Sustainability and Water Resources in the Middle East

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CAROLINE SMITH, NOV 9 2009

Introduction

The Middle East[1] is one of the most water-short regions in the world: almost all countries in the region (with the arguable exceptions of Iran and Turkey) have less (in most cases, significantly less) water available – through rainfall and other sources – than the 1,000 cubic metres per person, per year, which is traditionally taken to be a minimum human requirement.[2] Moreover, the region's problems will greatly increase in severity over the coming decades, since the area has a high population growth rate, which will reduce the per capita availability even further.

Facing such a crisis, good water management strategies are essential: and yet there is, as yet, no evidence of this in the Middle East. The purpose of this essay will be to examine the various sources of water available in the Middle East from a sustainability perspective, in order to demonstrate the extent of the challenge facing the region. This is, as far as I am aware, a novel approach, since the factual literature on Middle Eastern water does not fit the issue into the environmental framework of sustainable development.

For the purposes of this essay, I will define 'sustainability' in the words of the Brundtland Commission of 1983, which stated that Sustainable Development should *"[meet] the needs of the present without compromising the ability of future generations to meet their own needs"*. In my overview of the situation in the region, it will become clear that 'sustainability', in terms of long-term access to water-sources, is intimately linked with the complex politics of the region, and that environmental ideals are frequently subordinated to political objectives which are not necessarily economically efficient or environmentally sustainable.

My analysis will make particular reference to the phenomena of 'overshoot' and 'feedback delay', as outlined in the seminal environmental work, *Limits to Growth*, which outlines how humans are usung natural resources at a rate beyond that which is sustainable. In this context, 'overshoot' can be defined as the use of a resource based on its apparent availability, rather than setting a rate of use based on the rate of renewal – i.e. exceeding the amount which can sustainably be used (Meadows& Meadows 2006:175). 'Feedback Delay' is defined as a kind of 'response time' needed for the negative effects of an unsustainable activity to be realized, and for action to be taken to combat these effects. This means that in the specific case of water scarcity in the middle east; as for the cases illustrated in *Limits to Growth*, the longer it takes for measures to be developed to combat environmental problems, the more harm will be done, since *every year of delay in starting the transition toward a sustainable equilibrium reduces the attractiveness of the trade-offs and the choices that will be readily available after the transition has been achieved* (Meadows& Meadows 2006:247).

Although numerous solutions to the Middle East water question have been proposed, none of them have so far been effective. This essay will conclude by suggesting that from a theoretical point of view, correcting the delays in the 'feedback system' will be essential if the problem of 'overshoot' – use of water resources at a rate greater than that which is sustainable – is to be corrected. However, since the 'feedback system' in the Middle East is shaped by a complex political agenda, the prospects of resolving the water crisis in the short, or even medium-term future, are relatively bleak.

Unsustainable Practices: Aquifers

Different countries in the Middle East have different natural water resources available to them: and additionally, different countries undertake different water-related projects based on their financial ability to do so. However, as will become clear, there is by no means a direct correlation between a country's wealth and the efficiency of its water management.

My survey of the region will attempt to give a cross-section of the various sources of water, and analyse the extent to which they are being used sustainably. We will begin our account with perhaps the most 'classic' sustainability problem: the depletion of groundwater, in the form of deep underground aquifers.

Aquifers are underground sources of water which have been formed over thousands or even millions of years: whilst they can be partially recharged by rainwater seeping into them, they are essentially non-renewable (since the vast time-scales over which they are recharged are essentially irrelevant to humans). The aquifers to be found in the Middle East region vary enormously in their usefulness (see Allan 2008:81-86) – principally in the purity of the water extracted, and the depth of the well which must be drilled to access them (in some cases this is as much as 2, 500 metres – (Elhadj 2004:24) : but almost all share the common feature of being used at a rate which is not sustainable.

