

CHAPTER 1

An introduction to the hydropolitical drivers in the Okavango River basin

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Introduction

The Okavango river basin is one of the last near pristine aquatic ecosystems on the African continent. This ecosystem is extremely complex, with occasional links to the Zambezi River via the Selinda spillway, which backs up in times of high flow in the Cuando/Chobe/Linyanti and floods into the Okavango Delta. There is also a downstream hydraulic connection from the outflow of the Okavango Delta to the Makgadikgadi salt pans, which are also fed via the Nata River from Zimbabwe. The whole Okavango system is endoreic in nature, with the floodwaters of both the Cuito and Cubango rivers that rise in the well-watered Angolan highlands, ‘disappearing’ into the sands of the Kalahari Desert and the ‘thirsty’ atmosphere above the Okavango Delta. The two downstream riparian states on the Okavango system – Namibia and Botswana – are extremely arid countries. In fact, the Kavango (as it is known in Namibia), or the Okavango (as it is known in Botswana), is the only exploitable perennial river that flows through the territories of both these sovereign states.

Angola, as the upstream riparian state, is relatively water rich, straddling five transboundary river basins (Cunene, Cuvelai, Okavango, Zaire and Zambezi). Yet, Angola has been debilitated for almost three decades, first by a war of independence, then a civil war that destroyed much of the country’s infrastructure. This created a legacy of starvation with the massive internal displacement of people, while the upper reaches of the Okavango River basin became littered with thousands of landmines and other items of unexploded military ordinance. Finally, given the unique characteristics of the Okavango Delta, which forms part of a large Ramsar site, the whole river system can be regarded as being an ‘internationalised’ basin, with a range of stakeholders that extend beyond the norm for most transboundary rivers in Africa. In short, the Okavango River and its associated terrestrial and aquatic ecosystems pose significant challenges for the modern trend towards the integrated water resource management of the entire basin.

Why is the Okavango River basin so important?

It is argued in this book that the Okavango River basin is important for three major reasons. First, it is the last near pristine river system in Africa. It is described as ‘near

Map 1

The distribution of perennial rivers in Africa



Note: Sites where disputes over water have occurred are indicated on the map with circles.

pristine', because it has already been adversely affected during the last four decades by the construction of veterinary fences in the Botswana portion of the catchment (Pearce 1993). These have destroyed the centuries-old seasonal migration paths of plains animals that would move in great numbers from the Kalahari and Namib deserts, and the Makgadikgadi pans, into the Okavango Delta, the Savuti/Chobe/Linyanti complex and the Zambezi basin around the Victoria Falls area. In fact, one of the current features of the lower reaches of the Okavango basin is the large number of elephants, whose population growth is resulting in significant habitat destruction. Further, the Okavango River system is but one component in a complex ecological web of crosscutting linkages, embracing perennial rivers, seasonal wetlands and varying types of desert and semi-desert, with water availability in both spatial and temporal terms being one of the fundamental driving variables. Yet, ecosystems are not only important for plants and animals. They also support human activities and entire economies, and their health is a critically important precondition for political stability, particularly in semi-arid regions.

Secondly, the Okavango River basin is strategically important for all three riparian states. For Angola, the upper reaches are located in an area of relative water abundance that used to be part of the area traditionally controlled by UNITA, one of the belligerents in this country's protracted civil war. In the immediate post-war era, the government of Angola is confronted by the pressing need to relocate large numbers of internally displaced refugees, to demobilise former combatants and integrate them into some form of sustainable economic activity, while generally 'jumpstarting' the economy. The mobilisation of water resources is one of the key elements in developing a sustainable economic future if the threat of a return to civil war is to be averted.

For Namibia, the Kavango River is one of the most important sources of perennial water available in the entire country, together with the four other perennial rivers (Cunene, Cuando/Linyanti/Chobe complex, Zambezi and Orange) that form part of the borders of the country. Ironically, these border rivers are located far from those areas where the need for water is most pressing. Advanced planning envisages a pipeline from the Kavango River at Rundu, linking into the Eastern National Water Carrier at the town of Grootfontein (CSIR 1997; Ashton & Manley 1999; Ashton 2000a; 2000b; 2002). For the government of Namibia, this pipeline is seen as a form of 'insurance policy' that will enable existing (internal) water resources to be used when available, secure in the knowledge that if they fail, the Kavango River would always be there as a reliable backup.

For Botswana, the Okavango Delta supports a key component of the country's growing tourist industry and sustains many thousands of rural inhabitants in a harsh environment that is made habitable only because of the relatively predictable availability of water. In the past, the Okavango Delta was seen as a potential source of supply for mining and industry (UNDP/FAO 1976; Trolldalen 1992; Scudder et al 1993), but the plans have been shelved. After the initial announcement of Namibian plans to build the proposed pipeline, tensions arose that were fuelled largely by irresponsible and

inaccurate media reports (Weekly Mail & Guardian 1996a; 1996b; Electronic Mail & Guardian 1997; Ramberg 1997), but these have subsided, at least between the members of the Permanent Okavango River Basin Water Commission (OKACOM) (Treaty 1994). As expected, media rhetoric generally continues to be sensationalist and seldom provides an accurate or balanced reflection of the reality of the situation.

