Section II: Water

"Virtual Water:" An Essential Element in Stabilizing the Political Economies of the Middle East

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ABSTRACT
Why has there been no war over water despite the fact that many economies in arid regions have only half the water they need? This paper posits that the Middle East region has been able to access water in the global system via trade, enabling economic systems to solve the water supply problem for the region. Water in the global trading system is known as "virtual water"– the water embedded in key water-intensive commodities such as wheat. The international wheat trade is a very effective and highly subsidized global system which operates to the advantage of countries experiencing water and food deficits.

MIDDLE EAST AND GLOBAL WATER RESOURCES: THE LINK

Whether there will be enough water for a future global population double its present size is the subject of considerable controversy. The answer to the question is of particular importance to the peoples and political leaders of the Middle East and North Africa (MENA). The region's economies are already as dependent on imported water as they are on the renewable waters of the region, and that dependence is likely to increase over the coming decades.

Whether there will be enough freshwater for future populations is a mega-question which is not given a fraction of the attention it deserves by scientists.

Freshwater needs are driven by rising populations. The range of the estimates of future global population vary by over 50%. In this uncertain information domain there is the opportunity for pessimists and optimists to offer opposing interpretations. Whether to believe the optimists, including the author and most economists (Islam 1995; IFPRI 1995 and 1997; Dyson 1994), or the pessimists (Brown 1995 and 1996; Brown and Kane 1996; Postel 1995) depends upon the assumptions used.

Mega-questions tend either to be ignored or to attract difficult-to-test ideological interpretations of religious intensity. Whether there will be enough freshwater for future populations is a mega-question which is not given a fraction of the attention it deserves by scientists. In the 1960s and 1970s there were attempts in the former Soviet Union to review the world's water balance (L'vovich 1969 and 1974) and in the years since there have been further efforts to address global water availability and use (Shiklamanov 1985, 1986; Shiklamanov and Sokolov 1983; Shiklamanov and Markova 1987; and Gleick 1994).

Meanwhile international funding agencies are prepared to devote millions of dollars annually to the provision of advice on water management and lending for water projects without offering a view on the status of global water. The World Bank has produced shelves of reports on water allocation and management for the interested professional and general reader (World Bank 1993a; Serageldin 1994 and 1995) and for the specialist focused on local and regional issues (World Bank 1991, 1993a, and 1997). It has not, however, situated the debate in the global resource context. Only since 1994 has there been an attempt to address the subjects of water availability for the Middle East and North African region (FAO 1995a and 1997a) and water use by irrigation, the major water-using sector (FAO 1995b and 1997b). These publications provide first approximations whose reliability should continue to be tested.

The upper and lower bounds of the above projections are quite high, but about Middle East water there is far less uncertainty.

Although it is generally not publicized, the Middle East as a region actually ran out of water in the 1970s (Rogers 1994; Allan 1994). In politics, facts which are judged to have costly political consequences can easily be ignored or de-emphasized. For leaders in the region, political imperatives are more compelling than scientific facts. On water, these imperatives have led to denials of the scope of domestic and regional water scarcity. An ex-Prime Minister of Egypt (Higazi 1994) and mid-1990s Egyptian ministers of water resources, agriculture and planning have all publicly asserted that Egypt has sufficient water (Arab Research Centre 1995). The discrepancy between the views of scientists and politicians in the assessment of acute scarcity generally stems from the politicians' failure to account for the water required for increasing food production. Politicians limit their analysis to municipal, industrial, and agricultural job sustenance, and in doing so, claim water sufficiency despite the absence of large water volumes needed to grow crops to feed their populations. For politicians in almost all countries in the region the food gap caused by the insufficiency of water has to be ignored, because to draw attention to the food gap is politically suicidal.

The reason the Middle East is important with regard to water is because it is the first major region to run out of water. The Tigris-Euphrates riparians have not yet fully utilized their water resources but will do so in the coming decades. Similar problems are envisioned among the upper riparians of the Nile.

