An Assessment of Strategic Issues in the Policy Field Relating to Water Resource Management in Southern Africa

By

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Introduction

The growing literature on water and politics, or what is increasingly being called hydropolitics, is generating a range of new ideas, concepts and management approaches. Yet the literature is also skewed in favour of water and conflict (Turton, 2002a:13). Whilst this has resulted in a reasonably deep knowledge of this aspect of water resource management, our attention has been diverted away from some of the real political issues associated with water in areas where conflict is not endemic. These include, but are not limited to, our understanding of power structures and coalitions for example, particularly when it comes to understanding these in a more profound manner like analysing how they develop, how they change, and how they impact on decision-making at various levels in society. Two levels are particularly important in the context of Integrated Water Resource Management (IWRM) - the

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national and sub-national scale of management on the one hand versus the international or supra-national level of scale on the other. This paucity of knowledge impacts in turn on the depth of our understanding of the dynamics of water resource management institutions. This paper seeks to present some work that is being done in this regard from a region that has water-scarcity limitations to its future economic growth and development potential. While it is widely accepted that the first region in the world to have reached this constraint is the Middle East and North Africa (MENA) (Allan, 2000:9), it is becoming increasingly apparent that the Southern African region is likely to become the second. This has given rise to deep introspection in the Southern African Development Community (SADC) region because every effort is being made to become reflexive and to generate a management approach that is proactive in nature. This paper will focus on the emergence of a new set of concepts that explain power structures and coalitions as they pertain to the management of international rivers in the SADC region. It will then distil out some strategic issues that arise from this set of concepts in order to make a range of recommendations for consideration by the World Water Council.

The Southern African Hydropolitical Complex as a Concept

A security complex is a set of units (usually states), whose major processes of securitization, desecuritization, or both, are so interlinked that their most important security problems cannot reasonably be analyzed or resolved separately (Buzan *et al.*, 1998:201; Buzan & Wæver, forthcoming). In this regard, securitization is constituted by the inter-subjective establishment of an existential threat within any sector (military, political, economic, societal and environmental) with a saliency sufficient to have substantial political effects (Buzan *et al.*, 1998:25); whereas desecuritization refers to the shifting of specific, strategically important issues out of the emergency mode and into the formal bargaining processes of the political sphere (Buzan *et al.*, 1998:4). Security complexes thus emphasize the interdependence of both rivalry and shared interests (Buzan, 1991:190), or stated differently, reflect the shifting patterns of amity and enmity over time (Buzan, 1991:198). Security complexes are analytical[3] entities consisting of units displaying distinct patterns of both amity and enmity, characterized by predominantly inward looking national security relationships, surrounded by a zone of relative indifference.

Buzan (1991:194 & 210) has noted the existence of a regional Security Complex in Southern Africa comprising eleven of the twelve mainland SADC states of the Republic of South Africa, Namibia, Botswana, Zimbabwe, Zambia, Lesotho, Swaziland, Mozambique, Angola, Malawi and Tanzania. Given the fact that national security is a relational issue, usually mitigated by geographic proximity, the role of international river basins as an element of a regional security complex becomes an interesting, and as yet, largely unexplored analytical variable. In the case of contemporary SADC for example, there are no less than 16 rivers that cross the political borders of two or more states in the region. As such sovereign control over

[3] It is important to note that this is not an actor defined condition but rather an analyst defined condition. It is known for example that some actors prefer not to define themselves in this way for reasons of strategic negotiation positions being developed. Being a non-actor defined condition assists the analyst by developing an understanding of the clustering of issues, the dynamics of coalition formation and the generation of a likely future trajectory. This is in keeping with the methodology as developed by Buzan *et al* (1998:14).

these rivers is shared when seen from the perspective of any given basin that is being managed as a hydrological entity. These international river basins are presented in Table 1.

Table 1. International River Basins found in the SADC Region.	
River Basin	**Riparian States**
Buzi	Mozambique, Zimbabwe.
Cunene	Angola, Namibia
Cuvelai	Angola, Namibia
Incomati	Mozambique, South Africa, Swaziland
Limpopo	Botswana, Mozambique, South Africa, Zimbabwe
Maputo	Mozambique, South Africa, Swaziland
Nata	Botswana, Zimbabwe (a component of the Makgadikgadi System)
Nile	Burundi, Democratic Republic of Congo (formerly Zaire), Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda
Okavango	Angola, Botswana, Namibia
Orange	Botswana, Lesotho, Namibia, South Africa
Pungué	Mozambique, Zimbabwe
Rovuma	Malawi, Mozambique, Tanzania
Save	Mozambique, Zimbabwe
Umbeluzi	Mozambique, Swaziland
Zaire (Congo)	Angola, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of Congo (formerly Zaire), Rwanda, Tanzania, Zambia
Zambezi	Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe

Threats to economic security can be seen as a national security issue, because relative economic growth is a major determinant of the power of states within a given system (Buzan, 1991:242). This is particularly pertinent to international river basins that are reaching the point of closure. In this regard, a closed river basin is one with no utilizable outflow of water (Seckler, 1996). A river basin is said to be facing closure when most of the readily available water has been allocated to some productive activity and there is little water left for allocation (Svendsen *et al.*, 2001:184). When this condition is reached, competition for water becomes high, with a resultant increase in conflict potential. This can become an issue of high politics when this water scarcity results in a limitation of the economic growth potential of the state, or stated more accurately, when perceptions that this is possible take root in the ranks of the political elites of a given riparian state. Under such conditions perceptions become reality because they inform the decision-making process (Turton, 2003c:90).

Seen in this light, international river basins form an important element of the Southern African Regional Security Complex - a fact that seems to have gone largely unnoticed by scholars - leaving a significant gap in the International Relations literature of the region. Given that this is largely about the dynamics of power structures and coalitions, this is of major significance to the World Water Council.

A Hydropolitical Security Complex as a Concept

Using the Security Complex Theory articulated by Buzan (1991) and Buzan *et al* (1998), Schulz (1995) has developed the concept of a Hydropolitical Security Complex in the context of the Tigris and Euphrates River Basins. Schultz (1995:97) defines a Hydropolitical Security Complex as "including those states that are geographically part 'owners' and technically 'users' of the [shared] rivers and further, as a consequence, consider the rivers as a major national security issue. In this way Turkey, Syria and Iraq compose a security complex or, rather, form *the Euphrates and Tigris hydropolitical security complex*" (emphasis in original text).

Emerging from this analysis, Schulz isolated what he calls horizontal and vertical relations within the Euphrates and Tigris Hydropolitical Security Complex, and between that complex and other complexes. Vertical linkages include relationships with higher structural levels, such as superpower rivalry, whereas horizontal linkages relate to the same structural levels between complexes, such as the Palestinian-Israeli linkage (Schulz, 1995:97).

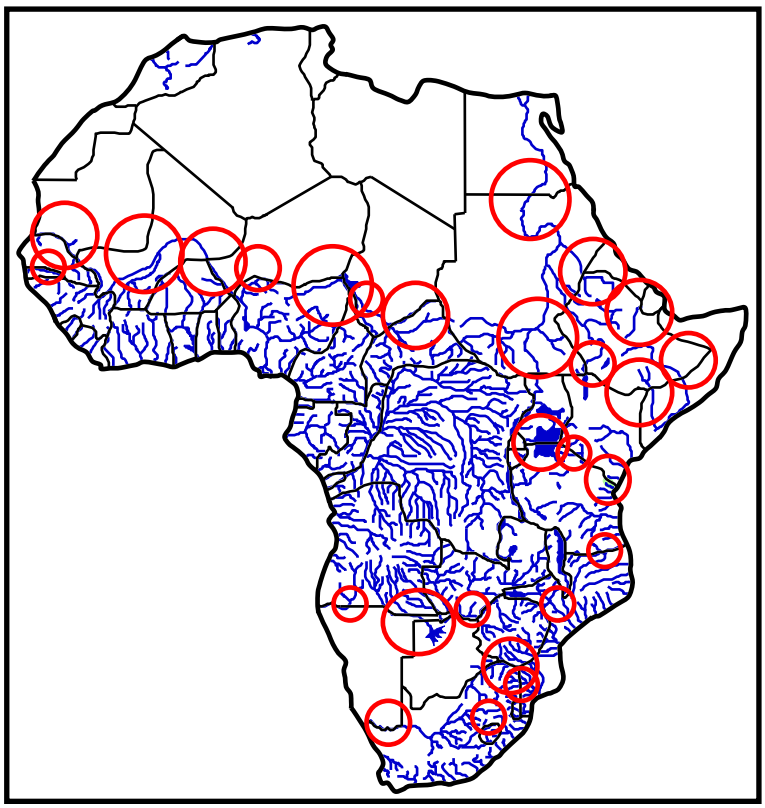
The significance of Schulz' work is that it indicates what can happen in the field of hydropolitics if water resource management becomes linked to national security concerns, or other issues of a high politics nature. This has happened in many parts of the Middle East North Africa (MENA) region, where economically damaging water deficits first arose (Allan, 2000:37). One of the indicators of the securitization of water resource management is the classification of hydrological data as secret, and its consequent removal from the public domain, as has occurred in the MENA region (see Lesch, 1992:148; Warner, 1996). It is therefore instructive to understand the dynamics of this process, and in particular, ways of avoiding the securitization of water resource management. In support of this, it is interesting to note that Allan (2000:245) has found the concept of Security Complexes to be a useful way of describing the hydropolitical dynamics of the MENA region.