The Okavango River basin presents a classic example of potentially opposing national interests when prioritising strategic concerns over the use of transboundary waters. Central to this is the dominant paradigm that is based on sovereignty as a fundamental component. Significantly, Wolf (2002a) refers to the sensitivity that sovereignty poses in the management of transboundary waters, and supports the notion of coordination rather than integration as was proposed by Turton (1999; 2002a). This consequently serves to highlight one of the central challenges for OKACOM: how to develop policy for the integrated management of the water resources in the Okavango River basin to the mutual benefit of all three riparian states, without the individual states losing their sovereign control over these resources. This is a huge challenge, and one that this book addresses.

Thirdly, the Okavango River basin can be seen as a key component of a Southern African hydropolitical complex (Turton 2001a; 2002b; 2003a; 2003b; 2003c). The logic behind this is based on the broad security complex theory of Buzan (1991:210) and Buzan and others (1998), which Schulz (1995) has refined to apply to river basins where water scarcity becomes linked to the national security aspirations or threat perceptions of the respective riparian states. In this regard, the Southern African hydropolitical complex is said to be centred in the four most economically developed countries in Southern Africa – South Africa, Botswana, Namibia and, to a lesser extent, Zimbabwe (once economically powerful, it has now been reduced to near economic ruin as a result of the emergence of a kleptocratic government model). These countries are all riparians in two pivotal transboundary river basins – the Orange and Limpopo – and also share other international rivers with less developed neighbours – Zambezi, Cunene, Okavango, Incomati, Maputo, Pungué and Save (see Turton 2003c for more details). This proposed hydropolitical complex (Turton 2002b; 2003c) links the four most economically developed countries in the Southern African Development Community (SADC) with seven other less developed states via nine shared transboundary river basins (see figure 1). Planned linkages or transfers of water between transboundary river basins are examples of the interconnected nature of transboundary rivers that are central to the concept of a hydropolitical complex in Southern Africa (Turton 2003a; 2003b; 2003c), among others:

- the mooted Chobe/Vaal water project (Borchert & Kemp 1985; Borchert 1987; Trolldalen 1992:138);
- the Senqu linkage with the Vaal/Orange (Ninham Shand 1956; Young 1961; Carter 1965; James 1980; Blanchon 2001);
- the mooted Zambezi/Vaal connection that involved parts of the Okavango basin (Midgley 1987:15; Scudder et al 1993:263);

Figure 1

The Southern African hydropolitical complex as encapsulated in the first hypothesis

Riparian state	International river basin								
	Pivotal basins		Impacted basins						
	Orange	Limpopo	Okavango	Cunene	Incomati	Maputo	Pungué	Save	Zambezi
Namibia	PS		PS	PS					PS
Botswana	SC	PS	PS						PS
South Africa	PS	PS			PS	PS			
Zimbabwe		PS					PS	PS	PS
Angola			IS	IS					IS
Mozambique		IS			IS	IS	IS	IS	IS
Swaziland					IS	IS			
Lesotho	IS								
Zambia									IS
Malawi									IS
Tanzania									IS

PS = pivotal state IS = impacted state SC = special case

Source: Turton, 2002b; 2003c

- the mooted Zambezi/Limpopo linkage (Heyns 2002:167); and
- the mooted Congo/Zambezi/Okavango linkage (Heyns 2002:166).

The significance of this hypothetical condition is profound. If a hydropolitical complex does in fact exist in the SADC region, then the way that transboundary rivers are managed becomes a strategic regional concern if peace is to be a lasting condition. In fact, it can be argued, that the New Partnership for Africa's Development (NEPAD) will likely fail if transboundary waters are not effectively managed. This rather bold statement is based, in the first place, on the fact that NEPAD is about poverty

alleviation. One of the core indicators of poverty is the lack of access to safe drinking water and basic sanitation, a condition that exists in most of the Okavango River basin and elsewhere in Southern Africa. Secondly, NEPAD is about economic development and sustained growth. It can be argued that this noble ideal simply cannot be realised if water supply is not secured to the extent that agriculture and industry can thrive, and new investments can be attracted to the SADC region. Why would any foreign investor consider investing capital in a region that has a history of political instability, and lacks the basic hydraulic infrastructure on which to develop future economic prosperity? Thirdly, NEPAD is about good governance. It can be argued that there is no better way to cultivate good governance than in the management of shared water resources, because water is ultimately basic to all human existence. In fact, the management of shared water resources via *waterschappen* (loosely translated as 'water cooperatives' for the management of flooding) became the very foundation on which democracy grew in the Netherlands.

The management of transboundary rivers such as the Okavango is a critical component of the future economic security of the respective riparian states. It can be argued that this aspect alone, given the unusually large number of transboundary rivers that occur in the SADC region, can become one of the foundations of the subsequent functional integration of SADC. This could occur in much the same way that the modern-day European Union (EU) evolved over time from the smaller European Economic Community, the European Atomic Energy Community (or Euratom) and the European Coal and Steel Community. Seen in this light, the management of transboundary waters in Southern Africa holds the key to either a political culture of cooperation, or one of conflict. The Okavango River basin can therefore be regarded as ideal material for a classic case study of the need to avoid conflict and promote cooperation if lasting peace with sustained economic growth and satisfactory human development is to become the norm in future.

