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## A South African Perspective on a Possible Benefit-Sharing Approach for Transboundary Waters in the SADC Region

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**ABSTRACT:** The concept of benefit-sharing is emerging in the international discourse on transboundary water resource management with greater intensity than a decade ago. While it sounds simple, the concept is complex and benefits are difficult to quantify and thus the concept remains unconvincing to potentially sceptical negotiating partners. Any discourse on water resource management is based on a core logic. This paper tries to distil some elements of a proposed benefit-sharing approach, presenting an alternative core logic, showing how these differ from what can be thought of as the *traditional paradigm*. This work is linked to ongoing research at the South African Council for Scientific and Industrial Research (CSIR), into benefit-sharing and processes of policy harmonization, within the context of developing countries.

**KEYWORDS:** benefit-sharing approach, hydro-political complex, inter-basin transfer, Integrated Water Resource Management (IWRM), Parallel National Action (PNA), river basin commission, sovereignty

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### INTRODUCTION

A recent study completed on behalf of the Expert Group on Development Issues (EGDI) in the Swedish Ministry of Foreign Affairs sought to develop an understanding of the concept of benefit-sharing as it applied to the management of transboundary waters (Phillips et al., 2006). Based initially on the work by Sadoff and Grey (2002), but informed also by the Green Cross International (GCI) work on the Okavango river basin (Turton et al., 2003), the EGDI initiative sought to push the envelope of current thinking by introducing a number of new ideas. Elsewhere, there has been a series of incremental shifts in thinking around the management of transboundary waters, most notably associated with large dams (Abrams, 2000), within significant transboundary river basins (Kibaroglu, n.d.) and from the World Bank (2004). This paper seeks to record a thought process involving nine distinct differences between what can be called a 'traditional' water resources management paradigm, and a possible new benefit-sharing approach. The objective is not to be the final word on the matter – something that it clearly cannot be – but rather to distil a few key elements that might help us along that path of incremental thinking that is moving us into a new direction. This is particularly relevant for the Southern African Development Community (SADC) region, because of the large number of transboundary rivers present there, combined with the fact that the natural distribution of water across the region presents particular developmental challenges that need clear new thinking around benefit-sharing.

### WHY IS SADC SIGNIFICANT?

SADC, as a region, consists of 14 sovereign states, all seeking to integrate their economies into a new form of bloc, shared by a vaguely common geography at the southern tip of Africa. There are three distinct aspects arising from the distribution of water across the mainland SADC region that are relevant to this discussion (Mauritius and Madagascar are somewhat different by virtue of being islands).

First, the spatial distribution of water across the region is highly skewed. In fact, the SADC region has the lowest conversion ratio of mean annual precipitation (MAP) to mean annual run-off (MAR) in the world (McMahon, 1979; O’Keeffe et al., 1992). Figure 1 shows precipitation patterns across the mainland SADC region, with the global average of 860 mm/yr indicated as a red isohyet. It is evident that many of the SADC member states are on the 'wrong' side of this defining line, with annual averages being shown in parentheses beneath each country name. This means that water availability at a high assurance of supply level is a potential inhibiting factor to the attainment of the SADC vision of regional economic integration and poverty eradication (Turton, 2008b).

Second, the distribution of hydraulic infrastructure across the region is also highly skewed, reflecting levels of historic economic development. Figure 2 shows the distribution of large dams, whereas figure 3 gives an indication of some of the major inter-basin transfers (IBTs) that already exist (red/orange), are planned, or have been considered at some time in the past (maroon/purple) (Turton, 2008b). Combined, these two components (dams and IBTs) form the type of infrastructural foundation needed to overcome what the World Bank (2006) refers to as being "hostage to hydrology" (Heyns, 2002).

Finally, the spatial distribution of large cities, or centres of economic development is peculiar in the sense that they are not found on rivers, lakes or seafronts, but rather on watershed lines (Turton et al., 2008a). For example, the Gauteng area (Johannesburg and Pretoria) of South Africa generates 10% of the economic output of the entire African continent, employing 25% of all South African citizens, is situated on the watershed between the Orange and Limpopo river basin and is 100% reliant on IBT (Basson et al., 1997; Turton et al., 2008a). We also find Harare, Bulawayo, Gaborone, Francistown and Windhoek, all straddling, or close to, major watershed divides, thus being highly dependent on water that is pumped uphill, often from rivers far afield.

Within the SADC region one therefore finds a critical set of drivers at work that push the notion of benefit-sharing to new levels of urgency. On the one hand, there is a drive to create hydrological equity by means of IBT and "heroic engineering" (Heyns, 2002) (see figure 3) and, on the other, there is the possibility of creating equity by means of benefit-sharing that would redistribute wealth and opportunity without the known ecological downside of such major infrastructural interventions (Davies et al., 1993; Davies and Day, 1998; McCully, 1996; O’Keeffe et al., 1992; Snaddon et al., 1999). SADC can thus be regarded as a crucible in which ideas from other parts of the world can be tested and refined.

## THE TRADITIONAL PARADIGM

For purposes of this paper, what is called the traditional paradigm can be traced back to the United Nations Water Conference (United Nations 1977a, 1977b), which gave rise to the first ever Register of International Rivers (United Nations, 1978) after it became evident that transboundary waters were relevant. Taking place at Mar del Plata, this initiated a process by which the existing structure, function and core assumptions underpinning the way we manage water resources have been systematically examined and critiqued over time (Turton et al., 2007). One of the manifestations of this process of introspection was the emergence of Integrated Water Resource Management (IWRM) as an overarching set of management approaches (Cardwell et al., 2006). This recognized the fact that water problems are multi-dimensional, multi-regional, multi-scalar and multi-sectoral in nature, being driven by multiple interests and manifesting as a range of causal effects (Biswas, 2004; Conca, 2006; Gyawali et al., 2006; Hooper, 2006; Funke et al., 2007). In essence then, the traditional paradigm sees the river basin as the unit of management within the overall context of IWRM as an approach (Cardwell et al., 2006). It is this specific aspect of IWRM that is relevant to the rest of this paper – the river basin as being the primary unit of management – because this introduces a critical element of scale that would be part of a viable benefit-sharing approach.

Figure 1. Spatial distribution of mean annual precipitation across the mainland SADC region (image, courtesy of Peter Ashton).