The major indicator of the scale of the water deficit of an economy is the level of its food imports, since water used in the agricultural sector exceeds by ten times the water used by the industrial and municipal sectors combined.

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Table 1 World population in the year 2100 (IFPRI 1995).

Low scenario:	7.7 billion
Mid scenario:	9.4 billion
High scenario:	11 billion

In the humid temperate latitudes, attention is rarely drawn to the relative demands of the agricultural and the municipal/industrial sectors, since crops can generally be grown in those regions without irrigation. In the arid and semi-arid Middle East, however, the dominance of the agricultural water demand is stark. There is little or no naturally occurring soil moisture there even during the winter rainy season.

In the semi-arid and arid Middle East and North African region, water for irrigation is expensively won because of the costs of storage and distribution. Moreover, that water which is diverted for the purposes of irrigation is lost to the industrial sector, putting water-stressed riparians at a competitive disadvantage in terms of economic (non-agricultural) production. The effective allocation of water between sectors to gain high returns and high levels of employment is fundamental to economic and political stability.

Table 2 Per-capita annual water consumption.

Drinking water:	1 m^3
Municipal and industrial uses:	100 m^3
Food production:	1000 m^3

THE REGIONAL WATER GAP AND THE GLOBAL WATER SURPLUS

The production of every metric ton (1000 kg) of a food commodity such as wheat requires an input of about 1000 metric tons of water (equivalent to 1000 m^3). The interannual trend in cereal imports reflects a reasonable approximation of the capacity of an economy to meet its strategic food needs. Figure 1 illustrates the trend in cereal and flour imports in the Middle East and North Africa since the 1960s.

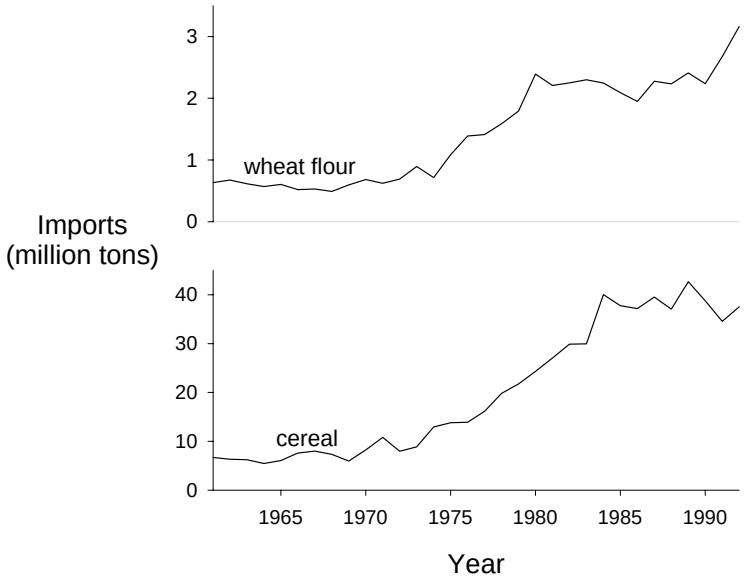

Figure 1 Wheat and cereal flour imports to the MENA region, 1961-1992.

The leveling off in the trend in 1986 reflects changes in particular agricultural and food production policies by Egypt and Saudi Arabia, the two biggest players in both cereal and flour production and consumption in the region. Egypt introduced wheat subsidies (to begin a shift away from cotton) and Saudi Arabia's irrigation projects began to produce sufficient wheat for most of its needs (as it became a significant wheat exporter in the world market). Saudi Arabia has subsequently reduced its wheat production because it was palpably an unrealistic way to use its fossil water.

Although the region has suffered fairly acute water scarcity since the 1970s, the peoples and their leaders refuse to recognize these resource and economic realities. Their interpretations of Middle East hydrological and economic contexts are at best underinformed and at worst dangerous. Figure 2 provides the estimated status and utilization of MENA water resources.

