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International waters in Southern Africa

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International waters in Southern Africa

Edited by Mikiyasu Nakayama



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Note on measurements

In this volume:

1 billion = 1,000 million

1\$ = 1 US dollar

MCM = 1 million cubic metres

BCM = 1 billion cubic metres

Introduction: Opportunities and risks

Mikiyasu Nakayama

It is a known fact that, world wide, there are more than 200 international water systems and that some 60 per cent of the global population resides within such systems. This has important implications for international security of these water systems and the people dependent on them. With this in mind, the United Nations University (UNU), within the framework of the environmentally sustainable development initiatives, has carried out various activities related to such international water systems as the Aral and Caspian seas; and the Ganges, Jordan, Danube, La Plata, and Nile rivers (Nakayama and Jansky 2001).

This volume reflects the continuing efforts of the UNU in the field of international water systems. The shared river systems in Southern Africa are featured in this volume. The Southern African region is one of the “hottest” areas in terms of managing international water systems, because (a) there is a great disparity in the availability of water between the relatively “wet” northern part of the region and the “dry” southern part, (b) the first-ever transboundary transfer of water (between Lesotho and South Africa) has occurred within the region, (c) discussions have taken place in many international water systems about sharing of water resources among basin countries, and (d) some planned water-transfer schemes have been the subject of disputes, in both environmental and security contexts.

The author once worked on the Zambezi River system in the Southern African region towards establishment of a basin-wide management

scheme for the shared water resources (David, Golubev, and Nakayama 1988). The region was then in a different political setting from that currently existing, and that political setting led to many difficulties in developing an action plan for managing the Zambezi River basin, as well as for its implementation (Nakayama 1999). Those difficulties have now been removed as a result of the current political setting and the ensuing friendly atmosphere in the entire region rather than the hostile relationship that existed between South Africa and other nations in the 1980s. This change may be interpreted as an opportunity for the region, in that all the countries in the region can participate in discussions about water matters on an equal footing; on the other hand, the new circumstances may be interpreted as a risk for the region, in that each country now has a “free hand”; thus, a very protracted negotiation process may be necessary before any region-wide decision is achieved as a result of international discussion.

It is hoped that this volume, which deals with issues related to international water systems of Southern Africa, will help to reduce the risks involved in negotiations concerning international water systems. Chapters 1 to 5 are an overview of the region and of thematic issues. Specifically, Chapter 1 (by Heyns) serves as an introduction to the situation of shared water resources in the Southern African region, and amply reflects the extensive experience of the author in dealing with international water issues in that region. In chapter 2, Bruch depicts, from his great involvement in environmental issues in the African continent, how public participation and access to information are instrumental in managing international waters. Chapter 3 (by Giordano and Wolf) features the role of treaties among riparian states in their dealing with the shared water resources; this chapter is based on their long-term efforts in developing the Transboundary Freshwater Dispute Database (TFDD) and analysis with the database. Chapter 4 (by Nakayama, the editor of this volume) reflects his experience in the formulation and implementation phases of the Zambezi Action Plan (ZACPLAN); emphasis is placed on institutional aspects of international water management, with reference to other international water systems. Salewicz suggests, in chapter 5, how a decision support system (DSS) could be used as a viable planning tool for decision-makers. His remarks stem from his experience in developing a DSS for the Zambezi River basin, for optimization of reservoir management in the basin. These chapters provide readers with an overview of the region, as well as of efforts made and instruments developed for international water systems of the region for the purpose of more rational and streamlined management of these systems.

Chapters 6–10 are case studies on shared international water systems

in the region. Chapter 6 (by Turton) vividly describes the rather complicated hydropolitics among countries of the Orange River basin. The fact that many water-transfer schemes are either planned or implemented in the basin makes it a most interesting and informative example among other international water systems. In chapter 7, Ashton gives an in-depth analysis of disputes over the proposed transboundary water-transfer schemes in the Okavango River. It should be remembered that the potential impact of such a scheme on the Okavango delta has made this basin a “hot spot” in terms of “environment or development” trade-offs. Chapter 8 (by Chenje) explores the possibility of establishing a river-basin organization (RBO) for the Zambezi River basin, the largest international river system in Southern Africa. The Zambezi River basin may become another hydropolitical hot spot of the region, and Chenje suggests that an RBO should be established for preventive diplomacy by riparian states. Abdullahi Elmi Mohamed, in chapter 9, puts forward a detailed comparative analysis of the Limpopo and Orange river basins. He vividly records how geopolitical differences have given rise to unique progress in each of these areas regarding dialogues among basin countries, although these river basins are located back-to-back in the region. Chapter 10 (by Meissner) deals with another international water system – the Kunene River – which is also of hydropolitical importance in the region, and gives a detailed analysis of the sensitive political agenda among stakeholders of the basin. The findings and suggestions in these chapters clearly show that a “one size fits all” type of simple solution is not at all possible for these international water systems, and that various issues specific to a river system should be carefully examined to elaborate a plan for better management of shared water resources.

Chapter 11 (by Adeel, Ballatore, and Giordano) touches upon the discussions made at the workshop held on 25 and 26 September 2000 in Sandton, South Africa, in which all the authors participated. It describes (a) previous work by the United Nations University in the field of international waters, which led to the workshop and, subsequently, to this volume, and (b) understandings and assumptions shared by the authors as a common agenda in elaborating chapters.

To fulfil the aim of this volume, authors were given the following mandate in developing their chapters: practical suggestions and/or estimation should be given, regarding the particular subject of the chapter, about “to what extent we may proceed” under the prevailing political circumstances and technical constraints, not about “where we should go” on the basis of idealistic/unrealistic assumptions. In other words, as the editor of this volume, I was keen to see in each paper “what may/could happen in the near future under existing constraints,” not “what should

happen if everything goes well.” This policy in developing this volume was reiterated at the workshop, and I can state without hesitation that all authors adhered to this policy in developing their chapters.

To what extent may this volume prove useful in assisting people in the Southern African region? I am very optimistic in this regard after repeated perusal of the manuscript; however, the final answer to this question should be left to you, the readers of this volume.

This Introduction should not end without an expression of my sincere thanks to many people who helped to produce this volume. First, I thank all the authors, who painstakingly followed my suggestions from preparation of their first draft up to the final version. Special thanks should be given to Dr Thomas Ballatore, who undertook all the administrative tasks associated with the workshop. Thanks are also due to those whose names do not appear in this volume as authors. For example, Dr Libor Jansky, Senior Academic Officer of UNU, and his assistant Ms Hiroko Kuno were very kind and patient in guiding my footsteps during the long process of preparation of this volume, which would not have materialized without their care and attention; Dr Juha Uitto, former Senior Academic Officer of UNU, initiated the UNU’s project for this volume and gave me a number of helpful suggestions regarding project formulation; Professor Asit Biswas, the Chair of the ad hoc Committee on International Cooperation of the International Water Resources Association (IWRA), also provided me with useful guidance in organization of the workshop and preparation of the volume. Last but not least, special thanks should be given to those members of the UNU Press who helped me to prepare this volume for publication.

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Water-resources management in Southern Africa

Piet Heyns

Introduction

In the Southern African Development Community (SADC) region, water is generally in short supply compared with that in other parts of the world; this is due to low and variable seasonal rainfall, combined with high potential evaporation. Water sources may also be located far from demand centres and this complicates the transport and distribution of water.

As water flows through the landscape, whether on the surface or underground, it is not normally confined to one private property in a country, nor are the watercourses of the large rivers contained within the borders of a single state. Where large rivers or their tributaries flow from one state to the other, or form the boundaries between states, they are referred to as shared watercourse systems or international rivers.

Sharing water entails the apportionment of water from a common resource to certain consumers for specific uses and usually implies that everyone should receive at least an equitable, reasonable, beneficial, and environmentally sustainable portion. Difficulties in achieving these objectives may result in poor access to water for many people. In turn, poor access to adequate water sources is usually a major constraint to the improvement of the existing socio-economic situation in any country and limits the opportunities for further development. Consequently, the need to obtain access to shared water sources can become a cause of international and regional conflict.

Although it is clear that water resources should be shared between different users, not only are the available water sources scarce and finite but also the numbers of consumers continue to increase. Therefore, the only assurance that no harm is done to the interests of any party lies in the process of collaboration and negotiation to facilitate the sustainable management of water, including all the other available natural resources interlinked with water.

The purpose of this chapter is, therefore, to highlight the existing and planned water projects in the international river basins in the SADC region as well as the degree of cooperation that exists between the basin states in the sharing of water and the joint development of infrastructure to utilize those resources.

The international river basins in the SADC

Although there are 14 SADC states, only 12 of those states are located on the Southern African subcontinent: these are the republics of Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe; the United Republic of Tanzania and the Democratic Republic of Congo; as well as the kingdoms of Lesotho and Swaziland.

The international boundaries of those states were drawn in the second half of the nineteenth century by the colonial powers; this was an attempt to avoid conflicts between themselves as a result of the intense competition for territory at that time. The boundaries were determined through bilateral negotiations and subsequent demarcation by using straight lines between clear geographic features such as mountain peaks and watersheds or by following river courses to describe the boundaries. Those decisions never took cognisance of the extent to which groups of people with common historical, cultural, and economic interests were arbitrarily divided – least of all, how it would affect the concept of the integrated management of a river basin as a single unit.

A river basin or catchment area is recognized as the only natural unit for integrated river management; however, owing to political boundaries, water-resources planning, development, and management tends to be fragmented between local communities within a nation or even between nations. This emphasizes the need for better understanding and more cooperation between the basin states in order to prevent conflict in the allocation of a fair share of water to each consumer.

The boundaries of the 12 SADC states in Southern Africa (and of another 11 non-SADC countries) lie across 15 major perennial and ephemeral international river basins as reflected in table 1.1 and in figure 1.1.

Table 1.1 Location of river basins and basin states

River basin	Number of states	Basin states
Kunene	2	Angola, Namibia
Cuvelai	2	Angola, Namibia
Okavango	3	Angola, Botswana, Namibia, Zimbabwe
Orange	4	Botswana, Lesotho, Namibia, South Africa
Maputo	3	Mozambique, South Africa, Swaziland
Umbeluzi	2	Mozambique, Swaziland
Incomati	3	Mozambique, South Africa, Swaziland
Limpopo	4	Botswana, Mozambique, South Africa, Zimbabwe
Save	2	Mozambique, Zimbabwe
Buzi	2	Mozambique, Zimbabwe
Pungué	2	Mozambique, Zimbabwe
Zambezi	8	Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe
Rovuma	3	Malawi, Mozambique, Tanzania
Congo	9	Angola, Cameroon, Central African Republic, Congo, Democratic Republic of Congo, Burundi, Rwanda, Tanzania, Zambia
Nile	10	Tanzania, Burundi, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Uganda, Democratic Republic of Congo

In table 1.1 it is interesting to note that the territory of one of the SADC states (namely, Tanzania) falls within the Nile River basin, of which the largest portion falls outside the SADC region.

In table 1.2 the number of international river basins within each SADC state is shown. Both Botswana and Namibia, which are the most arid of the SADC states, have access to at least four and five international river basins, respectively. Mozambique is party to nine international river basins (the most of all the SADC countries); however, in each case the country is at the bottom end of the particular river system.

In table 1.3 more details are given regarding the catchment area, topography, river length, and virgin run-off of each river basin where it terminates, in either an ocean or an endoreic (inland) basin.

Existing and proposed water projects on the shared rivers in the SADC

The Buzi River basin

The Buzi River originates to the south of Mutare in the eastern highlands of Zimbabwe before it cascades down to the coastal plains of Mozam-

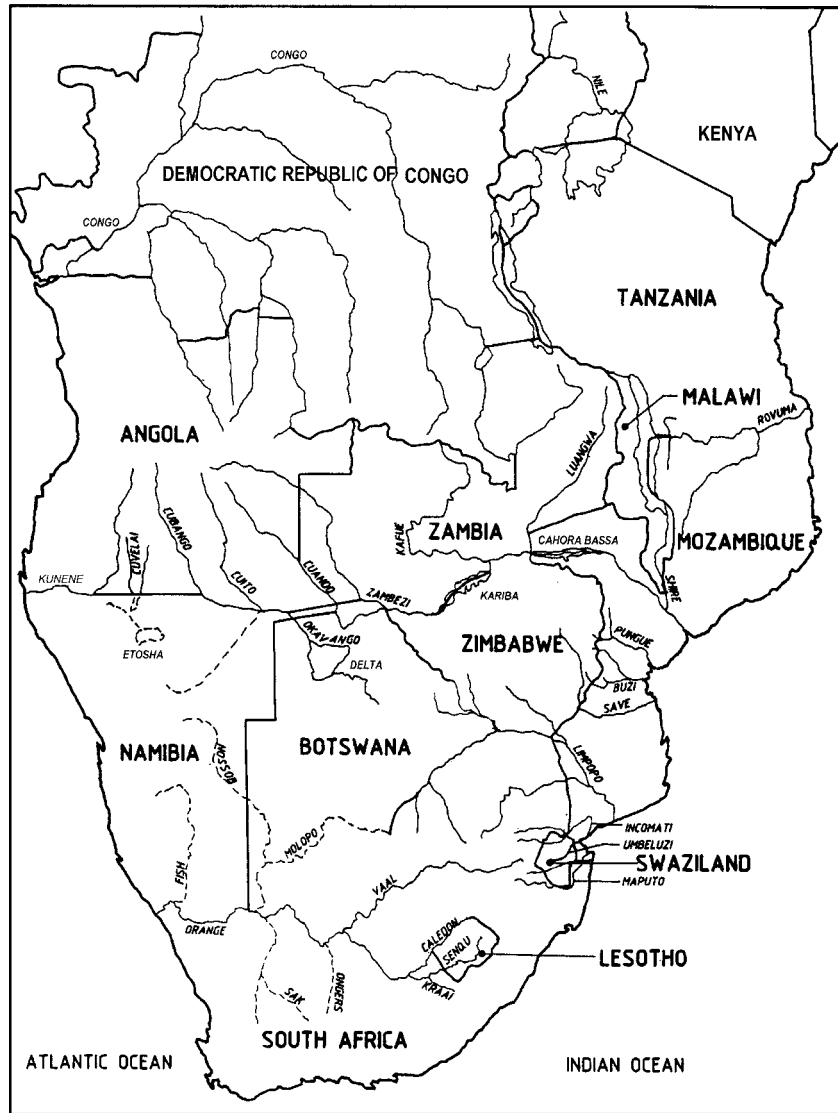


Figure 1.1 International river basins in the Southern African Development Community

bique. The mouth of the river is 25 km south of the important harbour of Beira on the Indian Ocean. The major tributary of the Buzi is the Revué.

The Chicâmba Dam, which can impound 450 Mm³ (million cubic metres; MCM), has been built for water supply, irrigation, and power

Table 1.2 Shared river basins within the SADC states

SADC basin state	Number of basins	River basin(s) covered
Angola	5	Kunene, Cuvelai, Okavango, Congo, Zambezi
Botswana	4	Limpopo, Okavango, Orange, Zambezi
Democratic Republic of Congo	2	Congo, Nile
Lesotho	1	Orange
Malawi	2	Rovuma, Zambezi
Mozambique	9	Buzi, Incomati, Limpopo, Rovuma, Save, Maputo, Pungué, Umbeluzi, Zambezi
Namibia	5	Kunene, Cuvelai, Okavango, Orange, Zambezi
South Africa	4	Incomati, Limpopo, Maputo, Orange
Swaziland	3	Incomati, Maputo, Umbeluzi
Tanzania	4	Nile, Rovuma, Zambezi, Congo
Zambia	2	Zambezi, Congo
Zimbabwe	6	Buzi, Limpopo, Okavango, Pungué, Save, Zambezi

Table 1.3 Geographic details of the shared SADC river basins

River basin	Catchment area (km ²)	Elevation amsl ^a (m)	River length (km)	Mean annual run-off ^b (MCM ^c /year)
Buzi	31,000	1,000	250	2,500
Kunene	106,500	1,900	1,050	5,500
Cuvelai	100,000	1,500	430	130 ^d
Incomati	50,000	1,100	480	3,500
Limpopo	415,000	1,100	1,750	5,500
Maputo	32,000	1,200	380	2,500
Nile	2,800,000	1,500	6,800	86,000
Okavango	530,000	1,700	1,100	10,000 ^e
Orange	850,000	3,300	2,300	10,000
Pungué	32,500	1,400	300	3,000
Rovuma	155,500	1,500	800	15,000
Save	92,500	1,400	740	7,000
Umbeluzi	5,500	1,100	200	600
Zambezi	1,400,000	1,500	2,650	94,000
Congo	3,800,000	1,760	4,700	1,260,000

^a Above mean sea level.

^b At the mouth of the river.

^c Million cubic metres.

^d At the ephemeral, endoreic Etosha pan.

^e At the perennial, endoreic, “panhandle” of the Okavango delta.

supply on the Revué River near Chimoio on the Beira–Mutare road in eastern Mozambique. The installed capacity is 38 MW. About 60 km lower down the river, at Mavuzi, more power is generated with an installed capacity of 52 MW.

The Kunene River basin

The Kunene River (known as the Kunene River in Angola) originates near Huambo in the Sierra Encoco Mountains in south-western Angola. The river flows in a southerly direction to the Ruacana Falls, where it turns to the west and proceeds to the Atlantic Ocean. The lower section of the river cuts through a deep gorge which starts at the Ruacana Falls. In the 340 km between Ruacana and the Atlantic Ocean, the river falls more than 1,100 m; this important feature provides the Kunene River basin with a hydroelectric power potential of approximately 2,400 MW.

