GLOBAL SYSTEMS AMELIORATE LOCAL DROUGHTS: WATER, FOOD AND TRADE

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The term “drought” needs to incorporate a measure of the effectiveness of the climate for a specific purpose, be it the maintenance of an ecosystem, or of livestock herds. One should be able to define a “pastoral drought” or an “ecosystem drought” or a “millet drought”. Drought would then be defined in terms of land use, and it follows that if the land use were to change, the frequency of drought would also change, without a necessary change in climate. (Warren and Agnew, 1988:17)

ABSTRACT

The paper will show that solutions can be found in 'problemsheds' when they cannot be found in 'watersheds'. This concept is relevant with respect to short-term drought as well as to long-term water stress. The volumes of water transferred across the world via trade, embedded in water intensive commodities such as grain, are massive in terms of the occasional and accumulating water deficits experienced in water stressed regions. Such strategic water is relatively easily mobilised; very easily mobilised compared with the problems that engineers would face in shifting such high water volumes. The reason such secure and globally available ‘virtual water’ is significant is that politicians can defer dealing with the impacts of a high proportion of the drought events because these reserves of accessible ‘water’ exist.

The study will discuss water resource deficits in Mediterranean countries in the MENA region (Middle East and North Africa region) as these economies have encountered the extreme water shortage and drought events in the first region to run out of water. Only Spain of European countries has experienced water stress on the scale experienced by the MENA economies. The MENA economies, apart from Turkey and Lebanon, moved into water deficit in the two decades before 1970. The experience of these political economies has highlighted the remedies mobilised by the political leaderships of water stressed economies. It will also be explained why environmentally and economically sound water policy reforms are difficult to implement.

INTRODUCTION

In discussing drought it is important to define which type of drought is being addressed. Droughts may impact water supplies for drinking water, for domestic water, for
municipal water, industrial water and/or agricultural water. Interruptions to the first three types of consumption are very evident when they occur as individuals, communities and even members of the government in metropolitan centres may suffer breaks in supply. Such interruptions have immediate political significance. They draw attention to progressive declines in water availability as well as to drought events. Water shortages which impact livelihoods in industry and agriculture can also be politically as well as economically significant, but they tend to generate less political heat than interruptions to drinking and domestic supplies.

The per person use of water in these different sectors varies greatly. Very tiny amounts of water, as measured in annual consumption per head, are used by an individual for drinking - one cubic metre per year per person (m3/p/y). About 100 m3/p/y are used for domestic purposes in an industrialised political economy in the North; although only five m3/p/y in a poor African country south of the Sahara. About 1000 m3/p/y are needed to raise the food consumed annually by an individual whether living in the North or the South. They may of course consume much more in affluent economies. Meanwhile water for livelihoods in non-agricultural industrial sectors can be negligible, for example at a research institute in Ispra. On very rare occasions use per head in industry may be higher than those encountered in agriculture.

Social factors drive the levels of water used in association with food consumption. Decisions made within the family determine the overall population. Individuals in families decide how many children they will have and demographic theory has shown that these decisions are greatly affected by socio-economic circumstances. The latter also impact decisions on whether to consume a diet which involves modest inputs of water, for example that of a vegetarian, or an animal protein rich diet which requires very large volumes of water to produce animal products. It only requires about 1000 tonnes (m3) of water to raise a tonne of wheat. It requires about 16 times that amount to raise a tonne of meat.

Water for food is the ‘big’ water in any national water budget. Happily it has been found that there is a global water, food and trade nexus (McCalla 1997) which operates extremely efficiently to move water across the world from water surplus regions to those in permanent or occasional deficit. This ‘virtual water, embedded in water intensive commodities such as wheat, is moved into the MENA region to make good the 25 per cent of water which would be needed if the region was to be water and food self-sufficient.

**APPROACH AND METHODS OF ANALYSIS**

The methods of the economist, political scientist and social theorist will be the main methods deployed to explain why water policies evolve as they do in the face of progressive and periodic water shortages. It will be shown that the MENA economies that have run out of water have taken decades to reform water using policies to accord with sound environmental and economic principles. It took between two and three
Decades for a political economy well favoured with economic capacity and social adaptive capacity (Ohlsson 1998), namely Israel. (Allan 1996a & 1996b, Feitelson 1996) Other economies, both rich and poor, which have not had the social adaptive capacity to install water policy reforms are only just beginning on the process of such reforms thirty years after the water deficits could be identified.