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Scientists cannot provide truly reliable information on either the supply side (the availability of water) or on the demand side (the current and future consumption of freshwater driven by future populations). In any event, the capability of the region's hydrological system to meet the rising demands being placed upon it is in question.

At the same time, however, the global hydrological system is expected to be able to meet the most significant element of global water demand, the global consumption of food. Assuming a medium water consumption scenario of 1500 m^3/capita/yr, global freshwater needs are about 8.25 billion m^3 (BCM) annually. Consumption of this magnitude is well within the estimates of global freshwater availability (Rodda 1996), but there are differing interpretations of the position *vìs-a-vìs* future demands driven by higher world population (Brown 1996; Postel 1997; IFPRI 1996).

At this stage in history the Middle East's water deficit is not serious because global systems (i.e. trade) balance the Middle East's deficit (Allan 1994). It is economic systems and not hydrological and water engineering systems which achieve water security for the economies of the region. At the regional level there can only be degrees of pessimism about the future availability of water, at least for irrigated food production. On the other hand, optimism about the capacity to use the region's water more productively is sound. It is on this aspect of water management that politicians and regional optimists focus. At the global level there is certainty neither about volumes of freshwater available nor about the capacity to use the water effectively. In these circumstances there is evidence to support the arguments of both optimists and pessimists. Because of the mighty error bars on the statistics produced by the as yet inadequate models of global change (Conway 1993; Conway and Hulme 1993

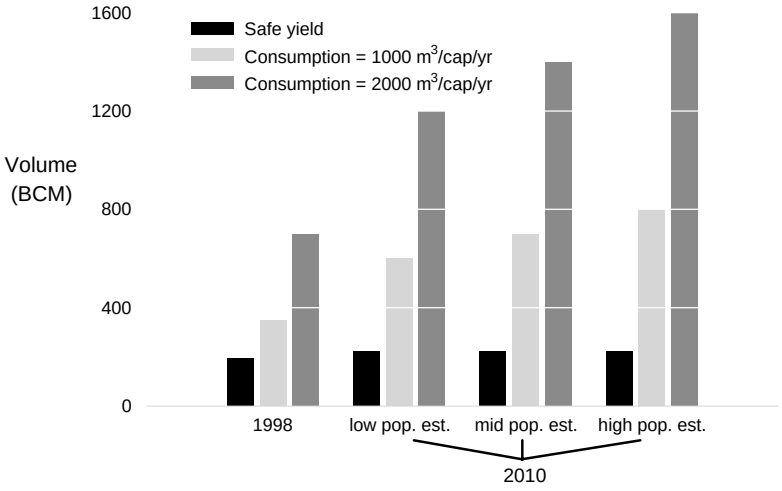

Figure 2 Uncertain MENA scenarios: population and water consumption.

and 1996; Conway *et al.* 1996) very different views emerge concerning the capacity of the world's agricultural systems to raise food. The pessimistic global freshwater scenario is persuasive if we assume:

- static patterns of food and water consumption by individuals;
- high estimates of the demographic transition;
- static technology;
- inflexible political and international institutions; and
- ineffective trading systems.

If, however, we assume:

- increasing food and water consumption efficiencies;
- lower range population projections (7-9 billion people); and
- continued open trade,

then we can conclude that the world's water and food futures are uncertain but not seriously insecure.

The specific deficits of the MENA region arise not from poor local resource endowment, which is significant, but from the inability of agricultural sectors, governments, and international institutions to adapt to the resource scarcity and take measures to find and mobilize substitutes. It must be recalled that human consumption should not be assumed to remain in the 1000-2000 m^3/capita/yr range. Consumption rates in the vast semi-arid tracts of Africa south of the Sahara have been measured at as low as a mere 3.5 m^3/capita/yr.

Anxiety over municipal and industrial needs – even in the MENA region – is misplaced. The genuine tension over water in the region has been and will continue to be in the agricultural sector. Food production requires about 90% of a community's water; should there be insufficient water for local food needs (the predica-

ment of the Middle East since 1970) then "virtual water" has to be imported. Domestic water is likely also to be augmented by desalination.