The Southern African Hydropolitical Complex

Using the work of Buzan (1991; 1994), Buzan *et al.*, (1998), Buzan & Wæver (forthcoming) and Schulz (1995), Turton has been developing a model that factors in the hydropolitical dimension of international relations within the SADC region (Turton, 2001; 2003a; 2003b; 2003c; 2003d; 2003e). The rationale for this model is based on the fact that a large number of international rivers (refer to Table 1) establish a permanent linkage between different states within the Southern African Security Complex as originally defined by Buzan (1991:210).

The importance of water to any given national economy is self-evident. No state has ever grown economically without developing its national water resources. It can be said that the reliable availability of water is a fundamental determinant of the economic growth potential of the state. This makes reliable access to sustainable water supply a strategic issue, particularly for developing countries that are situated in arid and semi-arid regions of the world. The full significance of water in the context of Southern Africa is illustrated by the fact that the first protocol that was signed within the SADC region was the Protocol on Shared Watercourse Systems (Ramoeli, 2002:105). Heyns (2002:158) notes that one of the major development challenges in

the near future within the context of SADC will be the implementation of large, regional water transfer schemes in order to meet the economic limitations imposed by endemic water scarcity.



Map 1. The distribution of perennial rivers in Africa (Redrawn from Ashton, 2002). The circles indicate areas of existing disputes that have water as an element and also coincide with the transition from perennial to ephemeral river systems (Ashton, 2002; Turton *et al.*, 2003:10).

The SADC region is characterized by significant differences in the distribution of water resources, with large areas of land receiving less than 500 mm of precipitation per annum. In fact, around 60% of the total mean annual runoff (MAR) of South Africa arises from 20% of the land surface area. Coupled with this is an extremely high evaporative demand, which means in effect that what water does fall as rain, is almost immediately lost to evaporation. In South Africa for example, the annual average rainfall is 487 mm, with one of the lowest conversions of rainfall to runoff in the world. In fact, the total average runoff (that portion of rainfall that is not lost to evaporation and which eventually finds its way into rivers) is only some 10% of total annual rainfall (Rabie & Day, 1992:647). Of the resultant runoff that becomes streamflow, a mere 60% (Rabie & Day, 1992:647) to 62% (O'Keefe *et al.*, 1992:278) can be economically exploited, because of the extreme variability of these rainfall events. This natural climatic variability has acted as a stimulus for the construction of dams in attempts to retain as much streamflow as possible. Significantly, the World Commission on Dams report listing the top ten countries by virtue of the number of dams constructed for particular purposes (irrigation, water supply, flood control and hydropower), contains both South Africa and Zimbabwe (WCD, 2000:373). In fact South Africa and Zimbabwe have between them 752 large dams while the SADC

region's other nine mainland countries have only 55 among them. The SADC region's wetter countries (Angola, Malawi, Mozambique, Tanzania and Zambia) have amongst the lowest density of dams in the world for non-karstic regions with annual precipitation in the range of 600-2000 millimetres (Turton, 2003d:76).

The erratic nature of streamflow, particularly in Namibia, Botswana, Zimbabwe and South Africa, has also resulted in a number of ephemeral rivers in the region. A distinguishing feature of the SADC region is that Botswana and Namibia have no permanent rivers flowing on their sovereign soil, other than a short reach of the Okavango, which is difficult to exploit for a variety of reasons. This series of facts is generally left unexplored in the International Relations literature of the region, so the political implications of this are largely unknown at present. This has prompted the authors to develop a series of research projects in Southern Africa, in an effort to determine the role of international river basins as potential drivers of political dynamics within SADC in future, particularly in light of the unpredictability of global climate change as an interceding variable. This has led to the development of a typology of riparian states and international river basins, which appears at first glance to be useful.

As noted earlier, a distinguishing feature of the SADC region is the large number of international river basins. The relevance of this becomes clearer when one realizes that four of the economically most developed states in the region - South Africa, Botswana, Namibia and Zimbabwe - are all water scarce. In fact these four states are approaching the limits of their readily available water resources and water scarcity poses limitations to economic growth potential in the near future. Significantly, these four states are also linked by virtue of their co-riparian status with each other, in the Orange and Limpopo River Basins.

The emerging typology is based on a distinction between two distinct types of riparian state (pivotal state and impacted state), and two distinct types of international river basin (pivotal basin and impacted basin). In this regard, the following definitions have been developed (Turton, 2003d):

- Pivotal States are those riparian states with a high level of economic development that also have a high reliance on shared river basins for strategic sources of water supply. In the context of Southern Africa, there are four states in this category - the Republic of South Africa, Botswana, Namibia and Zimbabwe.

- Impacted States are those riparian states that have a critical need for access to water from international river basins that are shared with a Pivotal State for their own economic and social development, but by virtue of the unequal power relations within the basin concerned, are unable to negotiate what they consider to be an equitable allocation of water. In the context of Southern Africa, there are seven states in this category - Angola, Mozambique, Swaziland, Lesotho, Zambia, Malawi and Tanzania.

- Pivotal Basins are those international river basins facing closure that are also strategically important to any one (or all) of the Pivotal States by virtue of the range and magnitude of economic activity that they support. In the context of Southern Africa, there are two basins in this category - Orange and Limpopo.

- Impacted Basins are those international river basins that have at least one (or more) of the Pivotal States as co-riparians, which in turn reduces the freedom of choice for the Impacted States to develop their water resources in a manner that they deem to be fair and equitable. In the context of Southern Africa, there are seven basins in the category - Zambezi, Cunene, Okavango, Incomati, Maputo, Pungué and Save.

Using these key concepts, the authors have developed a model that attempts to show the impact of inherent patterns of amity and enmity within international river basins as a critical component of the Southern African Security Complex as defined by Buzan (1991:194). Figure 1 shows the authors' rendition of what is visualized as being the structure of the Southern African Hydropolitical Complex.