Between 1926 and 1969, the Portuguese and South African governments entered into three Water Use agreements on the Kunene. In the First Agreement of 1926 it was agreed that Namibia has the right to one-half of the flow of the Kunene, provided that a water scheme for such a purpose would be feasible. The Second Water Use Agreement in 1964 related in general to the utilization of rivers of mutual interest between the parties, implying the inclusion of other rivers, such as the Cuvelai and the Okavango in Angola, or river systems, such as the Limpopo and Incomati in Mozambique. In that Agreement, the principle of best joint utilization was accepted and was defined as the allocation and utilization, on an equitable basis, of shared water resources with a view to achieving the optimum benefit for the states concerned, within the limits of the available quantity of water. This Agreement has also been acceded to by one other country, the Kingdom of Swaziland, in 1967.

The detailed feasibility investigations and related activities for the first phase of development of the hydropower potential of the Kunene River and the diversion of water into northern Namibia, set in motion by the 1964 Agreement, culminated in the Third Water Use Agreement of 1969, which initiated the construction of the proposed Kunene River Scheme. This Agreement established a Permanent Joint Technical Commission (PJTC) and made provision for Namibia to abstract water (maximum 6 m³/s) at Calueque for diversion to the Cuvelai basin in northern Namibia. The project comprised the Gove Dam to regulate the flow of the Kunene River, the Calueque Dam and Pump Station for the diversion of water into Namibia, the Ruacana Weir for the diversion of water into the Ruacana Power Station, and the power station itself. Of this infrastructure (refer to table 1.4 for more detail), the Calueque Dam was

Table 1.4 Major dams in the Kunene River basin

Country and river	Dam	Dam capacity (MCM)	Surface area (km ²)	Use of dam ^a
Angola				
Kunene	Calueque ^a	475	180.6	a
	Gove ^b	2,575	178.2	b
	Matala ^c	60	40.8	c
	Ruacana ^d	30	5.0	d
Angola/Namibia				
Kunene	Epupa ^e (proposed)	7,300	295	e

- 1: Diversion of water to northern Namibia (pumpstations completed, dam incomplete);
- 2: Flood regulation for Ruacana power station (completed 1975). At present, damaged owing to military activities;
- 3: Domestic water supply, power supply, and irrigation;
- 4: Diversion of water into the Ruacana Power Station;
- 5: Hydropower generation; feasibility study completed.

never completed, owing to the war in Angola at the time. The Gove Dam was completed in 1975 and the works at Ruacana in 1978. The Ruacana Power Station, with an installed capacity of 240 MW that can generate 1,055 GWh/year, is located in Namibia. This facility has not been operating at its full capacity because the flow of the Kunene was not continuously regulated at Gove. This situation is currently being discussed by the PJTC to restore the obligation of Angola to regulate the flow.

At present, the total development of the Kunene River includes the multi-purpose hydropower and irrigation scheme at Matala in Angola. The hydropower facilities at Matala were upgraded from 27 MW to 40 MW in 1989, but the 3,000 ha of land available for irrigation is not cultivated because of damage to the canal system. Namibia can, at present, divert 3.2 m³/s from the Kunene River at Calueque across the watershed to the Cuvelai drainage basin to supply the domestic and irrigation water demand in northern Namibia. In September 1990, some 6 months after the independence of Namibia, the governments of the republics of Angola and Namibia endorsed and affirmed the previous agreements reached between Portugal and South Africa. The PJTC was reinstated, but the Joint Operating Authority for the Kunene basin has not yet been re-established. The PJTC was also given the task of investigating possible new developments on the Kunene River.

The future development of the Kunene basin received immediate attention under the auspices of the PJTC. A pre-feasibility study on the

Table 1.5 Kunene River basin hydropower developments

Year	Facility	River	Country	Capacity (MW)
1954	Matala A	Kunene	Angola	27
1978	Ruacana	Kunene	Namibia	240
1989	Matala B	Kunene	Angola	13
2002	Epupa/Baynes	Kunene	Angola/Namibia	400
Total				680

proposed Epupa Dam hydropower scheme was completed in September 1993. The subsequent feasibility study on this project commenced towards the middle of 1995 and called for a complete re-evaluation of the hydropower potential of the lower Kunene. Several alternative dam sites were investigated and this led to the completion of a feasibility study that proposed two alternative hydropower schemes on the lower Kunene River (Epupa and Baynes). The proposed installed capacity will be about 400 MW and will be able to generate about 1,600 GWh/year. On completion of either one of the alternatives, the total installed power-generating capacity of the Kunene will be about 700 MW. Refer to table 1.5 for more detail on the existing and most recently proposed hydropower developments in the Kunene Basin.

The proposed development of the Epupa Dam raised a number of environmental concerns, such as the impact that the project would have on the lifestyle of the Himba people and the inundation of the Epupa Falls. At present, the development of further hydropower schemes on the lower Kunene is on hold because the Angolan Government prefers the Baynes site – which is technically, economically, and environmentally not the most optimal site in the Namibian view.

Other objectives on the Kunene are the rehabilitation of the Matala irrigation scheme, the rehabilitation and completion of the Calueque Dam embankment, and the upgrading of the pumping station at Calueque to abstract the agreed quantity of 6 m³/s from the Kunene for transfer to Namibia. New studies of the hydrology of the Kunene basin will be undertaken in the near future, probably as part of the proposed SADC Energy Project 3.0.5.

The Cuvelai River basin

The Cuvelai River is an endoreic river, rising in the southern foothills of the Sierra Encoco in south-western Angola. It drains southwards towards the Etosha pan in northern Namibia. The Cuvelai is perennial for about 100 km before it ramifies into a delta of ephemeral watercourses which

cross a broad plain of low relief; this delta converges again to terminate in the ephemeral Etosha pan. The watercourses, called oshanas, are the lifeblood of an area where 700,000 people (or just less than half of the population in Namibia) live.

Because of the arid climatic conditions, surface waters and shallow wells dry up from time to time. The groundwater is saline and the only way to augment these rather unreliable water supplies is to import water from the perennial Kunene River. This is the main reason for diverting water from the Kunene River basin to the Cuvelai basin. The water scheme is operated by the Namibia Water Corporation on Angolan territory and serves as an excellent example of cooperation between basin states. The existing water-supply network, distributing water through canals and pipelines to the population, is one of the largest in Southern Africa.

It is clear that any alteration to this international watercourse system in Angola or Namibia will have major repercussions for the fragile, semi-arid ecosystem and the people living on the flood plains. However, there is no specific international agreement between Angola and Namibia on water allocation or further studies in the Cuvelai basin.

The Incomati River basin

The Incomati River rises in the south-eastern Transvaal in South Africa. Its major tributaries in South Africa are the Lomati, the Crocodile, the Sabie, and the Sand; those in Mozambique are the Massintonto and Mazimchopes. The Incomati descends from a highland plateau in South Africa, cutting through a valley 900 m deep in northern Swaziland before crossing South Africa again and passing through a narrow valley in the Lebombo Mountains on the border between South Africa and Mozambique. The Crocodile River joins the Incomati upstream from this gap through the mountain called Komatipoort. Downstream of this 200 m deep valley, the river flows through the coastal plains of Mozambique in a northerly loop, turning south-west to the Indian Ocean. The lower reaches of the river are swampy where it flows into Lake Chuali and then to the sea, some 30 km north of Maputo.

Ten dams with storage capacities in excess of 12 MCM have been built on the river (eight in South Africa; two in Swaziland). The Sterkspruit Dam in South Africa is the largest and has a storage capacity of 167 MCM (Department of Water Affairs and Forestry 1986).

In Swaziland, the water from the Incomati is diverted to irrigate some 12,000 ha of land in the Incomati basin and across the watershed between the Incomati and the Umbeluzi rivers. A weir on the Incomati diverts 12 m³/s into an irrigation canal 67 km long. Water is also pumped out of

the canal to the Sand River Dam, which serves as a storage reservoir to provide additional water during low-flow periods in the Incomati. This project was completed in 1964 and has proved to be a very successful irrigation scheme, producing sugar, rice, and citrus.

As far as institutional arrangements are concerned, a Tripartite Permanent Water Commission was formed between Mozambique, South Africa, and Swaziland concerning the Incomati and Maputo River basin, but this Commission has not been functioning well since its inception. However, a Joint Water Commission has been established between South Africa and Swaziland; this Commission functions well and has created the Komati Basin Water Authority to prepare a Komati River Basin Development Plan. This plan was completed and facilitated the development of two dams, the Driekoppies Dam in South Africa (completed) and the Maguga Dam in Swaziland (under construction): the Driekoppies Dam will inundate a portion of the Kingdom of Swaziland; the Maguga Dam will supply water for irrigation. These dams are part of a multiphase joint-venture project aimed at joint management of the water resources of the Incomati River and to provide water for existing and new areas for irrigation purposes. Mozambique agreed to these developments, provided that an agreed minimum discharge of water was available at the border.

There is also a joint water-availability study on the Incomati basin and cooperation between South Africa and Swaziland is satisfactory. The cooperation of the third party, Mozambique, has been obtained to complete a management study on the basin. The proposed Injaka Dam on the Sabie River in South Africa is currently under construction.

The Limpopo River basin

The north-flowing tributaries of the Limpopo River originate in South Africa along the northern slopes of the Witwatersrand, which forms the watershed between the Limpopo and Orange River basins. The east-flowing tributaries come from Botswana, and south-flowing tributaries start along the watershed between the Limpopo and the Zambezi rivers in Zimbabwe.

The water resources of the Limpopo Basin have been very well developed. Of the many dams that have been built in the basin to supply water for cities and towns, as well as to support industry and agriculture, 43 have a storage capacity of more than 12 MCM (Botswana 3, Mozambique 2, South Africa 26, Zimbabwe 12) (Department of Water Affairs and Forestry 1986); of those dams, 12 have a storage capacity of more than 100 MCM (Botswana 1, Mozambique 1, South Africa 7, Zimbabwe

3). The largest dam is the Loskop Dam on the Olifants tributary, which can impound 348 MCM.

In Zimbabwe, the river has been developed to nearly its full potential and the remaining run-off makes a very small contribution to the flow in the Limpopo.

The Botswana Government recently completed a new dam, the Letsibogo Dam on the Motloutse tributary, to augment the water supply to Gaborone via the proposed North–South Carrier which is currently under construction. It is also possible to augment the supply of water to Gaborone from the Molatedi Dam on the Great Marico tributary of the Limpopo in South Africa.

The Joint Upper Limpopo Basin Study by Botswana and South Africa has been completed and three proposed dam sites (at Cumberland, Martins Drift, and Pont Drift) have been investigated.

Mozambique has voiced concern about the reduction in run-off to the Massingir Dam on the Elefante tributary of the Limpopo, and all four basin states (Botswana, Mozambique, South Africa, and Zimbabwe) agreed to revive the Limpopo Basin Permanent Technical Committee. The Committee recently completed a monitoring study (hydrology) of the Limpopo and is currently drafting terms of reference for a development study of the whole basin.

A number of important interbasin water transfer schemes relate to the Limpopo River. From table 1.6 it can be calculated that South Africa has the capacity to transfer 700 MCM water annually from other international river basins (Orange 510 MCM/year, Incomati 100 MCM/year, and Maputo 90 MCM/year) to the Limpopo basin; there is also the capacity

Table 1.6 Water-transfer schemes in the Limpopo basin

Transfer scheme	Capacity (m ³ /s)	Head (m)	Distance (km)
To the Limpopo basin	19.7	–	–
From the Orange Basin			
• Vaal–Olifants	7.7	142	50
• Vaal–Crocodile	12.0	–	–
From the Incomati Basin			
• Incomati–Olifants	3.8	7.50	150
From the Maputo Basin			
• Usutu–Olifants	3.4	445	115
Within the Limpopo basin			
• Great Marico–Notwane	0.3	400	350

to supply 9.5 MCM/year from the Molatedi Dam on the Great Marico River to Gaborone on the Notwane River in Botswana.

The Maputo River basin

The Maputo River rises on the border between northern Natal, south Swaziland, and the south-eastern Transvaal.

Four dams, which can store more than 12 MCM each, have been built on the tributaries of the Maputo in South Africa and two in Swaziland. The largest dam in the Maputo basin is the Pongolapoort Dam in South Africa, which can impound 2,500 MCM and inundates a portion of Swaziland (Department of Water Affairs and Forestry 1986). The water in the Maputo River basin in South Africa is diverted from the Usutu catchment and the Pongola catchment for industrial use and the cooling of power stations in the Limpopo River basin (Olifants River catchment) and the Orange River basin (Vaal River catchment).

The Nile River basin

Although Lake Victoria is generally seen as the origin of the Nile, that river actually rises as the Kagera River in Burundi and is contiguous to Rwanda and Tanzania before it flows into the lake. As the development of water resources in the Nile River basin is of no real consequence to the SADC States, it is not discussed further in this chapter.

The Okavango River basin

The Cubango River rises in the south-western Angolan highland, near and just east of the source of the Kunene and Cuvelai rivers. The Cubango flows for more than 600 km from the upper catchment in a southerly direction until it reaches the West–East cut-line through the vegetation that indicates the (unfenced) border between Angola and Namibia. From that point, the river forms the border between Angola and Namibia over a distance of some 400 km. It then turns southwards again and ends in the Okavango Swamps in Botswana. The mean annual run-off of the Okavango River at Muhembo on the border between Botswana and Namibia is 10,000 MCM.

The main tributaries of the Okavango are the perennial Cuito River and the ephemeral Omatako River. The Cuito River rises in the highlands in the central Cubango Province of Angola and contributes half the flow of Okavango River; the Omatako River rises near the Omatako Hills in central Namibia, but contributes nothing to the flow of the Okavango River.

Very little is known about water-resource development in the upper reaches of the Cubango and Cuito in Angola. It is thought that virtually no development has taken place in the catchment since the start of the civil war in Angola in 1975.

It is estimated that about 20 MCM water is abstracted annually from the Okavango River for domestic consumption and irrigation in Namibia. A dam has been built in the upper catchment of the Omatako River as part of the Eastern National Water Carrier (ENWC) project to divert water for domestic and industrial consumption in the Windhoek–Okahandja–Karibib complex in the Swakop River catchment in central Namibia. The ENWC will eventually be linked to the Okavango River at Rundu (Department of Water Affairs 1974).

No major development of the water resources of the Okavango River or the delta have taken place in Botswana, except for the Mopopi Dam, which was built to supply water to the Orapa diamond mine and was created by using the basin of the Putimolonwane pan and constructing earth embankments around it to impound more water. The reservoir capacity is 100 MCM and it covers 24.3 km² at full supply. Water is pumped into the dam from the Boteti River, which is the outflow river of the Okavango delta; this system has been replaced with groundwater because of the weak outflow from the delta. The development of the proposed Southern Okavango Integrated Water Development Plan in Botswana was shelved temporarily in 1992 before a draft of the review report by the World Conservation Union (IUCN) (Manley 1993) on the project was published in October 1992.

Little is known about future upstream developments in Angola. However, Namibia will have to import water from the Okavango River to supplement supplies to the central area of the country as early as the year 2005 and not later than 2009. The water project to achieve this objective, the ENWC, has been under construction in phases since 1969. The project links three state dams in the central area of Namibia and groundwater resources at Grootfontein in the north; however, the final phase, which is a pipeline of about 250 km between Grootfontein and the intended abstraction point on the Okavango River at Rundu, has yet to be constructed. The intention is to abstract 4 m³/s (or 100 MCM/year) from the Okavango by the year 2020, and Botswana is aware of this requirement.

The institutional arrangements concerning the utilization of the Okavango Basin have been under discussion between the three basin states since 1992. The existing PJTC between Angola and Namibia (which deals with the Kunene River basin), and the existing Joint Permanent Water Commission between Botswana and Namibia, established to deal with the utilization and management of common water resources (such as the Okavango, the Cuando–Linyanti–Chobe System, and other water

resources such as groundwaters) did not incorporate all three basin states in one Commission on the Okavango Basin. In view of the absence of an instrument of cooperation between all three basin states on the Okavango, the Namibian Government took the initiative by bringing the members of the existing commissions together to establish a Tripartite Water Commission on the Okavango basin. This endeavour came to fruition in September 1994, when a permanent Okavango River Basin Commission (OKACOM) was established between Angola, Botswana, and Namibia.

The OKACOM agreed to study the potential of the Okavango River basin and to develop an integrated management plan. This would be achieved by executing a comprehensive environmental assessment of the basin in order to determine the possibilities for development, the water requirements, the impacts of the proposed development projects, and the measures required to reduce any adverse impacts as much as possible. The OKACOM also decided to approach the Global Environmental Facility (GEF) to provide resources to support this initiative. Funding was provided for a transboundary diagnostic assessment (Permanent Okavango River Basin Water Commission 1999) and the GEF subsequently indicated its further interest in funding the development of a strategic action plan that would eventually lead to the formulation of an integrated management plan for the basin.

Owing to an unexpected drought in Central Namibia between 1994 and 1997, there was a real threat that the internal water resources would not be able to meet the managed water demand. Preventative measures had to be taken to develop the required infrastructure, on an emergency basis if required, to link the internal water resources by means of a pipeline to the perennial Okavango River. The Namibian Government informed Angola and Botswana about its planned measures to execute the necessary feasibility studies possible within the emergency time constraints. However, the possibility of this development resulted in a very negative response from the environmental community, who expressed concern only about the perceived negative impact of the proposed project on the Okavango delta ecosystem. Although the whole project was planned and ready for implementation by August 1997, an excellent 1997/98 rainy season allowed the project to be delayed for a number of years, well into the first half of the first decade of the new millennium.

The Orange River basin

The Orange River basin has four basin states – namely, the Kingdom of Lesotho and the republics of Botswana, Namibia, and South Africa. The river rises 3,300 m above mean sea level in the Mont-aux-Sources

Mountains in north-eastern Lesotho and flows for 2,300 km before discharging into the Atlantic Ocean. The main tributaries of the Orange are the Senqu in Lesotho, the Caledon (which forms the border between western Lesotho and South Africa), the Vaal in South Africa, the Molopo and Nossob rivers (which form the border between southern Botswana and South Africa), and the Fish River in Namibia. The natural (virgin) mean annual run-off of the Orange River is 10,000 MCM at the coast.

