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Water Wars in Southern Africa: Challenging Conventional Wisdom¹

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The Ethiopians hold it for a fact that Egypt is “trying to monopolise” the Nile and cite the Aswan Dam, the Tochkan Canal, and the Peace Canal as examples of how Egypt step-by-step claims a larger amount of the Nile water; claims that may be used as evidence of an “acquired right” in future negotiations. This is the classic upstream-downstream dilemma, unsatisfactorily managed by international law, which has given rise to fears of *water wars*’ (Ohlsson & Lundqvist 2000).

Introduction

Africa is dominated by transboundary waters, due largely to the scramble for Africa during colonial times, when European powers arbitrarily drew borders on the continent, showing little regard for the natural, geographic or ethnic realities that existed. The Charter of the Organisation of African Unity (OAU) originally recognised all borders that existed at the time of its founding, thereby locking in one of the elements of potential political instability. Africa contains about 80 international river and lake basins. No less than 21 of these



river basins have catchments greater than 100,000 square kilometers, some of which are shared by more than ten states. The major issue confronting the management of these basins is access to, and control over, water resource use (Hirji & Grey 1998:78).

During a Stockholm meeting in August 1995, Ismail Serageldin, the then World Bank Vice President for Environmentally Sustainable Development, confidently declared that 'wars of the next century will be over water' (Homer-Dixon 1996:362). This paper will argue that no justice was done to Africa when that statement was made. That statement has often been repeated in the media, thereby allowing a knowledge construct to develop, based on teleological arguments and unsubstantiated facts, and which has ultimately undermined investor confidence. Who, in their right mind, will make direct foreign investment in southern Africa if northern-based conventional wisdom suggests that in the twenty-first century, Africa will slide into a messy series of water wars in direct response to rising levels of water scarcity? This paper will try and shed some light on this subject.

What is a water war?

There is a fundamental, epistemological problem regarding the notion of a water war. In order to obtain some degree of conceptual clarity on this issue, it is necessary to establish distinct definitions of a water war as a point of departure.

Firstly, the desire for access to water can be seen as being the direct cause of war. In this case, water scarcity is both a necessary and sufficient condition for going to war. For the purposes of this paper, this will be defined as a true water war.

Secondly, water, and especially hydraulic installations such as dams, pipelines and water treatment plants, can be seen as becoming targets of war. In this case, water scarcity is neither a necessary, nor a sufficient condition for going to war. A war in this category is thus caused by something quite unrelated to water scarcity. However, during the progress of such a war, the belligerents may select hydraulic installations as being legitimate targets. For the purposes of this paper, this is not regarded as being a true water war and can be called a conventional war, with water as a tactical component.

Thirdly, waterways that form part of contested international boundaries, can become the focal point of war. In this case, water scarcity is neither a

necessary, nor a sufficient condition for going to war. However, because the war is apparently fought in and around waterways, it appears to be a water war. Under these conditions, the root causes of war are totally unrelated to water, but water issues may become politicised as a result of the larger belligerence, and may consequently take on the appearance of a water-related conflict. For the purposes of this paper, this is not regarded as a true water war. Instead, it will be called a quasi water war, because the war is merely being fought in a theatre that is dominated by an aquatic environment.

During the course of this paper, literature will be reviewed that will enable the reader to place the facts into either one of these three categories.

Linkages between water and conflict

The three water war scenarios noted above presuppose violent conflict. Gleick (1998) notes that there are four major links between water and conflict, each with a different degree of violence or potential violence.

Firstly, water has been used as a military and political goal. This is most relevant to a Cold War/Realpolitik framework where water, like other natural resources, can be the defining factor in terms of the wealth and power of a state (Gleick 1998:108). In this regard, there are four variables that are important. These are (1) the degree of water scarcity; (2) the extent to which the supply is shared by two or more groups; (3) the relative power of those groups; and (4) the ease of access to alternative sources of water (Gleick 1998:108).

Secondly, water has been used as an instrument or tool of conflict. There is a long history of this, with the earliest records dating back to an ancient Sumerian myth from 5,000 years ago, paralleling the biblical account of the great flood (Gleick 1998:109). Two modern accounts of this exist (Gleick 1998:109-110). In 1986, North Korea announced plans to build a major dam on the Han River, upstream of Seoul. This project was justified by providing for hydroelectricity, but it could also be used as a weapon to destroy Seoul, should it be breached. During the Gulf War, the Allied coalition against Iraq considered the possibility of using the Ataturk Dam on the Euphrates River to shut off the flow of water to Iraq.

Thirdly, water and hydraulic installations have been used as targets of war (Gleick 1998:110). There are many documented cases of this dating back to ancient Babylon. In modern times the 'dam busters', under the command of 'Bomber' Harris, provide an excellent example. In contemporary southern



Africa, the damage to Gové Dam in Angola is also an example.

Fourthly, inequities in water distribution, use and development can result in tensions and conflict (Gleick 1998:111), both within a country and between countries in an international river basin.

One need only consult any standard textbook on foreign policy or international politics that has been published in the post-Second World War era to become convinced that guaranteed control over, and access to, strategic raw materials is essential to national security. Yet, on closer analysis, a conflict ordinarily described as a 'resource war', has usually been triggered by other factors (Lipschutz 1989:2).

Conventional wisdom's on water and conflict

In order to achieve a meaningful insight into the problem, it is necessary to understand what discourses on water and conflict exist. A recent overview of the literature reveals that at least five – and possibly more – different discourses can be found in one form or another. These discourses will be presented below, roughly in the chronological order in which they were developed. It must be noted that some discourses contain elements of others, and a clear-cut distinction is sometimes difficult to make. This is because elements of some earlier, relatively crude discourse, later found their way into the more sophisticated discourses that were developed.