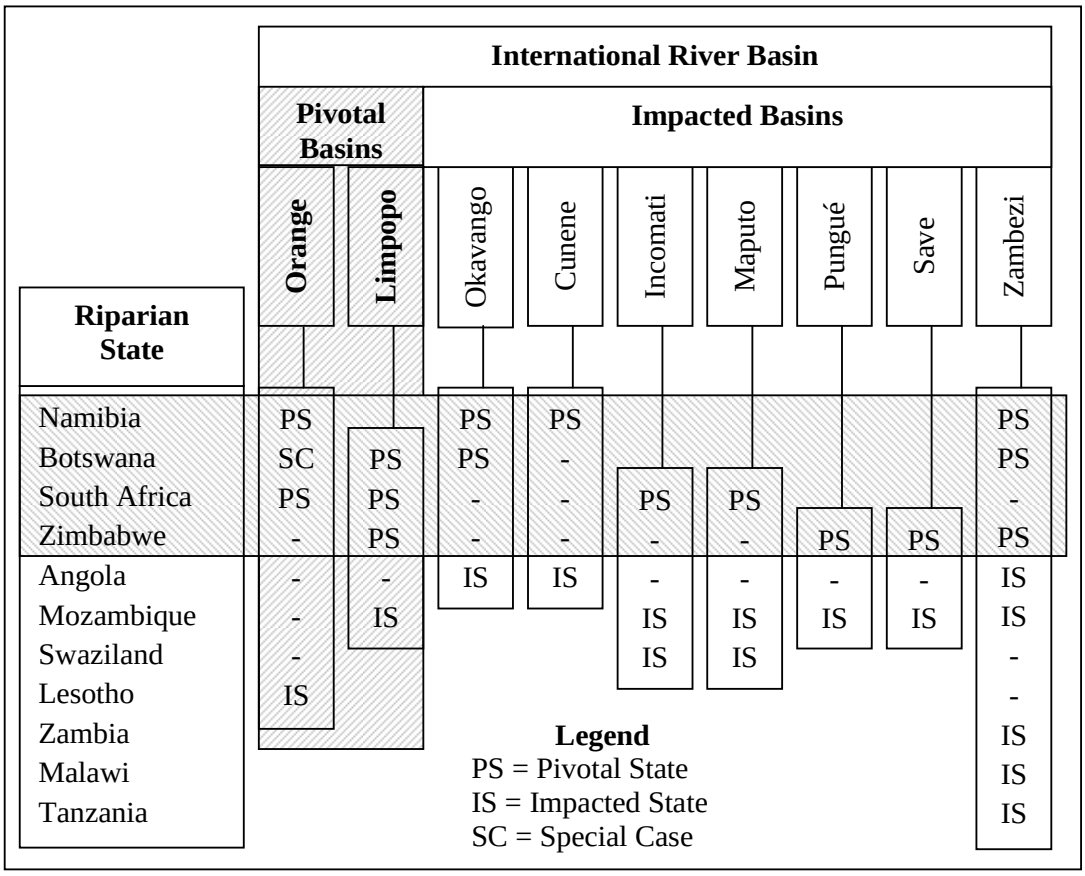


Figure 1. The Southern African Hydropolitical Complex (Turton et al, 2003:13).

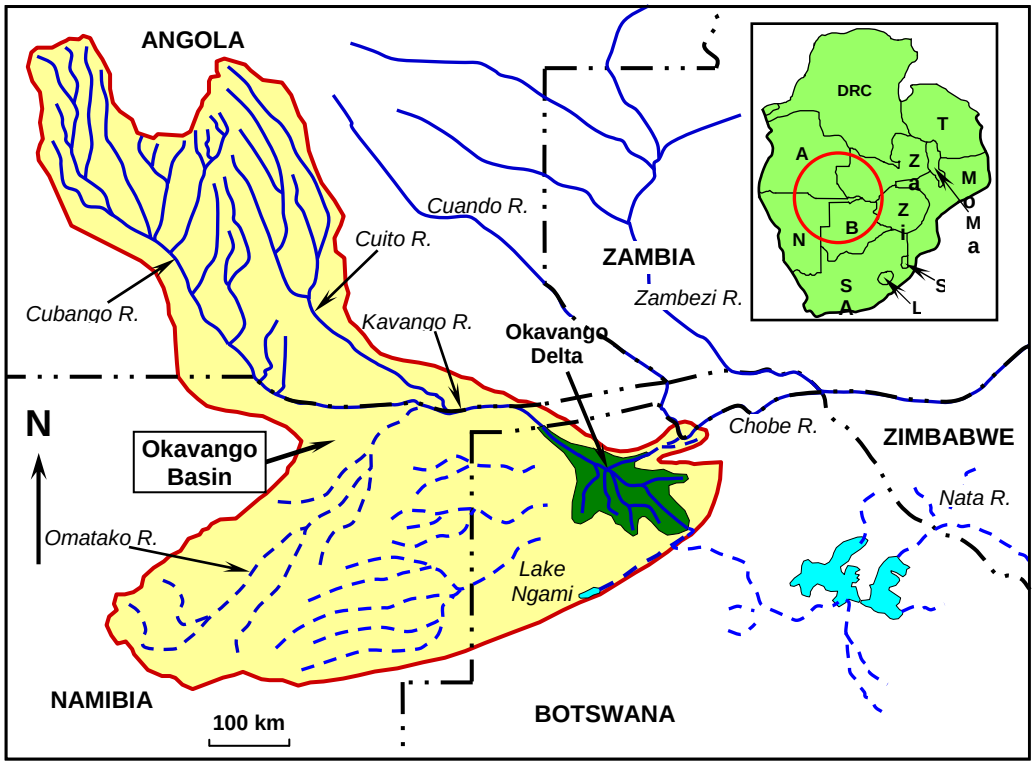
In this regard it must be noted that earlier work used the terminology "Southern African Hydropolitical Security Complex" (Turton, 2001), in keeping with the work by Schulz (1995). Subsequent research has shown that the degree of securitization within the water sector is far less in Southern Africa than is the case in the Euphrates and Tigris Hydropolitical Security Complex, prompting a revaluation of the concepts being used, and removal of the word "security" from the chosen name of the concept. Within the SADC region however, water has a long history of politicization, having played a prominent but subtle role during the conflict years of Superpower overlay and Apartheid's struggle for regional hegemony (Turton, 2003a). In the post-

Apartheid era, the overt nature of water politics has changed somewhat in the region, but the underlying drivers remain largely unchanged. The four economically most developed states in the region are the most water scarce, they all share international river basins with other states, and they all face significant limitations to their future economic growth prospects as a result.

By using these conceptual nuances, the facts presented in Table 1 start to take on a new meaning. Clearly all international river basins are not equal in strategic importance or in terms of their inherent conflict potential. The two Pivotal Basins in the SADC region are the Orange and Limpopo, by virtue of three critical criteria: significant portions of the basin fall within Pivotal States; those Pivotal States have a high reliance on the water from those basins; and the basin itself is approaching the point of closure. A deeper analysis of the two Pivotal Basins raises a number of subtle but important facts that are not visible when one uses the Regional Security Complex approach on its own. For example, the larger of the two Pivotal Basins in terms of volume is the Orange River (11,200 Mm^3 per annum, compared with 5,750 Mm^3 per annum for the Limpopo) (Basson, 1999). The Orange River is extremely important for South Africa, arguably being the strategically most important river it has unfettered access to. Botswana is listed in Table 1 as being a co-riparian, yet the portion of the basin that lies within the geographic area of that country is located within the Kalahari Desert. As such the watercourses within the Orange basin that lie in Botswana are ephemeral in nature, contributing no streamflow to the main stem of the river. Botswana is therefore listed as being a Special Case, because it occupies its position as co-riparian in all deliberations over the Orange River, but it makes no use of the water and it contributes no streamflow.

This prompts one to ask why this should be the case? The answer is revealed when one examines Botswana's potential strategic interests in greater detail. Botswana is a rapidly growing economy and is critically water scarce. The main economic growth hub is located around Gaborone, which is supplied with water via the North-South Carrier, deriving its source of supply from the Limpopo Basin. This supply is supplemented by a small transfer from South Africa via the Molatedi Dam (Conley, 1995:13). Gaborone could be supplied in future from Lesotho, giving it a strategic interest in the Orange River Basin. In addition to this however, Botswana could use its presence in all international negotiations on the Orange River Basin, to leverage advantage for itself in other more strategically important basins such as the Limpopo and Okavango. This could be achieved by offering to support certain parties such as South Africa in return for diplomatic favours in other deliberations on the Limpopo or Okavango River Basin. Conversely, pressure can be placed on South Africa by siding with Namibia when future deliberations about Phase 2 of the Lesotho Highlands Water Project (LWWP) occur. Seen in this light, Botswana is certainly not as powerless as it first seems on the strength of hydrological data alone, and can be seen as the balancer of hydropolitical power in both the Orange and Limpopo River Basins. The significance of this only becomes apparent when one understands the historic relevance of past South African planning to gain access to the waters of the Zambezi River, via either Botswana or Zimbabwe (Blanchon, 2001:123; Borchert & Kemp, 1985; Borchert, 1987; James, 1980; Midgley, 1987:15; Scudder *et al.*, 1993:263 & 268; Turton, 2003a; Williams, 1986). These plans now seem to have been placed on the backburner in the immediate post-Apartheid era, but could conceivably be resurrected in the future as water scarcity becomes more acute in the Pivotal States.