Coastal aquifers such as those in the West Bank (and also in Libya, in North Africa) are already showing very visible signs of 'overshoot' (i.e. overpumping) in the phenomenon of saline intrusion:[3] however, in other regions, the first signs that the aquifer is not being used sustainably is the point where the wells begin to dry up. There do not seem to be any regulations on the use of water from underground aquifers: the only limitation to extraction of water is having the financial capital to pay for it to be pumped to the surface, and (as is becoming increasingly necessary) to have wells deepened. The exception to this lack of regulation is in the Palestinian Occupied Territories, where stringent restrictions are imposed regarding the number, and depth of wells Palestinians are allowed to drill: Israel claims that this is a sustainability measure, but in reality, it bears all the hallmarks of resource capture,[4] since Israel has *created a blatantly unequal situation in the area, with Jewish settlers receiving five to eight times more water per capita than the Palestinians* (Klare 2001:171). For instance, *while Israeli wells are 300 to 400 meters deep on average, Palestinian wells are only about 70 meters deep* (Park 2008:2). Whilst the issue of conflict over environmental resources goes beyond the scope of this essay, it should be noted that the long-term perspective which is essential to sustainable water-management strategies is incompatible with an unequal allocation of resources, either amongst inhabitants of the same country, or between countries which share the same resource.[5] However, the delicate balance of power in the Middle Eastern regions makes it seem likely that such inequalities will persist.

Economic Restructuring for Sustainable Water Management: Successes and Problems.

Israel's approach in the Occupied Territories is unsustainable: however, within its own borders, it is the clear leader of the field in Middle Eastern Water management. Israel has been the only Middle Eastern country so far to take on World Bank advice about water privatization: i.e. water allocation schemes driven by the economic concept of 'return to water' (Lichtentäler & Turton 1999:3), which naturally favour water allocation towards sectors such as industry over agriculture, since industry typically produces a product of greater value, per unit of water consumed.[6] In Israel, allocations of water to agriculture have been systematically cut over the past decades (Allan 2008:79), and Israel, thanks to its relative prosperity, has been able to restructure its economy away from agriculture:*Israel has achieved a position where 97 percent of its GDP is generated from activities which use only five per cent of its water* (Allan 1999:4). Additionally, it now has only 2% of its economically active workforce employed in agriculture, whilst neighbouring countries such as Egypt and Syria still employ 31% and 26% of their workforce in agriculture respectively.[7]

However, this large-scale restructuring of the economy was only possible in Israel because of its prosperity and level of development: water-efficient agricultural technologies such as drip-irrigation are expensive and, more importantly, poorer Middle Eastern countries are not in a position to offer alternative employment to farmers who would be put out of business by introducing water quotas: thus countries such as Jordan, Syria and Egypt cannot undertake such a restructuring, as creating mass unemployment is not a politically rational course of action, regardless of its environmental desirability. As Jägerskog summarizes:

Governments and the International Community should be especially attuned to the possibility of local conflicts sparked by reduction in the volume of water allocated to irrigated agriculture, the source of employment income for a large part of the population. The social pressures that will result are potentially severe. (Jägerskog 2008:2).

Thus we see a profound dichotomy in the region between a pressing need to develop sustainable water policies, and governments' relative inability to act, since developing water management strategies will inevitably lead to unemployment in the agricultural sector which, in countries where this reflects such a significant proportion of the population, would be politically inviable.

Virtual Water: A Sustainable Solution?

The Middle East water expert, Tony Allan suggests that the concept of 'virtual water' might be the solution to the political obstacles standing in the way of water policy. By 'virtual water', Allan means importing grain into the region, which has been produced elsewhere in the world (i.e. effectively importing water in 'virtual' form).

It takes 1,000 tons of water to grow one single ton of grain (Merret 2003:3). If grain is therefore imported from regions of the world (notably Europe and North America) where water scarcity is not presently an issue, this saves Middle Eastern governments the political inconvenience of developing the water-management strategies which would be needed to mobilize the vast quantities of water needed to grow this food locally.[8] Middle Eastern countries having been using this strategy for some time, and the region is now heavily reliant on grain imports.[9] In fact, Allan asserts that without such imports, there would not be enough water to sustain the current population. He even radically argues that *[t]he Middle East ran out of water in the 1970s* (Allan 2008:5), and that food imports are the only measure preventing a water crisis: indeed, he claims they are the long-term solution.