Origin and purpose of this book

During the Second World Water Forum held in The Hague in 2000, one of the issues that were raised as pressing needs was the management of transboundary rivers. Driving this need was the then dominant 'water wars thesis' that saw violent conflict becoming the norm in water scarce parts of the world in the near future (Solomon & Turton 2000). Green Cross International, a non-governmental organisation (NGO) with a strong environmental security agenda, led the way by hosting the National Sovereignty Panel (Curtin 2001; Turton 2001b; Heinzen 2001) where it launched two reports on *National sovereignty and international watercourses* (Green Cross International 2000a) and *Water for peace in the Middle East and Southern Africa* (Green Cross International 2000b). The National Sovereignty Panel, consisting of Mikhail Gorbachev (chairperson and former president of the Soviet Union), Sir Ketumile Masire (former president of Botswana), Fidel Ramos (former president of

the Philippines) and Ingvar Carlsson (former prime minister of Sweden), laid the foundation for the *Water for peace* programme.

Concurrently, Wolf's work at Oregon State University on the transboundary freshwater dispute database provided empirical evidence that water resource management tends to be a catalyst for peace rather than conflict. This has subsequently led to the emergence of a new school of hydropolitical thought (Wolf 2002a; Turton & Henwood 2002) that seeks to focus on understanding the fundamental drivers of potential conflict in order to mitigate such conflict and stimulate cooperation. This has led, among others, to the establishment of the Universities Partnership for Transboundary Waters that seeks to develop knowledge and textbook material for use in future training and research programmes.

Green Cross International provided funding via the Department of Development Cooperation of the Royal Dutch Ministry of Foreign Affairs and the Swedish Foreign Ministry to undertake research on the Okavango River basin as part of its *Water for peace* programme, which involves six international river basins (Danube, Jordan, Volta, Okavango, La Plata and Volga). The programme is coordinated by Green Cross International and UNESCO at the Third World Water Forum in Kyoto in 2003. The objective of the *Water for peace* programme is to promote peace in the use of transboundary watercourses by addressing conflicts (and potential conflicts) and fostering cooperation among states and stakeholders. The ultimate goal is to facilitate the integrated management of shared water resources for the benefit of all parties (Green Cross International 2002:5).

This book is a product of the Green Cross International *Water for peace Okavango pilot project* managed by the African Water Issues Research Unit (AWIRU) of the University of Pretoria. It draws upon other like-minded initiatives that have been developed since the Second World Water Forum. The broad objectives of this book are to:

- support OKACOM, as the legitimate intergovernmental agency responsible for the management of the Okavango River basin, in the generation of knowledge that will be useful in the development of alternative policy options;
- foster a healthy relationship between OKACOM and the scientific community, by sensitising the latter to the needs of the former, and by cultivating a professional environment where future research needs can be appropriately articulated, properly coordinated and sustainably funded in a manner that is conducive to the development of appropriate knowledge;
- map the hydropolitical dynamics of the Okavango River basin in sufficient detail so that OKACOM commissioners can understand the basic drivers of potential conflict and be able to avoid it, while cultivating the dynamics of cooperation instead;
- initiate the development of adequate policy for consideration by OKACOM that will suit the needs of the three riparian states as they strive to attain their independent national development objectives, while attempting to reach

convergence around a set of common core values and goals, thus institutionalising the existing cooperative sentiments;

- generate accurate case study material for consideration by riparian states on any of the other 14 international river basins that exist in the SADC region;
- build sustainable capacity, among others, within the SADC Water Sector by generating African literature on African water issues; and
- contribute meaningfully to the changing water management paradigm that is shifting from a rights-based approach towards a more equitable benefits-sharing approach.

Central to the attainment of these objectives are two key initiatives:

- The *Water for peace Okavango pilot project* held a workshop in Maun from 9-11 September 2002. It was funded by both the Dutch and Swedish foreign ministries through Green Cross International and managed by AWIRU. The workshop enabled OKACOM commissioners to meet outside their scheduled OKACOM meetings for the first time, and to present a joint paper on their vision for the future. A number of leading researchers also had the opportunity to present specialist input for consideration by OKACOM. These papers have been edited for publication in this book.
- The European Union currently funds the project on *Water and ecosystem resources in regional development* (WEERD) in the Okavango basin. AWIRU is responsible for the development of a series of policy-related papers for consideration by OKACOM in the WEERD project. These papers will be largely informed by the outcome of the *Water for peace Okavango pilot project*, thereby linking apparently disconnected initiatives into a more sustainable and cohesive endeavour.

Hypotheses

This book is based on three hypotheses, which it seeks to develop. The first hypothesis is related to the existence of a hydropolitical complex in Southern Africa (see figure 1 above). Seen through this conceptual lens, it would be a mistake simply to analyse the actions of the riparian states in the Okavango River basin. These same states are also co-riparians in other transboundary river basins and diplomatic negotiations over one basin can cascade into other basins. For example, the three Okavango riparian states could be potential rivals in issues arising from the Okavango River, but could conceivably form a coalition and thereby increase their negotiating power in deliberations on the future management of the Zambezi River where they are also riparians. The same holds true for the Orange River, where Botswana and Namibia could form a coalition and thereby enhance their joint negotiating position with South Africa and Lesotho in the Orange/Senqu River Commission (ORASECOM) (Treaty 2000). These shifting patterns of potential amity and enmity

that would otherwise go undetected, can be analysed in terms of a hydropolitical complex.