Referring now to the concepts of an Impacted Basin and an Impacted State, again a more nuanced understanding of the international relations of the SADC region can be developed. Figure 1 indicates the existence of no less than seven Impacted Basins and seven Impacted States. What is the significance of this in terms of the international relations of the region? Two clear examples can be used to illustrate this point.



Map 2. The Okavango River Basin as an example of an Impacted Basin in the Southern African Hydropolitical Complex. Inset shows the location of the Okavango River Basin in Southern Africa (Redrawn from Ashton & Neal, 2003).

The first example is found in the Okavango River Basin, which is strategically important for the two Pivotal States (Namibia and Botswana) that lie downstream (refer to Map 2). The Okavango is somewhat of a unique river basin. It is endorheic in nature, meaning that it does not flow into the sea. The water that arises from the relatively water-abundant Angolan highlands, flows into the Kalahari Depression in Botswana and simply disappears, lost largely through evapotranspiration in the Delta (Scudder *et al.*, 1993:290; Turton, 1999). In this case, the two downstream riparians are Pivotal States with a high resource need, but they are held captive in a sense because the upstream riparian (Angola) appears to be reluctant to agree to anything that will ultimately limit its own future economic development potential, which is likely to become more important as post-war reconstruction commences. Therefore, when seen strictly in terms of the Okavango River Basin, both Namibia and Botswana can be considered as being rivals with different development agendas and resource needs. Namibia and Botswana are not entirely equal in terms of hydropolitical power in this basin, however. Namibia is highly dependent on water from the Cunene River Basin, which it shares with Angola. As such, there is a long history of water-sharing and cooperation between Namibia and Angola, whilst Namibia and Botswana have

cooperated on joint technical exercises (Ashton & Neal, 2003; Turton, 2003a). Namibia and Botswana are also co-riparians on the Zambezi, but they both share portions of the basin that are unfavourable for the development of the resource. This forces them into a cooperative mode. As such, Namibia and Botswana could be induced to cooperate with Angola in order to develop the water resources of the Zambezi in future, which can also impact on their negotiations regarding the Okavango. Similarly, South Africa could consequently gain future access to Zambezi River water if it is channelled via Botswana, which could be used to the advantage of the latter, illustrating the complexities of future strategic hydropolitical options in greater detail.

The second example relates to the Impacted State of Mozambique, which shares a number of international river basins and on paper ought to be relatively water abundant. The truth is somewhat less optimistic, however. In all six cases presented in Figure 1, Mozambique is a downstream riparian and therefore in a traditionally weak position. In the case of the Limpopo as a Pivotal Basin, Mozambique is downstream of three of the four regional Pivotal States and negligible volumes of water are left after the strategic needs of those states have been taken care of. Furthermore, any attempts by Mozambique to develop dams on the Limpopo will be opposed by the upstream riparians because this will mean that each will have to relinquish a degree of control over water that they already monopolize. On the other five Impacted Basins, Mozambique is downstream of South Africa (as an historically hegemonic Pivotal State) in two cases (Incomati and Maputo), and downstream of Zimbabwe (as a Pivotal State with a known aggressive posture) in two cases (Pungué and Save), and downstream of seven riparians (three of them being Pivotal States) in the case of the Zambezi. This means that in the overall context of the hydropolitics of Southern Africa, Mozambique always occupies a weaker position than its co-negotiating partners. This is manifest in the relative absence of working agreements involving Mozambique, and which accounts for the extremely cautious approach that Mozambican officials have always adopted when negotiating the SADC Protocol on Shared Watercourse Systems and the various Zambezi River agreements that have been attempted in the past.

Seen in this light, the hydropolitical dimension of the international relations of Southern Africa can be viewed as being a key component of the Regional Security Complex, acting as an interceding variable on occasion. This is shown schematically in Figure 2. Nowhere in contemporary Southern Africa is there hard evidence of the emergence of a Hydropolitical Security Complex along the lines of that found in the Euphrates and Tigris River Basin, and possibly the Nile and Jordan River systems. This has resulted in a revision of the original concepts (Turton, 2001) to those presented subsequently (Turton, 2003a; 2003d; 2003e).

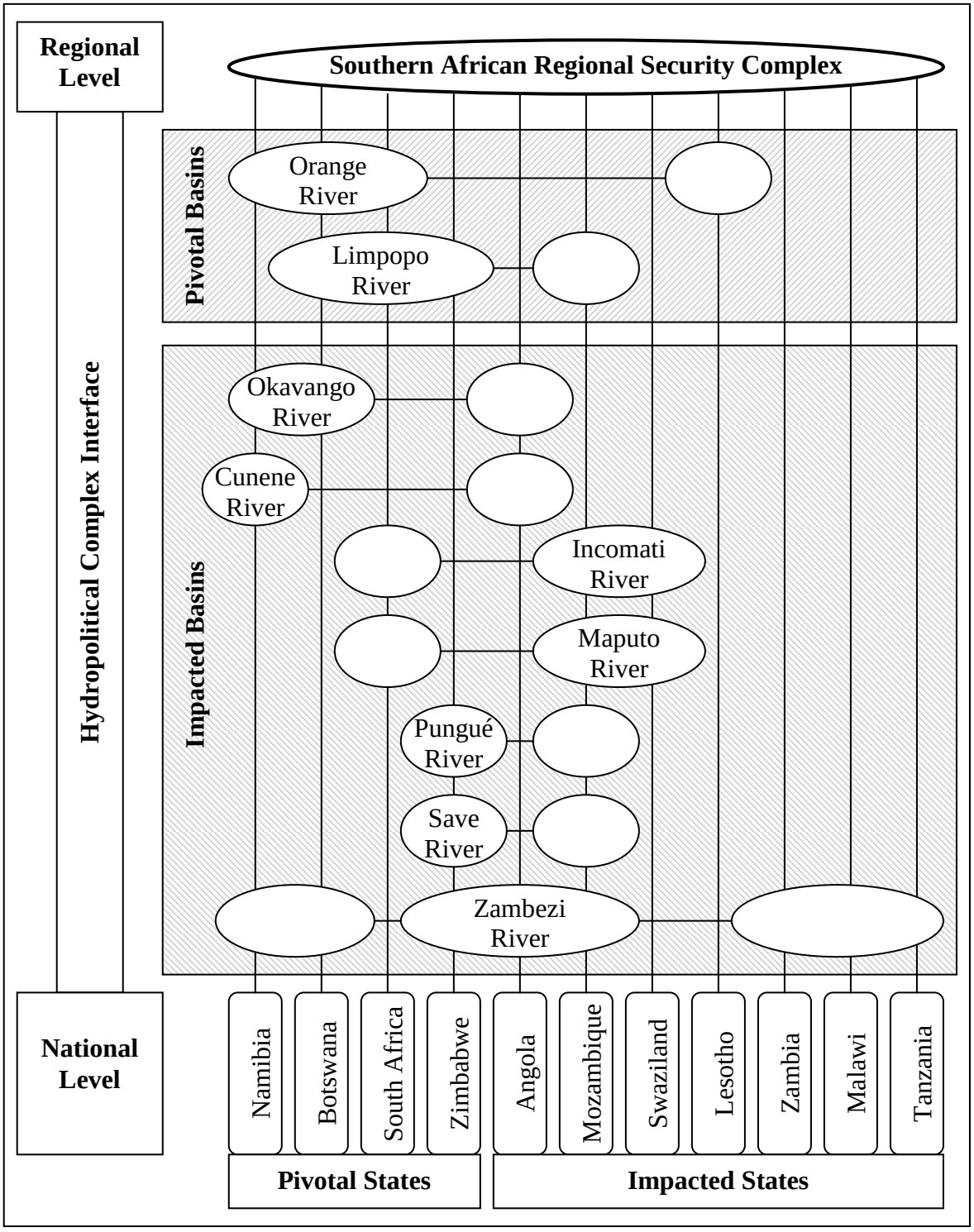


Figure 2. The Southern African Regional Security Complex showing the relationship of the Hydropolitical Complex as an interceding variable (Turton, 2003e:267).

A Hydropolitical Complex as an Element of the Southern African Regional Security Complex

So what are the implications of the development of these theoretical elements?