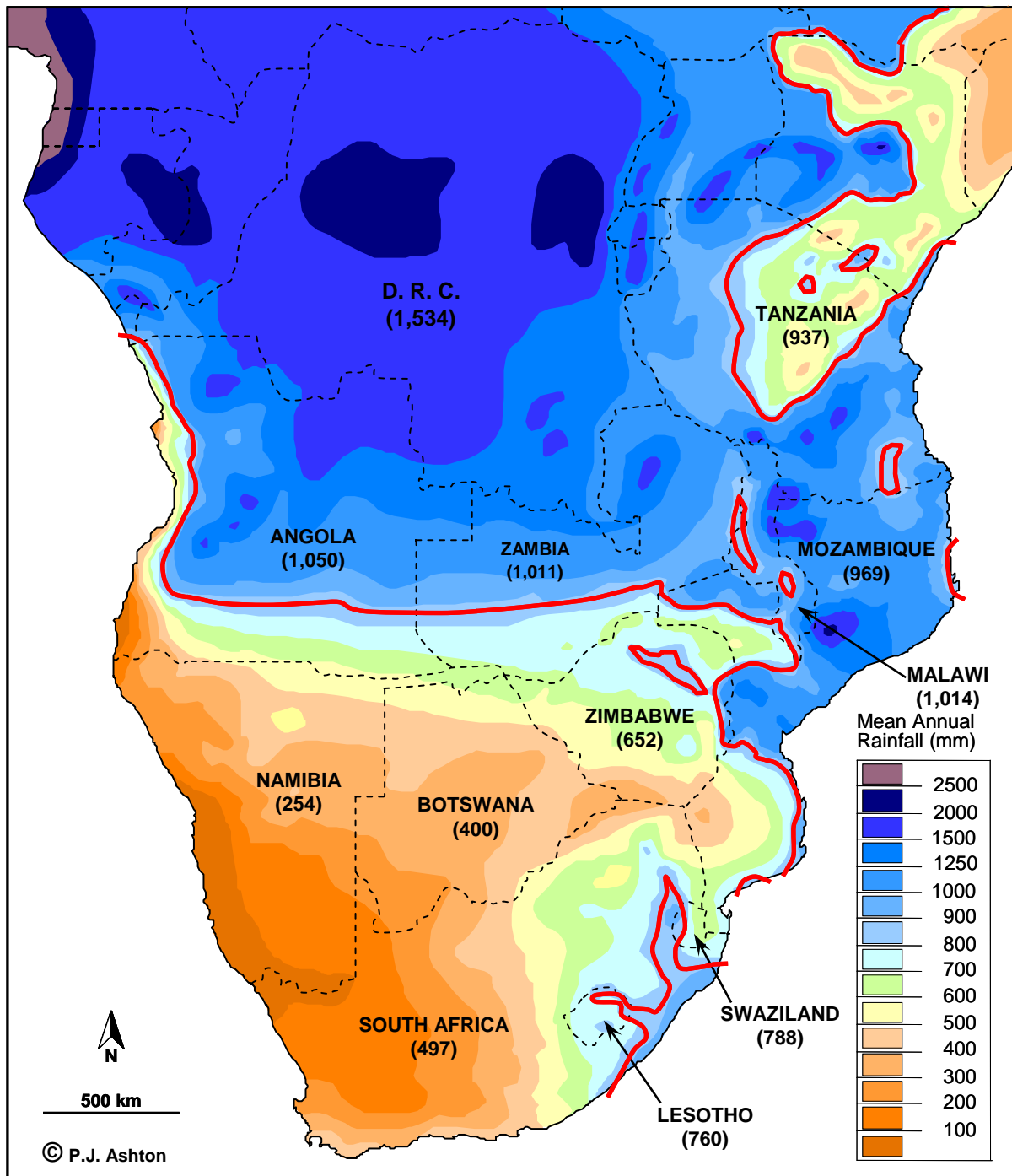


Figure 2. Distribution of large dams across the mainland SADC region (image, courtesy of Peter Ashton).