The second hypothesis relates to the development of a new definition of hydropolitics that moves away from the existing bias towards water and conflict and focuses instead on cooperation potential (Turton 2002c). Hydropolitics is thus defined as the systematic study of the authoritative allocation of values in society with respect to water (Turton 2002c). This new definition embraces the dynamic aspects of water resource management, while including the elements of scale and range, all highly relevant to the Okavango River basin.

The third hypothesis is based on the empirical work of Wolf (1998; 2002b) and Wolf and Hamner (2000). When interpreted in the broadest sense, their research indicates two critical hydropolitical phenomena that have to be better understood:

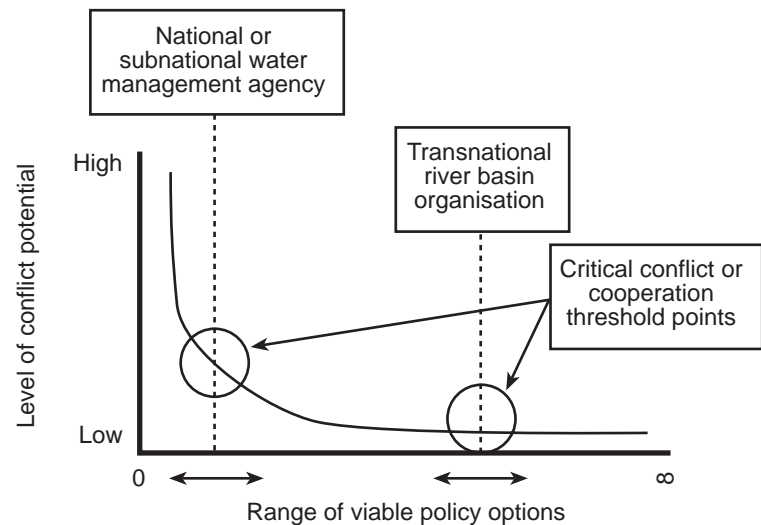
- There is a propensity to cooperate rather than to fight over shared water resources.
- The likelihood of violence over water is inversely related to the scale of interaction.

Based on empirical evidence, an individual rather than a country is more likely to use physical violence in seeking recourse to a perceived water injustice. This is particularly relevant in Southern Africa where protracted civil war has been the norm, and where large numbers of weapons and an array of military ordinance are readily available. This evidence also highlights the need to develop viable ways of reintegrating former combatants into the economy and rehabilitating them through the implementation of skills development programmes.

These deductions are interpreted in the third hypothesis (see figure 2). Conflict potential increases dramatically in a non-linear fashion, as the range of potential coping strategies, expressed as the number of viable policy options, tends towards zero. The likelihood that a cooperative spirit will develop increases dramatically in proportion to the available number of viable policy options. In other words, the greater the number of viable policy options, the greater the likelihood of peaceful coexistence and cooperation within a given system.

The third hypothesis thus postulates that the reason for lower levels of conflict potential between countries is related to the wider range of remedies that are available in the international political economy – the so-called ‘watershed’ versus ‘problemshed’ scale of analysis (see chapter 11; Allan 1998; 1999; 2000; 2002; Turton 2000). Conversely, the reason for the higher conflict potential when moving closer to the level of the individual is probably related to the limited range of available coping strategies. Consequently, it is hypothesised that the critical element contained in the empirical findings made by Wolf (1998; 2002b) and Wolf and Hamner (2000) is the range of available coping strategies, or stated differently, the range of viable policy options that can be developed. This ties in with the work of Ohlsson (1999), Ohlsson and Turton (1999), Turton and Ohlsson (1999), Turton (2002d; 2002e) and Turton and Warner (2002) that identified ‘second-order resources’ as the key determinants – the social resources needed to develop a viable range of coping strategies during times of

Figure 2
Relationship between conflict potential and the range of viable policy options in a given transboundary river basin



drought or flood, along with the capacity to develop institutions and negotiate compromises. A rational person will only fight over water once all other options have been exhausted, or if this individual perceives that no other options are available.

There are two critical threshold points in policy development that have to be carefully understood in terms of this hypothesis.

The first relates to the management of water resources at the international level, as conflict can potentially arise at this level if there are insufficient viable policy options. This is likely to be the main focal point for organisations such as OKACOM, and will certainly be an important and welcome outcome of the WEERD process. In terms of the third hypothesis, conflict potential is lower at the international level because the respective governments have recourse to a wider range of potentially viable policy options. The dotted line (specifically the one on the right) in figure 2 is thus capable of shifting either to the left or to the right. The ideal is for the dotted line to be as far as possible to the right, where a wide range of viable policy options attenuates any potential conflict. It is possible, however, for the dotted line to be located further to

the left, where the two critical conflict or cooperation threshold points can converge, resulting in acute conflict. In terms of the third hypothesis, acute conflict could potentially occur when a river basin organisation is incapable of generating a wide enough range of viable policy options to accommodate the needs of all the riparian states, thereby allowing conflict to erupt. This is clearly an undesirable condition and should be avoided at all costs.