However, from a sustainability perspective, this position is dubious: whilst it is clear that food imports are providing a lifeline to Middle Eastern countries which cannot politically 'afford' to manage the actual (as opposed to virtual) water resources they possess, the status of 'virtual water' as a political loophole is another clear example of 'feedback delay'. By postponing the date where water issues will be openly addressed (apart from Israel, there is little or no evidence to date of governments having clear water management strategies), a situation is likely to result where the problems are more severe in the long run, and the options available are severely restricted. That is not to say that there is an obviously 'better' solution to the problem: the political situation in the region makes the environmental agenda infinitely more complex – but, as I suggest elsewhere, the only truly sustainable approach will involve addressing the 'feedback delay', since *[a] system cannot come into an accurate and orderly balance with its limit* [i.e. develop a sustainable approach] *if its feedback signal is delayed or distorted* (Meadows 2006:157).

Oil States and Water Consumption

In the above section, I suggested that poverty and the low level of development of some Middle Eastern countries would make it politically difficult for them to restructure water policy along the same lines as their rich neighbour, Israel. However, there is by no means a direct correlation between wealth and sustainability: one of the biggest problems of the region is that many of the oil states have effectively taken the view that *as long as oil pays for it, one can afford poor water management* (Viala 2008:2). In essence, they have been financing patterns of water-consumption and water-intensive projects which are inherently unsustainable, as their financial basis rests on a resource (oil) which is non-renewable.

Kuwait, for instance, has virtually no naturally occurring water: and yet its citizens rank amongst the world's biggest consumers of water, almost doubling their consumption every ten years (Darwish et al 2008:140). This is because Kuwait has built combined power and desalination plants using its oil wealth:[10] water and power are supplied to the population at highly subsidized rates. There are two major problems here: firstly, government subsidies mean that citizens do not have any understanding of the true cost of water.[11] This means that they do not appreciate the need for sustainable patterns of consumption (cf WCED 1987:44 –*living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability*). Secondly, as noted above, these patterns of consumption are of course certainly not sustainable, since the desalination plants – and,

indeed, the prosperity of the country as a whole – is entirely reliant upon its supply of oil which, as a non-renewable resource, will be exhausted in the relatively near future.

On the subject of non-renewable resources such as oil, the WCED offers the following advice:*In general the rate of depletion should take into account the criticality of that resource, the availability of technologies for minimizing depletion, and the likelihood of substitutes being available* (WCED 1987:46). According to Darwish et al, this action is not being taken in Kuwait, and high levels of consumption persist in spite of the central role of oil in the process of supplying water, and a lack of research into alternatives. The authors predict that in around 30 years' time, Kuwait will not have sufficient oil to meet the energy and water needs of its own population (Darwish et al 2008:341). Once again we see the model presented in the *Limits to Growth* of a delay in responding to a future crisis (no measures are currently being taken to regulate consumption or research alternatives) leading to a reduced set of options available for its resolution.

It is important to note that the lack of public awareness regarding water consumption in Kuwait is partly the result of the very peculiar political system found in the Gulf oil states: the 'rentier' economy. Since these states obtain so much revenue from their oil resources, there is no need to tax citizens. However, given that citizens are not contributing financial means to the governing process, their involvement with it is extremely limited, along with their ability to question it: thus the essential ingredient of 'public discourse', which many would regard as indispensable to a sustainable approach, is lacking.

Saudi Arabia is another example of oil-fuelled, unsustainable water-use. Here, a project was undertaken in the late 1980s and early 1990s to 'make the desert bloom' (Elhadj 2004). This involved using the country's oil revenues to heavily subsidize farmers, and incentivise them into growing wheat on a scale so vast that Saudi Arabia actually became a major exporter. However, whilst the country could afford this expensive experiment financially, since 1,000 tons of water are required to grow a single ton of wheat (Merret 2003:3), exporting wheat is essentially the equivalent of exporting water. Thus Saudi Arabia's use of its underground aquifers for this project is another clear example of overshoot – the use of a resource at a rate based on its apparent availability, rather than setting a rate of use based on the rate of renewal (n.b. as noted above, underground aquifers are essentially non-renewable and, furthermore, in the case of Saudi Arabia, these underground aquifers constitute the overwhelming majority of the country's naturally occuring water).

By the mid 1990s, FAO statistics[12] show that production was scaled back (see also Allan 2008:9), but wheat exports only finally ceased in 2008, following the eventual realization of the immensity of the water crisis this project was exacerbating.