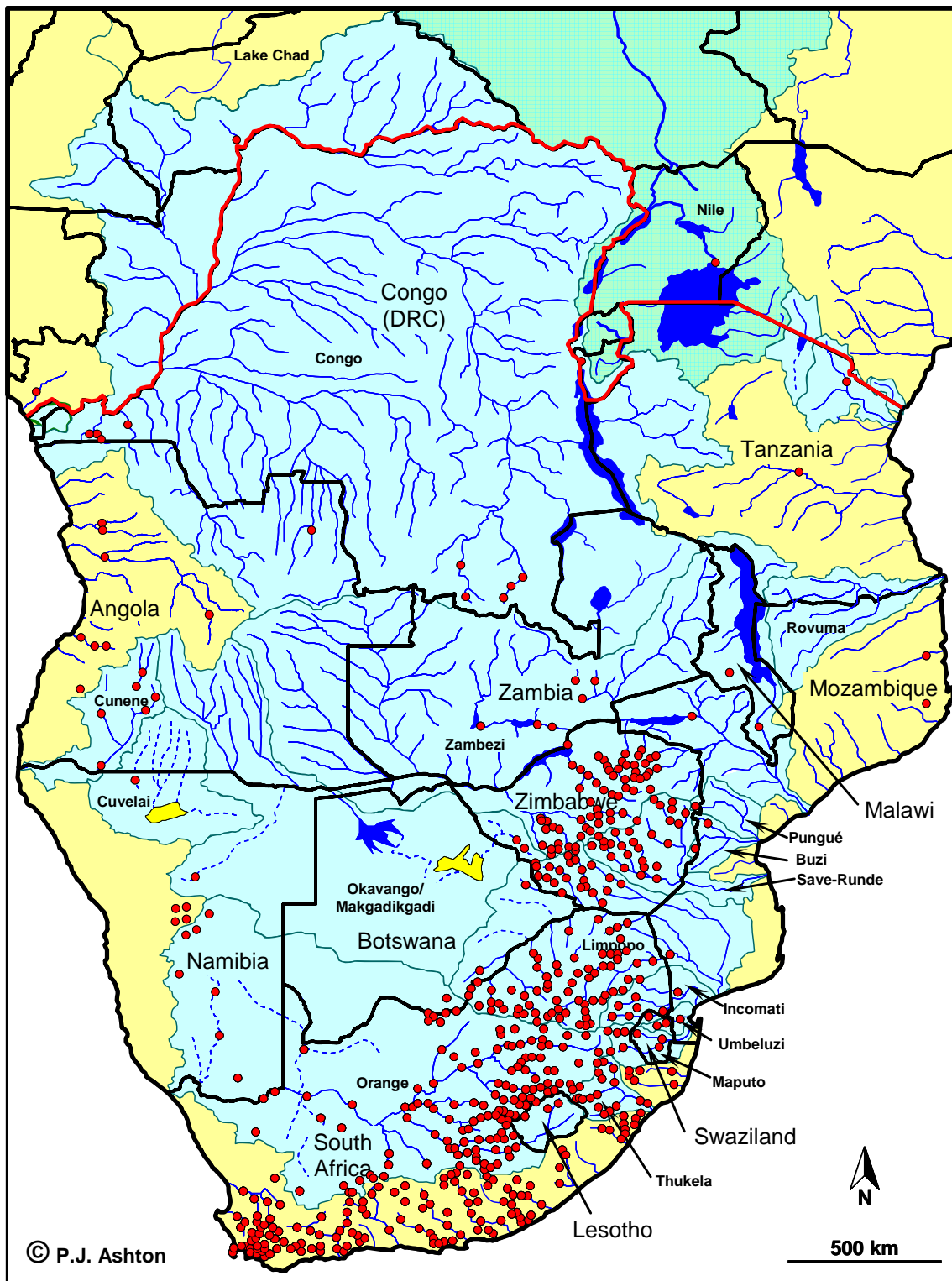
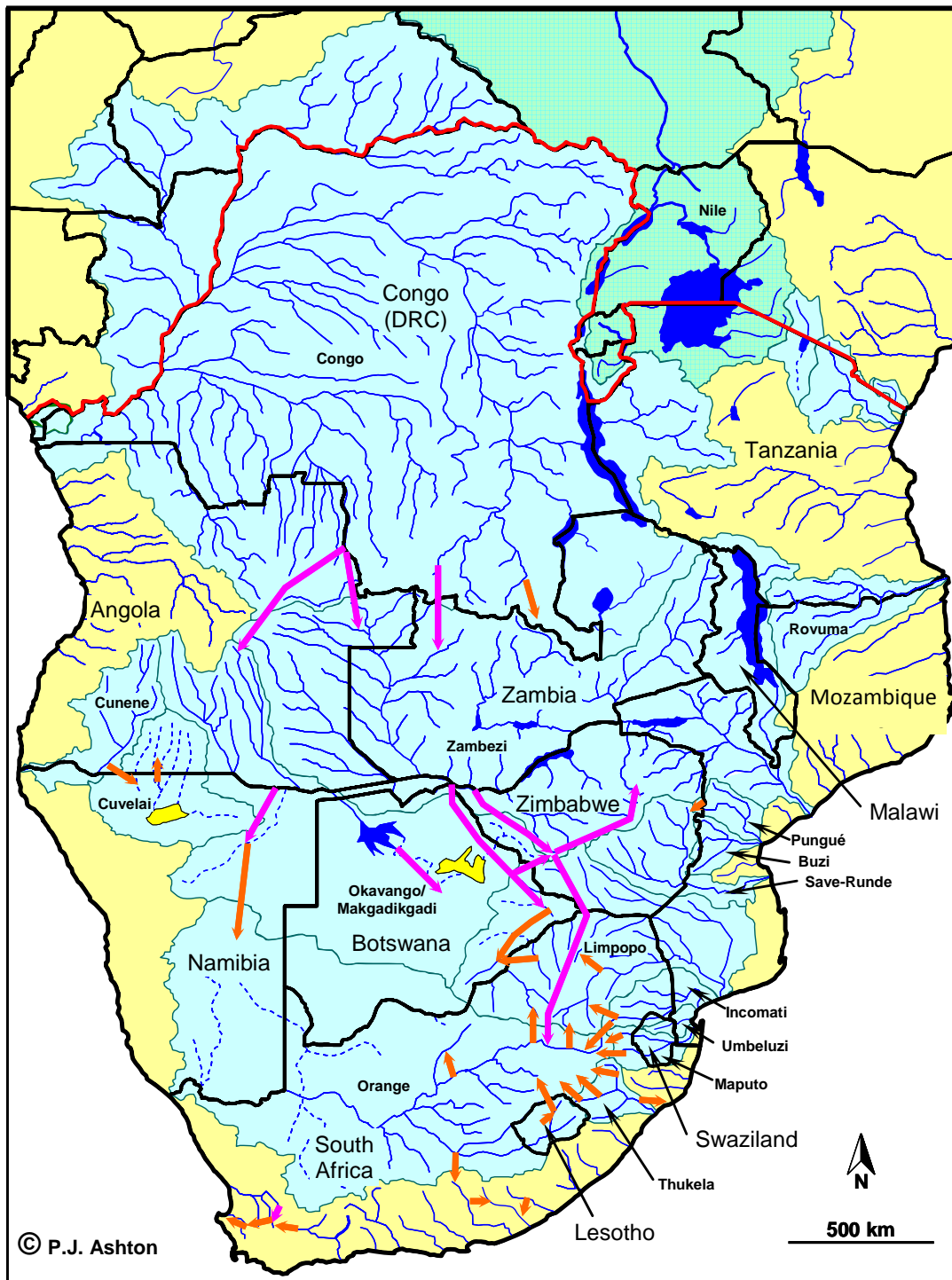


Figure 3. Inter-basin transfers (IBTs) and the SADC regional integration (image, courtesy of Peter Ashton).



**THE PROPOSED BENEFIT-SHARING APPROACH**

The proposed benefit-sharing approach is based on nine key elements, which differ fundamentally from the traditional paradigm as elucidated below.