The second relates to the subnational scale, where a marked increase in conflict potential arises, as the range of viable policy options tends to zero. This is unlikely to be the main focal point of OKACOM deliberations as this occurs at the subnational level and is therefore within the sole competence of the national government concerned. However, OKACOM can play a major role in harmonising policy in order to mitigate against this possible outcome.

These three hypotheses can be used by the reader as a backdrop to the information presented by the different authors. The aim is to achieve a greater degree of conceptual clarity, while contributing to the development of hydropolitics as a scientific discipline, with both explanatory and predictive capabilities.

Structure of the book

This book brings together a variety of specialists, each with a unique writing style. No attempt was made to change the style of presentation, as this represents the individual perspective of each contributor.

However, the reader's attention is drawn to one key issue. The construction of knowledge is a fundamental element in the study of hydropolitics, because this is central to the position taken by respective riparians vis-à-vis specific issues, and the subsequent case that they develop to support this position during negotiations. In the case of the Okavango River basin, perhaps the main difficulty relates to disagreements between stakeholders over the use of scant and often incomplete baseline data on river flows and the extent of inundated area within the Okavango Delta. This situation is not unique to the Okavango system. Indeed, it is a characteristic of almost all African river systems: the available data are often sparse, incomplete or span a very short period of time. However, given the importance attached to the unique Okavango system, this feature has assumed greater importance among stakeholders. There is therefore a strong case to be made for stakeholders to reach agreement on the available baseline data relating to all issues relevant to the future management of the Okavango River basin (see box 1 for details of the extent of variation in the area of the Okavango Delta).

A second, associated problem relates to the fact that some authors may present a case from the perspective of a specific riparian state. If stakeholders disagree with any of the statements made, there is a tendency to dispute the correctness of the numbers used in support of the original argument. This further emphasises the need for stakeholders at all levels to reach agreement on the accuracy or 'acceptability' of the

Box 1**The extent of the Okavango Delta**

Many reports on the Okavango Delta have used widely different figures to delineate the area and extent of this unique wetland system. This situation has arisen because of the incomplete understanding of the dynamic nature of the Okavango Delta, different opinions on which ecosystem components actually constitute the Okavango Delta system, and differing perspectives held by individual authors. Unfortunately, this confusion hampers efforts to improve the understanding of the Okavango Delta, and constrains the ability to reach consensus on suitable management approaches for the system as a whole.

The area of the Okavango Delta fluctuates between 6,000 and 8,000 km² during the dry season to approximately 15,850 km² during the flood season. Erratic regional rainfalls across the Okavango catchment cause significantly variable river inflows and these, in turn, give rise to the highly variable pattern of flooding in the Okavango Delta. The precise pattern and extent of flooding each year depend on antecedent conditions (extent and duration of previous floods), as well as the timing and duration of rainfalls in the catchment and direct rainfalls onto the Okavango Delta (Wilson & Dincer 1976; McCarthy & Ellery 1998; Ashton & Manley 1999). The rising and falling flood pattern each year also determines the spatial extent of the different ecosystem components within the Okavango Delta (Ellery & McCarthy 1994; Ashton & Manley 1999; Gumbricht et al 2002).

The Okavango River enters Botswana as a single broad river, approximately 200 metres wide and 4 metres deep, which meanders within a broad floodplain (the so-called 'Panhandle') before branching out to form the Okavango Delta. The Okavango Delta consists of a series of permanent river channels, semi-permanent drainage channels, lagoons, islands and floodplains that link up and then separate again during the course of an annual flood. Several habitats can be recognised in the Okavango Delta, including permanent swamps that are permanently flooded, seasonal swamps that are dominated by seasonally flooded grasslands, and over 150,000 islands that vary in size from several metres to tens of kilometres across (Smith 1976; Ellery & Ellery 1997; Gumbricht et al 2002). A number of extensive dryland savannah habitats known as 'sandveld tongues' extend into the Okavango Delta from the surrounding Kalahari and form important terrestrial ecosystem components within the system.

available baseline data. This is highlighted by the fact that, while there is agreement at national level between the respective Departments of Water Affairs in Namibia and Botswana on the 'correctness' or 'accuracy' of the available data for river flow volumes measured at Mohembo, other stakeholders have questioned the validity of the data. Clearly, the responsibility for 'accepting' the validity of the data or deciding that the data is 'acceptable' rests with the respective government department with line function responsibility for custodianship of the water resources in the Okavango Delta.