The ephemeral Molopo River is blocked by Kalahari Desert dunes downstream of its confluence with the Nossob River from Namibia and never reaches the Orange; these rivers can therefore be seen as an endoreic system. The Nossob River originates in the central highlands of Namibia, but the ephemeral summer run-off rarely reaches the confluence with the Molopo. The Oanob River, which rises to the south of Windhoek, is an ephemeral endoreic river in Namibia, within the Nossob catchment.

The Fish River originates in the Zaris Mountains near Maltahöhe in Namibia and flows into the Orange River some 112 km from the Atlantic. The mean annual run-off of the Fish River where it flows into the Orange River is about 500 MCM.

The water resources of the Orange River are certainly the most developed of all in the SADC Region. A number of major water projects have been completed in the Orange River basin (Department of Water Affairs and Forestry 1986) and 31 dams with storage capacities of more than 12 MCM each have been constructed (South Africa 24, Namibia 5, Lesotho 2). The most notable development in recent years is the Lesotho Highlands Water Project (LHWP), currently under construction. The LHWP is a four-phase project that will eventually be able to generate hydroelectric power (110 MW) and transfer water (70 m³/s) to South Africa. The project entails the construction of five major dams and one smaller one, two hydropower stations, three pumping stations, and 225 km of tunnels.

In spite of the international status of the Orange River system, international cooperation on the development of the river did not start until 1978, when Lesotho and South Africa established a Joint Technical Committee (JTC) to investigate the feasibility of the proposed LHWP. This project was already conceptualized by the early 1950s and became known as the Oxbow Scheme. In May 1979, the JTC completed its preliminary feasibility investigation and a decision was made by the two countries to proceed with a final feasibility study. Work on the LHWP started in 1987 after a treaty, which approved the proposed project and established a Joint Permanent Technical Commission (JPTC), had been signed in 1986 between the governments of Lesotho and South Africa.

Further institutional arrangements followed, with the creation of two autonomous statutory parastatal bodies – the Lesotho Highlands Development Authority (LHDA) in Lesotho and the Trans-Caledon Tunnel Authority (TCTA) in South Africa – each entrusted with the implementation of that part of the project situated in their respective territories. The JPTC has monitoring and advisory powers concerning the activities of the LHDA and the TCTA.

This project will enable South Africa to save on the capital and operational cost of transferring water from the Orange, downstream of Lesotho, to the Vaal River by bypassing Lesotho on the western side. In return for this saving, South Africa will pay a unit cost for the water as well as royalties to Lesotho for the next 50 years, after which the royalties will be renegotiated.

All the other water developments that took place in South Africa and Namibia were downstream of Lesotho. South Africa, which was the Mandatory of the Territory of South West Africa between 1920 and 1990, acted as administrator for Namibia and there was no sovereign state with which to negotiate regarding utilization of the waters of the Orange River downstream of Lesotho. Another, related, complication was the fact that the border between Namibia and South Africa was defined as a line rising on the northern bank, which effectively meant that Namibia had no access to the waters of the Orange River. However, in 1980 an Interim Government was instituted in Namibia and in 1987 the two governments agreed to cooperate on the utilization of the Orange River. They subsequently established a JTC; after the independence of Namibia in 1990, a Permanent Water Commission (PWC) was created in 1992 to facilitate further cooperation. The South African Government subsequently conceded that the earlier definition of the border along the Orange River was not according to internationally accepted principles and it was agreed to shift the border to follow the centre or deepest valley of the river. The border is currently being demarcated by a Demarcation Commission. Because the Molopo makes no contribution to the flow of the Orange, little discussion took place between Botswana and South Africa on the development of the Molopo or the lower Orange rivers.

It is clear that Namibia is at the bottom end of the Orange River system and that Namibia should be involved with water-resource developments in the upper catchment areas. This was emphasized when the Namibian Government was requested to raise no objection to the LHWP before the internationally financed construction could actually start. In 1994 the Namibian Government proposed that a Joint Permanent Orange River Basin Commission be established to coordinate future water-resource development between the basin states. The agreement

between Botswana, Lesotho, Namibia, and South Africa on the establishment of a water commission on the Orange River (the Orange–Senqu Commission) was signed on 3 November 2001 at Okapuka near Windhoek in Namibia.

Namibia gave no objection only to Phase 1 of the LHWP project. Phase IA of the LHWP comprises the construction of the Katse Dam (180 m high), transfer tunnels with a total length of 51.4 km, a hydro-power station (72 MW installed capacity) at Muela, and a 37 km long delivery tunnel to supply 18.2 m³/s to South Africa; Katse Dam, Muela, and the transfer tunnels have been completed. Phase IB of the LHWP includes the construction of the Mohale Dam (146 m high), a 30.3 km transfer tunnel from the Mohale Dam to the Katse Dam, upgrading of the power station at Muela to 110 MW, and a second (37 km) delivery tunnel to increase the transfer of water to South Africa to 29.6 m³/s. Construction on the Mohale Dam started in 1998; further development of phases 2–4 of the LHWP is under investigation and various options are being considered.

The dams on the Orange River in South Africa serve a variety of purposes, including water supply for domestic and industrial use, irrigation, and hydropower generation to a lesser extent. Some of the most impressive of these water-resource developments on the Orange are the Gariiep Dam and the Vanderkloof Dam, which can impound 5,600 and 3,200 MCM, respectively (SANCOLD 1994). The Vaal Dam on the Vaal River supplies water to the Gauteng industrial complex, and the Sterkfontein Dam (which is the largest of its kind in the world without a spillway) augments the waters of the Vaal Dam. The huge Bloemhof Dam downstream of the Vaal Dam supplies water for irrigation: more than 300,000 ha of land is at present under irrigation in the Orange Basin and the consumption of water for irrigation is at least 2,800 MCM/year; however, only 2,000 MCM/year is used for domestic, industrial, mining, and power consumption (Department of Water Affairs and Forestry 1986). Owing to the general nature of the topography, the hydropower potential of the Orange Basin is very modest (table 1.7).

Table 1.7 Orange River basin hydropower developments

Year	Facility	River	Country	Capacity (MW)
1962	Hardap	Fish	Namibia	0.5
1971	Gariiep	Orange	South Africa	320
1977	Vanderkloof	Orange	South Africa	220
1998	Muela	Senqu	Lesotho	72
Total				612.5

The Noordoewer/Vioolsdrift Irrigation Scheme (800 ha) is located on Namibian and South African territory. A treaty was signed in 1992 between the governments of Namibia and South Africa to establish a Joint Irrigation Authority; about 20 MCM/year is supplied from the Orange River to this scheme.

Another important water-resource development is the transfer of water from national and international river basins within South Africa to the international Orange River basin, the transfer of water from the Orange River basin in South Africa to other national and international river basins, and the transfer of water by Lesotho and South Africa within the basin. Examples of these are given in table 1.8, from which it can be calculated that, on the basis of the capacity of the water-transfer schemes, about 1,500 MCM water gravitates every year from the Orange River basin at the Gariep Dam via the Orange–Fish Tunnel (at 85 km the longest in the world) to the Great Fish River basin in the Eastern Cape Province of South Africa. The Great Fish River discharges into the Indian Ocean and some 30,000 ha is under irrigation with the water from the Orange River basin. The pumping of water from the Tugela River in Natal to the Vaal River catchment, which is part of the Orange River basin, takes place within the borders of South Africa and amounts to 725 MCM/year. The transfer of water from the Maputo River basin, which is shared between three basin states (Mozambique, South Africa, and Swaziland), is 200 MCM/year. The same applies to the annual transfer of 620 MCM of water from the Orange River basin (Vaal River) to

Table 1.8 Water-transfer schemes in the Orange River basin

Transfer scheme	Capacity (m ³ /s)	Head (m)	Distance (km)
From the Orange basin	67.7	–	–
To the Fish River	48.0	Gravity	85
To the Olifants River	7.7	142	50
To the Crocodile River	12.0	–	–
To the Orange basin	29.4	–	–
From the Tugela basin	20.0	570	45
From the Buffels River	3.0	140	40
From the Assegaai River	6.4	385	60
Within the basin	56.6	–	–
Caledon to Modder	4.0	177	20
Orange to Riet	16.0	49	70
Orange to Vaal	7.0	39	20
Sengu to Vaal	29.6	Gravity	80

the Crocodile and Olifants rivers, which are major tributaries in the Limpopo basin, shared by four basin states.

These water-transfer schemes complicate the principle of equitable and beneficial utilization of the water resources of internationally shared watercourse systems because, in the case of the Orange River, it is clear that South Africa has the capacity to export 2,120 MCM/year from the basin and can import only 925 MCM/year, leaving a deficit of 1,195 MCM/year. The Lesotho Highlands Project will initially convey 930 MCM/year between the Senqu River in Lesotho and the Vaal River in South Africa within the Orange River basin. The capacity of all water-transfer schemes within the Orange River totals 1,780 MCM/year.

Water development in the Orange River basin in Namibia comprises the Otjivero Dam on the White Nossob tributary of the Nossob River, the Oanob Dam in the Oanob River, and the Dreihuk Dam on the Hom River. Two major dams have been built on the Fish River in Namibia, namely the Hardap Dam (1963) and the Naute Dam (1970). Both of these dams were built for domestic and irrigation (1,400 ha at Hardap) water supply, but the development of an irrigation scheme at Naute started only after the independence of Namibia.

The South African Government completed a comprehensive replanning study of the Orange River system, including the hydrology and water demands. Lesotho and Namibia are also participating under the auspices of their respective water commissions with South Africa. Future developments on the Orange River system will depend on this study, which also looks at the environmental water requirements and the huge water losses as a result of evaporation. The eventual viability of developing phases II, III, and IV of the LHWP, as far as it would affect a downstream country like Namibia, will have to be taken into consideration. In this regard the bilateral PWC will soon embark upon a preliminary feasibility study to improve the management of the water resources of the lower Orange River along the common border, and the possibility to develop a dam will also be investigated. The work started in January 2002.

The planned additional transfer of 40 m³/s of water (LHWP phases 2–4) from the catchment in Lesotho to the Gauteng industrial complex in South Africa is of critical importance, and must be analysed very carefully, especially in view of other alternative transfer schemes in South Africa and the needs of the other basin states.

Further development on the Fish River in Namibia and at several places along the Orange River border with South Africa is currently under investigation in Namibia. These developments include the proposed Bruckaros Dam irrigation project; water for a new zinc mine near Rosh Pinah (Skorpion Mine); a proposed copper mine at Haib, near

Table 1.9 Estimated water demand in the Orange River basin

Type	1990	2010
Urban and industrial	1,381	2,792
Mining	176	411
Power	333	533
Irrigation	2,779	3,473
Stock	114	132
Environment	594	599
Total	5,377	7,940

Noordoewer; a gas-fired power station at Oranjemund; and further irrigation at Noordoewer, Daberas, and Aussenkehr in Namibia. The water demand on the Orange River system in 1990 and the estimated future water demand by the year 2010 is shown in table 1.9.

As the water demand in South Africa increases, the development of other resources will also have to be considered. South Africa investigated the possibilities of transferring more water into the Orange River basin from rivers flowing to the east from the Drakensberg massif. These include studies on water transfers from the Umzimvubu basin to the Orange via the Kraai River, or increasing the existing supply from the Tugela by including the Spioenkop Dam and utilizing the rivers in the Maputo basin, or by transferring more water to the Gauteng area from the Orange River to the Vaal River catchment. The studies indicated that the most viable options would be the development of further phases of the LHWP or the transfer of water from Tugela. Other “sources” of water include greater emphasis on water conservation, demand management, effluent reuse, desalination, water reclamation, and the importation of water from further afield – for example from the Okavango or Zambezi river basins. Some of these developments relate to international rivers, and collaboration between the basin states is imperative.

The Pungué River basin

The source of the Pungué River is the eastern highlands of Zimbabwe to the north of Mutare. From there it crosses the coastal plains of Mozambique and enters the Indian Ocean at the port of Beira. The river is navigable for some 60 km upstream from Beira. The major tributaries of the Pungué are the Urema and the Muda.

Little development has taken place on the Pungué River, but Zimbabwe has constructed a dam to divert water from the headwaters of the Pungué in Zimbabwe for water supply to Mutare and to the Save River

catchment. The water requirement for Mutare is $0.75 \text{ m}^3/\text{s}$, and $12.5 \text{ m}^3/\text{s}$ will be made available for irrigation along the Save River. Zimbabwe has informed Mozambique of its plans to proceed with the project; the creation of a river commission between Mozambique and Zimbabwe is being considered to execute river-basin studies on the Pungué and the Save rivers.

The Rovuma River basin

The Rovuma River rises in the Matogaro Mountains in Southern Tanzania and flows eastward into the Indian Ocean. It forms the border for 650 km between Tanzania and Mozambique. The major tributary of the Rovuma is the Lugenda River, which originates at Lake Chiuta on the border between Malawi and Mozambique.

The flow of the Rovuma River has not been systematically gauged and little significant development has taken place. A preliminary study was undertaken in 1982 for the construction of a 2.0 MW hydropower plant to supply power to Tundura in Tanzania, but no further development took place. As there is no demand, no significant development on the Rovuma is planned for the near future.

The Save River Basin

The Save River and its major tributaries (the Odzi, Runde, Mutirikwi, and Turgwe) arise on the southern side of the watershed with the Zambezi, between Marondera in the east and Gweru in the west. These rivers flow southwards and turn to the east, where they converge before crossing the border with Mozambique and entering the Indian Ocean through swamps on the coastal plains.

At least 17 dams with a storage capacity of more than 12 MCM (7 can impound more than 100 MCM) have been built in the Save Basin to supply water to some 2.6 million people, irrigation schemes, and mining development. The largest dam, the Osborne Dam on the Odzi River, can impound 400 MCM. The estimated present consumption of water in the Save Basin within Zimbabwe is 1.25 MCM/year, and Zimbabwe is planning to divert $12.5 \text{ m}^3/\text{s}$ from the Pungué River to the Save catchment for irrigation purposes. As a result of the present land-use patterns, erosion causes high silt loads in the river beds. A Pungué/Save Water Commission to regulate the water-resource development activities within the two river basins has been proposed. Zimbabwe is also planning the Mukosi Dam, with a capacity of 180 MCM, on the Tokwe River in the Save basin.

The Save Development Plan proposed by Zimbabwe envisages a considerable increase in water consumption in the Save basin in Zimbabwe.

The needs of Mozambique, as a downstream basin state, should therefore be taken into account by the proposed water commission.

The Umbeluzi River basin

The Umbeluzi River rises in the eastern mountainous highveld of Swaziland to the north of the capital Mbabane. The river flows in an easterly direction to Maputo, the capital city of Mozambique and a major harbour on the Indian Ocean. The main tributaries of the Umbeluzi are the White and the Black Umbeluzi in Swaziland as well as the Matola and the Tembre rivers in Mozambique.

The most important developments on the Umbeluzi are the Hawane and Mnjali dams in Swaziland as well as the Pequenos Libombos Dam, with a capacity of 400 MCM, in Mozambique. No immediate future development is envisaged in the Umbeluzi catchment, but there is a Joint Permanent Technical Water Commission between Swaziland and Mozambique that deals, *inter alia*, with the development of the Umbeluzi Basin.

The Zambezi River

The Zambezi River basin is the largest of the African river systems flowing into the Indian Ocean. It is shared by eight basin states and supports a population of more than 20 million people. The major tributaries of the Zambezi rise in Angola, Malawi, Tanzania, Zambia, and Zimbabwe. There are five major swamps – the Borotse, the Eastern Caprivi, the Kafue, the Busanga, and the Lukanga – covering an area of 20,000 km² at the height of the flood periods.

Apart from a number of smaller lakes, the most significant natural lake is Lake Malawi (30,000 km²), but there are also two major artificial lakes – namely, Kariba (5,180 km²) and Cahora Bassa (2,660 km²). Other reservoirs with large surface areas are the Kafue Dam (809 km²) and the Ithezithezi Dam (365 km²). It is estimated that more than 160,000 metric tonnes of fish are caught every year in these bodies of water. The mean annual run-off in the Zambezi at selected sites is reflected in table 1.10

At least 28 dams with a storage capacity in excess of 12 MCM, of which Kariba is the largest (160,000 MCM) and Cahora Bassa the second largest (52,000 MCM), have been built for domestic, industrial, and mining water supply and for irrigation and power generation. The countries with dams are Malawi (1), Mozambique (1), Zambia (4) and Zimbabwe (21), plus Kariba, which lies between Zambia and Zimbabwe. At present there are at least 12 established hydropower facilities in the Zambezi basin, of which the major ones are at Victoria Falls, Kafue Gorge,

Table 1.10 Mean annual run-off in the Zambezi

Location	Mean annual run-off (MCM)
Kongola (on the Cuando in Namibia)	1,300
Katima Mulilo	41,000
Victoria Falls	38,000
Kariba Dam	46,000
Cahora Bassa Dam	88,000
Liwonde (Lake Malawi outflow)	15,000
Indian Ocean	94,000

Table 1.11 Zambezi basin hydropower developments

Year	Facility	River	Country	Capacity (MW)
1924	Mulungushi	Mulungushi	Zambia	20
1938	Victoria Falls	Zambezi	Zambia	108
1944	Lunsemfwa	Lunsemfwa	Zambia	18
1959	Kariba South	Zambezi	Zimbabwe	666
1966	Nkula A	Shire	Malawi	24
1971	Kafue Gorge	Kafue	Zambia	900
1973	Tedzani I & II	Shire	Malawi	40
1975	Cahora Bassa	Zambezi	Mozambique	2,075
1976	Kariba North	Zambezi	Zambia	600
1992	Nkula B	Shire	Malawi	100
1995	Wovwe	Songwe	Malawi	4.5
1996	Tedzani III	Shire	Malawi	50
1998	Kapichira 1	Shire	Malawi	64
2000	Kapichira 2	Shire	Malawi	64
Total				4,733.5

Kariba, and Cahora Bassa on the Zambezi and on the Shire River at Nkula A and B, Tedzani, and Kapichira (see table 1.11).