## No. 1. Perspective of water

The traditional paradigm is based on language that views water as a stock. So, for example, international agreements between riparian states would be based on a quantification of the volume of water in a given system, and then propose an allocation of that volume between riparian states. The best example of this is the Nile Waters Agreement reached between the Governments of Great Britain, Egypt and Sudan (as British colonial entities) in 1929 (Turton et al., 2006a), which was again codified in 1959 as the Nile Water Treaty. In terms of this, the "total flow" of the Nile – wording strongly indicating that water is seen as a finite stock – was distributed between Egypt and Sudan, ignoring the future needs of the other eight riparians in the system (Postel, 1999). This has given rise to what is now known as the Nyerere Doctrine (Collins, 1990; Hultin, 1995; Ohlsson, 1995; Turton et al., 2006a) that challenges the legitimacy and fairness of the process that resulted in this volumetric allocation. A southern African example of this is the Lesotho Highlands Water Treaty (Treaty, 1986; Vorster, 1988; Ashton et al., 2005), which has a clearly defined volumetric allocation based on known flows. More recent examples are the Vioolsdrift and Noordoewer Joint Irrigation Scheme Agreement between South Africa and Namibia (Treaty, 1992; Ashton et al., 2005) and the Incomaputo Agreement (Treaty, 2002; Ashton et al., 2005) between South Africa, Swaziland and Mozambique, all of which have a sophisticated series of allocations based on current volumetric data. The core issue here is that water is viewed as a stock with a known volumetric magnitude, which is then distributed between riparians, much like the slices of a pie.

The proposed benefit-sharing approach challenges this core assumption by viewing water as a flux that moves through space and time with variability in this flow being the norm (Gleick, 2000). As Ashton (2000; 2002) explains, water is by its nature, a "fugitive" resource. Central to this is the hydrological cycle, which is an accepted element of the traditional IWRM approach. The important aspect of this core assumption is that a flux means water can be cascaded around a given system, theoretically an infinite number of times, restrained only by the level of technological solutions available and/or affordable at the time (Van Rooyen, 2008). This logic shifts the debate from water resource management to the scientific and technological capacity of a water-scarce country to find appropriate technological solutions (see Barbier and Homer Dixon, 1996; Homer-Dixon, 1995, 1996, 2000; Walwyn and Scholes, 2006). So, if a given stock can be used twice – for example first as a generator of hydro-power in the upper reaches of the system and later as irrigation water in the flood plains along the lower basin – then in effect the flux is twice as large as the stock (Van Rooyen, 2008). This means that the pie is effectively larger than when it is viewed through the lens of the traditional paradigm, laying the foundation for a number of new options associated with non-volumetric allocation – a practice that is currently not the norm. This concept lies at the heart of research work currently underway in a consortium consisting of the CSIR, the Stockholm International Water Institute (SIWI) and Phillips Robinson and Associates (PRA) based in Namibia (see Turton et al., 2008b).

## No. 2. National sovereignty

While it is acknowledged that the concept of sovereignty is profoundly complex, for the purposes of this paper it will be reduced to a narrow focus only, specifically with a developing-country perspective on the matter. In the context of a developing country such as many of those in the SADC region, the recent history has been one of wars of liberation (Turner, 1998), so in many cases sovereign authority has been paid for in blood, and also in living memory. It is the latter – the living memory aspect – that makes the issue so sensitive in the context of a developing country. The traditional paradigm is based on national sovereignty as a "given", with an inherent fear in some developing countries that close cooperation in the management of a shared resource might inadvertently lead to an erosion of sovereign control over that resource (Turton, 2002). It therefore assumes that sovereignty is a problem that is unbridgeable. In essence, this paradigm undermines the potential effectiveness of an IWRM approach by imposing national borders onto a given basin, assuming that these 'artificial' creations are

impervious to the 'natural' flows of the system. The transboundary water management problem can be defined as being the manifestation of problems arising when 'natural' hydraulic flows are intersected by 'artificial' jurisdictional boundaries.

The proposed benefit-sharing approach recognizes sovereignty as being important, but not as being a stumbling block to cooperation, by presenting alternative ways that sovereignty can be dealt with (Turton, 2008b). One of these is for the respective states to agree that national sovereignty will never be challenged by deliberately adopting a normative framework entrenching this view. The best example of this is found in Parallel National Action (PNA), originally defined by Nielsson (1990) in the context of Nordic Cooperation prior to incorporation into the European Union (EU), but later applied to the water sector by Braid and Turton (2004), Turton and Earle (2004), Phillips et al., (2006) and Turton (2008b). In essence the PNA model is based on an understanding that closer cooperation will never lead to sovereign erosion. It goes on to recognize that institutional strengthening is a key thrust, with possible corruption being ruled out because of multiple contact points both horizontally and vertically between all of the institutions relevant to the management of water and its associated benefits (energy, tourism, agriculture, etc). The key element of the PNA model is the architecture of decision-making, where specific gates are hard-wired into the system that flip-flop the process, into the direct area of sovereign control, at critical moments in time (Turton, 2008b). This not only leaves a large 'space' in which cooperation can be achieved in transboundary water management but also retains the final control within the ambit of the sovereign authority of participating countries. Therefore, a PNA model fits in nicely with many of the core objectives of international donor agencies, as well as with the actual needs of many developing countries in water-constrained regions, making it a potentially useful approach for benefit-sharing. This aspect remains largely unexplored by scholars at the time of writing, so no robust literature is available (see Turton, 2008b for the most recent known work on the topic).

### **No. 3. Institutional architecture**

The traditional paradigm is based on the preference for a negotiated regime as the foundation for an institutional arrangement to manage shared water. In this regard, regimes are defined as a set of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given area of international relations (Krasner, 1982, 1983). While regimes differ from institutions because of their lack of enforceability, they are a form of institution (Turton, 2003b). As Conca (2006) notes, however, a regime is a very blunt instrument and is largely ineffective when one examines the actual distribution of functioning regimes in transboundary river basins (see also Conca and Wu, 2002; Conca, 2003). For example, of the data set studied by Conca (2006), two-thirds of the bilateral regimes (agreements between only two states) were found in river basins that have a multilateral configuration (more than two riparian states). This means that regimes are not universal in their application, and were often found to reflect a skewed hydro-political relationship between two riparians in a basin containing many more riparian states. This finding was supported by Wolf and his team in their comprehensive analysis of existing river basin treaties using the Transboundary Freshwater Dispute Database (TFDD) (Wolf, 1998, 1999a, 1999b, 2006; Wolf and Hamner, 2000), concluding that a number of them were so-called "basins at risk" (Wolf et al., 2003), simply by virtue of the absence of formal institutional capacity capable of responding to rapid changes in the overall system. This suggests that a regime is certainly not the most effective approach, even if it is the norm (Conca, 2006). Typically, institutions arising from regimes are hierarchical in nature and many take the form of a River Basin Commission.