The Malthusian Discourse

Malthusian-type discourse posits a linear relationship between population growth and water scarcity. Classic examples of this form of discourse include the now famous Club of Rome's '*Limits to Growth*' and The Ecologist Magazine's '*Blueprint for Survival*' (Eckersley 1997:11-12). Selby (1998) calls this discourse an ecological one, based on the notion of the 'finite carrying capacity' of the planet. As estimated by Postel et al (1996), humans now appropriate approximately a quarter of all evapotranspiration over land, and more than a half of the surface flows available. This is what Ohlsson and Lundqvist (2000) refer to as 'the numbers game — a story of shrinking per capita-allotments'. Arguably one of the important writers on this topic was Malin Falkenmark (1986), who first developed the so-called 'water scarcity indicators' that were based on the central notion of a 'water barrier'. This led to the publishing of what has now become a classic index of water scarcity

(Falkenmark 1989), which is often used by other authors. Central to this thesis is the argument that as populations grow, so water scarcity increases, leading ultimately to a water war. It was this type of linear thinking, based on the teleological arguments inherent in the linkage of water scarcity to violent conflict, which led authors, such as Starr (1991), to conclude that water wars were more or less inevitable in the twenty-first century.

The Virtual Water Discourse

This grew partly in response to the crude Malthusian Discourse referred to above. Whereas the Malthusian Discourse predicted water wars with some confidence, the Virtual Water Discourse explained why there was an almost total lack of evidence of any water war in areas that are known to be highly water stressed (Allan 1999:15-19). Developed by Tony Allan, the main concept is that of 'Virtual Water'. Allan noted that it takes approximately 1,000 tons of water (one cubic metre of water is the same as one ton) to produce one ton of wheat (Allan 1996a). Therefore, if a country is facing a debilitating water deficit, the government can balance the water budget by importing wheat, instead of mobilising additional water. Thus, for every ton of wheat that is imported into a country or region, it is the same as importing 1,000 tons of water in a 'virtual' sense, with the added bonus of being ecologically benign and politically friendly. Allan (1996b) notes that 'as much water enters the Middle East region as "Virtual Water" in the form of subsidised grain purchases than flows down the Nile annually'. It is this importation of water – embedded in grain and therefore available at highly subsidised rates – that has prevented the type of water war that was so confidently predicted by Starr (1991) from actually happening (Allan 1996c).

The Structural Inequality Discourse

Structural inequality results when unequal access to, and control over, water resources within a given country occurs over time. This is particularly relevant in societies where a water deficit occurs, and where access to water can give certain social groupings a major advantage in political and economic terms. This has led Thomas Homer-Dixon (1994a) to develop the concept of 'resource capture' and 'ecological marginalisation'. Selby (1998) calls this a political discourse, and notes that people are seen as being the victims of a political economy. In this discourse, conflict is inherent within society, as inequalities are contested and positions of hydropolitical privilege are entrenched and protected. Richard Sexton (1992) was focussing on similar



issues when he expanded the concept of scarcity to include the economic use of water, thereby highlighting the adverse effects of deliberate policies designed to favour agricultural export (Warner 2000). Turton (2000a) has shown that hydraulic pipelines become a significant instrument of political control under such conditions, as was the case in apartheid South Africa, where structural scarcity was managed to the almost exclusive advantage of the white minority. Within this paradigm, hydraulic engineers are discursive elites, and their skills of dominating and controlling nature leads inescapably to the domination of some people over others (Warner & Turton 2000).

A component of this discourse is induced scarcity. A specific category of this induced scarcity is the depletion of the resource base as a result of pollution (Ohlsson & Lundqvist 2000). Approximately all of the projected population increase over the next few decades is expected to move to the already overloaded cities. Figures are staggering: about 80% of two billion people (Ohlsson & Lundqvist 2000). Currently, some 90% of all wastewater in developing countries is returned to river systems untreated. This is what Jan Lundqvist (1998) has called 'hydrocide'. The significance of this is that developing countries with vibrant economic growth and a strong modernisation development policy, are caught in a serious dilemma. Strong and sustained economic growth is ecologically unsustainable, yet following environmentally friendly policies could result in political suicide and major economic hardship. Consequently, economic sustainability and ecological sustainability are two distinctly separate concepts (Turton 2000b). There are three ramifications of hydrocide (Ohlsson & Lundqvist 2000). Firstly, increased levels of water pollution will affect morbidity and mortality in developing countries. Secondly, the loss of aquatic ecosystems and their resultant biomass production capacity will impact heavily on developing countries, and most notably in marginalised areas. Thirdly, there will be an increased cost as the need to import uncontaminated water over longer distances, and the need to treat contaminated water, will increase. This will lead to developing countries hitting a new form of trade barrier as a result of 'green labeling' in some industrialised states. What the hydrocide concept shows, is that water scarcity should not only be thought of in terms of volumes of water, but also in terms of the quality of water, with the latter arguably being a bigger threat to society because of its direct threat to ecological functioning.

This more sophisticated (but still relatively crude) discourse focuses on water scarcity, positing a more complex causal link to violent conflict.

Elements of this were subsequently included in the more sophisticated, environmental scarcity discourse presented below.

The Environmental Scarcity Discourse

This is a relatively sophisticated discourse, having developed over a period of time, and having been supported by a substantial body of research. It grew from the cruder Structural Inequality Discourse that was presented above. The key author in this regard is undoubtedly Thomas Homer-Dixon, who has published widely on the subject. This discourse has a strong environmental or ecological dimension to it, therefore a number of other authors can also be categorised under this broader heading. Homer-Dixon (1996) summarises this discourse by building the following argument. Research has shown that there are three major sources of environmental scarcity (Homer-Dixon 1996:360). Firstly, there is supply-sided scarcity. The depletion and pollution of resources reduce the total available volume. This can be thought of as reducing the size of the total pie available. Clearly upstream abstraction and polluted return flows fall under this category, leaving less water available for downstream riparians. Secondly, there is demand-induced scarcity. Changes in consumptive behavior and a rapidly growing population can cause demand to exceed supply. This can be thought of as resulting in a smaller piece of the pie. Thirdly, there is structural scarcity (or the severe imbalance in distribution of wealth and power), which results in some groups receiving disproportionately large slices of the resource pie, while leaving others with progressively smaller slices. This imbalance is reflected in institutions that act in a gate-keeping manner, making control over institutions the key to control over resource distribution. It is important to note that, in reality, these three scarcities do interact.