While the underlying message in this paper is optimistic, it must be very strongly emphasized that the types of adjustment anticipated by the optimists cannot be achieved quickly. Thirty years is a rather short transitional period for the necessary major adjustments in water policies to be developed in response to limited water availability. Adjustments such as the changes in the public perception of the value of water take time. The associated political discourses enabling fundamental changes in water policies may take decades. So deep are the belief systems and so challenging any proposal that beliefs should change that politicians are loathe to contradict them, even though the measures are essential for the stabilization of the political economy.

How is it that the two camps, pessimists and optimists, can exist simultaneously and dispense such confusing contradictory interpretations? The central reasons are analytical uncertainty in the areas of freshwater availability and the impacts of various climate change scenarios on the supply side and of consumption rates on the demand side.

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VIRTUAL WATER AND THE PROBLEMSHED

Watershed-based water budgets do not provide a complete source of explanation because they are not determinant of the options available to those managing a national economy. If national hydrological systems restrict economic options then politicians have to find remedies in systems that do provide solutions. United States water resource specialists have coined the term "problemshed," to make the idea of the "system" in which solutions can be found more accessible. National economies operate in international political economic systems – in problemsheds – and not just in hydrological systems – or watersheds. The political economy of the global trade in staple cereals is the relevant analytical catchment for water deficit economies. Access to, and management of, the problemshed is not restricted to environmental systems; it necessarily includes extremely powerful and flexible economic systems as well.

The shared and limiting watershed-based water budgets, with all their troublesome international relations, are dangerously misleading frameworks of analysis. The existence of solutions in "problemsheds" enables politicians to avoid the stresses of inter-riparian relations in the "watershed." In brief, if half of the water needed to feed the MENA region's people in the 1990s lies in the soil profiles of temperate humid environments in North America, South America and Europe, it would be scientifically derelict to ignore that water. It would also be neglectful of scientists in general and the governments of water-short economies in particular to ignore predictable future

competition for this water. The scientific neglect is just as serious as the predictable devious and selective hydropolitics engaged in by political interests.

The coming fifty year transformation of the perceptions of the value of water (Allan and Radwan 1998) will be a tough environment for those looking for quick solutions. There is no reliable checklist with which to change the perceptions of large groups of people quickly. And people "convinced against their will (tend) to be of the same opinion still." Even when perceptions have transformed and shifted, the implementation of new water policies, especially water reallocation policies, must be gradual. These processes will all be slow, sometimes painfully slow, for anxious agency officials and for economists and engineers because of limited funding and career horizons.

As noted above, the foundation scientific concepts for economically and environmentally sound water policies require reforms and adjustments with high political prices (World Bank 1997). Politicians will defer for as long as possible paying these political prices, which can be so extreme as to involve loss of power. It requires a nearly inhuman level of courage for a political leader of a country that for five thousand years has enjoyed water security to announce that water resources are no longer adequate.

Those innovators purveying economic and environmental facts of life which contradict the deeply held belief systems of whole populations will be ignored if they do not shape their message and pace its delivery to accord with political realities. The authors of the 1997 World Development Report (World Bank 1997) put it another way, quoting Machiavelli:

> The innovator makes enemies of all those who prospered under the old order, and only lukewarm support is forthcoming from those who would prosper under the new.
>
> *The Prince*, Machiavelli, N., 1513.

CONCLUSION

Ultimately the water pessimists are wrong, but their pessimism is a very useful political tool, enabling the innovator to shift the eternally interdependent belief systems of the public and their politicians. The water optimists are right, but their optimism is dangerous because it enables politicians to treat water as a low policy priority, to delay innovation, and to thereby please those who perceive that they are prospering under the old order. Pessimists also bring more sensational stories to the media. Optimists bring a version of good news which is complicated and indigestible, as well as unsensational.

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