It must be noted that the "basins at risk" work by Wolf and his team (Wolf et al., 2003), underscored the number of agreements that are found in some of the African countries. One reason for this is simply that many of the agreements are not stored in a central database that is easily accessible to researchers. A second reason is that many agreements that are water-relevant, might not be specifically about water, so a search using key words in the title might miss some of these regimes. Consequently, work done by

researchers from the SADC region has shown the extent to which these agreements have been under-represented, concluding that some of the so-called "basins at risk", at least in the southern African category, might best be categorized by a label other than the one chosen (Ashton et al., 2005; Turton et al., 2004; Turton, 2008).

The proposed benefit-sharing approach embraces a wider range of institutional architectures needed to reflect the nature of the benefits being shared. For example, current practice within the SADC region is for transboundary water resources to be managed by means of regimes, with many examples in existence, often at different stages of their evolution. However, these regimes (usually manifest as River Basin Commissions), act in total isolation of similar management structures in other key sectors such as Agriculture, Energy and Industry. One therefore needs to achieve at least two key objectives if benefit-sharing is to be viable. The first is to rationalize water allocation *between* sectors within a given country. This would need arriving at a coherent national interest in water, in which many of the trade-offs needed would be negotiated at the sub-sovereign level. The second is to rationalize water allocation *between* sectors at the international level. It is the balancing of these two key areas – national interest versus sectoral interest – that would potentially unlock the type of value that would translate into incentives that are robust enough to induce hegemonic states to cooperate, and possibly concede some of their existing water allocation (Turton, 2008b). Conceivably a PNA model would be best suited for this purpose as such architecture enables the complex linkages that are needed to manage the wide range of potential benefits, such as energy, tourism, industry, agriculture and national security, both *between* riparian states and *within* each of those countries. Given the increased range of activities associated with benefit-sharing, these institutions will probably have to be matrix-styled in configuration (Nielsson, 1990; Turton and Earle, 2004), and will therefore differ fundamentally from traditional River Basin Commissions as we currently know them (Turton, 2008b). This places a major burden on institutional development, brought into sharper focus when one realizes that the capacity for institutional change is *the* critical variable when examining the literature on water and conflict (Wolf et al., 2003; Wolf, 2006). So, for example, national departments of agriculture, energy, health and industry would have to be better coordinated *within* each country as a primary objective, and then at a higher level *between* each riparian state as a secondary objective, if the potential benefits are to be recognized, and then shared as a by-product of closer cooperation (Turton, 2008b).

#### **No. 4. National security**

The traditional paradigm is state-centric in nature and consequently tends to be national security in its focus (Turton, 2003a), specifically in the context of developing countries in the SADC region, whether that is the primary objective of IWRM as a component of transboundary water management or not (see Hooper, 2006). This can be thought of as building security from the top down. In many cases, the state concerned is confronted by a range of threats (either real or imagined) to its survival (Buzan, 1991; Buzan et al., 1998), which in the context of a water-constrained economy, can lead to a compounding of the problem as hydrological insecurity becomes potentially equated to national security (Gleick, 1991, 1992, 1994; Wolf, 1995; Trottier, 1999; Daoudy, 2005). This introduces the issue of securitization of water resource management in countries where national security concerns are paramount (Buzan, 1991, 1994; Buzan et al., 1998; Warner, 2000). The consequence of this is that water resource management processes and their associated data can become classified (Warner, 1996; Turton, 2003b; Phillips et al., 2007) and thus removed from the realm of public debate (Buzan et al., 1998).

The proposed benefit-sharing approach is more regional in its orientation and involves human security as its focus. This acts as a potential desecuritizing force, placing both data and water resource management processes back in the public domain (Warner, 2000, 2008; Turton, 2003b, 2008b). In this regard, human security is the overarching rationale within which water resource management is embedded (Swatuk, 1996; Wolf, 1999b). While human security is a complex field of study in its own right, for the purposes of this paper it is defined in terms of three critical dimensions: freedom from

want; freedom from fear; and freedom from hazard impact (Brauch, 2005a, 2005b; Phillips et al., 2006). This more diffuse view of security enables the linkages to be made to specific aspects of the benefits being shared, including poverty eradication, legal reform based on the rule of law, and security from the impacts of natural disasters. This can be thought of as building security from the bottom up. Significantly, cooperation brings stability, becoming a global public good in the form of security (Nicol et al., 2001), which is associated with investor confidence and thus economic growth and development. Thus without the desecuritization dynamic brought about by a shift from national security (a top-down process) to human security (a bottom-up process), within the proposed benefit-sharing approach, the potential benefits embedded within the allocation of water at a high assurance of supply (Grey and Sadoff, 2007) will probably remain unrealized. Stated simplistically, it is here that the basket of benefits becomes larger and thus more attractive to those interested in receiving some of them, in the context of developing countries in water-constrained regions.

### **No. 5. Scale of optimization**

Given the national security focus of the traditional paradigm, the scale at which a given resource is optimized is at the level of the state, simply because it is perceived as being too risky to trust other riparians with elements of national survival like energy or food security. The recent global energy crisis, combined as it has been with food insecurity, has probably exacerbated this situation in some developing countries. For this reason one gets examples of blatantly unfair water allocation in closing river basins, such as that found in the 1959 Full Utilization of the Waters of the River Nile agreement (Phillips et al., 2006; Turton et al., 2006a), and the Incomati, Maputo and Limpopo river basins from which Mozambique has been generally left out (Turton, 2003b; Vas, 1999; Vas and Pereira, 1998). This is probably driven by a desire to improve security of supply by one riparian state, which merely cascades perceptions of national insecurity elsewhere in the same river basin. Typically, this is associated with a classic zero-sum dynamic, which has a high conflict potential inherent in it. In this regard, zero-sum means the gains of one party are the loss of the other party, such as in a game of tennis, where each party is an 'opponent' seeking to maximize his or her individual gain by minimizing the gain of the other. This is relevant in the context of SADC, given the interest by some riparian states to develop national water security by means of IBT and 'hard' hydraulic infrastructure (Heyns, 2002) (see figures 2 and 3), which could simply create a new driver for discontent (or dispute) if inadequately managed.

