demand in these countries, with conclusions as to water balance at present and forecasts for the future (the tables are from Soffer, in press, where the sources are not given).

In the Nile basin (Tables 1,2) the picture indicates impending crisis: the forecast for Egypt is a water shortage at the beginning of the 21st century. Its postponement is a function of the civil war in Sudan, which has caused water allocated to Sudan not to be used fully and to reach Egypt. Egyptian plans continue to give priority to development of the desert, despite the fact that accumulated experience with desert reclamation generally shows failure and enormous national cost. Signs exist of the start of recycled water use, and an effort is being made to save water, but all this is dwarfed beside the increasing demand.

Table 1: Water Supply and Demand in Egypt (billion m³)

	Mid 1970's W	Mid 1970's E	1980 W	1980 E	1990 W	1990 C	2000 Sr	2000 Sd	2000 E	2000 A
Demand										
Irrigation	33.0	29.4	37.2	37.9	44.2	33.6	50.7	45.2	40.9	58
Domestic	¹ 5.0	1.8	3.0	2.2	4.0	¹ 2.4	¹ 4.8	¹ 4.8	3.5	6
Industrial	-	4.1	3.5	2.4	3.6	-	-	-	3.0	5
Drainage	12.0	16.0	15.0	14.2	14.2	17.5	11.7	11.7	23.4	4
Evaporation	1.4	2.7	6.7	2.2	7.4	2.0	2.0	2.0	2.3	2
Total Demand	51.4	54.0	65.4	58.9	73.4	55.5	69.2	63.7	73.1	75
Supply										
Aswan release	55.5	57.5	60.0	61.7	58.9	55.5	55.5	50.0	57.5	58
Water reuse	-	-	2.5	5.4	6.0	-	6.0	6.5	4.5	6
Drainage reuse	-	-	4.0	-	4.0	-	3.0	3.5	6	3
Groundwater									4.9	5*
Total Supply	55.5	57.5	66.5	67.1	68.9	55.5	64.5	60.0	73.9	72
Balance	+4.1	+3.5	+1.1	+8.2	-4.5	-	-4.7	-3.7	-	-3

¹ Domestic and Industrial use together

Sources*: E - Egyptian Water Master Plan

W - Waterbury, 1979, 1988, 1991

C - Chesworth, 1990

S - Stoner, 1990 (r-rainy year; d-drought)

* Groundwater use can slightly change the balance positively

A - A. Soffer's assumptions, based on E and the great efforts to reclaim more Western dessert

* Soffer A. Rivers of Fire, Boulder: Rowmen and Littlefield Publ. (in Press.).

Table 2: Water Supply and Demand in Sudan (estimation, billion m³)

	1990	1990	2000	2000
	Estimate A	Estimate B	Crisis continues	End of political crisis
<u>Demand</u>				
Irrigation	17	12	12	30
Domestic and industrial use	2.0	1	2	2.7
Total	19	13	14	32.7
<u>Supply</u>				
Groundwater	0.3	0.3	0.3	0.3
Nile	20.5	20.5	20.5	20.5
Total	20.8	20.8	20.8	20.8
Balance	+1.8	+7.8	+6.8	-11.9

Sources: Soffer A. Rivers of Fire, Boulder: Rowmen and Littlefield Publ. (in Press.).
Waterbury 1979, 1988; Chesworth, 1990; Knott and Hewett, 1990;
Whittington and Haynes, 1981

To Egypt's misfortune, Nile water cannot be replaced by desalinated water because the price is too high for so poor a population. This is also the case with Sudan and Ethiopia.

The only way to prevent hunger and unrest within and among these states is by external aid, especially in food. Such aid may save the day only temporarily, and cannot serve as a long-term solution. This requires assistance to these countries to build water-recycling installations and to introduce water-saving measures such as replacement of irrigation through open canals by pipes. Meanwhile the effort must continue within states, primarily Egypt, at family planning, otherwise all other steps will go to waste.

We must be ready for another climatic crisis in the Nile basin, and if it materializes Egypt will have to receive emergency aid.

In sum, people's minds in Egypt have to become accustomed to the fact that it is time to build dams in Ethiopia for Egypt, and thus reduce dependency on the wasteful Aswan Dam.