One result of this interaction is resource capture, where powerful groups in society seize control over the resource base and use it to their exclusive advantage. Water in apartheid South Africa is a classic example (Turton 2000a), as is the Israeli control over groundwater aquifers in the occupied West Bank (Homer-Dixon 1996:360). The result of this is ecological marginalisation, as people who have had their resource base captured, are forced to move to increasingly precarious locations. Cases of this are legion.

Significantly, severe environmental scarcity can reduce local food production, aggravate the poverty of marginal groups, enrich a corrupt elite and eventually undermine the moral legitimacy of the state. South Africa is a classic example of this, where it has been shown that there are two distinct



phases of this process (Turton & Ohlsson 1999). The first phase, identified as coinciding roughly with the transition from water abundance to a condition of water scarcity, results in the birth of a hydrosocial contract (Warner & Turton 2000), with resource capture as a critical component. This results in structural scarcity and ecological marginalisation, because these elements have been allowed to become the major driving forces of hydropolitical interaction. At the same time, the legitimacy of the state is undermined to such an extent that water demand management cannot be introduced effectively (Turton, 2000a). The second phase, identified as coinciding roughly with the transition of water scarcity to a condition of water deficit, results in the birth of a new social conscience and the expansion of the hydropolitical elite base. In South Africa, this coincided with the transition to democracy, and is evidenced by the strong desire to redistribute the balance of hydropolitical privilege in a more equitable manner (Warner & Turton 2000).

Homer-Dixon (1996) maintains that some major wars in during the last century were motivated by the desire to seize non-renewable resources, such as fossil fuels. However, there is no evidence that this has been the case for renewable resources, such as cropland, forests, fisheries and water. There are two explanations for this (Homer-Dixon 1996:362). Firstly, modern states cannot easily convert such resources into power. Secondly, countries that are highly dependent on renewable natural resources tend to be poor, lacking the capacity to convert the desire to increase their resource base into an actual attempt in the form of armed aggression. The incentives and means of launching resource wars are likely to be lower for renewables than for non-renewables, with the possible exception of water. Those who argue that water wars are possible, say that both rich and poor countries need adequate water supplies equally. Homer-Dixon (1996:362) concludes that wars between upstream and downstream riparian states are likely to occur within a narrow set of circumstances. Firstly, the downstream riparian must be highly dependent on the water for its national survival. Secondly, the upstream riparian must have the ability to restrict the flow of the river. Thirdly, there must be a history of antagonism between the two states. Fourthly, the downstream riparian must be militarily superior than the upstream riparian. There are only a few river basins where these conditions hold true, with the most notable example being the Nile. Nowhere in southern Africa is this the case at present.

Homer-Dixon (1996:363) notes that while there is no real evidence that environmental scarcity is behind existing armed conflicts, one can expect

that this will change in future as environmental pressures become acute. Relevant to this future scenario is what Homer-Dixon refers to as 'pivotal states'. These states are central to international stability within a regional context, and include South Africa, Mexico, India, Pakistan and China. Existing conflict patterns in these states show that infrastructure is overtaxed due to population migration factors. However, this migration element is complex, with both environmental-push and population-pull factors at work. The essential element being the fact that marginalised communities are forced to migrate and settle on contested land, thereby bringing these incoming communities into conflict with people who are already eking out a tenuous existence. Elements of this can be found in southern Africa. Migrations away from the Kalahari towards the panhandle of the Okavango Delta (Turton 1999a), and migration towards Windhoek in Namibia, are two examples. Shack dwellers in places like Alexandra are also examples, where incoming migrants are forced to live on the flood plain of the Jukseei River. Other examples can be found in the lower Incomati River Basin in Mozambique, where subsistence agriculture is under threat due to the increased use of water upstream.

The specific case of South Africa was studied in some detail as part of Homer-Dixon's project. Details of the findings are found in Percival and Homer-Dixon (1998), and can be briefly summarised as follows. Environmental scarcity threatens the delicate give-and-take relationship between state and society, with violence being a manifestation of troubled relations between these two main components. Structural scarcity was one of the main elements of the political economy of apartheid, resulting in a high level of institutionalisation to protect the unequal distribution of environmental resources which had been mobilised for the white minority via a systematic process of resource capture. Consequently, there was a coincidence of both demand-induced scarcity in the former Bantustans, and supply-induced scarcity as the result of soil erosion, water depletion and fuelwood scarcity. Environmental scarcity reduced rural incomes and helped push many black South Africans into urban slums. The local authorities in these urban areas were collaborators of the apartheid state and were thus largely unresponsive to the needs of the expanding community, causing the polarisation of society and the weakening of the state's institutional base. Group division then became the basis of politics in South Africa. Environmental scarcity increased the salience of group boundaries, allowing warlords to gain control, which further fragmented society. Inkatha came to dominate informal



settlements during the early transition to democracy. Domination was achieved by striking political deals with warlords and manipulating conservative group identities evident in recently mobile migrant communities (Percival & Homer-Dixon 1998:293). The conclusion of this study was that while environmental scarcity heightened black grievances, the role of environmental scarcity was complex, contributing fundamentally to the social instability that was evidence of the pre-democratic South Africa.

Significantly, while environmental scarcity has been a determining factor in every case studied by Homer-Dixon's (1996:360) team, environmental scarcity is never a determining factor on its own (Homer-Dixon 1996:361). It is always found in conjunction with other factors which are usually the major causes of conflict. As such, environmental scarcity can aggravate existing conflict and make it more acute.