Some examples of potential hydroelectric developments are at Katombore upstream of the Victoria Falls; the Batoka Gorge (1,600 MW), and Devil's Gorge (1,240 MW) – both sites between the Victoria Falls and Lake Kariba; the Mupata Gorge (1,000 MW), located between Kariba and Cahora Bassa; as well as the development of the middle Shire River between Kholombidzo and the Hamilton Falls (with a potential 600 MW output, of which 339 MW has been developed so far). More dams are possible downstream of Cahora Bassa at Mpanda Unca, Baroma, Lupata, and Mutarare in Mozambique.

Although the available water resources in the Zambezi basin in general exceed the demand at present, this situation may deteriorate as a result of the increase in population, more industrial and mining develop-

ment, increased irrigated food production, a higher standard of living of the population, and taking the environmental water demand of the system into account. However, it is estimated that the most significant increase in water consumption will most probably be as a result of large-scale irrigation projects. More than 250,000 ha of land is currently under irrigation but the development of large irrigation projects to secure the food-supply situation may become necessary and it is estimated that more than 500,000 ha of land could be brought under irrigation in the next 30 years.

Other development projects that have been proposed are a 40,000 ha irrigation project (with Shire River water) at Bangala in Malawi, a 10,000 ha sugar-cane project in the Eastern Caprivi in Namibia, the proposed Bulawayo Water Diversion Project in Zimbabwe to supply water for domestic and agricultural consumption from the Zambezi, and the abstraction of water from the Zambezi at Kazungula or Katima Mulilo in the Caprivi to augment the water supplies in Botswana (Ministry of Mineral Resources and Water Affairs 1991) and South Africa by the year 2020. Some of these proposed projects are also typical examples of projects that may not be feasible owing to their questionable economic viability (SARDC 1996).

It is clear that the Zambezi River is the main life-supporting artery of eight basin states, and that the creation of an effective river basin commission to manage this vital resource is crucial to the socio-economic well-being of all basin states.

The Congo River basin

The Congo River originates in highlands located in eight co-basin states. However, most of the contribution to the run-off at the mouth of the Congo River is generated in the middle courses of the river in the central tropical rain forests of the Congo basin on the equator. The flow in the upper reaches of the drainage basin is of lesser magnitude – especially in Angola, the Central African Republic, and Tanzania. The annual average run-off in the Congo River is 1,260,000 MCM and the average flow is 40,000 m³/s. The historic minimum and maximum flows vary between 21,400 and 73,600 m³/s, respectively, but 98 per cent of the time the river flow exceeds 26,400 m³/s.

The main potential of the Congo River is for the generation of hydro-power. There are many falls and rapids that provide potential sites for development. The river has a total theoretical generating capacity of 100,000 MW and the total generating capacity installed at present is more than 2,500 MW.

In spite of its many waterfalls and rapids, the Congo River is a very

important waterway because the river is navigable over long distances and provides good opportunities for boat transport and trade between the basin states.

There are large wetlands and lakes in the Congo basin within Zambia and Tanzania that provide important grazing, fish, and wildlife resources for the population.

About 20 large dams have been built on the tributaries of the Congo River within the Democratic Republic of Congo, but none within the SADC Region. Most of the dams are used for water and power supply.

A major hydropower development on the Congo River is the Inga I and Inga II dams. They have a 350 MW and 1,400 MW (total 1,750 MW) installed capacity, respectively, but this is dwarfed by the proposed Grand Inga Dam, which will have a total installed generating capacity of 39,000 MW (equal to the total installed capacity in South Africa) or a power supply of 23×10^{12} kWh per annum. On completion, the Grand Inga Dam will be the largest hydropower facility in Africa (Olivier 1978).

There are no immediate plans for further development of water or electricity supply infrastructure on the Congo River, but the Namibian Head of State has mentioned the possibility of bringing water from the Congo River southwards to the more water-scarce countries – such as Namibia, Botswana, and South Africa. This proposal has been further elaborated by the Namibians and has been accepted as an SADC project. The first step would be a desk study to evaluate various alternatives for achievement of the objectives.

Important characteristics of the river basins in the SADC

The international rivers in the SADC region have several important general characteristics that influence their development potential and impact on international cooperation between the basin states, as follows.

- In all cases, the run-off that is supposed to be available in one country is mostly generated in mountainous areas in another country or countries – for example, the Orange along the Namibian–South African border.
- The run-off in all rivers is subject to marked seasonal and annual variations due to the climatic conditions.
- In some cases the contribution to the run-off in these rivers from the territory of one basin state is negligible, although access to the water is of critical importance to support development in that country – for example, the Save in Zimbabwe and the Okavango in Namibia.
- As a direct consequence of the variation in the annual and seasonal flows in the perennial rivers, dams must be constructed to regulate the

rivers to impound water for later supply to domestic and industrial consumers or for hydropower generation – for example, the dams on the Orange, the Zambezi, the Save, and the Kunene.

- The very low flows that occur from time to time during droughts exacerbate sharing of water between riparian states. Droughts, and the major floods that occur during the good rainy seasons, emphasize the need for international collaboration on river-basin management, the equitable allocation of water, and cooperation on joint infrastructure development.
- A very fortunate aspect of the international rivers in Southern Africa is that the chemical quality of the water is still very good because the concentration of total dissolved solids and pollution is low, and toxic substances are virtually absent. This is one aspect that can be disastrously impaired if water-quality management is neglected.
- The availability of suitable irrigable soils along the international rivers is, in general, much greater than the availability of water to support such irrigation. The application of water for irrigation will have to be adjudicated carefully as far as the economic viability, environmental sustainability, and most optimal or beneficial use of the water is concerned.
- The international rivers on the borders of the basin states are widely spaced and remotely located from centres of development in the interior of the countries. This situation places limitations on the use of the water, simply because of the huge capital investment required for infrastructure development over long distances to convey the water from the source to the consumer, and because of the operational costs incurred as a result of the high pumping heads and energy costs involved.

However, water-transfer schemes remain of vital importance to many countries (see table 1.12)

River-basin institutions to support cooperation

The responsibility to investigate, control, supply, and manage water resources in any country is mainly vested in a Department of Water Affairs, which may fall within the ambit of a particular ministry in a country.

Each state normally has its own concrete projects for harnessing water resources and, as is to be expected, its own ideas on the utilization of the resources of river basins that it shares with others. For example, one state may regard the generation of hydropower as the main objective, with complementary goals in the areas of transport, industry, and mining. Other states in the drier parts of the basin may elect to harness the water

Table 1.12 International inter-basin water-transfer schemes

Transfer scheme	Capacity (m ³ /s)	Head (m)	Distance (km)
ANGOLA			
Angola–Namibia			
• Kunene–Cuvelai	3.2	20	300
LESOTHO			
Lesotho–South Africa (Orange)			
• Lesotho Highlands Water Project Phase 1A & 1B	29.6	gravity	115
NAMIBIA			
Eastern National Water Carrier			
• Okavango–Swakop	4.0	600	700
SOUTH AFRICA			
Incomati–Limpopo			
• Komati–Olifants	3.8	730	150
Maputo–Limpopo			
• Usutu–Olifants	3.4	445	115
Maputo–Orange			
• Assegai–Vaal	6.4	385	60
Orange–Great Fish	48.0	gravity	85
Orange–Limpopo			
• Vaal–Olifants	7.7	142	50
• Vaal–Crocodile	12.0	–	–
Tugela–Orange			
• Tugela–Vaal	20.0	570	45
• Buffels–Vaal	3.0	140	40
South Africa–Botswana (Limpopo)			
• Molatedi Dam–Gaborone	0.3	–	60
South Africa–Namibia (Orange)			
• Vioolsdrift–Noordoewer	0.8	gravity	30
ZIMBABWE			
• Zambezi–Bulawayo (proposed)	2.0	±800	360
ZAMBEZI			
• Zambezi–Gauteng (concept)	100	±600	1,200

for objectives of equal importance to them, such as animal and human consumption, irrigation, and fish farming. Nevertheless, the water must be rationed among those who have interests in it, and the only means of doing this on a long-term basis is through cooperation, which has to be done in the context of a river basin as a complete unit. Of critical importance in this endeavour is that the parties understand the complexities of water in the environmental system.

The challenge facing water users in international river basins can be

met only in a multi-disciplinary way. Such an approach calls for a major effort aimed at establishing proper institutional structures with adequate staff, with access to the multitude of disciplines in hydrology, engineering, agriculture, industry, economics, environmental sciences, and the social disciplines relating to human development – such as health and education.

Each basin state is entitled to an equitable and beneficial share of the waters of the international river basins to which it may have access; however, the realization that water resources must be managed sustainably in the river basin should be well established in all basin states. In many countries (especially the arid ones, such as Botswana and Namibia, or the possibly affected ones such as Mozambique), the waters of international watercourses are critical for sustained future socio-economic development within the borders of the country. Because of this situation, several technical water commissions have, in the past, been established between basin states to provide a forum for regional collaboration on water matters. The major advantages of such institutions, present and future, will be to promote understanding and mutual trust between the parties. The parties will have the opportunity to discuss mutual expectations and fears, but more clarity will be achieved after the parties decide to examine the potential of all the natural resources in an international river basin: this will enable them to base further negotiations on facts. In the process, expectations could be accommodated and all parties would be able to participate in joint planning to reach mutually beneficial agreements on the equitable development and utilization of the river-basin resources.

In general, the major objectives of these river-basin commissions are to direct studies on the natural resource potential of a river basin and to formulate an appropriate strategy leading to an integrated, equitable, economically viable, technically sound, and environmentally sustainable development plan to utilize all the resources of a river basin to the benefit of each basin state and to that of the basin as a whole.

Integrated river-basin planning and sustainable development cannot be achieved without assessment of the potential of the resource base and of all the social, economic, and environmental aspects relating to the equitable and beneficial utilization of the resources available. However, in many cases there is a severe lack of long-term data and it is, therefore, of paramount importance to embark upon the necessary investigations and research within the river basins, to exchange existing information, and to gather new data to develop an accurate database that can be used when the feasibility of any proposed infrastructure development project must be assessed in future. The need for baseline studies, starting long before any development takes place, is clear.

The most important functions (to name but a few) of a river-basin commission would be to exchange information, to procure funding for studies or projects, to collect and process data, and to assess the potential of all the natural resources in the basin. With this information at hand, it would be possible to discuss the equitable, beneficial, and environmentally sound allocation of water to each basin state in an informed and open way. All parties would be able to participate in the planning and implementation of joint projects to the benefit of all, as well as the sharing of costs, where applicable. Another very important responsibility of a river-basin commission is to maintain monitoring programmes, to monitor the operation of the scheme, to protect water quality, and to ensure that the environmental considerations receive proper attention. The importance of this collaboration in improving friendly relations and in developing mutual understanding and trust between the representatives of the parties involved should also not be overlooked (Heyns 1995).

In view of the fact that the principles of international water law may be useful to consider when disputes arise between the basin states, it is very important that early agreement is reached on the rules that would apply. In this regard, the Helsinki Rules of the International Law Association (International Law Association 1966), or the United Nations Convention on the Law of the Non-navigational uses of International Watercourses (United Nations 1997), or some form of arbitration may serve as a basis for negotiations, agreement, and dispute resolution.

In 1994, the SADC decided to create a Water Sector Coordinating Unit (WSCU) in Lesotho to facilitate integrated water-resource management and development in the region. One of the first major achievements of the WSCU was the finalization, signing, ratification, and entry into force of the SADC Protocol on Shared Watercourse Systems in the Southern Africa Development Community Region. By 1998 the WSCU had developed a five-year Regional Strategic Action Plan for Integrated Water Resources Development and Management in the SADC Countries (1999–2004) and about 30 regional water projects have been identified for execution. The WSCU also implemented a hydrological cycle observation system (HYCOS) in the SADC region; this system is currently being repaired because many of the stations were damaged during the floods in Southern Africa during the 1999/2000 rainy season.

The Southern African Technical Advisory Committee (SATAC) of the Global Water Partnership (GWP) also found its roots in the SADC region in 1998 and worked closely together with the WSCU and other stakeholders to produce a document, submitted at the Second World Water Forum in The Hague in March 2000, on the Southern African Vision and Framework for Action for Water, Life, and the Environment in the Twenty-first Century.

Potential hydropolitical hot spots

There will always be the potential for conflict when natural resources have to be shared. This is even more so with regard to the existing situation, where so many SADC countries share rivers as boundaries. Fortunately, this has been recognized by the SADC as a sensitive issue and steps have already been taken to manage the situation in an amicable way by the development and acceptance of the SADC Protocol on Shared Watercourse Systems (recently amended). Although there is a regional instrument of international water law, the United Nations Convention on the Law of the Non-navigational Uses of International Watercourses (adopted in 1997 by the General Assembly) provides further guidelines to regulate the sharing of international waters among the riparian states. In fact, the amended SADC protocol incorporated a number of these guidelines. Nevertheless, a number of the proposed developments could give rise to conflict, either by a disagreement between the riparian states or as a result of the intervention of concerned international conservation institutions. Some of these potential hot spots are:

- the development of further phases of the LHWP on the Orange River in Lesotho;
- the completion of the Eastern National Water Carrier in Namibia by the construction of the proposed Rundu–Grootfontein pipeline component, starting on the Okavango River;
- the construction of the Batoka Gorge hydropower scheme between Zambia and Zimbabwe on the Zambezi River;
- the development of the “Congo River Project,” where a pipeline will have to cross war-torn Angola and the Democratic Republic of Congo on its way to the water-deficient South;
- the development of the proposed Epupa hydropower scheme between Angola and Namibia on the Kunene River;
- the proposed Divundu hydropower scheme on the Okavango, as well as the sugar-cane irrigation project on the Zambezi in Namibia, the Zambezi–Bulawayo water-transfer scheme in Zimbabwe, and the Mpande Uncua hydropower scheme in Mozambique;
- the supply of water to Botswana and South Africa from the Zambezi.

The development of these projects will, of course, depend on many factors, such as their economic feasibility, the extent to which they might cause significant harm to the other riparians, the question of what would be equitable and reasonable, as well as the identified environmental disadvantages that cannot be mitigated.

Some of the possible projects stated in the last item above may lead to conflicts from a somewhat different perspective, because the basin states can act unilaterally. In other words, cooperation on joint-scheme devel-

opment is not necessary and provides a view on the other side of the coin where development can take place without wider consultation. The sovereign rights of the basin states and the political commitment towards the spirit of the SADC Protocol will play a major role in this regard.

Finally, it should be mentioned that the World Commission on Dams completed their work in November 2000. A new framework for decision-making was created and provides for the elevation of the social and environmental dimension in infrastructure planning to the same level as technical and economic considerations. This will certainly enhance the sharing of international waters for peace, development, and security.

Conclusions

The international boundaries of Africa were inherited from the colonial scramble of the nineteenth century, and the concept of keeping river basins within territorial boundaries simply never entered the issue. In the SADC region there are 15 international drainage basins that have been developed to some extent, but there still remains great potential for socio-economic development in the states that share them.

Basin states should not allow badly planned development and the deterioration of the environment to ruin the chances of beneficial use of the natural resources for future generations. Serious attention should be given to using an international whole-basin approach to regulate and manage these immense resources. By the same token, the full development and optimal use of the water resources will be hampered if they are unilaterally developed in each country as a purely national matter, without giving due consideration to the interests of the other basin states. This could even militate against international harmony and security and might result in armed conflict (Pallet 1997).

Many existing shared water-infrastructure developments and proposed new projects have been discussed in this chapter; however, in future there will be a greater need to align legal principles and rules with the physical and environmental laws that govern the natural occurrence of water. Countries therefore need to establish links to allow discussion and the exchange of views to facilitate mutual and beneficial cooperation in order to achieve better management of shared water resources. This will serve to promote the sustainable and environmentally acceptable development of those resources.

Whenever international water resources need to be utilized by the basin states, it will be in the interest of all parties to establish appropriate river-basin institutions to collaborate on the equitable and beneficial allocation of water for different uses. It is advisable that river-basin com-

missions should be formed without intervention from parties outside the river basin, in order to ensure internal sustainability. The commissions should be lean, efficient, and effective to function optimally; this can be achieved by limiting the permanent representatives of each basin state to such a commission (perhaps not more than three). Nevertheless, in the agreement between the parties, the commission must be given the necessary powers and authority to utilize the available technical and financial resources in each state, or to coopt competent experts, or to appoint specialist consultants to carry out specific tasks. It is important that each basin state utilizes its own resources as far as possible, to facilitate the sharing of costs and to contain expenditure.

It may be necessary for these institutions to raise funding to assist them to reach their objectives; in this regard, external support by interested cooperating partners would facilitate the sustainable utilization of all the natural resources. What is important is that the basin states should take the initiative to manage their resources; external support must be stimulated by the success of the activities of the commissions.

More attention should be given to integrated water-resources management in the SADC framework because no development would be sustainable without the availability of water. In view of all the existing and proposed new water projects mentioned, as well as the implementation of the SADC Protocol on Shared Watercourse Systems and the United Nations Convention on the Law of the Non-navigational Uses of International Watercourses, it is trusted that this chapter has provided some food for thought about the real need to move forward dynamically in the water sector.

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Role of public participation and access to information in the management of transboundary watercourses

Carl Bruch

Introduction

Citizens, non-governmental organizations (NGOs), universities, and other members of civil society have played an essential role in developing and implementing environmental and natural-resource laws and institutions at the local and national levels over the past decades. This role has extended more recently into the international arena (Giorgetti 1998; Shelton 1994; Stec and Casey-Lefkowitz 2000; Taylor 1994). This chapter examines the emerging norms and practices that guarantee transparency, public participation, and accountability in the management of international watercourses. Particular attention is paid to how these norms may be implemented to improve the management of transboundary watercourses in Southern Africa.