Firstly, by using these new concepts, a more nuanced understanding can be developed of the international relations dynamics of the Southern African region. This is particularly relevant in the post-Cold War and post-Apartheid era, where the dynamics of regionalism seem to be more strongly manifest than before. Central to the process of regionalization is the formation of coalitions and the transformation of past power structures and relationships into new ones. This means that the political processes of the past are unlikely to resemble the political processes of the future, particularly as the need to secure access to strategic supplies of water at a high assurance of supply level become a necessary pre-condition for future sustained economic growth for the Pivotal States on the one hand, and the SADC region on the other.

Secondly, the current drought and looming famine can be analyzed in a more nuanced context than before. The role of water as an independent variable in the overall political dynamics of the SADC region can now be assessed in greater detail. The implications of this for early-warning capabilities are self-evident. For example, while environmental factors have long been considered by some as being a driver of migration and conflict (Homer-Dixon, 1991; 1994a, b; 1996; 1999), few predictive models have been developed.

If there is any validity to the assertion that a Hydropolitical Complex exists in Southern Africa, and acts as an important interceding variable in the context of the Regional Security Complex that Buzan has identified, then it becomes potentially fruitful to dwell for a few moments on five strategic issues that arise.

The first strategic issue that needs to be unravelled further is the implication of water as a limiting factor to the long-term economic growth potential of the four Pivotal States in particular, along with the implications of this for the seven Impacted States in general. In this regard is has been suggested by Turton & Warner (2002:67) that the determining variable is the relative availability of so-called Second-Order Resources. This has been defined by Ohlsson (1999:161) as the ability of societies, administrative organizations and managers responsible for dealing with natural resource scarcities, to find the appropriate tools for dealing with the consequences of those natural resource scarcities. This is similar to the logic used by Homer-Dixon (1994c; 1995; 1996; 2000) and Barbier & Homer-Dixon (1996) in developing the case for ingenuity as a resource with which to develop economies. If this is true, then the Pivotal States will need to mobilize significant quantities of what Ohlsson calls “second-order resources”, and what Homer-Dixon calls “ingenuity”, if they are to avoid the consequences of water scarcity as a limiting factor to their future economic growth potential. In other words, if a Hydropolitical Security Complex along the same lines as that found in the Euphrates and Tigris River Basins is to be avoided in Southern Africa, special emphasis will have to be placed on the mobilization of so-called “second-order resources” by the relevant Pivotal States. What are the necessary conditions for this to occur in a sustainable manner? The answer to this is as yet unknown.

The second strategic issue relates to what can be considered to be the great unknown of our modern times - the political impact of global climate change in the developing world. In all likelihood, climate change will create more variability in what is already a highly variable and unpredictable precipitation pattern. This is likely to result in

more extreme events such as floods, droughts and famines, with a series of secondary effects that are not yet fully understood. From an early warning perspective, this has major ramifications for the SADC region and its international trading partners.

The third strategic issue relates to the conflict potential of water scarcity. This is not well understood at present, despite the work that has already been done by Homer-Dixon (1991; 1994a, b, c; 1996; 1999) and others (Molvaer, 1989; Porter, 1998; Turton, 2003d; Warner, 2000; Westing, 1991). A significant component of this issue-area relates to the impact of famine and drought as manifest in the SADC region. To what extent can this food security issue have a politically destabilizing effect? How will this impact on the economic growth potential of both Pivotal and Impacted States in the SADC region? The answers to these questions are as yet largely unknown.

This leads directly into the fourth strategic issue, which relates to the trade of virtual water as a mitigator of the conflict potential inherent in water scarcity. Virtual water is the volume of water used to produce a commodity such as wheat, which has been identified as one of the fundamental reasons why war over water has not erupted in the water scarce economies of the MENA region (Allan, 1997; 1998a, b; 1999; 2000; 2002). Basically, it is easier to meet national water deficits via the importation of water-rich cereals, but this raises a series of downstream political issues that are not yet fully understood. For example, what level of economic activity is needed in a given Pivotal State before it can rely on the importation of virtual water as a strategic solution to the problem of endemic water scarcity? What new dependencies arise from this situation, particularly in terms of a global economy that is characterized by a playing field that is skewed in favour of the industrial nations of the world? How can this trade in virtual water be used to balance out the skewed intra-regional trade patterns within SADC, with scarce foreign exchange being directed to water-rich but economically weak economies such as Zambia, Angola, Mozambique and the Democratic Republic of Congo, rather than being sent to the already rich United States of America, Canada and the European Union? The definitive answers to these vexing questions are as yet largely unknown.

The fifth strategic issue is a crosscutting one and is based on the need to achieve a degree of regional developmental equity within the SADC family of member states. At present development is highly skewed in the region, mostly concentrated in the hands of the Republic of South Africa, but also generally concentrated in the four[4] Pivotal States. The water resource component of this becomes evident when one views the distribution of large dams and related hydraulic infrastructure, most of which is in South Africa, but a large portion of it is under the direct control of the Pivotal States[5]. The linkage between dams and development is thus acute in the

[4] As always, Zimbabwe is a special case. Zimbabwe is a regional economic power but this advantage has been systematically lost under the demagogic leadership of President Robert Mugabe. It is anticipated that his fall from power is imminent, driven by rampant hyper-inflation, the technical insolvency of a number of the banks in the country, the critical shortage of foreign exchange and the famine that is growing in response to the loss of production caused by illegal land redistribution and a regional drought. In the post-Mugabe era Zimbabwe is likely to regain its position of regional economic importance once again.

[5] South Africa and Zimbabwe have between them 752 large dams while the SADC region's other nine countries have only 55 among them. The SADC region's wetter countries (Angola, Malawi, Mozambique, Tanzania and Zambia) have amongst the lowest density of dams in the world for non-karstic regions with annual precipitation in the range of 600-2000 millimetres (Turton, 2003d:76).

SADC region and if any viable regional development plans are ever formulated they will have to take this inequity into consideration. One important component of the spatial maldistribution of development in the region that is likely to become increasingly visible is the link between areas of high HIV/AIDS prevalence, poor water and sanitation infrastructure and underdevelopment. The strategic significance of poor water and sanitation infrastructure in a region where a substantial portion of the population has a compromised immune system has yet to be unravelled, although initial attempts are being made (see Ashton & Ramasar, 2002). At the strategic level of water resource management in the SADC region, the concept of virtual water as a tool to stimulate intra-regional trade between water-rich but economically underdeveloped states and water-scarce but industrialized states can become a driver of regional integration. However, this will place a high level of demand on institutional and policy development at the supra-national level if it is to succeed.

The Reform of Water Institutions in the SADC Region

Effective institutions are an important factor that mitigates conflict potential (Turton, 2003e). This is particularly important in the context of Pivotal States as the condition of basin closure is being approached. Basin closure can result in a heightened probability of conflict potential, but this is linked to cases where institutional development is stunted or inadequate. Stated differently, basin closure places an increased demand on institutional development, which if managed effectively, can mitigate the conflict potential by reducing the range of uncertainty left open to other riparian states (Turton, 2003c). In short, institutions build trust, but they also enable a strategically-important aspect of river basin management under conditions of closure to be executed – the shift in paradigm away from water sharing to benefit sharing instead - which simply increases the range of potential solutions to a given problem that is sourced from outside the stressed river basin (Earle, 2003).

The SADC region has undergone a period of rapid institutional development in the water sector. Significantly, the four Pivotal States all have a high level of institutional development in their shared river basins, and all have embarked on ambitious legal and policy reforms. South Africa, as the regional power, has a basin-wide agreement in all of the four international river basins on its sovereign soil. Namibia has a basin-wide agreement[6] on four of the five international river basins it relies on (Orange, Okavango, Cuvelai and Cunene) and is working towards an agreement on the Zambezi. Botswana has a basin-wide agreement[7] on three of the five international river basins it relies on (Orange, Okavango and Limpopo) and is working towards an agreement on the Zambezi. Zimbabwe has a basin-wide agreement on the Limpopo River and is working towards a similar arrangement on the Zambezi. In the other four

[6] The Cuvelai River is shared between Namibia and Angola but it is an ephemeral endoreic system that has limited capacity for the development of dams. This means that it is not a major river in terms of international cooperation. The Cuvelai River system is extremely important for the rural community in Northern Namibia however (Marsh & Seeley, 1992). See Jacobsen *et al* (1995) for more information about ephemeral rivers in general.