The proposed benefit-sharing approach seeks to optimize scarce water resources at a level of scale *above* that of the sovereign nation-state. In order to unlock this potential, a supranational grouping must be viable. An example of such a supranational grouping is the Southern African Development Community (SADC) that has created an enabling environment in which member states can begin to explore regional cooperation. Significantly, the SADC Protocol on Shared Watercourse Systems and its subsequent amendments have provided the legal and policy harmonization instrument to enable water resource management to become a driver of regional integration and poverty eradication (Ramoeli, 2002). A surprising level of policy harmonization has already been achieved (Hollingworth et al., 2004; SADC, 2004, 2006, 2007), with areas of common outstanding interest defined as effluent-related issues (SADC, 2003a), and agreement reached that this should happen incrementally and over time (SADC, 2003b). This is not inconsiderable by any means and is possible only because national security concerns have mostly been dealt with by means of desecuritizing water resource management, to the point where a hydro-political complex has started to emerge (Turton, 2003c, 2008a, 2008b, Ashton and Turton, 2005, 2008; Turton et al., 2006b). A hydro-political complex (of which there are two distinct types) is defined as existing when a nation's dependence on shared water systems – both surface water and groundwater – is of such a strategic nature that this dependence starts to drive interstate relations of potential cooperation (amity) or competition (enmity) in a discernable manner (Turton, 2003b, 2008a). If it is in the direction of amity, then a hydro-political complex emerges, such as that found in

the SADC region (Turton, 2003b, 2008b). If it is in the direction of enmity, then a hydro-political security complex emerges, such as that found between Turkey, Syria and Iraq at least until a decade ago (Schulz, 1995). This dimension of transboundary water resource management is largely absent from contemporary literature (Turton and Ashton, 2008). This is significant because Allan (1992, 1996, 2000, 2002) shows us that solutions to water deficits at the level of the watershed are found outside the water sector, in what is known as the "problemshed" (Earle, 2003). The failure to recognize this is probably what has prompted Beach et al. (2000) to lament the fact that states seem to be incapable of avoiding disputes in the face of mounting water scarcity, simply because they are locked into a level of optimization that is just too small to provide adequate remedies. In this regard it must be noted that a dispute is not the same as a conflict, both being on a continuum but at distinctly different levels of intensity (Wolf, 1998, 1999b, 2006; Wolf and Hamner, 2000; Wolf et al., 2003). This means that disputes are happening, mostly driven by increasing water scarcity, but are being mitigated by means of institutional capacity, again placing a spotlight on this dimension of water resource management. It is also possible to find both a dispute and a cooperation happening simultaneously in a given transboundary river basin (Kistin, 2007).

### **No. 6. Basket of options**

The traditional paradigm is narrow in focus because, as shown above, it views water as a stock; is constrained by fears of sovereign erosion and the resultant institutional architecture emerging from this; and possesses national security as a key focal point and consequently has the sovereign state as the unit of optimization irrespective of constraints imposed by hydrological and biophysical realities. The net result of the interaction of these key elements is that the basket of options is relatively small, typically manifesting as a water-sharing (or more accurately as a water-allocation) model. Significantly this has an inherent zero-sum dynamic, because a regime negotiated at a given moment in time, is not necessarily flexible enough to deal with unknown future issues (Kistin and Ashton, 2008). This means that the conflict potential is both intrinsic and high in some cases (Turton, 2003a). It must be clearly stated that this is a simplification of a complex real world, in which many drivers exist, including levels of inequality and poverty, but it is included here to make the point that as a result of these issues, the outcome is a limited basket of options. The significance of this is that it is the size of the basket of potential options that becomes the incentive for hegemonic states to cooperate, so if that incentive level is low, the status quo is likely to prevail, and hence a propensity towards potential conflict at the localized scale, in spite of the global trend towards cooperation (viz Conca and Dabelko, 2002).

The proposed benefit-sharing approach is broader in focus, because as shown above: it views water as a flux; is not constrained by fears of the erosion of national sovereignty arising from closer cooperation in the joint-management of a strategic resource; may manifest a matrix-styled institutional architecture potentially based on the PNA model; possesses a human-security focus unlocking a wider range of potential benefits; and the unit of optimization is a hydro-political complex at a level above the sovereign state or river basin. The outcome of these combined factors is the emergence of a larger 'pie' to be shared in a more creative way than simply by cutting up individual slices. More importantly however, this has an inherent positive-sum dynamic, which means that the conflict potential is attenuated as incentives to future cooperation that are jointly explored (Phillips et al., 2006). In this regard, positive-sum is taken to mean the opposite of zero-sum, with the gains of one party not necessarily equating to the losses of another (Turton et al., 2008b).

### **No. 7. Scale and remedy**

The traditional paradigm, purely by virtue of the configuration of the key elements noted above, tends to focus the minds of decision-makers on the state-level of scale. This is the probable reason why Beach et al. (2000) have concluded that despite the existence of international law and river-basin management institutions, states seem to be persistently incapable of finding appropriate remedies

when basin closure occurs. Typically, these remedies might include attempts to gain security of supply at the national level by building dams and IBTs, both of which are strictly supply-sided in their focus. This often results in the unintended consequences arising from such major disruptions to the natural hydrological characteristics reported by some researchers (Davies et al., 1993; McCully, 1996; Davies and Day, 1998; Snaddon et al., 1999), so an earlier problem (water insecurity) later becomes another more complex problem (ecological collapse, loss of biodiversity and consequently loss of system resilience to natural shocks), threatening the sustainability of the previous supply-sided solutions. This is highly relevant in the SADC case, given the interest by certain riparian states to prefer IBTs as a potential solution (Heyns, 2002) (figures 2 and 3).