The Social Scarcity Discourse

While the above discourses have focussed on natural resource scarcity as a source of conflict, the recent work by Leif Ohlsson (1998, 1999) made a quantum leap in our understanding of the dynamics of resource scarcity. Ohlsson constructed his argument by showing that as water scarcity increases, so to does the need for social adaptation to the consequences of this scarcity. For example, as deserts have encroached, lifestyles have been forced to change and social patterns have had to shift. Ohlsson suggests that just as there can either be a scarcity or abundance of natural resources, so to can there either be a scarcity or abundance of social resources. To this end, Ohlsson notes the need to distinguish between a natural resource (what he calls a first-order resource) and a social resource (what he refers to as a second-order resource). Consequently, it is possible for a social entity – that is being confronted by an increasing level of first-order resource scarcity (water) – to adapt to these conditions, provided that a high level of second-order resources (social adaptive capacity) are available. This has enabled Turton and Ohlsson (1999) to develop a set of key concepts by using a matrix consisting of different combinations of a first and second-order resources. This explains why a country such as Israel has managed to defy the debilitating effects of what Falkenmark (1986, 1989) originally defined as the 'water barrier'. To this end, water scarcity (a strictly first-order definition) is distinctly different from 'Water Poverty', which is a combination of both first and second-order resources. 'Water Poverty' is therefore defined as the existence of both a first and second-order resource scarcity simultaneously

(Turton & Ohlsson 1999). 'Structurally Induced Relative Water Abundance' (SIRWA) is the condition that exists as a combination of both a first-order resource scarcity and a second-order resource abundance (Turton & Ohlsson 1999). The latter condition is what best describes Israel, and what possibly describes South Africa, Botswana and Namibia.

The key to the existence of a second-order resource is found in what Homer-Dixon (1994b) refers to as 'ingenuity'. In his original work on the subject, Homer-Dixon noted that what made developed states stable, was the level of ingenuity they could amass. Conversely, the reason why developing countries often failed, lies in the fact that they are faced with increasingly complex problems on the one hand, and a rapidly dwindling capital base with which to solve these problems, on the other hand. Capital in this context can best be understood as being a combination of financial resources, natural resources, institutional resources and intellectual resources, all working together in some degree of harmony. In developed countries, this harmonious interaction allows problems to be solved, thereby enabling economic and technological progress to be made. In developing countries, the lack of harmony between – or in many cases, the total absence of key components of this overall resource base – results in the absence of ingenuity, with the resultant economic and social decay that is evident in large parts of the developing world. Developing countries that are facing increasing levels of environmental scarcity, will thus have to develop an active strategy aimed at becoming more innovative, if they wish to maintain their well-being in the face of rising first-order natural resource scarcity.

In reality, the supply of ingenuity will be constrained by a number of factors (Homer-Dixon 1996:365), including the brain drain from poor states, limited access to capital, incompetent bureaucracies, corrupt legal systems and weak states. In addition to this, markets in developing countries are inadequate, property rights are unclear, and prices for water and other commodities do not adjust adequately to reflect the rising levels of scarcity. Consequently, responses from both the state and entrepreneurs are slow and inadequate (Homer-Dixon 1996:365). This has led Homer-Dixon to conclude rather somberly that,

'In South Africa, scarcity-driven migrations into urban areas and the resulting conflicts over urban environmental resources (such as land and water) encourage communities to segment along lines of ethnicity or residential status. This segmentation shreds networks of trust and debilitates local institutions. Powerful warlords, linked



to the Inkatha Freedom Party or the African National Congress, have taken advantage of these dislocations to manipulate group divisions within communities, often producing violence and further institutional breakdown. ... Societies like these may face a widening "ingenuity gap" as their requirement for ingenuity to deal with scarcity rises, while their supply of ingenuity stagnates or drops. A persistent and serious ingenuity gap boosts dissatisfaction and undermines regime legitimacy and coercive power, increasing the likelihood of widespread and chronic civil violence. Violence further erodes the society's capacity to supply ingenuity, especially by causing human and financial capital to flee. Countries with a critical ingenuity gap therefore risk entering a downward and self-reinforcing spiral of crisis and decay. ... Rather than speaking of limits, it is better to say that some societies are locked into a "race" between a rising requirement for ingenuity and their capacity to supply it' (Homer-Dixon 1996:365).

Thus, what Homer-Dixon (1996) is essentially saying is that in the coming decades, one can expect to see a bifurcation of the world into two types of society. Firstly, those societies that can adjust to population growth and natural resource scarcity, and thereby avoid turmoil through the successful development of what Turton and Ohlsson (1999) have defined as 'Structurally Induced Relative Water Abundance'. Secondly, those societies which cannot mobilise the necessary ingenuity, and thereby fall prey to a black hole of acute conflict and unparalleled violence as a manifestation of what Turton and Ohlsson (1999) have defined as 'Water Poverty'. This is represented schematically in Figure 1 as originally conceived by the author (Turton 1999c).

A distinct component of this Social Scarcity Discourse is the Virtual Water Discourse noted above. In this regard, Ohlsson and Turton (1999), and Ohlsson and Lundqvist (2000) suggest that 'Virtual Water' is a component of what has now become known as 'The Triple Squeeze' or 'The Turning of the Screw'. As water scarcity increases, the result will be a series of bottlenecks, primarily of a social nature. Each of these bottlenecks can be likened to a spiral, oscillating between an alternate scarcity of first-order resources (water) and second-order resources (social adaptive capacity). In this discourse, it is posited that not all states will be able to mobilise sufficient second-order resources with which to cope, in support of Homer-Dixon's ingenuity thesis.

At the first squeeze, water changes from being an open-access resource,

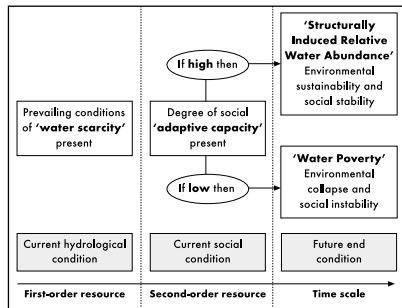


Figure 1. Schematic representation showing the hypothesised two-end conditions that are likely to occur when combining both a first-order and second-order resource in the definition of key variables (Turton 1999c)

into a socially managed good. This has been identified as being the first transition (Turton & Ohlsson 1999) and the birth of the hydrosocial contract between the state and society (Warner & Turton 2000). At this transition, water is changed from being a free good – sometimes referred to as a 'gift from God' – in certain cultures (Lichtenthäler & Turton 1999), into an economic good with a price tag and all the ensuing problems of relative scarcity and distribution. At this stage, human perceptions of water are still centered around the notion that it should be free, even if it now costs something to mobilise. In addition, access to it may even have human rights implications (Ohlsson & Lundqvist 2000). This is the birth of the hydraulic mission of society (Reisner 1993), focussing on supply-sided solutions, with the major management content being engineering in nature.