[7] The Nata River is an ephemeral or episodic river that flows from Zimbabwe to Botswana. Some authors (incorrectly) name this is part of the Okavango River Basin. The Nata River is too episodic to be dammed to any great extent although it is used in rural Botswana as an important water source for communities in the Kalahari area.

international river basins it shares with other riparian states there is no visible sign that a basin-wide agreement[8] is being explored.

Coalition Formation: The Parallel National Action Approach

The emergence of a Hydropolitical Complex in Southern Africa has started to impact on the international relations of the SADC region, with the formation of coalitions starting to become evident for the first time. One of the elements of this is the way that states engage one another in the field of water resource management. The most appropriate model to describe this process is what is known as Parallel National Action (PNA). Originally described by Nielsson (1990) as it applied to Scandinavia prior to the inclusion of the respective Nordic countries into the EU, PNA has been applied to an analysis of the Southern African water sector by Turton (2002b), to an analysis of the Okavango River Basin by Turton & Earle (2003), and to the environmental sector in Central Africa by Braid (2003). In essence PNA as an approach seeks to develop and apply policy that is appropriate and sustainable in a multi-country setting. As such it is a way that states can structure the anarchy in which they find themselves when it comes to dealing with neighbouring (co-riparian) states.

In essence PNA strives to achieve four core objectives (Turton, 2004):

- Institutional strengthening is achieved through the commitment to understanding policy-making processes in order that support can be given by developing appropriate institutional arrangements. In many developing countries such as those found in Southern Africa, institutions are weak with this aspect becoming a major stumbling block to the development of coherent and viable policy.

- Encouragement of communication both vertically and horizontally within institutions. Vertical communication refers to the way that policy is developed within the national borders of the sovereign state concerned. As such it seeks to harmonize local grass-roots structures with provincial and national-level structures in an attempt to improve the coherence of the policy by marrying the bottom-up needs with what are often top-down technocratic solutions. Horizontal communication has two distinct sub-components to it. At the national and sub-national level horizontal communication focuses on establishing linkages with other government departments, special interest groups and governance structures as appropriate to the integrated management of a fugitive resource like water. This seeks to link for example the Department of Agriculture to the Departments of the Environment, Water, Industry and Tourism in a way that makes the management of water more streamlined and effective. At the international level horizontal communication focuses on establishing linkages with similar government departments in neighbouring co-riparian states.

[8] The Nata River shared with Botswana is too small and episodic to be commercially exploited to any large extent. The Buzi, Pungué and Save are all shared with Mozambique and there is a considerable history of tension between these two states over the management of these rivers. Zimbabwe has shown no real interest in negotiating a bilateral agreement with Mozambique despite the loyal political support of the latter during the period of protracted Cold War-related localized conflicts (see Turton, 2003a).

- Harmonization of policy is the stated objective of these initiatives. The word harmonization is very important in this regard because it recognizes that each state has the right to make policy and legislation in response to the specific mandate given by the electorate within that country. Harmonization therefore seeks to make the policy as compatible as possible without making it totally seamless or homogenous. This allows for differences where appropriate while striving to reduce those differences as much as possible. PNA therefore tries to establish the lowest common denominator first and then roll this out progressively over time by increasing the area of overlap and by reducing the area of incompatibility.

- State sovereignty is recognized at all times and is never challenged. This is a core principle of the PNA approach so there is never any stated attempt to fuse together national departments or to promote regional integration to the point of merging two (or more) countries into one new sovereign entity. This is an important aspect for the newly-independent states of Southern Africa, many of which have paid for that independence with a high blood price and all of which jealously guard their newfound sovereignty (see Turton, 2002b; Turton & Earle, 2003).

So much for theory; how is this achieved in practice, and more importantly, how does this approach impact on our understanding of coalition formation? There are a number of interesting examples from the Southern African Hydropolitical Complex that suggest a PNA approach is potentially applicable to policy-making.

- The Permanent Okavango River Basin Water Commission (OKACOM) is currently being presented with the possibility of using a PNA approach (Turton & Earle, 2003) in light of the joint management imperatives arising from the United Nations Convention on Biological Diversity (UNCBD), the Ramsar Convention on Wetlands of International Importance (Ramsar), the United Nations Convention to Combat Desertification (UNCCD), the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention on the Non-navigational Uses of International Watercourses (see Ashton & Neal, 2003).

- During the negotiations that led to the revival of the Limpopo Basin Permanent Technical Committee (LBPTC) and its recent upgrade to a Commission, contact was made between the various government departments involved in the process at levels lower than the Minister at a time when talks were bogged down. This sustained communications horizontally across international borders, which in turn facilitated the vertical communication within each government department, to the extent that negotiations could resume once the specific issues had been resolved internally. This contact was mostly informal and served to gain consensus around contentious issues while keeping alive the desire to seek cooperative solutions to seemingly intractable problems.

- The SADC Secretariat has recently completed a major regional water policy review. This involved a number of consultants and donor agencies that combined forces to produce the first draft of a regional water policy that will be presented to the Heads of State later in 2004 for their debate, acceptance and hopeful signature. This will foster communication and debate over specific issues, which in turn will probably mean that policy harmonization will take place at a regional level to the benefit of all SADC member states. The Pivotal States have a specific interest in

this regard because it develops a normative framework that in turn reduces uncertainty and fosters a cooperative approach to problem-solving.

Actions to be Considered by the World Water Council

An assessment of the above enables the authors to distil out a number of actions that can be considered by the World Water Council. These are as follows:

- A research agenda should be drawn up that serves to focus the combined attention of scientists, practitioners and water resource managers. This agenda should be linked with, and supported by, appropriate financial instruments that aim to further the research on the one hand, while fostering regional and international cooperation.
  - Increased emphasis should be placed on the role of water resource management in international river basins as a driver of regional integration and a catalyst of cooperation.
  - The role of the Water Cooperation Facility, consisting of the World Water Council, UNESCO, the International Court of Arbitration and the Universities Partnership for Transboundary Waters needs to be strengthened.

- Particular attention needs to be paid to unravelling the complexity surrounding the linkage between national and international levels of scale.
  - The role of PNA in this regard needs to be given greater prominence in an attempt to determine its usefulness and applicability to the developing parts of the world.
  - The way in which the existing obligations that arise from multilateral agreements to which states are signatories, should be linked to IWRM principles and used to strengthen the efforts already being made to implement policy and institutional reform.
  - The relationship between these processes and existing regional integration efforts that are underway in SADC needs to be made more explicit.

- The concept of a Hydropolitical Complex needs to be assessed independently in order to determine its value as an analytical tool to understand the dynamics of coalition formation, power structures and negotiations over shared water resources.
  - Particular attention needs to be given to an exploration of the vertical and horizontal linkages that can inform the negotiating positions of respective co-riparian states in the context of international river basins.
  - Attention needs to be given to an understanding of the dynamics of institutional development, particularly as it pertains to the fostering of trust between riparian states, the development of institutional learning and the capacity of the negotiating parties to develop new paradigms in which water management problems can be re-formulated.
  - A deeper understanding is needed of the role and function of second-order resources in the process of institutional development and coalition formation, in order that it may be fostered by honest brokers and third parties such as donor agencies, the Water Cooperation Facility and the World Bank.

- The dams and development debate needs to be taken to a new level, beyond that achieved by the World Commission on Dams, in an attempt to understand the need for major water infrastructure projects on the one hand, while mainstreaming the normative elements of the WCD report as a benchmark for best practices.
  - The role of dams and inter-basin water transfers in the context of semi-arid and arid regions needs to be better understood.
  - The water/poverty nexus needs to be nested within this "dams and development" debate.
  - The implications of poor water supply and sanitation infrastructure in regions where a significant portion of the population have compromised immune systems needs to be better understood.
  - The importance and limitations to the utility of Inter-Basin Transfers of water, particularly in places like the Southern African Hydropolitical Complex, needs to be better understood in order to inform policy-making processes in areas where water scarcity is becoming a limiting factor to the economic growth potential of the state.
  - The role and function of virtual water trade, as one of the possible solutions should be better understood. This should specifically aim to mainstream virtual water as a viable policy option while assessing the opportunities that such a policy creates, without ignoring the vulnerabilities that inevitably arise from such a policy.