Saudi Arabia's motivation for undertaking this project was partly prestige, but also partly to do with the crucial issue of food security: it prized the ability to generate all the food it needed to support its population within its own borders higher than the economic and environmental costs implicit in doing so.[13] This concern over food security is the direct result of the unstable political situation in the region, and the potential threat that countries supplying food imports (for grain, mainly Europe and the USA, both of which have a history of intervention in the Middle East) might withdraw trade under particular constellations of alliances. Indeed, the undertaking of the Saudi Arabian project may have been triggered by US threats to withhold food supplies following the 1973 oil price hikes (Elhadj 2004:35). This is a potential threat for Allan's 'virtual water' solution: although in theory it is a useful model, heavy reliance on food imports, whilst the most efficient water-management option, is politically dangerous, and unlikely to be achieved until long-term stability is established in the region, since reliance on outside powers for food imports effectively means surrendering the power to decide whether or not a country's population will starve to external, rather than domestic actors. Furthermore, buying grain on the international market is not necessarily a stable solution, as the market is subject to price fluctuations[14], which once again represents a loss of control.

The Politics of Water-Sharing: Sustainability = Durability of Agreements.

It should be clear by now that the concept of water sustainability in the Middle East has a strong political dimension. In the final part of this essay, I will examine the relations between countries in the region, and the impact this has on

water sustainability. In effect, I plan to broaden the definition of sustainability ('meeting the needs of the present without compromising the ability of future generations to meet their own needs') to imply that sustainable water management in the Middle East will necessitate long-term agreements regarding the water resources which are available to each state. For instance, Israel's ability to ensure water availability for future generations will be partly contingent on its political ability to maintain control of the Occupied Territories, from which it sources a large percentage of its total water requirements (Homer-Dixon 1994:14).

In the region as a whole this issue primarily concerns water-sharing agreements between states in the same river-basin. In International Law, there is not as yet any official framework for water-sharing (Lonergan 2001:115), and thus states in the Jordan and Tigris-Euphrates basins[15] have tended to act unilaterally, typically with those states which possess the greatest military power (Israel and Turkey respectively) taking the largest share of resources, since they have no incentive to cede their advantageous position.

For instance, whilst Turkey has sufficient water from a number of different sources, and thus could theoretically afford to compromise with other riparian states, it takes a position of 'absolute territorial sovereignty' (Lonergan 2001:115), seeing its rivers as a sovereign resource which it has the right to use as it sees fit. Accordingly, in a development project which has been going on since the 1960s, Turkey has built a series of dams on the Tigris and Euphrates both to generate HEP and to supply a new network of irrigation to increase agricultural productivity. Given Turkey's secure position as regards water supplies, the irrigation systems which are being used are in fact highly inefficient (Beschorner 1992:31), but there is no incentive for it to invest in expensive drip-irrigation technologies – and thus the volume of water which it releases to its downstream neighbours, Syria and Iraq, is adversely affected. Indeed, with Syria also in the process of implementing a large-scale irrigation project, some estimates claim that Iraq may receive between 50 and 80 per cent less water (Park 2008:36). Not having a reliable supply of water makes it extremely difficult for countries such as Iraq to develop sustainable water-use policies in the long term – and unilateral action taken by upstream states only aggravates the problem.

Similarly, Israel maintains a position of power in the Jordan basin. One of the important strategic advantages Israel gained through the 1967 war was that, *by occupying the Golan Heights of Syria, Israel gained direct control over the Baniyas River, thus eliminating any threat to the headwaters of the Jordan* (Klare 2001:170). Additionally, it also controls the amount of water it releases to its downstream neighbor, Jordan. Whilst Israel, like Turkey, has access to other sources of water, *Jordan has no watershed to rely on besides the Jordan river* (Park 2008:37), and thus is highly vulnerable.

In Turkey, part of the problem is that the GAP, or 'South-Eastern Anatolian Project' is intended to create jobs in the country's most unstable region, where most of its ethnic minority of 15 million Kurds are concentrated. Thus it is understandable that Turkey should favour the interests of its own (voting) citizens above those of inhabitants of downstream countries, who do not influence national elections; as is also the case with Israel and its relationship with Jordan. This type of problem can only be resolved through the agency of international bodies.

Conclusion: Overshoot, Feedback Delay, Stability and Sustainability.