Regarding the Tigris and Euphrates basins, Table 3 shows that there is no crisis for the time being. The Arab states evince great anxiety over the major activity taking place in Turkey. In the future, the danger of a crisis in the Euphrates basin looms over Syria and Iraq. The Tigris basin, by contrast, does not show signs of a water crisis, and this fact allows solutions for the water needs of the three states even without many joint projects, on condition that good-will and wise policies are evinced. Iraq is rich in oil, which it could use to make the transition from agriculture to industry. The Tigris could compensate for the Iraqi portion of the Euphrates, all of whose water would serve eastern Turkey and Syria. Syria would be able to move Euphrates water southwards, to the Damascus area and the south of the state where water is scarce.

Table 3: Demand and supply of water in Euphrates-Tigris Basins
(1995-2040) (billion m³)

	1995	2000	2010	2020	2030	2040
A. Euphrates:						
Country						
Turkey	3	4-6	10	12	15	20
Syria	1-2	2-3	6	8	10	12
Iraq	14-17	14-17	14-17	14-17	14-17	14-17
Total demand	18-22	20-26	30-33	34-37	39-42	46-49
Supply	30	30	30	30	30	30
Balance	+12 +8	+10 +4	-3	-4 -7	-9 -12	-16 -19
B. Tigris:						
Country						
Turkey	0.5	1	2	3	5	7
Syria	0.1	0.1	0.2	0.3	0.4	0.5
Iraq	32-38	32-38	32-38	32-38	32-38	32-38
Total demand	33-39	33-39	34-40	35-41	37-44	40-46
Supply	50	50	50	50	50	50
Balance	17-11	17-11	16-10	15-9	13-6	10-4
C. Euphrates + Tigris						
Country						
Turkey	3.5	5.7	12	15	20	27
Syria	1-2	2-3	6.2	8.3	10.4	12.5
Iraq	46-55	46-55	46-55	46-55	46-55	46-55
Total demand	50.5-60.5	65-65	64.2-73.2	69.3-78.3	76.4-85.4	85.5-94.5
Supply	80	80	80	80	80	80
Balance	+30 +20	+27 +15	+15.8 +6.8	+10.7 +1.7	+3.6 -5.4	-5.5 -14.5

Source: Soffer A. Rivers of Fire, Boulder: Rowmen and Littlefield Publ. (in Press.).

Remarks: Iraqi demands based on 1980s use. The table is based on the author's interpretation from available data and the progress of the development projects.

In the Jordan basin the water crisis is severe even now in some of the basin states; this is evident from Tables 4-6 (maps 1,2). The crisis in the Jordanian kingdom has been put off for now due to the Israel-Jordan peace agreement whereby Israel transfers about 80 million cubic meters of drinking water to the kingdom annually, and in the future this volume will increase to about 150 million cubic meters (Israel-Jordan Peace Agreement, 1994). Yet Table 4 also shows that the Jordanian kingdom has plans to enlarge its agricultural areas and increase the demand for water. If indeed the first strategy described above guides the kingdom, the water crisis is inevitable in the next

five or ten years. Nor will the citizens of this state be able to afford the cost of desalinated water that will be needed to make up the deficit. The only way to save the Jordanian kingdom is constant movement towards the second strategy, meaning a reduction of agriculture, re-use of recycled water, economy in irrigation methods and choice of water-frugal crops, replacement of the water piping networks in the towns, and increased storage of floodwater. In parallel the countries of the first world should assist the Jordanian kingdom with essential food aid for its citizens until the shift is accomplished to more industry and tourism and less agriculture. In the first place, natural increase must gradually diminish, otherwise disaster is sure to strike. If a crisis erupts in Jordan it will endanger domestic stability and may also find expression in worsening hostility between Jordan and Syria over the use of the Yarmuk river water, and between Jordan and Israel over the use of Lake Kinneret water.