- The whole issue of global climate change needs to be better understood, particularly as it pertains to an increase in the vulnerability of states that are already facing water scarcity constraints to their future economic growth potential.
  - Specific emphasis needs to be placed on the role of institutional development and second-order resources in developing appropriate solutions through policy, coalition formation and cooperation.

Conclusion

Water scarcity is becoming a key driver of political dynamics in Southern Africa. More acutely felt by the most economically developed countries in the region - South Africa, Botswana, Namibia and Zimbabwe - water scarcity is increasingly becoming a limiting factor to the future economic growth potential of these states. Yet the SADC region as a whole is not water scarce. The spatial maldistribution of water resources, particularly those found in international river basins, is one of the most strategically significant challenges facing SADC as a regional structure that has been formed along the lines of the EU. Analysis has shown that a Hydropolitical Complex is emerging in Southern Africa, clustered around key international river basins and driven by differing interests in these river basins by the respective riparian states. The theoretical concept of a Hydropolitical Complex provides a simple and robust classification system that takes the differing strategic interests of the respective co-riparian states into consideration. When viewed through the lens of this theoretical construct, explanation, analysis and possibly even prediction is possible, because it enables the analyst to tease out the processes and dynamics of power structures, coalitions and decision-making in a more nuanced fashion than before. Two levels of analysis are important - the sub-national and the international - both of which are captured in the concept of a Southern African Hydropolitical Complex. Superimposed on this is the potential value of the PNA model of inter-state engagement, which is

highly appropriate to water resource management in international river basins, specifically in a region where newly-independent states jealously guard their sovereignty and view any attempt at an erosion of that sovereignty with a jaundiced eye. State sovereignty can become a stumbling block to regional cooperation, but by defining challenges to that sovereignty out of the overall hydropolitical equation by using a model similar to the PNA approach, this can, and already is, a significant feature in the process of coalition formation in Southern Africa. The World Water Council can play an important role in fostering a new understanding of the drivers of, and factors influencing, this process.

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Bibliography

Allan, J.A. 1997. '*Virtual water': A Long Term Solution for Water Short Middle Eastern Economies.* British Association Festival of Science. University of Leeds. 9 September 1997.

Allan, J.A. 1998(a). 'Virtual water': An Essential Element in Stabilizing the Political Economies of the Middle East. Yale University Forestry & Environmental Studies Bulletin, No. 103; 141-149.

Allan, J.A. 1998(b). Virtual Water: A Strategic Resource. Global Solutions to Regional Deficits. In *Ground Water*, Vol. 36, No. 4 ;545-546.

Allan, J.A. 1999. Avoiding War over Natural Resources. In **Fleming, S.** (Ed.*) War and Water*. Geneva: ICRC Publication Division

Allan, J.A. 2000. *The Middle East Water Question: Hydropolitics and the Global Economy.* London: IB Tauris.

Allan, J.A. 2002. Water Resources in Semi-Arid Regions: Real Deficits and Economically Invisible and Politically Silent Solutions, in **Turton, A.R. & Henwood, R.** (Eds.) *Hydropolitics in the Developing World: A Southern African Perspective*. Pp 23-36. Pretoria: African Water Issues Research Unit (AWIRU).

Ashton, P.J. 2002. Avoiding Conflicts over Africa's Water Resources. *Ambio*, Vol. 31. No. 3; 236-242.

Ashton, P. & Ramasar, V. 2002. Water and HIV/AIDS: Some Strategic Considerations in Southern Africa. In **Turton, A.R. & Henwood, R.** (Eds.) 2002. *Hydropolitics in the Developing World: A Southern African Perspective*. Pp 217-235. Pretoria: African Water Issues Research Unit (AWIRU).

Ashton, P. & Neal, M. 2003. An Overview of Key Strategic Issues in the Okavango Basin. In **Turton, A.R., Ashton, P. & Cloete, T.E.** (Eds.) *Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin.* Pp 31-63. Pretoria & Geneva: AWIRU & Green Cross International.

Barbier, E. & Homer-Dixon, T.F. 1996. *Resource Scarcity, Institutional Adaptation, and Technical Innovation: Can Poor Countries Attain Endogenous Growth?* Washington: American Association for the Advancement of Science.

Basson, M.S. 1999. *South Africa Country Paper on Shared Watercourse Systems.* Presented at the SADC Water Week Workshop that was held in Pretoria, South Africa.

Blanchon, D. 2001. Les nouveaux enjeux géopolitiques de l'eau en Afrique Australe, in *Hérodote Revue de Géographie et de Géopolitique*. Troiseme Trimestre. No. 102; 113-137.

Borchert, G. 1987. *Zambezi-Aqueduct.* Institute of Geography and Economic Geography, University of Hamburg, Hamburg.

Borchert, G. & Kemp, S. 1985. A Zambezi Aqueduct. *SCOPE/UNEP Sonderband Heft*. No. 58; 443-457.

Braid, S. 2003. Managing Lake Victoria's Water. Unpublished draft of a M.Sc. Dissertation, Department of Land and Water Resources Engineering. Kungl Tekniska Högskolan (KTH), Stockholm, Sweden.

Buzan, B. 1991. *People, States and Fear. An Agenda for International Security Studies in the Post-Cold War Era.* London: Harvester Wheatsheaf.

Buzan, B. 1994. *National Security in the Post Cold War Third World.* Paper presented at the Conference on National Security in Developing Countries, 26 January 1994, Institute for Strategic Studies, University of Pretoria, South Africa.

Buzan, B., Waever, O. & de Wilde, J. 1998. *Security: A New Framework for Analysis*. London: Lynne Rienner.

Buzan, B. & Wæver, O. (Forthcoming). Regions and Powers: The Structure of International Security. Draft copy dated June 2001. Forthcoming publication by Oxford University Press.

Conley, A.H. 1995. A Synoptic View of Water Resources in Southern Africa. Paper presented at the Conference of Southern Africa Foundation for Economic Research on Integrated Development of Regional Water Resources, Nyanga, Zimbabwe, November 1995.

Earle, A. 2003. Watersheds and Problemsheds: A Strategic Perspective on the Water/Food/Trade Nexus in Southern Africa. In **Turton, A.R., Ashton, P. & Cloete, T.E.** (Eds.) *Transboundary Rivers, Sovereignty and Development: Hydropolitical*

Drivers in the Okavango River Basin. Pp 229-249. Pretoria & Geneva: AWIRU & Green Cross International.

Heyns, P. 2002. Interbasin Transfer of Water Between SADC Countries: A Development Challenge for the Future. In **Turton, A.R. & Henwood, R.** (Eds.) *Hydropolitics in the Developing World: A Southern African Perspective.* Pretoria: African Water Issues Research Unit (AWIRU).

Homer-Dixon, T.F. 1991. On the Threshold: Environmental Changes as Causes of Acute Conflict, in *International Security,* Vol. 16, No. 2, Fall; 76-116.

Homer-Dixon, T.F. 1994(a). Environmental Changes as Causes of Acute Conflict, in **Betts, R.K.** (Ed.) *Conflict after the Cold War: Arguments on causes of War and Peace.* New York: Macmillan.

Homer-Dixon, T.F. 1994(b). Environmental Scarcities and Violent Conflict: Evidence from Cases, in *International Security,* Vol. 19, No. 1; 5-40.

Homer-Dixon, T.F. 1994(c). The Ingenuity Gap: Can Developing Countries Adapt to Environmental Scarcity? In *Population and Development Review*. Vol. 21, No. 3; 587-612.

Homer-Dixon, T. 1995. The Ingenuity Gap: Can Poor Countries Adapt to Resource Scarcity? In *Population and Development,* Vol. 21, No. 3; 587-612.

Homer-Dixon, T.F. 1996. Environmental Scarcity, Mass Violence and the Limits to Ingenuity, in *Current History*. No. 95; 359-365.

Homer-Dixon, T.F. 1999. *Environment, Scarcity and Violence*. Princeton, NJ: Princeton University Press.

Homer-Dixon, T.F. 2000. *The Ingenuity Gap*. London: Jonathan Cape.