At the second squeeze, the new economic character of water gives rise to competition for this social good. Examples of this are competition between



cities and rural areas for access to the resource base. Large cities, with their stronger economic base, can capture resources far more effectively than smaller rural communities. The city of Los Angeles is a classic example, with its progressive capturing of water from as far afield as the Colorado River (Reisner 1993). Plans were even developed to make rivers flow backwards, in defiance of nature, in order that water, from as far afield as Canada and Alaska, could be appropriated by Los Angeles (Reisner 1993). Johannesburg is an excellent South African example where major hydraulic works, such as the Lesotho Highlands Water Project and the proposed Thukela Water Transfer Scheme, perform much the same function in sustaining the industrial heartland of the country. One of the results of this second squeeze is the emergence of a social conscience in the form of environmentalism, as water scarcity moves into water deficit (Turton & Ohlsson 1999; Warner & Turton 2000). This, in turn, gives rise to early notions of water demand management, with the overall management function shifting from the pure engineering desire to the need to appropriate more water, and embrace elements of end-use efficiency (Ohlsson & Turton 1999) or intra-sectoral allocative efficiency (Turton 1999b).

At the third squeeze, it becomes evident that engineering solutions are no longer viable on their own, and that the only way to effectively balance the water budget is to introduce a policy of 'intersectoral allocative efficiency' – taking water away from agriculture, where it has a low economic return, and allocating it to industrial and domestic use where it creates far more jobs – and use 'Virtual Water' as a component of this adaptive strategy (Turton & Ohlsson 1999). This causes a fundamental restructuring of society, as people move from rural areas to urban environments and away from agriculture to industry. This social restructuring requires considerable planning and control by government, and also requires a high level of what Ohlsson (1998, 1999) calls social adaptive capacity, or what Homer-Dixon (1994b, 1996) refers to as ingenuity.

Why water wars are unlikely

There are few serious scholars active in the hydropolitical field today, who support the early water war arguments. There are three developments that have caused scholars to change their earlier views on the subject. These are as follows:

The concept of lateral pressure

The concept of lateral pressure is central to many analyses of water and conflict. Choucri and North (1975), together with Ashley (1980), developed the theory of lateral pressure when they examined some of the factors leading to war between great powers. Gustafsson (1985:133-135) summarised the work of these authors into the following brief notes. Lateral pressure refers to the process of foreign expansion of any activity. Included under this heading of 'lateral pressure' are actions such as selling wheat, buying oil, investing capital, increasing the labour force or moving troops. Three specific aspects of this process must be distinguished (Gustafsson 1985). Firstly, the disposition to extend activities beyond national borders. Secondly, the particular activities that result from the disposition to act. Thirdly, the impact that these activities have on people and the environment in other countries.

The origin of lateral pressure is explained by the increasing demand for resources, markets and living space due to a growing population, 'techno-economic' activity and military aspirations. A direct relationship exists between the level of advancement of a society's technological base, and the variety and quantity of natural resources needed to sustain it. In order for a natural, resource-scarce social entity to actively try and sustain itself from outside its own borders, that social entity must have the means to do so. In other words, demands and capabilities generate lateral pressure together (Gustafsson 1985:133). However, in order for this lateral pressure to manifest, it is necessary for a combination of these demands and capabilities to exceed a certain threshold. As such, lateral pressure refers to the unilateral process that originates from domestic growth. In the manifestation of lateral pressure, a society becomes involved in a bilateral process involving three general patterns (Gustafsson 1985:133). Firstly, a stronger society's lateral pressure generates expanding activities, thereby penetrating a weaker society. In this pattern, the weaker society adapts to the situation. Thus, no violent conflict ensues. Secondly, a society that is predisposed to lateral pressure cannot express it due to the obstacles posed by a stronger society. In this pattern, the weaker society will be held in check and no conflict will emerge. Thirdly, two or more expanding societies, which have roughly equivalent specialised capabilities, collide when their aspirations for expansion are directed at the same geographic area. In this case, the most likely result is violent conflict, with the degree of violence being dependent on the degree of competition between the two parties.

Choucri and North (1975) found that a good indicator of lateral pressure



ORGANSKI	GUSTAFSSON
Weak and satisfied states	These states are either satisfied with the existing order, or they lack the resources to change the status quo. The conflict potential is low in this group.
Weak and dissatisfied states	These states are usually very dissatisfied with the existing international order, but they lack the resources needed to change it. The conflict potential is low in this group, but dissatisfaction will continue to cause disharmony.
Strong and dissatisfied states	These states are dissatisfied with the existing order and actively strive to create a new international system. Conflict potential is high in this group.

Table 1. Schematic Rendition of Organski's State Typology and Gustafsson's Theory of Power Transformation (developed from Gustafsson 1985:134)

is domestic growth, as measured by population density and national income per capita. They also identified strong linkages between military expenditure, domestic growth and national expansion; and alliance formation and international interactions with an increasingly high propensity towards violent confrontation (Gustafsson 1985:134). Large military expenditures and aggressive alliance formation often evoke violent reactions from rival powers, and an arms race ensues, driven by an action-reaction response. At any moment in time, a given social entity may find itself embroiled in any one of a number of these bilateral relationships, often differing radically from each other.

Gustafsson (1985:135) notes that social units which generate lateral pressure can be found at three distinct levels – individual human beings, states and interstate systems (regimes) – with the latter two being most important due to their multilateral nature. At the multilateral level of analysis, Ashley (1980) applies classic balance of power theory. However, Gustafsson (1985:134) suggests a more fruitful approach being the development of a theory of power transformation. In this regard, Gustafsson (1985:135) cites similarities in bilateral interactions with Organski's state typology. Gustafsson (1985) develops this argument as presented in Table 1.