There is no definitive statement under customary law regarding public involvement in the management of international watercourses; nevertheless, the widespread inclusion of relevant provisions in regional and water body-specific instruments and the widespread practice of international bodies suggests that norms on public involvement are not only emerging but also rapidly crystallizing. In Africa, evolution of these norms has the added benefit of a “rich tradition of participation in water management” at the local level, which can form the basis for similar development at the international level (Sharma et al. 1996).

The next section (pp. 39–46) reviews the needs for and benefits of

public involvement in managing international watercourses. This section also briefly surveys the various international watercourses, global and regional conventions and declarations, and international institutions discussed in this chapter. The section on pages 46–52 examines mechanisms, norms, and practices that provide citizens and others with access to information about the water quantity and quality in transboundary watercourses, as well as activities that could affect these waters. The subsequent section (pp. 52–56) considers public participation in the negotiation of treaties, in the development of policies and other norms, and in the review and approval of projects. The section headed “Access to justice” on pages 56–61 considers different venues – domestic courts as well as international tribunals and fact-finding bodies – in which citizens may file complaints if a private or public entity is harming or threatening to harm international watercourses (often termed “access to justice”). The section on pages 61–66 analyses how public involvement may be advanced within the context of transboundary water courses in Southern Africa; the chapter ends (pp. 66–67) with brief conclusions.

Overview

This chapter analyses various ways in which the public can become involved in the management of international rivers and lakes. The mechanisms range from making information available to the public, to consulting the public, to empowering the public to file complaints, and they are available in both domestic and international forums. These different mechanisms improve the management of the waters and benefit governments, businesses, and the public in innumerable ways.

Some commentators categorize public involvement into two general approaches. In the “cost-sharing” approach, people donate their expertise, time, and even finances, particularly when there is a close relationship between the affected community and the decision to be made or project to be undertaken (Kaosa-ard et al. 1998). Thus, villagers frequently will be involved in making a decision whether to build a small-scale irrigation system and what form it should take, as well as contributing their labour in developing the system. The cost-sharing approach, however, can become unwieldy with large-scale projects. Further, many of these projects carry a significant risk of an adverse impact on poor people, who traditionally have been both disenfranchised and the most affected. Thus, the “empowerment” approach seeks to include affirmatively those who would not otherwise have a voice in the decision-making process. This approach obtains information about those who could be affected, provides them with information about the potential project (or

other decision), consults with them, and ultimately provides them with an opportunity to shape the outcome.

Benefits of public involvement

At its basic level, public involvement builds awareness (Shumway 1999). Governments and the business community learn about the public's concerns and priorities and about the environmental and social impacts of their decisions and operations. This knowledge can then substantially improve decision-making. The public, in turn, gains insight into the multitude of concerns regarding the management of international waters. This insight can build their capacity to participate and also their respect and support for the decision-making process.

Public involvement improves the quality of decisions. Public input can supplement scarce government resources for developing norms and standards, as well as for monitoring, inspection, and enforcement, by identifying environmental threats or violations of applicable laws (Sharma et al. 1996). This is particularly true of cost-sharing public involvement, but also of the empowerment approach. By allowing a wide range of members of the public to express their views regarding a proposed project or an unresolved issue, the decision makers can expand the knowledge base for decisions. People in communities frequently know the local environmental, agricultural, and social conditions more intimately than do government agencies; this is particularly true for transboundary decisions.

Decisions affecting international watercourses frequently are made by government officials who sit far from the waters in question. As a result, these decisions rarely reflect the interests of the border residents, who frequently are far from the sources of power. Expanding on this theme, Ingram, Milich, and Varady observed that:

[I]nternational agreements that depend on internal political processes may fall short of achieving goals precisely because they do not sufficiently consider the local interests that ultimately determine the extent to which laws are implemented. National and international institutions rarely have incentive to heed realities of the field. Instead high-level policymakers are rewarded for setting ambitious goals without providing the appropriate understanding, tools, and capacity at the local level to implement the measures needed to achieve those goals. (Ingram, Milich, and Varady 1998)

They conclude that “transnational linkages that permit national agencies to speak to each other but remain deaf to local interests are destined to fail.”

Similarly, decisions made in the interest of national governments do

not necessarily reflect the interests of the transboundary ecosystems that are intricately connected to transboundary watercourses (Eriksen 1998). Thus, the public has a critical role to play in “represent[ing] an ecosystem over and above their national loyalties” (Sandler et al. 1994). By involving the public in the management of these waters, it is more likely that the decisions will respect the long-term ecological interest of transboundary ecosystems (Ferrier 2000).

Public involvement can identify and address potential problems at an early stage. Allowing the public to have access to information about proposed projects and decisions and allowing for public comment can thus save time, energy, and scarce financial resources in the long run. When the public is not given an opportunity to participate, negative public reaction to unaddressed (and unresolved) issues can lead to major (and sometimes violent) protests that stall or halt projects and add significantly to the overall cost of the project. For example, the construction of the Pak Mun Dam on a tributary to the Mekong River in Thailand did not include public participation in the assessment process. Although the dam was completed in 1994, the communities affected by the dam have objected to the compensation that they view as inadequate, and the unexpected costs have increased the dam’s overhead, altering the cost-benefit analysis (Kaosa-ard et al. 1998; Taylor 1994).

In contrast, involving the public in managing international watercourses can improve the credibility, effectiveness, and accountability of governmental decision-making processes (Environmental Law Institute 1991, 1992, 1993). Public participation at the outset defuses opposition by allowing the public to have a voice and giving time to find a solution that is acceptable to all parties and ultimately helps to build a broad-based consensus for the final decision.

Initiatives by NGOs can facilitate the decision-making process. When negotiations over international watercourses become polarized as governments become locked into their positions, NGOs with a regional focus can, “by highlighting regional and ecosystem-related perspectives, assist in breaking through barriers associated with traditional diplomacy. NGO expertise can also provide important information that may not be available to government negotiators” (Sandler et al. 1994).

Involvement also can build public ownership of the decisions and improve its implementation and enforcement, as the public is more likely to respect and abide by the final agreements (Ingram, Milich, and Varady 1998). Citizens and NGOs can also improve the monitoring of potential violations, particularly when they understand their rights and the standards that apply (Shumway 1999). They can supplement governmental enforcement efforts by identifying environmental threats or violations of applicable laws. For example, an increasing number of rivers and bays

in the United States and in other countries have “riverkeepers” and “baykeepers” – individuals who investigate and report potentially illegal actions that harm the waters, such as illegal discharge of wastes (Cronin and Kennedy 1997). Environmental agencies have also established environmental hotlines so that citizens can report environmental violations, frequently relating to illegal pollution of waterways (Fernandez 2000). Citizens and NGOs can also play a valuable role in enforcing norms where governments otherwise might be constrained by politics.

Lack of public support arising from a lack of public participation can impede project implementation. For example, the World Bank-funded Kampong Improvement Program lacked public participation, which led to apathy on the part of the intended beneficiaries and a failure to maintain the project (Taylor 1994).

A number of these reasons for public involvement in the management of international waters were recently explicitly addressed in the 1999 London Water and Health Protocol to the 1992 UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes. Article 5(i) provides that:

[a]ccess to information and public participation in decision-making concerning water and health are needed, *inter alia*, in order [1] to enhance the quality and the implementation of the decisions, [2] to build public awareness of issues, [3] to give the public the opportunity to express its concerns and [4] to enable public authorities to take due account of such concerns. (Water and Health Protocol 1999)

While this Protocol contains perhaps the most thorough enumeration yet in an international agreement of the benefits of public involvement in the management of international waters, a wide range of conventions and international institutions have sought to advance public involvement. The next subsection summarizes these initiatives.

Watercourses, conventions, and international institutions considered

In recent years, international conventions and institutions have strengthened the role of the public in the development, implementation, and enforcement of international commitments. Some of these have been general (relating to public involvement in environmental matters), whereas others have specifically incorporated public involvement into the management of international watercourses.

This subsection summarizes the different instruments and institutions considered in this chapter. The main sections on pages 46–61 examine

in more detail the specific provisions relating to access to information, public participation, and access to justice.

Watercourse-specific instruments and institutions

The Mekong River provides a case study in how public involvement is indispensable in effectively managing international watercourses. The 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin established the Mekong River Commission (MRC) as the primary body for managing river-related activities in the lower basin (Agreement on the ... Mekong River Basin, 1995). Cambodia, Lao People's Democratic Republic, Thailand, and Viet Nam are parties to the MRC, which replaced earlier committees dating back to 1957. The agreement seeks to promote sustainable development, utilization, management, and conservation of the Mekong River and related resources. The authority to develop water-allocation rights on the Mekong and its tributaries is one of the major strengths of the agreement.

The agreement established three management bodies within the MRC – the Council, the Joint Committee, and the Secretariat. The Council is the primary decision-making body, consisting of representatives at the ministerial and cabinet level. The Joint Committee implements the policies designed by the Council in order to fulfil commitments outlined in the 1995 agreement and formulates the Basin Development Plan which guides development along the Mekong River. The Secretariat to the Commission performs administrative and technical tasks. The MRC relies on financial support from member countries, the international donor community, and cooperating agencies.

Despite millennia of human use of the Nile River to meet residential, industrial, and agricultural needs, it is only recently that the international instruments governing its use have explicitly incorporated public involvement into its management. In 1999, 10 of the 11 Nile basin nations (all but Eritrea) commenced the Nile Basin Initiative (NBI), an informal, interim agreement to facilitate international management of this shared resource. The NBI promotes basin-wide sustainable development and management of the Nile River and its resources; its Policy Guidelines provide the framework for regional cooperation. The parties to the initiative created a Shared Vision Program, which established development priorities and emphasized shared benefits of the Nile River and its resources. The Strategic Action Program is the implementation mechanism (World Water Forum 2000).

Three separate international bodies with representatives from each riparian nation manage the NBI; the Secretariat, Technical Advisory Committee, and the Council of Ministers form its management structure. The Secretariat performs administrative tasks for the other two bodies, as

well as coordinating and monitoring the activities of the Shared Vision Program working groups. Technical Advisory Committee members present projects to implement the Shared Vision to the Council of Ministers. The Council of Ministers is the primary decision-making body for the NBI, comprising water ministers from Nile basin states; NGOs such as the International Nile Basin Association (INBA) are also active in gathering and disseminating information about the basin's water resources. These NGOs supplement the intergovernmental actions and provide possible models for transparency and participation in the basin.

The documents, plans, and programmes for the NBI have incorporated transparency and participation to varying degrees. Owing to the recent development of these instruments, however, there has been little opportunity to put these norms into practice. Nevertheless, it is notable that, even in a context as polarized and sensitive as the discussions regarding allocation of Nile basin waters, the riparian nations have seen fit to make the process more open and participatory.

Other transboundary watercourses around the world have experience in promoting and institutionalizing transparency, participation, and public accountability in the management of the waters, but they are not considered here. These bodies include the Rio Grande between Mexico and the United States, the North American Great Lakes, the Danube and Rhine rivers, and Lake Victoria (Bruch 2001).

Water-related instruments and institutions

The 1997 UN Convention on the Law of the Non-navigational Uses of International Watercourses represents the culmination of decades of international dialogue on the management of international watercourses. It sets forth basic principles for deciding how to allocate water for drinking and irrigation as well as for other non-navigational uses. The convention also includes a few norms that promote public involvement. As of 21 December 2000, 16 states had signed the convention and 8 had ratified, accepted, acceded to, or approved the convention (untreaty.un.org/ENGLISH/bible/englishinternetbible/partI/chapterXXVII/treaty30.asp – visited 21 December 2000).

Progressively, Southern Africa has adopted a series of legal and institutional initiatives that rely on public participation in developing and managing transboundary watercourses in the region. The 1987 Action Plan for the Common Zambezi River System (Zambezi Action Plan; ZACPLAN) recognized not only the environmental aspects of international waters but also the need for transparency and public participation in their management. Difficulties in implementing the ZACPLAN (Nakayama 1997, 1999) led to a more comprehensive 1995 Protocol on Shared Watercourse Systems in the Southern African Development Community (SADC) Region. Thirteen countries have signed or acceded

to this protocol, which promotes public awareness, public participation, and environmental-impact assessment as management tools for trans-boundary watercourses. The protocol is significant in that it establishes specific requirements for what basin states can and must do, and it recommends the development of integrated master plans to manage trans-boundary watercourses (Eriksen 1998). The 1999 Shared Rivers Initiative seeks to achieve equitable distribution of water resources in the Icomati River basin, and in other international river basins eventually (Quinn 2000; Turton and Quinn 2000). The initiative has established a basin-wide research agenda and a network of scientists to implement that agenda (Turton and Quinn 2000). In this way, the initiative hopes to foster research that generates legitimate data in a transparent and politically acceptable way and to develop a methodology that can be applied to other, more complex, basins in the region.

Other international instruments and institutions

In the last decade, the proliferation of global and regional instruments has expanded and crystallized public involvement in environmental matters generally (Bruch 2002). As both soft law (sometimes hortatory and sometimes reflective of general obligations under international law) and hard law (with binding obligations), these instruments apply to a wide range of international and domestic environmental contexts, including transboundary watercourses. Simultaneously, international institutions that conduct or support activities affecting these watercourses have opened up their processes to members of the public. The experiences of the international institutions are particularly illuminating, as they offer concrete examples of how public involvement can work, as well as some of the constraints that it can impose.

Perhaps the most universally agreed-upon international environmental declaration, the 1992 Rio Declaration, crystallized the emerging public involvement norms in principle 10:

Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided. (Rio Declaration 1992)

To implement the principles of the Rio Declaration, states at the 1992 United Nations Conference on Environment and Development adopted

Agenda 21 (the “Blueprint for Sustainable Development”). Agenda 21 envisaged public involvement in developing, implementing, and enforcing environmental laws and policies in many areas, including management of fresh waters. Specifically, chapter 18 contemplates integrated public participation in the management of domestic and transboundary water resources.

Since Rio, regional initiatives have elaborated on these general principles, clarifying and implementing them. In the Americas, Asia, East Africa, and Europe and the former Soviet Union, regional instruments have urged – and even required – nations to adopt specific measures to ensure domestic implementation.

The 1995 UN Special Initiative on Africa seeks to stimulate social and economic development in Africa throughout the UN system (UNDP 1995). The Water Component of the Special Initiative adopts a “Fair Share Strategy” with respect to fresh water, which relies on public participation in the management of domestic and international freshwater resources (UNEP/UNDP/Dutch Joint Project 1999).

Access to information

Broad access to information is the cornerstone of public involvement: it ensures that the public is able to know the nature of environmental harms and threats. This knowledge allows members of the public to decide whether a response is necessary and, if so, what would be the most appropriate and effective action. In an increasingly connected world, where actions in one nation can affect people and the environment in other nations downstream or downwind, states have recognized the need not only to make information available to their citizens but also to share information between nations.

Information and international watercourses

Recognizing that information is essential to the sound management of international watercourses and that states historically have been reluctant to compromise their negotiating positions by sharing information with other states or their own citizens (Okaru-Bisant 1998), international instruments and institutions increasingly facilitate or even require states to share information. This includes information on the status of a transboundary watercourse (such as water availability in the catchment area, rainfall data, simulated stream flows, and evaporation data, as well as water-quality data) and on factors that could affect the quality or quantity of water in the watercourse (such as ongoing or proposed projects).

The 1997 United Nations Convention on the Law of the Non-navigational Uses of International Watercourses mandates information sharing. Under article 9, states must regularly exchange hydrological, meteorological, hydrogeological, and ecological data (including information related to water quality and to forecasts). Article 11 requires states to exchange information on planned measures, and article 12 requires prior notification to states that could be affected by proposed actions (including technical data and an environmental-impact assessment).

A number of water-basin nations have committed to sharing information. In Southern Africa, the 1995 SADC Protocol on Shared Watercourse Systems requires member states to “exchange available information and data regarding the hydrological, hydrogeological, water quality, meteorological and ecological condition of such watercourse system.” In order to monitor and develop shared watercourses under article 4, River Basin Management Institutions are required by article 5(b)(i) to “Collect[], analys[e], stor[e], retriev[e], disseminat[e], exchang[e] and utilis[e] data relevant to the integrated development of the resources within shared watercourse systems and assist[] member States in the collection and analysis of data in their respective States.” Neither of these information-sharing provisions limits the obligations to inter-state exchanges, and in fact article 5(b)(ii) specifically commands the River Basin Management Institutions to “stimulat[e] public awareness and participation in the sound management and development of the environment including human resources development.” Implicit in this injunction to promote public awareness and participation is the need to guarantee public access to information about shared watercourses.

Development of public access

The SADC Protocol recognizes that governments and international institutions frequently lack the financial resources, technical infrastructure, and personnel to manage shared watercourses effectively. This lack of reliable data has impeded the development, implementation, and enforcement of international agreements on transboundary watercourses (Okaru-Bisant 1998). In fact, the World Bank observed that in Southern Africa, “without hard information [on the actual annual flow of the Senque (Orange) River], Lesotho is unwilling to make a firm international agreement guaranteeing a certain quantity of flow into South Africa” (Sharma et al. 1996). As a way of supplementing scarce resources and avoiding political difficulties, international instruments and institutions frequently rely on civil society to generate, review, and utilize information necessary to the management of transboundary watercourses (Eriksen 1998; Okaru-Bisant 1998; Sharma et al. 1996): thus, the Nile Tech-

nical Advisory Committee is currently considering projects designed to promote public participation and public information (World Bank Development News 1999). The 1999 London Water and Health Protocol to the 1992 UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes specifically sought to incorporate the principles of public involvement expressed in the Aarhus Convention into the management of transboundary watercourses.

NGOs are also finding fertile ground to promote access to information on transboundary watercourses in the absence of international sanction. For example, the INBA is a voluntary, non-profit organization that disseminates knowledge, shares experiences, and provides information relating to the development of Nile water resources. INBA constitutes an independent, alternative forum that complements the governmental forum and facilitates the generation and exchange of environmental information.