Three sets of economic concepts are helpful. First, the notion of comparative advantage underpins the concept of ‘virtual water’. Secondly, principles of water use efficiency provide foundation ideas for supply and demand management approaches to water management. (Lonergran and Brooks 1993, Brooks 1994, Merrett 1997, Winpenny 1994) Thirdly, models linking environmental resource use and development are very helpful in highlighting the socio-economic contexts which enable or impede water policy reform (Karshenas 1994, Karshenas and Allan 1996).

Even more important are five concepts developed in the fields of political and social theory. First, the notion of the ‘interest’ of the community or nation in ensuring beneficial outcomes for them of any water management intervention. Secondly, the concept of discursive analysis (McHoul and Grace 1993) which helps show how users of water contend with those advocating water policy reform. The process of contention and the achievement of ‘consensus’ takes time and outcomes never accord exactly with the goals of any of the contending parties; certainly not the alien scientist and consultant. A version of this explanation is that of ‘sanctioned discourse’ (Tripp 1997) which is a process especially evident in political economies which have a very long tradition of water management, for example Egypt. Thirdly, the concept of strong societies and weak states (Migdal 1988) captures the situation in many political economies where the size of rural water using communities is so large and vested with such long traditions of water management that their views prevail over those of the state. Fourthly the concept of ‘windows of opportunity’ (Kingdon 1984) is especially relevant to water management in water scarce circumstances. The occurrence of a drought brings a short period of convergence in the ideas held by government officials and ministers, as well as by the public and the media (Allan 1996). Such convergence provides an opportunity for those wishing to introduce water policy reforms. Fifthly, in social theory the notion of ‘belief systems’, information gaps’ and ‘mutual knowledge’ (Giddens 1984: 334-343) provide profound insights into the processes which alien innovators and local politicians and communities encounter when ‘new knowledge’ is being recommended by outside professionals and scientists.

ADAPTING TO PROGRESSIVE AND OCCASIONAL DROUGHT: REMEDIES AND HOW THEY ARE RESISTED

Economic theory

The concept of ‘virtual water’ is powerful in two senses. First it provides the remedy for progressive and occasional local ‘agricultural’ drought. Agricultural drought is the form of drought which is most common as deficiencies in soil water are evident in the failure
of crops. The much smaller quantities of water needed for domestic use almost always come from other parts of the hydrological cycle than the soil water which supports crops. Where the same surface source is used for all sectors, as in Egypt, then the volumes needed for domestic use are so small compared with those of irrigated
agriculture that the prioritisation of domestic supplies is not a major political problem. Where groundwater is the resource the exhaustion of a regional water resource by a high water using sector such as irrigated agriculture can lead to severe stress for all users including the urban domestic sector. The Libyan experience is a case in point. (Allan 1971) Spain is currently experiencing serious inter-sectoral competition for local waters. (Del Moral 1996) ‘Virtual water’ remedies national water deficits in a particularly effective way. The remedy is operationally effective. About 25 per cent of the water needs of the MENA region are accessed via trade in cereals – each tonne of imported wheat has 1000 tonnes of water ‘embedded’ in it.

Analysing the impacts of progressively deteriorating water supplies caused by demographically driven rising demands or the occasional single or multiple-year drought without taking into account the ‘virtual water’ remedy is a very partial and blind approach. It is rather like assuming that the only way for an individual to get to Milan from abroad is by road or rail; ignoring the airline option. Local water deficits can be accessed by hard pressed politicians by importing water from the soil profiles of very distant tracts. Farmers and traders combine the huge volumes of water required to raise food extremely effectively and Northern governments have intervened for much of the twentieth century to enable such commodities with their embedded water to reach the world market at about half its production cost. Politicians in water deficit economies get answers to their problem in international ‘problemsheds’ not in local watersheds. The latter are a form of closed system. Economies and polities operate in open economic and political systems. Politicians and economies are impeded by closed hydrological systems but their options are not determined by them.

Other concepts of the economist are also important because they explain why economies can avoid the stress of a drought by ensuring that scarce water is effectively and efficiently allocated. Principles of water use efficiency provide foundation ideas for the supply and demand management approaches to water management. (Brooks 1994, Merrett 1997, Winpenny 1994) Water can be engineered so that higher returns to water are achieved. ‘More crop per drop’ (IIMI 1996), the mission statement of the International irrigation Management institute, captures this principle. Doubling water use efficiency by improvements in the distribution of water and the reduction of leakage would go a long way to meeting the future needs of increasing populations. It is entirely possible that engineering measures will achieve such improvements as these via productively or technically efficient measures.