In conclusion, this essay has attempted to give a brief overview of the water situation in the Middle East. This has revealed a more or less ubiquitous situation of classic 'overshoot': water resources are being used with no regard for their long-term sustainability, even in countries such as Saudi Arabia, which are exclusively dependent on non-renewable sources. Furthermore, there seems to be an almost complete absence of water-management strategies; in part because making populations aware of the extent of the crisis, and implementing water allocation measures would be politically catastrophic. This is one of numerous examples of 'feedback delay' in the region: unless this is addressed, and water policies are developed in the short-term, the long-term options available to governments in the region will become progressively less attractive (Meadows 2006:247).

In this respect, the solution of 'virtual water', whilst it may well ultimately prove to be the key to resolving the crisis is, in my view, exacerbating the problem in the short-term, since it encourages politicians to dodge the issues. Additionally, I believe there are much more significant political problems with virtual water: Middle Eastern states

would rather pursue inefficient and unsustainable agricultural practices than import grain and subject the wellbeing of their people to the whims and political tactics of external powers.[16] In the current climate, then, and indeed unless permanent stability as regards external actors (US, EU) is achieved, virtual water is not a feasible solution.

A similarly pessimistic outlook applies to the relationships within the region itself: there are profound ideological and cultural rifts in the Middle East – not least the Israeli-Palestinian dispute. Thus, the political distribution of existing water is likely to be just as unfeasible as 'virtual water' because of regional instability.

As has been clear throughout this essay, the region suffers severely from a tendency to prioritize political objectives over environmental ones: even in Israel, which I have suggested is a leader in the field, there are clear signs of the political agenda taking precedence. For instance, despite demonstrating its ability to reduce its water consumption through cutting allocations to agriculture, with peace negotiations on the horizon, Israel once more increased its consumption in the mid 1990s in a tactical move in order to claim that it must be allocated a greater amount in negotiations (Allan 1999:7).

Ultimately, in the broader context of Sustainable Development, the Middle Eastern water situation shows many of the same problems which are proving stumbling blocks to the sustainability project world-wide: namely, extreme reluctance to take a long-term view and adapt behaviour in the present for the sake of future generations. However, the complex nature of the political situation in the region suggests that it will be more difficult to overcome these issues here than elsewhere: indeed, one is inclined to conclude that without long-term solutions to guarantee the political and economic stability of the region, sustainable water management policies are unlikely to emerge.

[1] For the purposes of this essay, the 'Middle East' will not include North Africa, for reasons of space. Where appropriate, it will be noted that these countries face many of the same problems.

[2] These countries are: Israel, Jordan, Kuwait, Saudi Arabia, UAE, Yemen – see (Gleick 1993:101)

[3] See Allan 2008: 82 for a description of the phenomenon.

[4] For another excellent example see Lichtenäler &Turton 1999 on agriculture in Yemen being taken over by rich landowners.

[5] See WCED 1987:52, which states that unfair distribution is unlikely to belsustainable in the long run, and may lead to greater environmental damage.

[6] The main water-user in the Middle East (and, indeed, worldwide) is agriculture: which consumes approximately 90% of the total available resources.

[7] 2004 FAO statistics on 'Economically active population in agriculture', available online: http://www.fao.org/corp/statistics/en/

[8] "*the availability of imported food allows [Middle Eastern Countries] both to postpone new water supply initiatives and to delay difficult decisions about the demand management of their water resources"* (Merret 2003:4).

[9] See Allan 2008:41 for details.

[10] Desalination is prohibitively expensive elsewhere, costing around $\$1/m^3$ (Allan 2008: 92).

[11] i.e. failure to incorporate externalities.

[12] http://www.fao.org/corp/statistics/en/

[13] See (Beschorner 1992: 34) for Syria

[14] See Halper&Clarke 2007:240 for an illustration of how the Soviet Union, turning to the international market following a poor harvest in 1972, caused the price of grain to more than double.

[15] The situation in the Nile basin is also extremely interesting, but cannot be covered here due to reasons of space. See (Klare 2001), (Beschorner 1992) etc.

[16] e.g. Reagan, upon his accession to the presidency, withdrew grain sales to the USSR.

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Written by Caroline Smith Written at: the University of Cambridge. Written For: Dr George Joffe Date Written: 2009