Information on status of watercourses

Knowledge about the quality and quantity of water in transboundary watercourses forms the foundation from which all decisions are made. Is there enough water? Is there enough water of sufficient quality? Could watercourse conditions cause a particular environmental or public-health harm? Is there any need to be concerned about proposed projects that might reduce the quantity, or impair the quality, of available water?

Some of the most promising developments in access to information about the status of transboundary watercourses occur through the growing practice of public and private institutions to collect and make this information publicly available. In addition to indigenous African initiatives, a number of global efforts are helping to build technical and institutional capacity to collect, store, and disseminate information on the status of freshwater resources in Africa. For example, the Southern Africa Flow Regimes from International and Experimental Network Data (FRIEND) programme is working to establish an international database on river flows, assemble data that can assist in determining flow regimes, analyse and estimate flood and drought frequency, integrate national inquiries into water resources, and model rainfall and run-off (Eriksen 1998). Similarly, the Nile FRIEND programme has strengthened flow-data collection and management along the Nile River in a non-governmental context, although some of the riparian countries have not supported or participated in the programme. Additionally, the World Hydrological Cycle Observing System (WHYCOS) is developing a network of observatories around the world – including in the SADC region – to collect high-quality hydrological data.

Since 1985, the MRC has undertaken baseline studies of water quality and resources in the basin through its Water Quality Monitoring Network. As of 1999, the network consists of 103 stations with 18 stations along the main river, 35 on Mekong tributaries, 44 in the Mekong delta, and 6 in wetlands (Mekong River Commission 1999). Discharge-measurement and sedimentation-sampling studies also have been conducted in Cambodia. Flow information is made publicly available in various media, and some commercial organizations have, in fact, established a business of publishing water-flow data (originally appearing in news reports) for their members.

Information on factors that could affect a watercourse

The public also needs to learn about proposed and ongoing activities that could affect transboundary watercourses. These activities could be developments such as water-diversion programmes that affect the quantity of water or industrial facilities that affect water quality. Environmental-impact assessment (EIA) is an important mechanism for assessing the potential impacts of a project and deciding whether and how to proceed. EIA is discussed in more detail in the next main section (pp. 52–56) but the threshold step of informing the public of the proposed activity and its potential ecological and social impacts merits mention here.

The SADC Protocol on Shared Watercourses specifically requires river basin management institutions to promote EIAs for development projects in a shared basin. Both the treaty establishing the East African Community and the East African Memorandum of Understanding (MOU) on Environment Management envisage EIA as an integral tool for environmental management in the region. Considering the shared concern expressed in these documents for the joint management of Lake Victoria, it is foreseeable that the public will eventually have access to information about development projects that could affect Lake Victoria, whether the proposed project is in their country or another one of the three countries.

The notice that the public receives in these situations could be similar to that provided by the International Joint Commission (IJC), which is charged with managing the North American Great Lakes (Bruch 2001). When the IJC receives a project proposal, the IJC must provide notice to the public

[t]hat the application has been received, the nature and locality of the proposed use, obstruction or diversion, the time within which any person interested may present a statement in response to the Commission and that the Commission will hold a hearing or hearings at which all persons interested are entitled to be heard. (International Boundary Waters Treaty)

Information on the development of watercourse norms, policies, and management plans

Building on the information regarding the status of a transboundary watercourse and information on factors affecting the watercourse, the public usually is guaranteed access to basic information on the institutional processes that relate to the development of policies and norms governing actions within the basin. These include draft policies, standards, management plans, and meetings, although internal documents reflecting the deliberative process are not always made available.

Many organizations – including the Border Environment Cooperation Commission (BECC) and the IJC in North America – require the public to be notified of upcoming meetings of regional bodies (Milich and Varady 1998). This notice normally states the time and place of the meeting, as well as the agenda or items to be discussed and how the public may participate.

The public frequently has the right to obtain information on proposed standards, management plans, and other means of implementing goals for the management of transboundary watercourses. Citizens are then allowed to review and comment on the proposals. The 1999 London Water and Health Protocol establishes a transparent framework in setting standards and levels of performance regarding protection against water-related disease. The European Water Framework Directive Proposal provides that the public must have access to river-basin management plans, as well as the opportunity to submit written comments on the plans (Ferrier 2000).

Institutionalizing access

Because of the importance of information and public involvement in the decision-making process, many mechanisms have evolved at the international, national, and local levels to ensure that citizens and organizations have access to information regarding transboundary watercourses (Kaosaard et al. 1998). This includes information on the status of water flow and water quality; information on ongoing and proposed activities that could affect the watercourse; and information on the development of norms, policies, and management plans.

Although different watercourse institutions and instruments vary in the specifics, most incorporate both “passive” and “active” mechanisms for ensuring that the public has access to the necessary information. Passive mechanisms guarantee that the public can request information from a governmental or supragovernmental authority. Active mechanisms require authorities to collect and affirmatively (proactively) disseminate

information, for example on the status of the watercourse environment or on proposed projects.

Some international institutions have established units tasked with facilitating public access to information on transboundary watercourses. Thus, the Public Relations and Co-ordination Unit of the Mekong River Commission Policy and Planning Division disseminates information through press releases, policy papers, an annual report, and release of monitoring and evaluation reports (Kaosa-ard et al. 1998).

Increasingly, institutions charged with the management of transboundary watercourses rely on electronic dissemination, through both e-mail and Web sites. The NBI (www.nilebasin.org), IJC (www.ijc.org), and BECC (www.cocef.org) have Web sites, as does the UN Economic Commission for Europe, which serves as the secretariat for the 1992 UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes and its 1999 Water and Health Protocol (www.unece.org). The MRC is currently constructing its own Web site (www.mrcmekong.org).

Civil-society organizations can provide a key element in generating and disseminating information on transboundary watercourses. Thus, the Mekong Forum has acted as a clearing-house of information for the lower Mekong basin, and universities along the United States–Mexico border have monitored and sampled contaminated groundwater in the Nogales area.

At the national level, constitutions, laws, regulations, and policies can provide an enabling environment and ensure that citizens have access to information held by their government (or even by other governments or private actors). In some cases, international agreements exhort (or even mandate) member states to modify domestic laws and institutions to allow for access to information, as in the case of the Aarhus Convention. In other cases, the national legislation creates an independent source of rights. Thus, the constitutions of MRC member states promote access to information by guaranteeing that citizens have the “right to be informed” (Viet Nam); to demand information without restrictions (Thailand); to require an EIA for projects (Thailand); and more generalized rights of press, expression, and publication which could implicate rights of access to information (Kaosa-ard et al. 1998). In fact, similar provisions found in many African constitutions establish cognizable legal rights of citizens to have access to information, to participate in governmental decision-making processes, and to have access to courts and administrative agencies to guarantee their procedural rights, as well as substantive rights to life and a healthy environment (Bruch, Coker, and VanArsdale 2001).

In spite of the developments at the national and supranational levels, challenges remain in ensuring public access to information on trans-

boundary watercourses as a practical matter. For example, in Cambodia, access to information on hydropower development projects prior to construction is not commonplace, despite policies to the contrary (NGO Forum 1997). One of the reasons for this in Cambodia is the lack of access to radio, television, and newspapers, particularly in rural areas. Another complication is language barriers, owing to the fact that many of the EIA documents in Cambodia are printed in English.

It is precisely because of the challenges posed by multiple languages, illiteracy, few technical resources, and a chronic lack of financial resources that public involvement is necessary. Citizens and NGOs can complement governmental and intergovernmental efforts in generating, reviewing, and utilizing data relating to the management of transboundary watercourses. The next section examines how members of the public have been able to take available information and contribute constructively to deliberations regarding the management of transboundary watercourses.

Public participation

If access to information is the first step, participation of civil society in decision-making processes is the centrepiece of public involvement. Participation ensures that decision makers have the opportunity to consider the diversity of interests at stake, and guarantees that citizens and organizations have an opportunity to submit information and arguments on decisions that could affect them.

Public participation in decisions relating to activities affecting transboundary watercourses

With the development of EIA as a standard tool in environmental management, international agreements on transboundary watercourses increasingly incorporate this type of assessment. In Africa, EIA is evolving as a key tool in environmental management, and institutions responsible for managing transboundary watercourses are incorporating and promoting EIA. For example, the 1995 SADC Protocol on Shared Watercourse Systems charged River Basin Management Institutions with “promoting environmental impact assessments of development projects within the shared water-course systems.”

For Lake Victoria, EIA is emerging as a key tool in protecting the shared water and ensuring that the public has an opportunity to participate in its management. Article 112(2)(b) of the Treaty Establishing the East African Community commits the partner states to “develop[ing]

capabilities and measures to undertake environmental impact assessment of all development project activities and programmes.” Under Article 7(1)(b) of the MOU on Environment Management, East African nations agreed to “develop[], enact[] and harmoniz[e]” EIA processes and procedures in national laws, regulations, and guidelines. Article 14 expanded on the commitments for harmonizing EIA in the region, and mandates that the public is to be involved “at all stages of the process.”

The MOU also committed states to “initiate, develop, implement and harmonize policies, laws and programmes to strengthen regional co-ordination in the management of the resources of the Lake Victoria ecosystem...” Considering the future of EIA as a component of Lake Victoria management, a group of experts recommended that:

Environmental impact assessment procedures in the three countries need to be adopted, harmonized and coordinated, especially with respect to activities affecting a shared resource such as Lake Victoria. This means agreeing on standards, criteria and levels of scrutiny and review that will apply in all three countries. It also means providing citizens/residents of one country the right to obtain information and participate in the EIA process of other countries. (UNEP/UNDP/Dutch Joint Project 1999)

Since 2000, the African Centre for Technology Studies, with assistance from the United States Agency for International Development (USAID), has been promoting the development and implementation of harmonized environmental-impact assessment in East Africa, centred around the management of Lake Victoria.

As the NBI is evolving, public participation appears to be an underlying principle for the Shared Vision Program and other NBI documents. The Shared Vision Program adopts the related principle of subsidiarity, calling for decision-making to occur at the lowest possible level for effective implementation. The Shared Vision Program also promotes public participation initiatives such as stakeholder involvement and community awareness. Policy guidelines that promote public participation in the implementation programmes include general statements regarding implementation at the lowest appropriate level, involvement of all affected stakeholders in implementation programmes, and consultation and involvement of stakeholders throughout the basin.

In the Mekong River basin, Vietnamese university academics and newspaper reporters held a series of public seminars on a government proposal to dyke the major river banks in the Mekong Delta to control flooding. As a result of the consultations, the “government accept[ed] an alternative proposal which suggested flood evacuation to the Western Sea, as opposed to the original plan of absolute flood control” (Kaosa-

ard et al. 1998). NGOs also have been active in fostering participation by citizens in decision-making processes regarding specific projects. MekongForum, an NGO with an academic and student membership base, provides the public with information on development proposals along the Mekong River and its tributaries in order to foster public participation and awareness of the impacts of development. Other Thai NGOs have worked to raise awareness of the environmental impacts of large-scale hydropower development on the Mekong River (Kværnevik 1994).

National EIA laws frequently provide a national framework for guaranteeing that the public has access to information about proposed projects that could affect the quality or quantity of water in transboundary watercourses. For example, in the Mekong River basin, Thailand's Enhancement and Conservation of Environmental Quality Act affirms the public right to environmental information and establishes an EIA framework (Kaosa-ard et al. 1998). Similarly, Cambodia and Viet Nam have EIA legislation in place, and Lao PDR is developing comparable legislation. Many of these legal and institutional developments have occurred in the context of efforts by the United Nations and the Economic and Social Commission for Asia and the Pacific (UN/ESCAP) to develop a regional initiative on public participation.

Public participation in decisions setting norms, policies, and plans for transboundary watercourses

Setting the broad norms and plans governing transboundary watercourses can be an effective avenue for incorporating the priorities of the public. In participating in the establishment of norms, policies, and plans, members of the public and government can avoid an interminable series of piecemeal battles and go to the root of the issue. The watercourse institutions, in turn, are able to benefit from the on-the-ground experience and expertise of civil-society members.

For most citizens and NGOs, the top priority simply is to submit information and arguments, rather than actually to serve on a decision-making body. Accordingly, the Mekong River Commission has affirmed that all Mekong riparian states, project supporters, project opponents, national Mekong committees, and representatives of indigenous populations should take part in developing sustainable policies for the basin. In addition to resource users and occupational groups in the basin, people living outside the Mekong River basin who may be affected by the impacts of a project may participate (Mekong River Commission 1999). This stakeholder participation is to occur in all aspects of MRC activities, including project and programme planning, implementation, monitoring, and evaluation.

These declarations signify progress toward incorporating public participation in establishing policies and plans; however, the practice, to a large degree, has yet to be realized.

In the 1998 MOU on Environmental Management, East African nations committed to the “full involvement of their people in the sustainable use and management of environment and natural resources.” The NBI provided that “[t]he appropriate planning level needs to involve all those who will be affected.” The 1999 UN/ECE (London) Water and Health Protocol commits parties to “ensure that due account is taken of the outcome of the public participation” in setting standards and levels of performance regarding protection against water-related disease. UN/ECE nations also committed to including the public in the development of water-management plans in transboundary, national, and local contexts. Owing to the newness of these instruments, however, little has yet to emerge, in practice.

Public participation in the development of transboundary watercourse agreements

Civil-society organizations have participated in the development of a number of international environmental agreements over the last decade (Bruch 2002). NGOs also played a key role in negotiating the 1987 amendments to the Great Lakes Water Quality Agreement (Sandler et al. 1994). NGO representatives served on the national delegations, reviewed draft position statements, and participated in decision-making at the national and bilateral levels. Through the process, they helped to establish trust between the governments and civil society. The NGO representatives complemented the government representatives, as the NGO representatives had technical knowledge that often exceeded that of their counterparts, particularly that of the official delegations representing the foreign ministries of Canada and the United States.

Following the adoption of the agreement, the NGO representatives worked to implement it. The IJC subsequently noted that “these [non-governmental] organizations are important in focusing political attention on the integration of Agreement objectives into domestic priorities and programs. They are instrumental in encouraging governments to provide the resources necessary to implement the agreement and actively promoting environmentally conscious behavior among their own membership and the public at large. . . .” (Sandler et al. 1994).

Following the adoption of an agreement governing a transboundary watercourse, the public can help to monitor compliance. The transparency of this review can encourage compliance and strengthens the credibility of the institution.

Implementing public participation

Full public participation involves all sectors of society. In order to accomplish this, it will be necessary to address challenges posed by historical, geographical, and financial constraints.

For example, along the Mexico–United States border, the BECC holds quarterly meetings in different cities. Although these meetings are open to the public, the great distances associated with the border region hamper public attendance (Milich and Varady 1998).

In Cambodia, there is a distrust of public participation since “‘public participation’ was used during the Khmer Rouge regime to gather villagers in coercive activities” (Kaosa-ard et al. 1998). Attempts to adopt a “participatory approach” have been more successful, but this may require an approach differing from that often used, particularly since “during the Khmer Rouge era, people attending public meetings could be killed or forced into hard labour.”

Education and training of the public and of public officials are essential for the establishment of trust in the value of public participation and in understanding how to participate in the management of water resources. Reliable enforcement mechanisms are also necessary to ensure that public participation is given its full due.

Access to justice

Citizen access to administrative and judicial review mechanisms – commonly termed “access to justice” – provides a third pillar in the governance of international watercourses (Ferrier 2000). Access to information and public participation depend on review and enforcement mechanisms for their guarantee. Additionally, these review mechanisms can help to ensure that substantive norms are complied with – for instance, that there is not undue degradation of water quality or illegal extraction of water.

While there remains work to be done to improve the transparency and participatory nature of governments and international institutions, discussions surrounding environmental law and international water management increasingly turn to implementation and enforcement. It is not enough in theory to provide information, to allow the public to participate, or to have strong norms; these legal rights and obligations must be backed by enforcement mechanisms that provide recourse for violations.

Over the last decade, governments have overcome much of their resistance to involving citizens in the enforcement procedures relating to international watercourses. As a result, people living along (and relying

on) transboundary watercourses have been able to challenge decisions using a variety of tools. This section discusses proceedings initiated by citizens in many forums, including domestic courts and international fact-finding and investigatory bodies such as the North American Commission on Environmental Cooperation and the World Bank. Although not always able to bring cases on their own behalf in certain venues, citizens may be able to participate in proceedings between countries before such international bodies as the World Trade Organization (WTO) and the International Court of Justice (ICJ), through the submission of amicus briefs (*amici curiae*).

Access to national courts and agencies

Citizens may be able use their domestic laws, courts, and administrative bodies to challenge activities that are resulting in international watercourse degradation. As discussed below, this can provide a familiar venue for aggrieved parties, although there might be difficulties associated with the extraterritorial application of domestic law.

In addition to utilizing domestic venues, citizens may also be able to participate in the judicial or administrative proceedings of another country as intervenors or affected parties (plaintiffs). This can be quite complex: cases involving transboundary harm often require complicated procedural and political issues to be addressed, such as sovereignty, the presumption against the extraterritorial application of national laws, jurisdiction, and *forum non conveniens*.

International treaties, conventions, and protocols increasingly include specific provisions to ensure fair, equitable, and effective access to courts and administrative agencies (Bruch 2001b). These provisions build upon the experiences of citizens in using national judicial and administrative forums to protect international watercourses and recognize the important role that these institutions can play in enforcing environmental norms.

Some of the conventions simply call for non-discrimination in providing access to justice. Thus, article 32 of the 1997 UN Convention on the Law of the Non-navigational Uses of International Watercourses provides:

Unless the watercourse States concerned have agreed otherwise for the protection of the interests of persons, natural or juridical, who have suffered or are under serious threat of suffering significant transboundary harm as a result of activities related to an international watercourse, a watercourse State shall not discriminate on the basis of nationality or residence or place where the injury occurred, in granting to such persons, in accordance with its legal system, access to judicial or other procedures, or a right to claim compensation or other relief in respect of significant harm caused by such activities carried on in its territory.