Gustafsson (1985:135) concurs with Ashley (1980) that lateral pressure 'represents a generic, timeless social process, potentially evidenced by all

living systems at all levels, of which processes Marxists call "imperialism" represent a specific, historically dependent form'. Gustafsson (1985:135) notes, however, that the generality of the theory may also hide its weaknesses, and he supports the call by Choucri and North (1975) that research is needed to determine the ways in which economic factors influence the expansion of national activities, and the resultant conflict of national interests.

Gustafsson (1985:141-142) concluded, after applying the concept of lateral pressure to the Middle East, that:

'The Euphrates River conflict is a good example of a resource conflict over fresh water with other economic, as well as political factors, involved. In these kinds of conflicts one cannot accurately say which factor is foremost at any given time; whether it is a dispute over fresh water resources which is spilling over to political conflicts, or *vice versa*; or whether some other economic factors and disputes are causing the sharpening of water conflict as well, or again *vice versa*'.

Development of the concept of second-order resources

The development of increasingly sophisticated discourses on water-related conflict have shown a distinct tendency. A direct linear linkage between water scarcity and conflict dominated the earlier discourse. This teleological argument is grossly oversimplified and results in a false conclusion. The reason for this lies in the emphasis on water as a first-order resource in the earlier discourses. Ohlsson (1998, 1999) has enabled a quantum leap in our understanding of water-related conflict by highlighting the pivotal role that second-order resources play as conflict mitigators. This shift in focus away from water scarcity, towards the social mechanisms that are needed to compensate for increasing levels of water scarcity, has allowed for a more sophisticated understanding of the problem. Turton and Ohlsson (1999) developed a series of concepts by using different combinations of first and second-order resources. Two of these concepts are crucial to the understanding of water-related conflict.

'Water Poverty' is defined as the simultaneous existence of both a first-order resource (water) scarcity and a second-order resource (social adaptive capacity) scarcity within a given social entity (Turton & Ohlsson 1999). Consequently, the debilitating effects of water scarcity are compounded under such conditions by the absence of adaptive mechanisms within society, ultimately leading to social decay (Figure 1). Owing to the fact that this



condition is likely to result in high levels of intra-state conflict, policy-makers in semi-arid regions need to develop a set of policy instruments aimed at developing the social capacity needed to cope with increasing levels of water scarcity before the debilitating effects occur.

This logically leads onto the second important concept. As SIRWA is defined as the existence of a first-order resource (water) scarcity and a second-order resource (social adaptive capacity) abundance within a given social entity simultaneously (Turton & Ohlsson 1999), the potentially debilitating effects of water scarcity can be effectively countered when a high level of social adaptive capacity can be mobilised (Figure 1). Due to the fact that the earlier indices (such as Falkenmark's Water Scarcity Index) were focussed exclusively on first-order resource scarcity, they tended to sound the water war alarm bells (Ohlsson & Lundqvist 2000). This also explains why a state, such as Israel, can survive 'beyond the water barrier' (to use Falkenmark's terminology). The emphasis on the importance of second-order resources has now enabled Ohlsson (1999:250-260) to develop a far more sophisticated Social Water Scarcity Indicator (SWSI). With Ohlsson's (1999) SWSI, some of the anomalies that existed in Falkenmark's Water Scarcity Indicator (WSI) are corrected. The development of subsequent indices have tended to highlight the role of ingenuity and other social resources – such as adaptive capacity – as the main concern, thereby focussing on conflict resolution instead.

Homer-Dixon's (1996) concept of ingenuity is nothing more than the empirical manifestation of Ohlsson's concept of social adaptive capacity. Consequently, a social entity with a high level of second-order resources will be in a position to develop the necessary ingenuity needed to avoid falling into the black hole of first-order resource scarcity. As a result, second-order resource scarcity seems to be the defining variable in the water war equation. Allan's concept of 'Virtual Water' as a coping strategy, also fits under this heading. Japan has long ceased to grow its own food. Instead, it uses its water in a far more efficient manner by diverting it to industrial and domestic use, thereby enabling it to generate sufficient foreign currency to buy its food on the open market. However, this policy needs a higher level of second-order resources to succeed, as a state with a strongly nationalistic population may resist the dependency that a 'Virtual Water' coping strategy brings, opting instead for national self-sufficiency in food, and the resultant water deficit that this policy option inherently entails.

Larger body of empirical research

The development of more sophisticated concepts, models and theories have resulted in an expanding body of empirical research. One of the most notable examples of this is the work that was done by Wolf (1997) in which he concludes that,

'... (more than) 3,600 water-related treaties have been negotiated, dealing with all manner of water management. ... Our findings should not be taken to mean that there is no conflict over water – as we all know, there is lots – only that it does not happen at the international level. In fact, our findings suggest that the likelihood of violence increases as the scale decreases. [...] rather than being causal, environmental degradation leads to *internal* political instability, which *in turn* can provide an environment conducive to acute conflict. This interpretation allows a less disingenuous argument which has the advantage of being backed up by data' (Wolf 1997 as cited by Ohlsson & Lundqvist 2000).

Regarding the use of water as a weapon in war, in which the aquatic environment is modified sufficiently enough to harm an enemy during conflict, Plant (1995:81) remains skeptical. He notes that such techniques are either undeveloped, incapable of being used or of dubious utility. While Iran did try to divert river water to flood Iraqi defense positions during the 1980-1988 war; and while the USA did try to use cloud-seeding in Indo-china between 1966-1972 in an attempt to stop the flow of logistical support along the Ho Chi Minh Trail; both of these met with failure (Plant 1995:81). The present reality is that the water weapon is restricted to attacks on hydraulic installations.

In fact, research has shown that attacks on enemy hydraulic installations are common in times of war (Zemmali 1995:73). For example, in 596 BC, Nebuchadnezzar captured Tyre after the aqueduct supplying water to the city was breached. In modern times, dykes and dams were not spared by American soldiers during both the Korean and Vietnam Wars. At the Diplomatic Conference on the Reaffirmation and Development of International Humanitarian Law Applicable in Armed Conflicts, the Vietnamese delegate recalled that 661 sections of dyke had been either damaged or destroyed during the war (Zemmali 1995:74).