The proposed benefit-sharing approach recognizes that interstate interaction is highly dynamic with a range of actors that are national, sub-national and supranational in nature (Meissner, 2005) so that it is possible to find examples of both conflict and cooperation occurring simultaneously in a given river basin (Kistin, 2007; Kistin and Ashton, 2008). This approach also builds on the important finding that sustainable remedies to water scarcity are typically located outside of the water sector (Allan, 1992, 1996, 2000, 2002; Earle, 2003). Central to this approach is the need to have an enabling environment conducive to the harmonization of regional laws and policies, such as that found in the SADC Protocol (Ramoeli, 2002), because this supports the emergence of a hydro-political complex above the level of the river basin, but below the level of the supranational economic and political grouping (Turton, 2003b, 2003c; Turton et al., 2006b; Turton and Ashton, 2008; Ashton and Turton, 2008). The important aspect to note in this regard is that there seems to be an inverse relationship between scale and the capacity to find a sustainable remedy. Stated simplistically, a local farmer is less capable of finding a solution to endemic and persistent water scarcity (other than to stop farming) than a government. The latter can introduce policies and incentives to trade, as well as initiate major engineering projects such as IBTs. This direct relationship between scale and capacity to source a viable remedy is an important aspect of the proposed benefit-sharing approach.

## **No. 8. Data**

A persistent trend in the management of hydraulically stressed (closing) river basins, in areas where economic growth and development are water-constrained, is the perception by the decision-making elites that data are precious and therefore in need of protection. This is particularly acute in developing countries where a recent history of conflict arising from wars of liberation has created a specific political culture (Porto and Clover, 2003; Turner, 1998). It is therefore a typical finding in any study on stressed transboundary river basins that data are not uniformly available to all riparians (Turton, 2003b). In extreme cases, these data can even be classified as secret (Warner, 1996; Buzan et al., 1998; Phillips et al., 2007), often when securitization processes have been deeply entrenched in river basins such as in the Nile (Waterbury, 1979; Collins, 1990; Hultin, 1995), the Jordan (Haddadin, 1992; Wolf, 1995; Allan, 2000; Jägerskog, 2002; Phillips et al., 2007), the Indus (Postel, 1999; Mohile, 2005), the Ganges (Swain, 1993; Rashid and Kabir, 1996), and the Tigris and Euphrates (Bari, 1977; Medzini, 2001; Daoudy, 2005). This non-availability of data to weaker riparians often reflects the power asymmetry in a given basin configuration and can become a reflection of the degree of hydro-hegemony in play (Zeitoun and Warner, 2006).

In the proposed benefit-sharing approach, the institutionalization of the process of water resource management starts off with the generation of an uncontested set of data (SADC, 2003b; Turton, 2003b). This results in the stimulation of institutional growth and learning with a new solution to the problem emerging as an inherent property of the process (Turton, 2003a). It is this new dynamic that enables a shift in the definition of the core problem over time (Turton, 2008b), which enables benefit-sharing to become a potential option.

## No. 9. Decision-making

Decision-making, in the context of developing countries, usually takes place against a background of imperfect knowledge (Turton, 2003a). This lies at the heart of what some scholars believe to be a defining variable in poverty eradication, namely the inherent inability of some developing countries to generate solutions to problems with ever-increasing levels of complexity, known as an "ingenuity gap" (Barbier and Homer-Dixon, 1996; Homer-Dixon, 1995, 1996, 2000; Walwyn and Scholes, 2006). This is particularly so where complex ecological problems arise such as those associated with the loss of dilution capacity in closing river systems or areas of endemic water scarcity (Awofolu and Fatoki, 2003; Bornman et al., 2005; Coetsee et al., 2002, 2006; Dalvie et al., 2003; Hobbs et al., 2008; Leaner et al., 2007; Oberholster and Ashton, 2008; Oelofse, 2008; Slabbert et al., 2007a, 2007b; Snaddon et al., 1999; Wade et al., 2002). This fact becomes relevant when the concept of threat perception is brought into the equation, because it is this threat perception that acts as an interceding variable, resulting in the propensity to assume the worst and act accordingly (Turton, 2003b). As a result of this the traditional paradigm, when applied in some developing countries with a recent history of violent conflict, entrenches decision-making that is fragmented, often driven by suspicion, and seldom informed by a complete and uncontested set of accurate data.

The proposed benefit-sharing approach is based on institutionalized knowledge with learning emerging as an inherent property of the basin management organization. Significantly, the institutionalization process develops a set of bureaucratic and legal procedures that limit the range of arbitrary actions a potential decision-maker can resort to (Turton, 2003a, 2003b). Stated differently, the need for a given decision-maker to assume the worst and act accordingly is attenuated by the evolution of data-management processes and institutionalized decision-making procedures (such as prior-notification and a recognized procedure for consultation between all riparians) that are robust enough to engender confidence and trust. The more the procedures are institutionalized the less the existence of the range for arbitrary action and, consequently, the greater the degree of confidence that emerges. This is a core element of the proposed benefit-sharing approach, because it creates the necessary institutional platform from which benefits can be shared with confidence as solutions are optimized at levels of scale other than the nation-state within the confines of a given river basin.

### Configuration of hydro-political dynamics

As shown above, the traditional paradigm, when practised in certain developing countries, has specific characteristics that collectively define a core property of the overall process. These characteristics are:

- A perspective of water based on a finite and definable stock.
- Sovereignty seen to be unbridgeable and absolute.
- Institutional architecture based on a regime consisting of the lowest common denominator with a narrow focus restricted only to seeing water as a stock allocated by defined rights.
- National security as an all-pervasive and primary concern impacting on all decisions.
- Scale of optimization at the level of the state within the confines of a given river basin.
- A basket of options limited by the perceptions of water as a stock and the scale of optimization as the state and basin.
- A scale of remedy that is national or sub-national in range, specifically because it is in this domain that the national security threat perceptions are best accommodated.
- Data are considered to be equivalent to power, which one does not easily give to one's rival (or 'enemy' depending on the threat perception), so data are not publicly available and might even be classified or restricted in extreme cases.

- Decision-making based on imperfect knowledge, mediated by an active threat perception that acts as an interceding variable in almost all cases.

The outcome of these nine factors is an inherent property of the overall "system" that is based on a zero-sum dynamic with the propensity to become destabilized in times of increased perception of threat and risk. This drives a dynamic process that sees a rapid escalation of tension as Riparian "A" interprets the actions of Riparian "B" against a background of imperfect knowledge, and is forced to apply the precautionary principle as it is appropriate to political decision-making under such conditions. Under those circumstances, it is logical to assume the worst case scenario and act accordingly, triggering an unstable chain reaction. Importantly, this means that the major concern of any riparian under these circumstances is likely to be a volumetric allocation of water only, which limits the range of options available. Benefit-sharing under these circumstances is thus unlikely, and probably a logical impossibility.