Although it is possible for states to agree otherwise, the general rule is that citizens and organizations shall have access to legal recourse on a non-discriminatory basis. This principle represents the culmination of three decades of negotiation and agreement among legal experts and decision makers around the globe, and as such it may represent an emerging norm of customary international law codified by the convention.

In East Africa, the nations of Kenya, Tanzania, and Uganda adopted an MOU for Cooperation on Environment Management that obligates the nations to ensure public access to their administrative and judicial proceedings. To build capacity, article 16(2)(d) commits states to

... develop measures, policies and laws which will grant access, due process and equal treatment in administrative and judicial proceedings to all persons who are or may be affected by environmentally harmful activities in the territory of any of the Partner States.

Article 16(3) further expands the non-discrimination principle, by providing that:

The Partner States agree to grant rights of access to the nationals and residents of the other Partner States to their judicial and administrative machineries to seek remedies for transboundary environmental damage.

Considering these two provisions in the context of managing and protecting Lake Victoria (article 8), the MOU lays out a normative framework for ensuring open, non-discriminatory access to justice in the management of this shared body of water. In fact, the MOU both builds on previous domestic experience and presages subsequent recognition of public involvement in enforcing environmental laws. In considering ways to develop and harmonize the environmental laws and institutions governing Lake Victoria, a United Nations Environment Programme/United Nations Development Programme (UNEP/UNDP) joint project recommended that “[b]road principles of *locus standi* should be adopted to allow private suits as a tool for the enforcement of environmental obligations.”

Access to international courts

In addition to the national bodies, aggrieved citizens and organizations increasingly find that international courts are willing to entertain their briefs on the matter before the court. By the terms of their organic statutes, the ICJ, the WTO, and other international tribunals usually are empowered to entertain cases brought by nations and occasionally by in-

ternational organs such as the United Nations and its subsidiary bodies. Nevertheless, these bodies increasingly allow members of civil society to provide separate briefs that lay out additional facts and legal arguments.

In a dispute between Hungary and Slovakia over the proposed Gabčíkovo–Nagymaros Dam, the ICJ for the first time accepted a position paper or “Memorial” from a coalition of NGOs, which included the Natural Heritage Institute, Greenpeace, International Rivers Network, Natural Heritage Institute, Sierra Club, and the Worldwide Fund for Nature (WWF) (Okaru-Bisant 1998). The ICJ recognized the NGO coalition as *amicus curiae*, or friend of the court. The coalition’s memorial demanded the restoration of the Danube ecosystem and argued that the planet’s natural treasures deserve international protection (Liptak 1997). More than two years later, on 25 September 1997, the ICJ ruled that the proposed diversion of the Danube was illegal.

Fact-finding and investigative bodies

In addition to international courts and tribunals, members of the public increasingly are able to gain access to international bodies with the authority to investigate alleged violations. In fact, a number of these bodies were established precisely to ensure that citizens and NGOs have the ability to review actions of nations and international bodies (such as the World Bank) and file complaints when actions violate procedural or substantive requirements. Although these bodies generally lack the authority of a legal body, they have been moderately effective in promoting compliance by publicly finding that an accused actor has violated agreed-upon norms.

The World Bank Group consists of five separate institutions that seek to promote development around the world. The International Bank for Reconstruction and Development (IBRD, and often known by the public as “the World Bank”) loans money to governments to develop typically large-scale infrastructure projects, such as hydroelectric power projects. In Africa, the IBRD has been involved with transnational water-resources management projects such as the Lake Victoria Environmental Management Project and the Lake Malawi/Nyasa Biodiversity Conservation Project, both of which are financed through International Development Association (IDA) credits and Global Environment Facility (GEF) trust-fund grants (Okaru-Bisant 1998).

In September 1993, the IBRD and the IDA created the Inspection Panel to increase transparency and accountability, as well as to respond to complaints regarding the social and environmental impacts of its projects. The panel is not a judicial or enforcement body, but it can influence and improve compliance with Bank policy (Udall 1999). The panel is

composed of three members from different World Bank member countries, who are independent of the World Bank's board of directors and management, but appointed by the World Bank's executive directors.

The Inspection Panel operating procedures authorize the Panel "to accept Requests for Inspection which claim that an actual or threatened material adverse effect on the affected party's rights or interests arises directly out of an action or omission of the Bank to follow its own operational procedures during the design, appraisal and/or implementation of a Bank financed project." These requests may be made by a group of two or more people from the country of the Bank-financed project, by a local representative who has been duly appointed to represent adversely affected people, by a foreign representative where there is no adequate in-country representative, and even by the Bank's executive director where serious violations of the Bank's procedures and policies are alleged.

The panel is responsible for determining whether a specific request falls within its mandate. If it does, Bank management must prepare a response to the allegations. The panel then conducts an independent preliminary assessment of the merits of the management's response and makes a recommendation to the Bank's board of directors about whether the claims should be investigated. Once the panel has received the approval of the board of directors, it can conduct an investigation (Udall 1999).

An example from Lake Victoria highlights some of the opportunities for citizens to utilize inspection panels to protect their interests. On 12 October 1999, RECONCILE (Resources Conflict Institute), a Kenyan NGO, submitted a Request for Inspection to the Panel concerning the Lake Victoria Environmental Management Project. In filing this request, RECONCILE also represented two other Kenyan NGOs – OSIENALA (Friends of Lake Victoria) and the Kenya Chapter of Ecovic (the East African Communities Organization for Management of Lake Victoria Resources). The requesters claimed that the individuals whom they represent are likely to suffer harm as a result of the failures and omissions of the IDA and the IBRD (the implementing agency of the GEF) in the design and implementation of the water hyacinth-management component of the project. This component entails mechanical shredding of water hyacinths and allowing the shredded material to sink to the lake bottom to decay.

The requesters alleged that this method was chosen without conducting a prior EIA or adequate community consultation and will cause environmental degradation and endanger the lake's communities. The request cited violations of several World Bank Policies and Procedures, particularly those dealing with environmental assessment, poverty allevi-

ation, economic evaluation of investment projects, and project supervision. On 20 December 1999, the World Bank management responded to the request by stating that, while it disagreed with the claims in the request, it believed that it should do a more thorough job of informing the public about its chosen management plan. In reviewing the request, the panel visited the site and met with representatives from RECONCILE, other NGOs, community-based organizations, fishermen, fishmongers, and individuals who depend on lake fishing and subsistence agriculture. Panel members also spoke with World Bank staff and Kenyan government officials. As a result of its review, the Panel recommended that an investigation be approved. On 10 April 2000, the World Bank's Board of Executive Directors approved the Panel's recommendation; the investigation is under way.

Implementing access to justice

Recent years have seen great strides in developing international norms on access to justice and enshrining them in domestic and international institutions. Nevertheless, as a practical matter, access to justice remains very much an emerging norm. As a general rule, many conventions, declarations, and scholars now highlight the importance of access to justice in environmental management generally, and in the management of transboundary watercourses in particular. However, specific requirements, practices, and institutional mechanisms remain lacking in many instances.

Developing and implementing public involvement in the management of transboundary watercourses in Southern Africa

This chapter has highlighted public involvement in transboundary watercourses in Africa, South-East Asia, Europe, and North America. With much of the experience coming from outside the region, it is worth considering the following points: (1) are the general principles of public involvement consonant with the cultural and political realities of Africa in general and Southern Africa in particular; (2) if so, to what extent might the experiences from around the world regarding public involvement in managing transboundary watercourses be relevant to Southern Africa; and (3) what might constitute the initial steps in developing and implementing public involvement in Southern African transboundary watercourses?

Relevance of public involvement principles to Southern Africa

The norms ensuring access to information and public participation in the management of international watercourses are rapidly crystallizing. The norms and institutions governing access to justice are also emerging, but remain nascent. These public-involvement norms will continue to develop as regional and global initiatives become more specific and more binding. Indeed, UN Secretary-General Kofi Annan observed that “[t]he 2002 Special Session of the United Nations General Assembly marking the tenth anniversary of the Earth Summit would be a timely occasion to examine the relevance of the Aarhus Convention as a possible model for strengthening the application of principle 10 in other regions of the world” (Annan 2000).

The 1989 African Alternative Framework for Structural Adjustment Programs (Bradlow 1991; Paul 1995) and the 1990 African Charter for Popular Participation in Development and Transformation established the importance of public involvement to Africa more than a decade ago. These pan-African instruments responded to traditional development mechanisms that inadequately included civil society and local governments in the decision-making processes (Note Verbale 1990). Although the Charter is not legally binding, many scholars have resorted to its declarations (Bradlow 1991; Cahn 1993; Grossman and Bradlow 1993; Oloka-Onyango 1995; Paul 1995; Taylor 1994), and regional and national initiatives appear to have drawn from it (Paul 1995). At the local level, community participation in natural-resource management has deep historical and cultural roots throughout Africa (Sharma et al. 1996).

The SADC has developed a number of binding protocols on natural resources for member states to adopt, including one on shared watercourses and one on mining (Protocol on Shared Watercourse Systems 1995; Protocol on Mining 1997; Draft Protocol on Wildlife Conservation and Law Enforcement 1998). These protocols incorporate principles of public involvement to varying degrees. As discussed earlier, the SADC Protocol on Shared Watercourses anticipates the collection of information on natural and man-made environmental conditions, making the information publicly available, and promoting public participation in the management of transboundary watercourses in Southern Africa.

The SADC Mining Protocol also mandates public access to information and public participation, much of it focused on providing an enabling environment for the private sector. Nevertheless, article 8 on “Environmental Protection” compels states to pursue a “regional approach in conducting environmental impact assessments especially in relation to shared systems and cross-border environmental effects.”

SADC countries may also incorporate public-involvement principles

and mechanisms into a binding environmental protocol that is currently being developed. Already, a UNEP/INFOTERRA (International Referral System) meeting on “Building Bridges for the Aarhus Convention” in Gaborone, Botswana in December 1998 has considered how access to information, process, and justice could be advanced in the SADC region (Ingraham 1998).

Finally, many nations in Southern Africa have constitutional provisions and laws that already guarantee that citizens have access to information, process, and justice. For example, South Africa, Mozambique, and Malawi all have a constitutional right of access to information (with Zimbabwe, Zambia, and Botswana having more limited rights); South Africa has a constitutional right for the public to participate in governmental decision-making processes; and almost all SADC countries ensure that their citizens can go to court to protect their rights, which includes a right to life and often a right to a healthy environment (Bruch, Coker, and VanArsdale 2001). Additionally, most SADC countries have an EIA law or sections of other laws that require an EIA.

Considering the African and SADC instruments (particularly the binding SADC protocols), the relevant constitutional and statutory authorities, and centuries of practice in community-based natural-resource management, it is inescapable that public involvement is culturally relevant to Southern Africa. The inquiry, then, turns to the extent to which public involvement should be developed for Southern African transboundary watercourses.

Factors that affect the applicability of experiences relating to public involvement in transboundary watercourses

Experiences in different transboundary watercourses vary greatly, depending on a range of geopolitical, historical, and social factors. When there are only a few riparian nations, agreements on transboundary watercourses are more likely to include the public, and to do so more effectively. For example, a 1909 agreement between Canada and the United States on the management of their boundary waters and the North American Great Lakes included public-participation provisions that remain unmatched in many contemporary agreements. The BECC agreement between the United States and Mexico is another such agreement, as is Lake Victoria. Conversely, rivers with numerous riparian nations (such as the Nile) are likely to raise more conflicts. The number of different parties with different concerns likely contributed to the difficulties in implementing the ZACPLAN, although other factors had more of an influence on the outcome. Similarly, where communities straddle a watercourse, there frequently is more incentive to develop a manage-

ment system that accounts for the interests of counterparts on the other side of the watercourse (Milich and Varady 1998).

A related factor is the degree to which nations share a cultural, historical, and social background. With this common basis, there is greater trust not only at the government level but also at the popular level. As a result, the United States–Canada and Kenya–Tanzania–Uganda agreements have evolved more rapidly and include stronger provisions for public participation.

A highly sensitive international context can make international agreements harder to reach and governmental officials reluctant to open the door to private third parties, whom they perceive as posing a very real danger of compromising their own position or of confusing the relationship. A context can become sensitive through economic or political instability, including warfare (Eriksen 1998). The international context could also become sensitive owing to actual, imminent, or prospective overburden of the available water, particularly where there is a historically dominant water user. The Nile River is highly polarized owing to political instability, a desire on the part of some riparian nations to address economic woes and promote development by drawing on water that Egypt has historically consumed, and the overdraft that such an action could precipitate and that would leave Egypt short and without another major source of water. In contrast, Southern Africa generally presents a more stable economic and political environment, and the demand for available water in Southern Africa is not as severe as it is along the Nile River. As a result, there appear to be more options for negotiating and for involving the public.

Advancing public involvement in Southern African transboundary watercourses

In developing and implementing norms and mechanisms for public involvement in the management of transboundary watercourses in Southern Africa, it is possible to expand on and extend experiences with domestic laws and institutions. Eriksen suggests a general strategy when starting cooperative management of transboundary watercourses that also applies to the context of public involvement: “focus[ing] on water quality issues avoids contention around water allocation. Water quality is also usually a concern shared by all riparians in some way. Co-operation on scientific assessments on a drainage basin and processes within it has been a starting point for basinwide co-operation.” It might also be prudent to start with transboundary watercourses that flow between only two nations and are not politically sensitive. For those reasons, the Okavango might not be a good candidate as a trial river, as it flows through three

nations and there are already sensitivities between Namibia and Botswana regarding its development.

Access to information can be promoted in Southern Africa through a number of discrete mechanisms, many of which are relatively low cost. Making information available upon request obviates the need for a sizeable staff and infrastructure, and the imposition of a reasonable fee (to cover copying, for example) can further reduce the burden on an authority. Establishing a resource centre is a more expensive endeavour, but it might constitute a project that foreign donors would support. Another, less expensive option would be to develop a Web site. Whereas this could benefit many of the NGOs and academic institutions in the region, it is unlikely that many citizens in Southern Africa, particularly those on the margins, would have access to the information as they are among the least likely to have access to the Internet. Producing a periodic "state of the river" report poses certain difficulties, which can be overcome. Because it is expensive, it would be important to keep the report brief. There is also the possibility of publishing the report every two years rather than annually, again reducing the production and printing costs. Such a report could focus initially on water-quality issues, draw upon a modest number of sampling points, and grow from there.

As a first step toward developing public participation in the management of transnational watercourses in Southern Africa, EIA can be developed at the national level and harmonized through the subregion or across rivers. As it is unlikely that river-management bodies will have the funds necessary to conduct detailed EIAs or lengthy public hearings on them, the river body could require project proponents to conduct an EIA for projects likely to have a significant environmental impact and then open the discussion to the public. One easy step could be opening meetings of the river-management authorities to the public; this costs relatively little, and the public could participate as either silent observers or as participating, but non-voting, observers. Considering the nascent status of public participation in the region's transboundary waters and the lack of internationally agreed-upon details governing what constitutes meaningful public participation in the development of plans, policies, or binding norms, it is likely to be a while before there is greater public involvement in the development of these broader norms in Southern Africa.

At this point, there is no body in Southern Africa properly charged to hear a claim from a citizen or NGO regarding a transboundary watercourse. As such a proposition would be both expensive and politically challenging, it is unlikely to be realized in the near future. In the meantime, nations in the region can establish broad interpretations of standing to facilitate access to their courts, both by their nationals and by

others who may be affected, particularly those living in other riparian nations.

In developing these norms – which give a voice to citizens, NGOs, and local governments – it will be necessary to balance the roles of international, national, and local actors in the management of transboundary watercourses (Milich and Varady 1998). The national and international actors are essential to ensuring that local control does not lead to parochial dominance and unsustainable abuse of natural resources; and the participation of local actors is necessary for the norms and institutions to be relevant and have local support (and thus be implemented) on the ground.

Conclusions

Although public involvement in the management of transboundary watercourses goes back decades, if not millennia (Kaosa-ard et al. 1998), the last decade has seen a proliferation of international agreements and institutional practice. At the same time, national laws and institutions charged with the management of freshwater resources (which frequently cross national borders) have incorporated transparency, public participation, and access to justice.

Public involvement includes access to information, public participation in the decision-making processes, and access to judicial and administrative redress. In the context of transboundary watercourses, access to information ensures that citizens and other members of civil society have the ability to request from governmental and intergovernmental authorities information on the status of the watercourse and its tributaries (including water flow and water quality); factors that could affect the watercourse or its tributaries; and norms, policies, and management plans that shape activities relevant to the watercourse. Public participation includes the opportunity for members of the public to submit comments (and have the authority take due account of the information) regarding specific activities that could affect the watercourse; the development of norms, policies, and plans that govern the watercourse; and even in the development of the transboundary watercourse agreements themselves. Access to justice includes resort to national courts and agencies, international courts, and fact-finding and legislative bodies.

In the 1995 Protocol on Shared Watercourses and the preceding 1987 ZACPLAN, Southern Africa has been a leader in developing international instruments that envisage public involvement as a necessary component of sustainable management of transboundary watercourses. This chapter highlights a number of concrete experiences from watercourses

around the world that might be relevant in the further development and in the implementation of public involvement in Southern African watercourses. These experiences build upon a history of community management of natural resources, national laws and constitutional provisions, and Southern African instruments. As such, they can provide significant guidance for Southern African decision makers in ensuring that the public has a voice in the management of this critical resource.

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Transboundary freshwater treaties

Meredith A. Giordano and Aaron T. Wolf

Introduction

Over the past century, concern has grown over the management and allocation of international fresh waters worldwide. In an effort to assist riparian nations in resolving or averting conflict over transboundary waters, the international community has developed generalized principles governing the management of international watercourses. In general, however, these principles have not been utilized by the countries that contain, or border on, the world's 261 international waterways. International riparian nations have, instead, continued to build upon a rich history of bilateral and multilateral water treaties, spanning nearly 1,200 years, that focus on the specific needs and conditions of each individual basin. The United Nations Food and Agriculture Organization (UN FAO) has identified more than 3,600 treaties, dating back to AD 805, related to international water resources. The vast majority of the treaties deal with some aspect of navigation; however, approximately 300 treaties negotiated since 1814 are specifically related to water as a limited, consumable resource (i.e. excluding navigation, fishing rights, or river-boundary delineations).