Kent (1999:109) notes that empirical research has shown that while water has been used as a weapon over time, evidence of water's 'potential as a *casus belli* is less directly evident. The relationship between [water and war]



... is part of a far more complex set of factors that *reflect the ways that societies structure themselves* and allocate their resources' (emphasis added). In fact, increasing evidence points to the fact that water is, at best, an indirect source of conflict, and global trends suggest that demands on water are increasing at the same time as conventional structures of governance undergo profound transitions. As a result, the emphasis clearly lies on social adaptive capacity or second-order resources.

This larger body of research has also developed a better understanding of the concept of lateral pressure. This has prompted Homer-Dixon (1999:12) to say that whilst the concept of lateral pressure has indeed helped to explain many past wars, more recent research on environmental scarcity and conflict has shown that a number of anomalies are evident within this concept. The most notable shortcoming being the failure to make a clear conceptual distinction between renewable and non-renewable resources. Work conducted in a number of global settings by Homer-Dixon's team, has revealed that while there is a large body of evidence showing that non-renewable resources (such as fossil fuels) have had a major contribution to war, 'it is hard to find clear historical or contemporary examples of major wars motivated by scarcities of renewables' (Homer-Dixon 1999:12). Two explanations are offered in support of this fact. Firstly, states cannot readily convert croplands, forests and seized waterways into increased state power. Secondly, countries with economies that are highly dependent on renewable resources tend to be poor, lacking in the capability of converting this lateral pressure into armed aggression.

Consequently, it can be argued that Kent's (1999:112) conclusion is reasonable and worthy of support when he said,

'If water throughout ancient as well as modern history has been used as a weapon, there is less evidence that water has been or will be a direct cause of war or violent conflict. Even the water of the Nile River, frequently regarded as an all-too-obvious *casus belli*, has never been a source of conflict. ... Water stress is not a sufficient condition for conflict over resources' (Kent 1999:112).

It thus seems safe to conclude, that of the three sets of epistemological conditions noted at the start of this paper, water scarcity (or the desire to alleviate such scarcity) as both a necessary and sufficient condition for war, is not supported by any historic evidence. There are no such things as 'water wars'. However, an overwhelming degree of evidence exists in support of the other

two epistemological categories. In almost every war, hydraulic installations become targets, and in some cases waterways forming borders of disputed territories are the focus of war. However, these are quasi water wars. In short, water scarcity, as a direct cause of war, is highly unlikely. The crucial element in this equation is the existence of social adaptive capacity, or second-order resources, as these are the actual determinants of the propensity for acute conflict.

What can we expect instead?

Having noted that a true water war (where water scarcity is both a necessary and sufficient condition for violent conflict) is in fact highly unlikely and is certainly unsupported by any empirical evidence, we can focus our attention on what can be expected instead.

The work that has been done by Ohlsson and Lundqvist (2000) points, instead, to the existence of second-order conflicts where water is diverted from agriculture to industry, and from rural areas to large cities. In this regard, the critical issue is about sustaining livelihoods, which is distinctly separate from just procuring food. To create sufficient new jobs in urban areas to compensate for the stagnating number of jobs that agriculture can sustain, is an enormous challenge. This is the adaptive phase (Turton 1999b) that is missing from almost all of the existing literature on water demand management, showing just how far we are from having an adequate scientific grasp of the problem at the conceptual level. It is during this adaptive phase that social resources will be taxed to their utmost, with the adequate supply of ingenuity being severely hampered by social conflict (Ohlsson & Lundqvist 2000). Bringing the adaptive capacity of society into the equation, thus means transcending the trap of absolute scarcity — at least for those social entities that are capable of mobilising sufficient intellectual and social capital with which to generate effective coping strategies. Second-order resources are thus far more critical than first-order resources on their own.

Evidence does exist that water scarcity can undermine a state's moral authority and capacity to govern, which in turn can tear a society apart (Kent 1999:110). This is the danger of 'Water Poverty', showing just how important it is to understand this concept better. The sensationalism of a water war scenario distracts the public's attention from the real results of water scarcity, such as reduced food production, aggravated disease and poverty, large-scale human



migrations and weakened states, devoid of the capacity to govern effectively (Homer-Dixon 1999:13). Consequently, the inability of governments to reconcile contending interests at the intra-state level will be a far more serious source of conflict than water scarcity (Kent 1999:111).

Some statistics showing the impact of water scarcity on economic growth within southern Africa are illuminating, and offer insight into how first-order resources influence wider socio-economic activities. World Bank data shows that during the droughts of the late 1980s and early 1990s, the economic impact was substantial. In Zimbabwe for example, the stock market declined by 62% (performing worst of 54 world stock markets), agricultural production fell by 40% (maize fell by a staggering 75%) and the GDP declined by 11% during the 1991/92 drought (Hirji & Grey 1989:83). Power generation fell by 15% due to the low levels of Kariba Dam and the Kafue River. A massive food relief program was needed to support 50% of the population, at a time that coincided with entry into a structural adjustment programme (Hirji & Grey 1998:84). During the same drought, South African agricultural production fell by 27%, with a net negative effect of R1,2 billion on the current account of the balance of payments, resulting in the direct loss of 49,000 jobs in the agricultural sector, and a further 20,000 jobs in the formal sector (Hirji & Grey 1998:83). In Namibia, the 1991-93 drought caused a 70% reduction in cereal production. Overall drought relief programmes in southern Africa for 1991-92 are estimated to have cost more than US\$2 billion — in a region where per capita incomes declined by an average of 1.1% annually throughout the decade 1982-92 (Hirji & Grey 1998:84).

Against this rather gloomy background, it becomes instructive to note the extent to which 'Virtual Water' trade has already become a viable coping strategy within southern Africa (Turton 1999c), even without it having been recognised as such by formal government policy. Figure 2 shows a distinct trend in 'Virtual Water' trading patterns within SADC. An increase in this trade is likely to become a crucial element in the prevention of water wars in southern Africa.