Another example of this type of problem is the debate about the extent of the Okavango River basin, which is hydraulically part of the Zambezi (at least on the extremely rare occasion of high floods in the Chobe/Linyanti), while the most affected riparian states have agreed among themselves that, for the purposes of management, the Okavango basin consists of three riparian states – Angola, Namibia and Botswana. Thus, the Nata River arises in Zimbabwe, but is not considered to be part of the Okavango River basin, since it only flows into the terminal Makgadikgadi Pan system. This is entirely in accord with accepted scientific approaches, both geographical and hydrological, which consider the Nata and Okavango rivers to be distinct parts of the larger Makgadikgadi system. The intellectual integrity of the authors included in this book is respected by the editors, who are neither actively promoting the dissemination of factually incorrect data, nor responsible for the accuracy of data included in the book. Instead, the data is presented by the respective authors at their own discretion, without input by the editors, who choose to remain impartial. Authors should be able to defend data in subsequent interactions between themselves and other interested scientists, as policy positions are prepared in the near future.

This book has been structured around a core logic involving three sections:

- Section 1 provides an introduction to the hydropolitical dynamics of the Okavango River basin. The intention is to introduce the reader to the range of issues found in the Okavango River basin. Although these issues are all important, some can be regarded as critical drivers. The latter can consequently be considered as independent variables in their own right, whereas others are mediating factors that could act as dependent or interceding variables.
- Section 2 presents detailed conceptual perspectives. These will equip the reader with greater conceptual depth and thus provide an enhanced understanding of the context in which the overall hydropolitical problematique is embedded.
- Section 3 draws these elements together in a conclusion aimed at laying the foundation for further detailed assessment of the hydropolitical complex of the Okavango River basin. It is from these hydropolitical assessments that future policy development will emerge.

Section 1 consists of seven chapters (including this introduction). The contribution by Peter Ashton and Marian Neal (chapter 2) introduces the reader to a number of strategic issues relevant to the Okavango River basin. In particular, the complexity

surrounding the actual size and component parts of the basin is presented in an accessible manner. This issue is extremely important. Two of the criteria for agreement on water allocation in terms of the Helsinki Rules are the extent of the basin area in each riparian state, and the relative contribution to streamflow by each riparian state. One of the drivers of the overall hydropolitical process in the Okavango River basin is the extreme variability of streamflow, which is introduced in this chapter. The central role of sovereignty is also introduced, along with an analysis of key international legal principles and existing international treaties on water of which the respective riparian states are signatories. The central need to share data in terms of the Helsinki Rules is touched upon, and is further elaborated in the contribution by Anthony Turton (chapter 4). The major contribution of chapter 2 is the conceptualisation of the five strategic issue groups – external geographic characteristics, system characteristics, external groups, socioeconomic drivers and impacts, and the basin states themselves – showing how they impact on one another, and on the Okavango catchment, the Okavango Delta and the Makgadikgadi catchment. This will go a long way in assisting with the development of future policy options.

João Porto and Jenny Clover present an overview of the peace process in Angola in chapter 3. This is undoubtedly one of the great unknown aspects of the overall hydropolitical equation in the Okavango basin. The truth is that the Okavango Delta is still relatively pristine because the civil war has prevented the development of hydraulic infrastructure in the upper reaches of the basin. Details of the peace process are analysed, and the conclusion is made that a return to war is highly unlikely. Several pressing needs are highlighted, among them the relocation of internally displaced people in time to plant the next crop and thus avert a humanitarian crisis, as well as the disarmament of belligerents and their integration into the economy.

The contribution by Anthony Turton (chapter 4) focuses on the need to share data as an element of the desecuritisation of water resource management. This chapter deals conceptually with two forms of peace – negative peace and positive peace – and two forms of security – supply security and national security. These are all key drivers of the hydropolitical process in the Okavango River basin. A model is developed that links the four concepts. The problematique of potential securitisation is identified within the context of a hydropolitical complex, which was presented earlier in this introductory chapter as the first hypothesis. The role of data is analysed in the context of institutional development, where it is shown that two distinct elements are necessary. The first is the capacity to generate data, whereas the second is the capacity to legitimise such data and the methodologies used to interpret it, as critical elements in institutionalising the conflict potential and building sustainable and harmonious cooperation between the various riparian states. This is highly relevant to the third hypothesis that has suggested that potential conflict is mitigated by the availability of a wide range of viable policy options. Without the capacity to collect, process, interpret and accept data, the capacity to generate viable policy options within OKACOM will remain absent.

The three riparian states, in a joint chapter, present the OKACOM perspective, along with a brief history of the organisation (chapter 5). Isidro Pinheiro from the Angolan government, Piet Heyns from the Namibian government and Gabaake Gabaake from the Botswana government are the authors of this chapter. It provides an insight into the Okavango River basin from the perspective of each of the riparian states, as well as some detail of the proposed pipeline in Namibia. As far as can be ascertained, this is the first time that OKACOM has written a combined document of this nature that reflects a common vision.

The chapter by Larry Swatuk provides a philosophical approach to the management of the Okavango Delta as a Ramsar wetland (chapter 6). The focus on the delta highlights the need to manage the Okavango River basin as a whole if the management of the delta is to be successful. It also builds on the notion of variability that Ashton and Neal introduced in chapter 2. Swatuk laments the fact that national interest and state sovereignty are factors in the hydropolitics of the Okavango River basin, as they are seen as problems rather than solutions. This is broadly consistent with the work by Turton (1999; 2002a) and Wolf (2002a), opening up the prospect for the examination of the potential for policy coordination as opposed to policy integration in future.