Much greater economic benefits than those achieved by technically efficient methods can be achieved by allocating water more effectively by economically or allocatively efficient measures. A hectare of wheat, requiring about 5000-6000 cubic metres of water use, would provide a livelihood for a family in a poor country. It would provide only a fifth or less of a livelihood in a Northern economy. The same area occupied by a service sector activity with the same water input could provide a thousand livelihoods and services turning over US$50 million per year. Allocatively effective water using activities can provide 10000 times the returns to water of agriculture. The greater livelihood providing potential of such activities enables communities and whole national economies to ensure their ‘entitlement’, to access to water intensive food commodities in trading systems. The notion of ‘entitlement’ transformed the analysis of famine in the
early 1980s (1981, 1993, 1994). Above it was suggested that productive efficiency is captured in the phrase ‘more crop per drop’. The concept of allocative efficiency is captured by the term ‘more jobs per drop’.

The importance of analysing water stress in socio-economic contexts is further highlighted in a third group of economic concepts linking environmental resource use and socio-economic development. These models are very helpful in highlighting the
socio-economic contexts which enable or impede water policy reform (Karshenas 1994, Karshenas & Allan 1996). In brief the models attempt to show that a political economy goes through a number of predictable phases in its approach to managing its environmental capital, for example water. In an early phase environmental capital tends to be an input enabling economic development. As a result the stock of environmental capital, for example water, tends to be degraded. When an economy reaches a phase of economic diversity and strength it can take different approaches and enjoy options not available when the economy was weak. One option is to curtail environmentally damaging policies. In a further phase when the economy is even stronger it is possible for governments and communities to rehabilitate the environment. The importance of the model is that it shows that remedies for drought impacts are not equally available. Concomitantly it must not be assumed that all political economies are equally afflicted by drought. (Wilhite 1993:5) Social adaptive capacity varies and is transformed in the course of the socio-economic ‘development’ of a political economy. The case studies of Israel, the West Bank and Gaza in Figure 3 indicate the very differing predicaments of these equally drought challenged political economies and their unequal capacities to respond to the challenges of implementing desirable policy reform.

Political and social theory

The first concept of political theory which is useful in analysing drought and its consequences is the notion of the ‘interests’ of the communities, bureaucracies and nations affected by drought events. These political entities will try to ensure that any beneficial outcomes of a drought are gained by them, or at least the most damaging ones are avoided. A number of analysts, have shown how drought events in the 1970s (Sen 1982) and the 1980s (De Waal 1989:30) have severe impacts when economic and administrative infrastructures work to amplify the disruptions of a drought event rather than alleviate them.

Secondly, discursive analysis (McHoul and Grace 1993), an approach used by social scientists, helps analysts of the water sector and of drought events in particular. These analytical techniques show how those coping with the absence of water in water using and water policy making communities contend with those advocating policy reform advocated from outside drought affected regions. The process of contention and the achievement of ‘consensus’ takes time and outcomes never accord exactly with the goals of any of the contending parties. A version of this explanation is that of ‘sanctioned discourse’ (Tripp 1996) which is a process especially evident in political economies which have a very long tradition of water management, for example Egypt. In brief, communities and governments oppose unfamiliar innovation. There is a condition of embattled tradition. Governments are involved with traditional water using communities, usually in agriculture, in a discourse which is sanctioned. There is only one agenda, the traditional agenda. Any deviation from this to consider for example allocative efficiency measures would have such a high political price that it is not considered. Similarly the notion of recognising that ‘virtual water’ is the actual remedy to the increasing national water deficits and drought events carries an even higher political price and is also rejected.
Thirdly, the concept of *strong societies and weak states* (Migdal 1988) reinforces the explanation derived from discursive analysis. In many political economies where the size of rural water using communities is large and vested with such long traditions of water management that their views prevail over those officials acting on behalf of the state. The state institutions are not strong enough to ensure that there is institutional capacity to respond to drought events and ideas and actions at the local level are
determining. Capacity at the local level to cope with major drought events when populations have risen and there are impediments to traditional responses such as migration resulting from local political differences or international boundary regulation then the outcomes can be as devastating as they have been in the droughts of the 1970s and the 1980s in Sahelian Africa.