Conversely, as shown above, the proposed benefit-sharing approach also has specific characteristics, which collectively generate a different core property of the overall process. These characteristics are:

- A perspective of water based on a flux that is limited only by the degree of technology and collective imagination that can be mobilized.
- Sovereignty manageable by means of a core normative agreement that closer cooperation will never lead to a creeping erosion of sovereignty.
- Institutional architecture based on a series of agreements, covering a wide range of issues including regional integration, collective security, and the harmonization of laws and policies, which enable a new level of optimization to be generated within the context of a hydro-political complex nested in a viable supranational institutional grouping.
- National security is less pervasive because of confidence-building measures that institutionalize behaviour, reducing the range of arbitrary options available to potential rogue states.
- A scale of optimization above the level of the state within a broader hydro-political complex that is nested in a viable supranational institutional grouping.
- A basket of options not limited by the above, particularly by the perceptions of water as a flux and the scale of optimization as the hydro-political complex.
- A scale of remedy that is supranational in range, made possible by means of the evolution of robust institutions that entrench confidence and attract foreign direct investment needed to integrate local economies into the regional and global economy.
- Data are considered to be the building block of institutions and confidence, and are managed to the extent that institutional learning starts to change existing threat perceptions and allows for new solution-thinking beyond the relatively limited scale that the nation-state offers.
- Decision-making based on institutionalized knowledge capable of growing and adapting to challenges, with no active threat perception as a major interceding variable to mediate the overall process.

The outcome of these nine factors is an inherent property of the overall 'system' that is based on a positive-sum dynamic with increased robustness and resilience. This drives a dynamic process that de-escalates tensions, but more importantly, generates confidence in both decision-makers and foreign investors. As a direct result of this dynamic process, non-volumetric allocations are possible as a larger basket of benefits is defined and brought to the negotiating table. Benefit-sharing under these circumstances consequently has the capacity to unlock considerable value that remains latent in the traditional paradigm when applied to water-constrained states with a recent history of violent conflict.

A comparison of the traditional paradigm and the proposed benefit-sharing approach, based on the nine key elements developed in this paper, is presented in table 1.

Table 1. Comparison of the traditional paradigm and the proposed benefit-sharing approach.

Element	Traditional paradigm	Benefit-sharing paradigm
Perspective on water	Water is treated as a finite stock.	Water is treated as a less finite flux with technological capacity becoming a key variable (Homer-Dixon, 2000).
National sovereignty	Fear of the erosion of sovereignty stunts institutional development (Turton, 2002).	Sovereignty is never eroded by agreement potentially using a PNA model (Nielsson, 1990).
Institutional architecture	Centralized decision-making and hierarchical structure within the context of a negotiated regime (Conca, 2006).	Decentralized decision-making in a matrix-styled structure potentially within the context of a PNA model (Nielsson, 1990; Turton, 2008b).
National security	Water resource management is subsumed to national security concerns, trying to cascade security from the top down.	Human security generates many types of benefits that can be shared, building security from the bottom up.
Scale of optimization	Level of the state within the context of a river basin results in a smaller range of potential solutions.	Level of the hydro-political complex above the state and basin results in a larger range of potential solutions (Ashton and Turton, 2008a; Turton and Ashton, 2008; Turton, 2008b).
Basket of options	Limited by viewing water as a stock with the scale of optimization being the state and basin.	Broader in focus, because water is viewed as a flux, with the scale of optimization being the hydro-political complex.
Scale and remedy	The potential impact of the remedy is limited by the lower scale of optimization.	The remedies to water constraints are sourced outside of the water sector (Allan, 2000) in a hydro-political complex.
Data	Sometimes classified, generally not freely shared and usually contested (Warner, 1996; Phillips et al., 2006).	Declassified, freely shared, institutionalized and usually uncontested (Turton, 2003b; 2008b).
Decision-making	Centralized and hierarchical designed to protect against the erosion of sovereignty, but always taken against a background of imperfect knowledge and mediated by the prevailing threat-perception (Turton, 2003a).	Decentralized and matrix-styled with fears of the potential erosion of sovereignty attenuated by a possible PNA model (Nielsson, 1990). Institutionalized data attenuates the background of imperfect knowledge.
Resulting configuration of hydro-political dynamics	Zero-sum, competitive and unstable in its fundamental configuration, with a high potential for conflict (Phillips et al., 2006).	Positive-sum and stable in its fundamental configuration, with a growing incentive for cooperation (Turton et al., 2008b).

## CONCLUSION

This paper constitutes an attempt to piece together many smaller components and ideas that are already in existence, albeit in disconnected and incomplete format. The paper is predicated on the assumption that paradigms define problems and therefore impact on solutions by limiting options. It is therefore argued that the traditional paradigm will, in all probability, prevent water from being the potential driver of the economic growth and regional integration that is so needed in some parts of the developing world, where a recent history of violent conflict coincides with water-constraints to future economic growth and prosperity. The evolution of South Africa, from a pariah state managed by an illegitimate government, to a vibrant democracy, has provided the opportunity for testing new ideas, some of which have been presented here. In the overall context of SADC, those ideas are already evolving into a new benefit-sharing approach (Turton, 2008b, 2008c), potentially capable of being applied in geographies well beyond our own immediate reach. This paper argues that there are at least nine critical elements of such an approach, and shows how each of these differs from the traditional paradigm.

There are also a number of distinct advantages and disadvantages associated with each.

The advantage of the traditional paradigm is that it is simple in configuration with a high degree of state-control where fears of sovereign erosion or national insecurity prevail. The disadvantage of the traditional paradigm is that it is inflexible and forces sub-optimal solutions to be generated by virtue of the smaller scale of optimization in play. Stated simplistically, the trade-off for direct control is a limitation to the possible remedy. The advantage of the proposed benefit-sharing approach is that it generates a larger basket of benefits that can be potentially shared by virtue of the higher scale of optimization in play, especially within a hydro-political complex. The disadvantage of the proposed benefit-sharing approach is that institutional arrangements are complex, because of the potential PNA model and resultant matrix-styled linkage between the larger numbers of government ministries involved. Stated simplistically, the larger basket of potential benefits comes only when direct control is loosened, but a more complex set of institutional arrangements remains a challenge. As with everything else in life, there are no free lunches and one ends up getting only what one pays for (or is prepared to risk).

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