Ruud Jansen and Masego Madzwe-muse present details of recent research by the IUCN into the evolution of a management plan for the Okavango Delta in chapter 7. This plan has been the subject of wide consultation to date and is in a relatively advanced stage of development. The critical need to harmonise the Okavango Delta Management Plan with the Okavango Basin Management Plan is introduced for consideration as a future focus of policy development.

Section 2 is structured around chapters that deal with conceptual perspectives, in an attempt to contextualise fundamental processes occurring in the Okavango River basin within a more conceptually sophisticated discourse. The contribution by Alan Nicol (chapter 8) draws comparisons between the Okavango and Nile river basins, highlighting similarities and differences. One of the key elements that is identified is the aspect of scale, in particular, the relative complexity that occurs at higher levels of scale, in keeping with the expanded definition of hydropolitics presented as the second hypothesis. The central issue of water and development is introduced and contextualised for both basins, and the need for effective institutional development is highlighted in support of the third hypothesis.

Given the fact that the Okavango River basin is an endoreic system – one of only a few in the region – the unique aspects of such ecosystems are introduced in chapter 9 by Mary Seeley, Judith Henderson, Piet Heyns, Peter Jacobson, Tufikifa Nakale, Komeine Nantanga and Klaudia Schachtschneider. The reader is introduced to some of the unusual environmental aspects of such systems, and their uniqueness in terms of management approaches. This is one of the aspects that makes the transfer of knowledge from other river systems largely irrelevant, particularly in the case of the Okavango River basin. Finally, the importance of ephemeral and endoreic river systems in terms of maintaining socioeconomic activities is discussed.

The management of transboundary river basins is impossible without a legal instrument. Chapter 10 by Laurence Boisson de Chazournes deals with the development of the United Nations Convention on the Law of Non-Navigational Uses of International Watercourses. The building blocks provided by legal concepts included in the convention are analysed in some detail, in an attempt to provide the layperson with sufficient knowledge of these important elements of hydropolitics.

The initial definition of problems determines the way in which solutions are developed. In this respect, Anton Earle introduces the conceptual distinction between 'watersheds' and 'problemsheds' (chapter 11). Water scarcity is at best a localised issue, as there is a relative abundance of water at the global level. The strategic significance of groundwater is analysed, as it relates to the international trade in wheat and other cereals. The trade in 'virtual water' (Allan 1998; 1999; 2000; 2002) has made an important contribution in preventing the once confidently predicted water wars (Cooley 1984; Cowell 1990; Starr 1991; Bullock & Darwish 1993; Gleick 1994; De Villiers 1999) from actually taking place (Homer-Dixon 1999; Turton 2000).

Central to the long-term sustainable management of transboundary rivers is good governance and sound policy. Bastien Affeltranger and Alexander Otte analyse some of the key elements of policy and governance, making a clear conceptual distinction between the two (chapter 12). The important aspect of public participation is introduced to the reader, and some of its methodological challenges are discussed.

A thorny issue in any future basin-wide management plan for the Okavango River basin would involve the complex task of determining instream flow requirements for various management regimes along different reaches of the river. This will become a cornerstone in any future management plan, and Heather MacKay and Brian Moloi unpack some of the key elements of this process in chapter 13. Some methodologies are discussed along with the overall relevance of instream flow requirements to policy-making. The implementation of instream flow requirements parameters is questioned, an issue that is taken up by Petrus Brynard in chapter 14. Brynard's work focuses on the *process* of policy-making, as it would apply to the Okavango River basin, rather than the *content* of such policy. A key issue that is highlighted is the problem of implementation. Yet, before criteria for instream flow requirements can be factored into policy options, there is a critical need to manage and interrogate data. Craig Schultz discusses some decision support tools that can be of use to OKACOM by presenting some well-known and locally used methodologies in chapter 15. These three chapters together are critically important because they deal with the complex issue of assessing the outcome of the authoritative allocation of values in society with respect to water, and are thus a central component of hydropolitics as defined in the second hypothesis. The issue revolves around the questions by whose authority an allocation is made; what values are used in making these allocations; and under whose authority these allocations will be implemented and enforced. Virtually all documented hydropolitical conflict has these aspects as central components.

Section 3 draws together the deliberations of experts in the previous two sections and lays the foundations for a subsequent and more detailed assessment of the hydropolitical dynamics of the Okavango River basin. In chapter 16, Anthony Turton, Peter Ashton and Eugene Cloete present a set of key elements. These elements are the fundamental drivers of the hydropolitical process, while interceding variables act on these drivers to result in different possible outcomes. An understanding of these elements is needed to embark upon policy development for the Okavango River basin, taking cognisance of the third hypothesis and, in particular, focusing on the two critical conflict or cooperation threshold points presented in figure 2.