Jacobson, P.J., Jacobson, K.M. & Seeley, M.K. 1995. *Ephemeral Rivers and their catchments: Sustaining People and Development in Western Namibia*. Desert Research Foundation: Windhoek.

James, L.H. 1980. Total Water Strategy Needed for the Vaal Triangle: Meeting the Challenge of the Eighties. In *Construction in Southern Africa,* May, 1980; 103-111.

Lesch, A.M. 1992. *Transition to Palestinian Self-Government.* Report of a Study Group of the Middle East Programme Committee on International Security Studies, American Academy of Arts and Sciences, Cambridge, MA: Published in collaboration with Indiana University Press, Bloomington and Indianapolis.

Marsh, A. & Seeley, M. (Eds.) 1992. *Oshanas: Sustaining People, Environment and Development in Central Owambo, Namibia.* Windhoek: Desert Research Foundation of Namibia.

Midgley, D.C. 1987. *Inter-State Water Links for the Future.* The South African Academy of Science and Arts Symposium: Water for Survival. August.

Molvaer, R.K. 1989. *Environmental Security in the Horn of Africa: An Annotated Bibliography*. Nairobi: United Nations Environment Programme.

Nielsson, G. 1990. The Parallel National Action Process. In **Groom, A.J.R. & Taylor, P.** (Eds.) *Frameworks for International Cooperation*. London: Pinter Publishers.

Ohlsson, L. 1999. *Environment, Scarcity and Conflict: A Study of Malthusian Concerns*. Department of Peace and Development Research. University of Göteborg.

O'Keeffe, J., Uys, M. & Bruton, M.N. 1992. Freshwater Systems, in **Fuggle, R.F. & Rabie, M.A.** (Eds.) 1992. *Environmental Management in South Africa.* Johannesburg: Juta & Co.

Porter, G. 1998. Environmental Security as a National Security Issue, in **Tuathail, G.O., Dalby, S. & Routledge, P.** (Eds.) *The Geopolitics Reader*. London: Routledge.

Rabie, M.A. & Day, J.A. 1992. Rivers, in **Fuggle, R.F. & Rabie, M.A.** (Eds.) 1992. *Environmental Management in South Africa.* Johannesburg: Juta & Co.

Ramoeli, P. 2002. SADC Protocol on Shared Watercourses: Its History and Current Status, in **Turton, A.R. & Henwood, R.** (Eds.) 2002. *Hydropolitics in the Developing World: A Southern African Perspective.* Pretoria: African Water Issues Research Unit (AWIRU).

Schulz, M. 1995. Turkey, Syria and Iraq: A Hydropolitical Security Complex, in **Ohlsson, L.** (Ed.) *Hydropolitics: Conflicts over Water as a Development Constraint*. London: Zed Books.

Scudder, T., Manley, R.E., Coley, R.W., Davis, R.K., Green, J., Howard, G.W., Lawry, S.W., Martz, P.P., Rogers, P.P., Taylor, A.R.D., Turner, S.D., White, G.F. & Wright, E.P. 1993. *The IUCN Review of the Southern Okavango Integrated Water Development Project*. Gland: IUCN Communications Division.

Seckler, D. 1996. The New Era of Water Resources Management: From "Dry" to "Wet" Water Savings. *IIMI Research Report No. 1*. Colombo, Sri Lanka: International Irrigation Management Institute (IIMI).

Svendsen, M., Hammond Murray-Rust, D., Harmancioğlu, N. & Alpaslan, N. 2001. Governing Closing Basins: The Case of the Gediz River in Turkey. In **Abernethy, C.L**. (Ed.) 2001. *Intersectoral Management of River Basins*. Colombo: International Water Management Institute (IWMI).

Turton, A.R. 1999. *Sea of Sand, Land of Water: A Synopsis of some Strategic Developmental Issues confronting the Okavango Delta.* MEWREW Occasional Paper No. 6. Water Issues Study Group, School of Oriental and African Studies (SOAS), University of London,

http://www.soas.ac.uk/Geography/WaterIssues/OccasionalPapers/home.html
Available from http://www.up.ac.za/academic/libarts/polsci/awiru

Turton, A.R. 2001. *Hydropolitics and Security Complex Theory: An African Perspective*. Paper presented at the 4th Pan-European International Relations Conference, University of Kent, Canterbury (UK). 8-10 September 2001.

Turton, A.R. 2002(a). Hydropolitics: The Concept and its Limitations. In **Turton, A.R. & Henwood, R.** (Eds.) *Hydropolitics in the Developing World: A Southern African Perspective.* Pretoria: African Water Issues Research Unit (AWIRU).

Turton, A.R. 2002(b). Water and State Sovereignty: The Hydropolitical Challenge for States in Arid Regions. In **Wolf, A.** (Ed.) *Conflict Prevention and Resolution in Water Systems.* Pp 516-533. Cheltenham: Edward Elgar.

Turton, A.R. 2003(a). The Evolution of Water Management Institutions in Selected Southern African International River Basins. In **Tortajada, C., Unver, O. & Biswas, A.K.** (Eds.) *Water and Regional Development*. London: Oxford University Press.

Turton, A.R. 2003(b). An Introduction to the Hydropolitical Dynamics of the Orange River Basin. In **Nakayama, M.** (Ed.) *International Waters in Southern Africa.* Tokyo: United Nations University Press.

Turton, A.R. 2003(c). The Hydropolitical Dynamics of Cooperation in Southern Africa: A Strategic Perspective on Institutional Development in International River Basins. In **Turton, A.R., Ashton, P. & Cloete, T.E.** (Eds.) *Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin.* Pp 83-103. Pretoria & Geneva: AWIRU & Green Cross International.

Turton, A.R. 2003(d). Environmental Security: A Southern African Perspective on Transboundary Water Resource Management. In *Environmental Change and Security Project Report*. The Woodrow Wilson Centre. Issue 9 (Summer 2003). Pp 75-87. Washington, DC: Woodrow Wilson International Center for Scholars.

Turton, A.R. 2003(e). The Political Aspects of Institutional Development in the Water Sector: South Africa and its International River Basins. Unpublished draft of a D.Phil. Thesis. Department of Political Science. Pretoria: University of Pretoria. Available from the Website http://www.up.ac.za/academic/libarts/polsci/awiru.

Turton, A.R. 2004. *The Challenges of Developing Policy in a Multi-Country Context.* Paper presented at the Seminar on Policy Development and Implementation in the Water Sector: Reflection and Learning, 10-12 February 2004 at the CSIR Conference Centre, Pretoria, South Africa.

Turton, A.R. & Warner, J. 2002. Exploring the Population / Water Resources Nexus in the Developing World. In **Dabelko, G.D.** (Ed.) *Finding the Source: The Linkage Between Population and Water*. Environmental Change and Security Project (ECSP). Woodrow Wilson Centre. Washington, DC. (Pages 52-81).

Turton, A.R. & Earle, A. 2003. *Discussion Document on the Implications of International Treaties on the Development of a Management Regime for the Okavango River Basin.* Deliverable D 6.2 of the Water Ecosystem Resources in Rural Development (WERRD) Project funded by the European Union. Pretoria: African Water Issues Research Unit. Available from the Website http://www.up.ac.za/academic/libarts/polsci/awiru.

Turton, A.R., Ashton, P. & Cloete, T.E. 2003. An Introduction to the Hydropolitical Drivers of the Okavango River Basin, in **Turton, A.R., Ashton, P. & Cloete, T.E. (Eds.)** *Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin.* Pretoria & Geneva: AWIRU & Green Cross International.

Warner, J. 1996. De drooglegging van de Jordaanvallei, in *Transaktie,* Vol. 25, No. 3; 363-379.

Warner, J. 2000. Global Environmental Security: An Emerging Concept of Control. In **Stott, P. & Sullivan, S.** (Eds.) 2000. *Political Ecology: Science, Myth and Power*. London: Edward Arnold.

WCD, 2000. *Dams and Development: A New Framework for Decision-Making.* London: Earthscan.

Westing, A.H. 1991. Environmental Security and its Relation to Ethiopia and Sudan, in *Ambio*, Vol. 20; 168-171.

Williams, G.J. 1986. Zambezi Water for South Africa? In *Zambia Geographical Journal*. No.36; 57-60.