Table 4: Jordan: Water Potential, Supply and Demand

	Yarmuk	Eastern Tributaries of Jordan River	Groundwater Renewable	Fossil	Recycled Water	Total
Potential (1990)	400	207	271	560	45	1483
Supply						
1990	130	170	190	210	30	730
1993	160	241	534		48	983
Years/Demand		Agriculture	Domestic		Industry	Total
1975		375	40		20	435
1985		400	150		30	580
1990		920	175		35	790
1995		889	224		49	1162
2000		1051	315		63	1429
2005		1224	398		80	1702
2010		1419	497		100	2016
2020		1879	705		150	2734
Years/Deficit						
1990 (Demand - Supply 1990)						-60
1995 (Demand - Supply 1993, without recycled water)						-179
2000 (" " " " ")						-446
2005 (" " " " ")						-719
2010 (" " " " ")						-1033
2020 (" " " " ")						-1751

Source: Soffer A. Rivers of Fire, Boulder: Rowmen and Littlefield Publ. (in Press.).
 For Supply 1990 and Demand 1975-1990 - Chezawi 1992; Canaan 1990;
 Sut al Sha'ab 6.6.89; al-Rai 8.1.90.
 For 1993-2020: Shatanawi and al-Jayousi 1995: 90; Rozental 1993/5.

The water shortage in southern Syria, for the population of greater Damascus (about 3 million in 1997) and 1.5 million more in the south of the country, will amount to about a billion cubic meters, but it can be solved by the laying of a pipeline carrying Euphrates water to southern Syria. This water will be an addition to the upper Yarmuk water that Syria now uses (about 150-200 million cubic meters). If the Euphrates water transfer is implemented the water crisis in southern Syria will be averted, and then Israel too will be more flexible, and likely to reach a peace accord with Syria. The water component in relations between the two states is as important as security (Soffer, in press).

Lebanon is rich in water, so it is the only state of the Jordan basin that does not constitute a threat to the water arrangements among these countries.

Israel is the only country in the Middle East considered a first-world state, and therefore it is able to adopt the first strategy should it so desire. If it undertakes a responsible policy (which was not implemented consistently in the past) the state machinery is capable of imposing water demand that will match supply. Hence no danger of a water crisis exists there (and see Table 5). In reality, Israel is already a decade into the transition to the second strategy. The shift is not easy, as agriculture and water have a mythic quality in Zionist history, and it is hard to break free of such a myth (Cophaken, 1996).

Table 5: Water Supply and Demand in Israel (1985-2010 in million m³)

Sector	1985			1990			2000			2010		
	FW	RW	T	FW	RW	T	FW	RW	T	FW	RW	T
Agriculture	1200	210	1410	860	380	1240	820	430	1250	550	767	1317
Domestic	420	-	420	650	-	650	768	-	768	970	-	970
Industry	80	30	110	(90)	40	40	100	45	145	131	50	181
Total (Supply and Demand)	1700	240	1940	1510	420	1930	1688	475	2163	1651	817	2468

FW: Fresh water; RW: Reclaimed water; T: Total

* within domestic use

Source:

Source: Soffer A. Rivers of Fire, Boulder: Rowmen and Littlefield Publ. (in Press.).
Israel State Comptroller' Report 1991: 46; Israel Water Commissioner's Report 1944

Israel was generous (in its perception) in the water agreement with the Jordanian kingdom, being willing to gradually transfer 100-150 million cubic meters of water to the kingdom. Despite some occasional friction, this agreement is in fact being implemented (Israel-Jordan Peace Agreement, 1994, Soffer, in press).

Israel fears that it will be required to give water also to Syria, and especially the Palestinians, and then a water shortage, although not a crisis, will develop. In preparation for such a likelihood, indirect action is being undertaken in water recycling and re-use in agriculture (Tahal, 1995), and the economy is now getting ready for the era of desalination, which is inevitable. From 2005-2010 Israel will begin to desalinate water incrementally, and the desalination of about a billion cubic meters is planned by 2040 (Water Commissioner, July 1997). By comparison, in 1997 the total desalinated water in the world is estimated at 6-7 billion cubic meters! Israel will be the only society in the region able to afford desalinated water for domestic and industrial use. To lower desalination costs, and to use the opportunity to assist Jordan and the Palestinians, ideas have been put forward to desalinate water by use of cheap electricity generated by a project sending Mediterranean water or Red Sea water down to the Dead Sea; Each project will cost an estimated 3 billion dollars. Israel hopes to receive this sum as aid from Europe, North America, and Japan (Israel, 1994/6).