Conclusion

This book does not intend to be a definitive tome on the hydropolitical dynamics of the Okavango River basin. Instead, it seeks to capture the essential elements of the hydropolitical process as they relate to the Okavango River basin in an attempt to start off on the long road to more complete knowledge. This book is an attempt to present a point of departure and to chronicle the commencement of a long journey, rather than a descriptive analysis of a final destination. In order to develop conceptual clarity and to foster scientific analysis, three hypotheses were presented in this chapter to assist the reader in analysing the complexity that is evident in the Okavango River basin. These are as follows:

- The first hypothesis relates to the existence of a hydropolitical complex in Southern Africa (presented in figure 1). This is an important interceding variable in the overall Southern African regional security complex as initially defined by Buzan (1991:210). The close proximity of so-called pivotal states in the SADC region – South Africa, Botswana, Namibia and to a lesser extent Zimbabwe – that are all economically developed, but highly water-stressed, leads to the reasonable conclusion that water scarcity can become a limiting factor to their future economic growth potential. As such, access to water in transboundary river basins can become either an element of potential conflict – and thus a potential security concern for each riparian state; or a catalyst for potential peace – and thus a fundamental driver of integration within SADC.
- The second hypothesis relates to a new and expanded definition of hydropolitics based on the unique circumstances of the SADC region. This sees hydropolitics as the systematic study of the authoritative allocation of values in society with respect to water (Turton 2002c), with the elements of both scale and range becoming relevant. These are certainly applicable to the hydropolitics of the Okavango River basin, particularly when trying to develop policy options that address the two critical conflict or cooperation threshold points that form part of the third hypothesis (figure 2).
- The third hypothesis relates to the apparent inverse relationship between conflict potential and scale as noted by Wolf (1998; 2002b), and to the apparent non-linear

relationship between conflict potential and the range of viable policy options (figure 2). Emerging from this as yet untested model is the existence of two critical conflict or cooperation threshold points. The fundamental elements of this hypothesis will need to be unravelled by the readers as they work their way through the respective chapters of this book. The editors will attempt to make some comments based on their observations of this case study material through the conceptual lens provided by the third hypothesis, in an effort to contribute to the debate of policy-related aspects in the near future.

Acknowledgements

This book would never have been possible without the unselfish work that was done by all of the authors, who rose to the occasion at relatively short notice and provided a range of excellent papers for presentation at the *Water for peace Okavango pilot project* workshop that was held in Maun from 9-11 September 2002. Neither the workshop nor the book would have been possible without the donors, whose commitment to the development of knowledge around the integrated management of transboundary rivers was manifested in a financial grant. The original donor source, the Royal Dutch Foreign Ministry, was financially augmented by the Swedish Foreign Ministry, with funding channelled through Green Cross International in Geneva. The support of Sir Ketumile Masire, the former president of Botswana, is gratefully acknowledged. The high level of commitment shown by the commissioners in OKACOM is greatly appreciated – all are extremely busy people, yet all managed to find the time to support the project. Eunice Reyneke added considerable value to the original text with language editing, design and layout of the final publication. Finally, the roles played by Anton Earle as the *Water for peace Okavango pilot project* manager, and Karien Earle who recorded the discussions and drafted the proceedings of the Maun workshop, are also gratefully acknowledged. While these individuals are recognised, the editors alone accept responsibility for the comments, interpretations and suggestions made in the introduction and conclusion of this book.

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The Okavango River Basin is a transboundary basin which serves as an important source of water resources for three riparian Southern African states, namely Angola, Botswana, and Namibia. If not properly managed, the Okavango River Basin is a potential source of conflict amongst the three countries. 7 Turton, A. R., Ashton, P. and Cloete, E., "An Introduction to the Hydropolitical Drivers in the Okavango River Basin"™, in Turton, A. R., Ashton, P. J. and Cloete, E. (eds.), *Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin* (2003), 9Google Scholar. The Okavango River Basin is a hotspot of bat diversity that requires urgent and adequate protection. To advise future conservation strategies, we investigated the relative importance of a range of potential environmental drivers of bat species richness and functional community composition in the Okavango River Basin. During annual canoe transects along the major rivers, originating in the central Angolan highlands, we recorded more than 25,000 bat echolocation calls from 2015 to 2018. We corrected for possible biases in sampling design and effort. The upper catchment areas of the Okavango Basin in the Central Angolan highlands are represented by the source lakes of the major rivers: the Cuanavale, Cuito and Cubango Rivers. 2.1. Acoustic Data Collection and Study Sites. of the Okavango River Basin. ENWC Eastern National Water Carrier. EWA. The Cubango-Okavango River Basin (CORB) areas is far away from the countries capitals. In terms of poverty, defined through analysis of expenditures and costs of basin needs, the basin areas are much poorer than the national average. The main drivers of change are population dynamics (population growth and urbanisation), land use change (e.g. increasing demand for crop production), poverty (associated with the remoteness of the basin and unequal wealth distribution) and climate change (expected increase in rainfall is likely to exceed the increase in evaporation leading to increased flow and run-off; OKACOM, 2011). Introduction The Okavango Delta in Botswana, Southern Africa, is one of the World's largest wetlands. Placed in a semi-arid region, the delta and its rich flora and fauna are under constant pressure due to human water abstraction and climate variations. The recently started HYDROGRAV research project (www.hydrograv.dk) focuses on the use of gravity data for hydrological model calibration at continental to local scales, with the Okavango Delta as one of two model areas. We here present our initial analysis of the ability of GRACE data to resolve the lateral movement of water in the Okavango Delta, and then move on to analyse the in-situ gravity response from a simulated pump test.