Fourthly the concept of ‘windows of opportunity’ (Kingdon 1984) is especially relevant to water management in water scarce circumstances. The occurrence of a drought causes a short period of convergence in the ideas held by government officials and ministers (Feitelson 1996), as well as by the public and the media (Allan 1996). Such convergence provides an opportunity for those wishing to introduce water policy reforms. The case of Israel is especially useful in illustrating this phenomenon (Allan 1995). The droughts of 1986 and 1991-92 were not by themselves sufficient to bring about a change in national water allocation policy. But they proved to be the essential window of opportunity to swing the necessary public focus onto the issue of the sustainable utilisation of national water resources. Two very important additional political economy contexts were also important in bringing about the shift in policy. The first factor was domestic. It was the discourse that had been in train since the early 1960s about the need to adopt allocatively efficient (Palmer 1962) as well as environmentally sustainable water policies. Activist scientists, Israeli officials and green pressure groups gained the attention of the media with talk of ‘red-lines’; these being dangerous drawdown thresholds with respect to lake levels in Lake

[Figure 5 illustrates the significance of drought. It also shows how Israel conformed to the Karshenas model until 1992 as have the water managing authorities of Australia (Chatterton 1995). Since then other political forces brought on by the Middle East Peace Process have been overwhelming and Israeli water use has returned to its mid-1980s levels.]
Tiberias/Kinneret and in observation wells monitoring the West Bank aquifer. The second factor was international. In 1986 the US Reagan Administration embarked on a campaign to steer the Israeli economy. The US Government made the granting of a US$10 billion financial support dependent on major reforms in the Israeli economy. Water was one of the sectors targeted. Water reform was linked to drought, international pressure and internal discourse.

The 1991-92 drought brought further shifts in water allocation out of agriculture in accord with principles of economic efficiency. An announcement that Israel proposed to reduce allocations to agriculture by 60 per cent from their mid-1980s levels. Half of this target had already been achieved. (Voice of Israel 1991). There has been a dramatic reversal in approach since 1992 by Israel. The shift confirms again the dominance of politics in political economies. The period since 1992 has been an important phase in the Middle East Peace Process. Great progress was made by 1995; a peace was signed in September 1994 between Jordan and Israel. In September 1995 the Oslo Accord was signed between Israel and Palestine. (Allan 1996 p 211 an page 215) Throughout the 1992-99 period Israel has allowed its water consumption to rise a reversal of the 1986-1992 policy. The shift confirms again the dominance of politics in political economies and the perceived need by Israel to negotiate over water from a high level of consumption rather than a low one.

Meanwhile the options available to strong political economies and to states in internationally significant theatres are revealed in the recent announcement by Ariel Sharon the Israeli Infrastructure Minister of a proposal to desalinate 400 million cubic metres salt and brackish waters of water annually for The West Bank, Gaza and Jordan. And a second phase of 800 million cubic meters annually for the 2010 needs of those three entities as well as those of Israel. (Ha’aretz 4 February 1999)

A fifth set of explanations, deriving from social theory help explain why the ideas of alien hydrologists, drought specialists and economists, generated at such workshops as this one in Ispra, have little impact on the national policies of the governments of water scarce political economies. The notion of ‘belief systems’, information gaps’ and ‘mutual knowledge’ (Giddens 1984: 334-343) provide profound insights into the processes which alien innovators and local politicians and communities encounter when new knowledge is being recommended by outside professionals and scientists. ‘Belief systems’ can reflect the experience of five millennia of occasional drought but not of systematic permanent deficit. Many political economies in the Middle East and the Mediterranean, including Spain, entered a period of progressively serious national water deficits – defined as insufficient water to meet all needs including that for self-sufficient food production. The idea of ‘mutual knowledge’ is useful. Giddens notion captures very well the existence of ‘mutual knowledge’ in circumstances very common for the consulting community and scientists working on for example water and the environment and other science and economics. Ideas purveyed by alien scientists may come to be understood, become ‘mutual knowledge’ for part of the population, usually an educated elite. The phase of mutual knowledge does not mean that water policy can easily be reformed. The process of reform is subject to the protracted discourse mentioned above which is subject to the interests of stakeholders other than those enjoying ‘mutual knowledge’. The attenuation of the adoption of ideas and their incorporation into policy
can take 30 years as in the Israeli case of the adoption of the concept of allocative efficiency. In less well found economies without the adaptive social capacity (Ohlsson 1998) the process could take much longer.

CONCLUSIONS
The analysis has shown that ‘new knowledge’, often very new indeed, on such issues as water resources and drought can take three decades to move from the existence of the new idea to its incorporation into national environmental and infrastructure polices in another country. Hydrological theory is not enough. In practice it can be misleading. Such theory tends be based on assumptions that water resources determine economic, social and political outcomes.

The two main conclusions are that the impact of drought is very different on a diverse and strong political economy than on a weak political economy. It is essential that those devising remedies to drought events take into account political and economic futures different from those that exist now. The future will frequently be a socially and economically developed future. The second main conclusion is that global economic systems are very important indeed with respect to local periodic drought. Global economic systems are especially important for those political economies which now, or will in future, face longer term permanent water deficits. The global system also has the capacity to meet any local periodic droughts provided that economic and political systems to move supplies to the stressed locality are enabling rather than impeding.

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