These facts give support to the conceptual model that is being developed by Turton and Ohlsson (1999). This model shows that under conditions of 'Water Poverty', social decay and the resultant disintegration of states is highly likely. Such states will probably lack the ability to project their power aspirations beyond their own borders, so internal violence can be anticipated instead. Under such conditions, highly repressive regimes can pursue active strategies of resource capture in order to sustain their political support base.

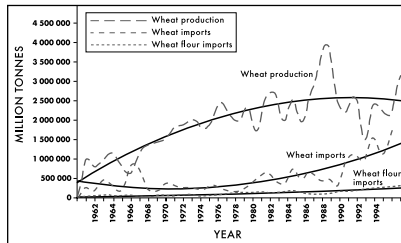


Figure 2. 'Virtual Water' trading patterns for Southern Africa (after Jobson 1999)

Source: FAO Data, 1998.

Note: Southern African Region: Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe

Such corrupt practices will further entrench inequality and result in chronic structural scarcity. One symptom of this social pathology will be environmental refugees, especially evident in times of drought.

Projecting this into a southern African scenario, it is conceivable to anticipate a regional drought affecting a number of countries, some of which are better able to cope than others. With the onset of a major drought — and in partial response to increased levels of state repression needed to sustain the resource capture policies in these hypothetical states that are founded on 'Water Poverty' — one can anticipate a series of outward migrations of environmental or resource-scarcity refugees. This is likely to be the result of the combination of mass poverty, a history of civil war and the existence of the critical threshold of 0.07 ha/person, beyond which subsistence agriculture becomes impossible to sustain. These refugees will target centres of perceived abundance. The latter will be suffering under the effects of the drought themselves, and will suddenly be confronted by the prospect of being inundated by masses of starving people. Consequently, a domino effect is



likely to occur, with a non-linear response beyond a given threshold. As a result, the receiving state will be confronted not only by its own drought-induced problems, but also by a series of exogenous factors, such as migration. The image of mass starvation and violent political repression will further serve to alienate foreign investors, introducing yet another negative factor into the overall equation.

Thus for Turton and Ohlsson (1999), 'Water Poverty' is the critical condition to avoid at the regional (SADC) level. Active measures should be initiated to assist with capacity building across international borders, in a joint attempt at creating SIRWA. Where international water resources are concerned, knowledge is power (Hirji & Grey 1989:89). Without knowledge, riparian states are extremely nervous about threats to their sovereignty, whether real or imagined, especially when another riparian state is deemed to have better information and 'decision support' systems. Under such conditions, dependency can result from the absence of adaptive capacity, which in turn becomes a stumbling block to peace initiatives. If 'Water Poverty' is the norm, then social decay and political disintegration can be anticipated at the sub-national level, resulting in an expanding black hole of internal conflict, rather than an aggressive expansionist state. However, if SIRWA can be achieved, then the debilitating effects of 'Water Poverty' will be effectively overcome and social stability can be expected. This will not be without disruption, however, because the social effects of a migrating rural population will impact heavily on a government, demanding a high level of resource allocation, both physically and intellectually. Furthermore, the social impact will exacerbate the problem during the latter stages of the water demand management phase.

Homer-Dixon's concept of ingenuity, and Ohlsson's concept of social adaptive capacity, are therefore crucial factors in the equation of water and war. If these are evident, then true water wars are highly unlikely to occur in the future, but they do not happen on their own. Governments need to play a leading role in nurturing and developing the second-order resources that are already found in society, and drought management has to be transformed from the existing crisis-induced response (Hirji & Grey 1989:83), to a more strategic, proactive approach, involving adequate data-sharing between states, as well as the development of competent 'decision support' platforms housed within functioning institutional settings. A healthy and active civil society is also important, as it can fill the gap between the individual and the state, and assist with the creation of capacity. Consequently, it is sobering to

note that within southern Africa, hardly any of these components exist (at present) in quantities sufficient to face the future with total confidence.

Conclusion

This paper has shown that epistemological clarity is needed in an analysis of water wars. As such, water as the cause of war is a very narrowly defined condition, with limited empirical evidence of its existence over time. Water as a weapon of, or target during war, is strongly supported by historic evidence. These are conventional wars, with water as a tactical component. Water wars as borders or components of disputed territories are also supported by history, but these are only quasi water wars. As a result, there is no evidence of true water wars existing, and the loose usage of terminology can lead an untrained person into mistaking a quasi water war for a genuine water war. Constructed knowledge, based on first-order indicators and readily propagated by the media, is thus counterproductive and can undermine investor confidence in the entire southern African region. However, this does not mean that conflict over water scarcity is unlikely to occur. On the contrary, while water wars are unlikely to occur, social decay and political instability can well be expected to rise as water scarcity reaches debilitating proportions. In this regard, a clear conceptual distinction needs to be made. On the one hand, 'Water Poverty' is a highly debilitating condition, where the absence of social capital will mean that the effects of water scarcity cannot be overcome. This condition will, in all probability, result in social instability, internal unrest, migration-induced conflict and *coups d'état*. On the other hand, SIRWA is a condition that is known to exist in certain societies that are confronted with water scarcity, but which have the social capital needed to make the necessary adaptations proactively. Rational government policy should thus be developed to address this condition, stimulating the ingenuity and institutional capacity needed to effectively manage water scarcity. Preliminary indications are that water scarce countries such as South Africa, Botswana and possibly Namibia, have the necessary ingenuity with which to adapt, provided that a concerted effort is made by government to enable this. Water scarce countries like Mozambique, Zimbabwe and Malawi seem to be less well endowed as the result of economic stagnation, large population growth, the debilitating knock-on effects of civil war and, in some cases, the results of upstream riparian activities. In this regard, a helping hand should be



extended to these countries, because drought and water scarcity respect no national borders, and the existence of islands of relative wealth and abundance, afloat a sea of poverty and resource scarcity, will inevitably result in endemic political tensions. The joint management of international river basins, including functioning institutions and adequate data sharing at the SADC level, is therefore imperative if water is to be allowed to play its rightful role as an instrument of peace. The active development of multidisciplinary scientific capabilities is also important.

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Notes

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