The Palestinians are partners (willingly or not) with Israel to the Jordan river, and principally to the mountain aquifer of Palestine (Table 6a, b).

**Table 6 A: Supply and Demand in the West Bank and Gaza Strip (million m²)
Present and Year 2000**

A.	Gaza Strip			
	1995	2000		
Supply	45-60	35-50		
Demand	110-120	190-200		
Agriculture	80-88	150		
Domestic	30-32	40-50		
Jews	3.4-4			
B.	West Bank			
	*1995	*2000	2008	
			**	***
Supply	610-670	610-670	610-670	610-670
To Israel	455	310-360	110-160	135-195
Demands in W.B.	200	250-300	500	475
To Arabs in W.B.	145	200-250	500	475
Agriculture	105			
Domestic	15			
(from Israel	25)			
To Jews in W.B.	55	50	-	-
Agriculture	40			
Domestic	10			
(from Israel	5)			

* "Business as usual"

** Palestinian demands

*** Minimum water requirement

Sources: Gaza Water Department 1994

Civil Administration 1993

West Bank Water Commission 1996

Gvirtzman 1993, 1995; Assaf et al. 1993

Soffer, (in press).

Table 6B. Water Consumed from the Aquifers of the West Bank (million m³)

Aquifer	For Jewish Population	For Palestinians	Total
Yarkon - Taninim	340 (to Israel)	20	360
Nablus-Jenin	115 (to Israel)	25	140
Eastern Aquifer	40	75	115
Total	495	120	615

Sources: Table 6A.

The water issue in the peace negotiations between Israel and the Palestinians is important, although it appears secondary compared with the weight of other matters such as Jerusalem, the Israeli settlements in the occupied territories, security, and the 'right of Palestinian return'. Several alternatives are on the agenda (Soffer, in press). One is that Israel will continue to control all the water throughout Palestine, an alternative that the Palestinians oppose. The second is that all the water in the territory that by agreement goes to the Palestinians will be under Palestinian ownership; this alternative is vigorously opposed by Israel, being a downstream state with historical rights to this water. The Palestinian approach is that once their view of their ownership of the water in their terrain is accepted, the water of the mountain aquifer will be carried to the Gaza Strip (through a corridor in Israel), so a water shortage in Gaza will be prevented. This claim is backed by a further argument holding that since Israel is rich state (annual GNP of \$17,000 annually against \$1000 in the Palestinian population), it can desalinate all the water it needs (Al-Katib & Assaf, 1994; Al-Kloub & Al-Shemmer, 1986).

The third alternative is joint management of the water by means to be decided on, and the fourth is acceptance of the principle that all the water in Palestine will in any case only suffice for drinking by the present and predicted population, and this will be the basis for all calculations and management methods for the water regime (which in fact will be integrated) (Assaf et al., 1993).

Summary

The findings presented indicate a real water crisis in the basins of the Nile and the Jordan, including groundwater, and increasing nervousness in the Euphrates basin.

In view of the expected increase in the region's population, the outlook for demand for water is grave; nevertheless, we have seen that human society is capable of assisting in the prevention of crises. We have suggested projects all of which are small-scale and do not need cooperation between the states of the region. This consideration stems from recognition of the facts: we are dealing with an area that has never known genuine cooperation (Soffer, in press), and our proposal is merely for recycling of sewage water and repair of piping systems in all areas. We suggest import of food to replace water-thirsty crops, and at the same time we recommend steps by the regional states to limit childbirth and to educate, in the wake of which will follow the vital transition from agriculture to industry, services and tourism.

For all this to occur, Europe and the other rich states have the duty to assist in funding these projects, and also to offer food aid for a short time, with the undertaking by the states involved to adopt the recommended strategies.

Talk of large-scale projects must be postponed for at least a generation. In the present atmosphere in the region plans and recommendations for cooperation among the states must be treated as unrealistic, and a time when the region is free of war and suspicion, and natural increase has declined, must be awaited. All ideas of importing water (the Turkish peace pipeline, the Egyptian peace pipeline, import from overseas, grandiose plans for cascading water down to the Dead Sea, and the like) and joint management of the drainage basins are entirely unreal; to speak of them raises false hopes on the one hand, and disappointment on the other.

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