To aid in the understanding of processes leading to both conflict and cooperation over international freshwater resources, Oregon State University Department of Geosciences, in collaboration with the Northwest Alliance for Computational Science and Engineering, is developing the

Transboundary Freshwater Dispute Database (TFDD). The TFDD currently includes the following: a digital map of the world's international watersheds; a searchable compilation of 149 international water-related treaties and 34 US interstate compacts, along with the full text of each; an annotated bibliography of literature on water-conflict resolution; negotiation notes (primary or secondary) from 14 detailed case studies of water-conflict resolution; a comprehensive "event history" of all reported cases of international water-related disputes and conflict resolution (1948–1999); and descriptions of indigenous/traditional methods of water-dispute resolution.¹

In the context of the global transboundary water-treaty experience, this chapter quantitatively and qualitatively evaluates two of the components of the TFDD – the treaty record and the event history – to offer lessons of treaty effectiveness that may be useful to the Southern African Development Community (SADC). With the goal of identifying possible measures for strengthening the region's ability to build effective, resilient treaties, the SADC's past record of (and future outlook for) cooperative water management is evaluated as follows:

1. *Assess the treaties that exist within the SADC region against components of treaties identified as effective in other parts of the globe.* A close reading of the world's treaties in the context of conflictive and cooperative interactions between co-riparians offers insights into provisions that promote institutional resilience such as flexible management structures, clear and flexible water-allocation criteria, the equitable distribution of benefits, and detailed mechanisms for conflict resolution.
2. *Assess treaty effectiveness through each basin's event history.* The overall effectiveness of each treaty can be further assessed by evaluating the events that took place between co-riparians both before and after agreements are signed.
3. *Assess the new SADC water protocol for its apparent ability to promote viable treaties.* Through an evaluation of the SADC's revised water protocol, the final stage of the analysis provides insights into the ability of a regional network to support basin-level cooperative efforts.

In order to set the global context for transboundary water cooperation, a brief discussion of international water-allocation theory² and global treaty practice precedes the SADC-specific treaty evaluation. This international perspective is necessary in order to demonstrate the limited extent to which riparian nations rely upon internationally established water-allocation norms in practice and to illustrate certain treaty components utilized at the basin scale for managing shared water resources. Against this global setting, the experience of the SADC in managing waters at both the basin and regional scale is then evaluated.

International water allocations in theory

During the past century, while populations and development pressures have grown within many of the world's river basins, water has become a significant source of political conflict, particularly in the world's 261 international river basins (Wolf et al. 1999). Disputes over water have led to conflict between Arabs and Israelis, Indians and Bangladeshis, Americans and Mexicans, and among all ten Nile basin co-riparians (Wolf 1999). In response, four general doctrines of transboundary water allocation have emerged – namely, absolute sovereignty, absolute riverine integrity, limited territorial sovereignty, and economic criteria (Buck et al. 1993; Wolf 1999).

Extreme principles

Of these four principles, the most extreme are the doctrines of absolute sovereignty and absolute riverine integrity. Absolute sovereignty is based on hydrography and implies unilateral control over waters within a nation's territory. Although this doctrine is often the initial claim by upstream riparians during treaty negotiations, it has rarely been applied in actual water treaties and has never been invoked in any international law judgement (Wolf 1999). The doctrine of absolute riverine integrity lies at the other extreme and is often the initial bargaining position for downstream riparians. Emphasizing the importance of historical usage, or chronology, absolute riverine integrity suggests that every riparian has a right to the waters that flow through its territory. Like the absolute sovereignty principle, the doctrine of absolute riverine integrity has rarely been applied in international law or in treaty practice (Wolf 1999).

Moderate principles

Limited territorial sovereignty and economic criteria represent more moderate water-rights positions. Limited territorial sovereignty, for example, reflects the right to reasonable and equitable use of international waters while inflicting no significant harm on any other co-riparian. Like the two antithetical extreme principles, however, the doctrine of limited territorial sovereignty inherently includes two diametrically opposed positions – reasonable and equitable use versus the commitment to inflict no significant harm. Not surprisingly, upstream riparians tend to place more weight on reasonable or equitable use, which would value present and past needs equally, whereas downstream riparians in general favour the “no significant harm” clause, which protects historic uses (Wolf 1999).

The principle of allocating water on the basis of its economic value is a more recent addition to water-conflict resolution. Under this principle, the market is used to allocate water among competing users in an economically efficient manner. Although the principle has received considerable attention and has been applied in a number of intrastate settings, water markets have not yet developed at an international scale owing, in large part, to concerns over equity (Wolf 1999). Economic principles have been applied in water treaties through the principle of equitable distribution of benefits, explored below.

Current applications of water-allocation principles in international water law

The international community has drawn from the generalized doctrine of limited territorial sovereignty, described above, in order to devise international laws concerning the equitable allocation of water resources between nation-states.³ In 1966, for example, the International Law Association adopted the Helsinki Rules, which provides a set of guidelines for “reasonable and equitable” sharing of common waterways (Caponera 1985). In 1970, the United Nations General Assembly commissioned its own legal advisory body, the International Law Commission (ILC), to study “Codification of the Law on Water Courses for Purposes other than Navigation.” After more than two decades, the ILC completed its draft articles,⁴ which the UN later adopted in 1997 as the Convention on the Law of the Non-navigational Uses of International Watercourses (UN Convention).⁵

As is evidenced by the 27-year period from commissioning to approval, developing a universal set of legal principles with application to the world’s 261 international waterways was no simple undertaking – in fact, it might be considered an impossibility. The uniqueness of each basin and its riparian nations suggests that any universal set of principles must, by necessity, be fairly general. However, the requisite generality of the principles may in turn inhibit their ultimate application.

The vague language present in the 1997 UN Convention is plainly demonstrated in the articles concerning water allocation. Drawing from the doctrine of limited territorial sovereignty, the ILC chose to include provisions for both “reasonable and equitable use” and an obligation not to cause “significant” harm. The definition of “reasonable and equitable use” is based on seven, non-exhaustive factors.⁶ The articles, however, neither prioritize the seven factors nor offer any clear order of preference between the inherently opposing provisions of “reasonable and equitable use” and “no significant harm.” With regard to the factors of “reasonable and equitable use,” Article 6 merely suggests that “the weight to be

given to each factor is to be determined by its importance,” and that “all relevant factors are to be considered together.” Further obscuring the issue, Article 10 states that “in the absence of agreement or custom to the contrary, no use . . . enjoys inherent priority over other uses,” and that, “in the event of a conflict between uses. . . [it shall be resolved] with special regard being given to the requirements of vital human needs.”

Not surprisingly, upstream riparians have advocated that the emphasis between the two principles be on “equitable utilization,” since that principle gives the needs of the present the same weight as those of the past. Likewise, downstream riparians (along with the environmental and development communities) have pushed for emphasis on “no significant harm,” effectively the equivalent of the doctrine of historic rights in protecting pre-existing use.

While such vague language (e.g. “reasonable,” “equitable,” “significant”) may have been necessary for reasons of geographic diversity and, ultimately, political expediency, the application of the UN Convention to specific water conflicts is indeed problematic. As suggested above, the UN Convention’s articles do not offer the specificity necessary to address the distinct needs and settings of *individual* basins. It is hardly surprising, therefore, that the generalized legal principles are rarely invoked in actual treaty practice at the basin scale.

International water allocation in practice

The development of water laws can be traced back at least to the eighteenth century BC, when civilizations began drafting codes to manage water for flood control, irrigation, communication, and transportation purposes.⁷ The Babylonian Code of Hammurabi, written nearly 4,000 years ago, is one such example (Biswas 1970). Treaties to manage waters shared by two or more nation-states have been in use since the ninth century AD and, although the vast majority have focused on navigational issues, a growing number concern non-navigational issues. Since 1814, approximately 300 international freshwater treaties have been negotiated that deal specifically with non-navigational water-resource issues.

The TFDD, described above, includes the full text of 149 international freshwater treaties concerning a broad array of water-resource issues.⁸ Of these 149 treaties, 49 describe water allocations for consumptive or non-consumptive uses. An analysis of the specific terms and provisions contained in these 49 treaties reveals how rarely generalized principles are explicitly invoked. In fact, the 1966 Helsinki Rules have explicitly been used only once to help define water use.⁹ Furthermore, although it would be premature to evaluate the success or failure of the 1997 UN

Convention, an analysis of the 49 treaties reveals certain trends that highlight the tendency of co-riparians to develop practices that meet basin-specific needs, as follows.¹⁰

From rights to needs

First, there is a tendency for a shift in positions to occur during negotiations, from “rights-based” towards “needs-based” values. Many of the negotiations surveyed begin with the parties framing their initial positions in terms of rights – the sense that a riparian is entitled to a certain allocation based on hydrography or chronology. In almost all of the water disputes that have been resolved, however, the paradigm used for negotiations has focused on co-riparian “needs,” defined by irrigable land, population, or the requirements of a specific project.¹¹ In agreements between Egypt and Sudan signed in 1929 and in 1959, for example, allocations were determined on the basis of local needs, primarily of agriculture. Egypt argued for a greater share of the Nile because of its larger population and extensive irrigation works. In 1959, Sudan and Egypt agreed to divide future water from development projects equally between the two riparians. Current allocations of 55.5 billion cubic metres per year (BCM/year) for Egypt and 18.5 BCM/year for Sudan reflect these relative needs (Waterbury 1979).¹²

Relative hydrography versus chronology of use

Secondly, as described earlier, generalized legal principles focus on some version of upstream versus downstream relations, whether defined in the extreme as absolute sovereignty versus absolute riverine integrity, or more moderately as equitable use versus the obligation not to cause significant harm. In practice, the only settings in which ambiguity remains are along humid, underdeveloped rivers. Along arid or exotic streams, where some aspect of consumptive use is involved, there is very little debate – in nearly all cases, prior uses are protected in the treaties that describe them and, in general, downstream needs are favoured. Six Nile Basin treaties signed between 1891 and 1959, for example, all involve the protection of Egypt’s prior hydraulic uses. Further, the boundary-water accords between the United States and Canada and the United States and Mexico all include prior-use clauses. Even in humid regions, prior uses tend to be protected: the Horgos River boundary agreement between Russia and China, for instance, divides the water equally, but protects the uses of existing canals.

Upstream or downstream position is not claimed as an a priori basis for water allocation in the 49 treaties. This does not suggest, however, that

the upstream/downstream relationship is ignored; rather, when the issue is addressed, it is done so *implicitly*. In general, the downstream riparian is favoured (or, at least, its allocations are protected) along arid and exotic streams. This is not to say that the downstream riparian receives more water, since this is not always the case – Mexico receives less water on both the Colorado and the Rio Grande/Rio Bravo than the United States – only that the allocations of the downstream riparian are generally delineated and protected. Mexico, Egypt, Bangladesh, and Pakistan all have their needs defined and guaranteed in their respective treaties. This precedence probably comes about as a consequence of two earlier observations – that rights give way to needs and that prior uses are generally protected. Because there is more, and generally older, irrigated agriculture downstream on an arid or exotic stream, and because agricultural practices predate more recent hydroelectric needs – the sites for which lie in upland headwaters – the downstream riparian has a greater claim, whether measured by needs or by prior uses of a stream system.

Economic criteria

Thirdly, although market-based water allocations have not been used to allocate international waters, economic criteria have been applied to the division of benefits when hydropower and/or river-development projects are defined by treaties. The boundary-waters agreement between the United States and Canada, for example, allocates water according to equal benefits in terms of hydropower generation; this results in the odd arrangement that power may be exported out of the basin for gain, but the water itself may not. Furthermore, the relative nature of “beneficial” uses is exhibited in a 1950 agreement on the Niagara, which provides a greater flow over the famous falls during “show times” of summer daylight hours, when tourist dollars are worth more per cubic metre than the alternative use in hydropower generation. Finally, the treaty with the strongest economic influence is the 1995 groundwater agreement between Israel and Palestine. Although no payments are made outright for water, provisions are included to consider water markets in the future, and the two sides agree not to subsidize marketed water – moves long encouraged by economists to promote efficient use.¹³

Unique local setting

Lastly, the uniqueness of each basin is repeatedly described, both implicitly and explicitly, in the treaty texts, further confounding the application of generalized water-allocation principles, whether based on legal or economic equity. While most of the debate in the realm of customary

international law has focused on accommodating as many concerns as possible in the development of generalized principles for all of the world's international water, riparians of these basins have been concurrently negotiating agreements that focus specifically on local concerns and conditions. In addition, many of these treaties also include a clause that explicitly disavows the treaty as setting an international precedent, further distinguishing the generalized principles from specific practices. The 1950 accord on Austria/Bavaria boundary waters is typical: "Notwithstanding this agreement," it reads, each nation maintains its "respective position regarding the legal principles of international waters." A more recent treaty, the 1996 Ganges Agreement, includes the similar provision that the parties are "desirous of finding a fair and just solution without . . . establishing any general principles of law or precedent."

The uniqueness of each basin – whether hydrological, political, or cultural – stands out in the creativity of many of the treaties. Illustrations from several agreements help to demonstrate this point. The 1969 accord on the Kunene River, for example, allows for "humanitarian" diversions solely for human and animal requirements in south-west Africa as part of a larger hydropower project. In the 1994 Treaty of Peace, Jordan stores water in an Israeli lake while Israel leases Jordanian land and wells. India, under a 1966 agreement with Nepal, plants trees in Nepal to protect its own water supplies. In a 1964 agreement Iraq "gives" water to Kuwait, "in brotherhood," without compensation. Finally, included in a 1957 agreement between Iran and the USSR is a clause that allows for cooperation in identifying corpses found in their shared rivers.

Cultural geography can overwhelm the capacity of generalized principles as well. In 1997 discussions among the riparians of the Euphrates basin, Syria objected strenuously to proposals for water pricing. This led to a temporary impasse, until it was explained by an outside observer that some Islamic legal interpretation forbids charging money for water itself; the term was modified to "tariff" (to denote costs only for storage, treatment, and delivery) and discussions were able to proceed.

Effective treaty characteristics

A global review of water-allocation treaties thus reveals a lack of reliance at the basin level on the generalized principles adopted by the international legal community. It also highlights certain components of treaties that help to instil institutional resiliency and that can be effective in ameliorating conflicts over treaty terms and provisions. Such "model" components include:

1. *Adaptable management structure.* Effective treaty-management struc-

tures incorporate a certain level of flexibility, allowing for public input, changing basin priorities, and new information and monitoring technologies. The adaptability of management structures must also extend to non-signatory riparians, whose needs, rights, and potential accession must be considered in the treaty provisions.

2. *Clear and flexible allocation criteria.* Water allocations are at the heart of most water disputes (Wolf et al.). Effective treaties identify clear allocation schedules while simultaneously providing for extreme hydrological events, new understanding of basin dynamics, and changing societal values. An alternative approach found in some treaties is to prioritize uses throughout the basin, rather than setting fixed allocations by country. Establishing catchment-wide water precedents may help not only to avert inter-riparian conflicts over water use but also to protect the health of the basin as a whole.
3. *Equitable distribution of benefits.* This concept, subtly yet powerfully different from equitable use or allocation, is at the root of some of the world's most successful treaties. The idea concerns the distribution of benefits from water use – whether from hydropower, agriculture, economic development, aesthetics, or the preservation of healthy aquatic ecosystems – *not* the benefits from water itself. Distributing water-use benefits allows for positive-sum agreements, often incorporating non-water-related gains, where dividing the water itself allows only for winners and losers.
4. *Detailed conflict-resolution mechanisms.* Although not explicitly discussed in the above analysis of global water treaties, this component is essential for treaty resiliency. Many basins continue to experience disputes even after a treaty has been negotiated and signed. Thus, incorporating clear mechanisms for resolving conflicts is a prerequisite for long-term effective management.

The following regional analysis of the water-treaty experience of the SADC illustrates the extent to which these components of treaty effectiveness have been adopted by SADC's members at the basin scale; the effectiveness of SADC water institutions historically; and the apparent ability of the new SADC water protocol, which draws heavily from the 1997 UN Convention, to promote effective treaty writing in the future.

Treaty experience in the SADC region

Building upon 12 years of regional cooperation experience under the Southern African Development Coordination Conference (SADCC), the SADC was established in August 1992 by 10 Southern African nations¹⁴ and has since grown to include 14 countries with varied economic and

political structures.¹⁵ One of the primary objectives of the SADC institution is to “achieve sustainable utilization of natural resources and effective protection of the environment” (SADC Declaration and Treaty 1992, Article 5). To fulfil this objective, several SADC subunits have been established to coordinate sector-level policies, priorities, and projects. Included among the subunit institutions is the Water Sector Coordination Unit, which was established to promote “sustainable, integrated planning, development, utilization and management of water resources” in the region (Southern African Development Community Web site 2000).

Evaluation of SADC water treaties

Within the Southern African region there are 15 international river basins, 13 of which exclusively contain SADC member nations – the Buzi, Etosha-Cuvelai, Incomati, Kunene, Limpopo, Maputo, Okavango, Orange, Pungwe, Ruvuma, Save, Umbeluzi, and Zambezi.¹⁶ To manage the region’s shared basins, during the past 50 years the Southern African nations, both colonial and independent, have concluded several bilateral and multilateral water agreements. Oregon State University’s TFDD, described above, includes 16 agreements related to SADC’s 13 shared watercourses;¹⁷ 9 of these agreements were concluded by current SADC member states and are detailed in Appendix 1.¹⁸

These nine SADC water agreements can be separated into three broad categories: (I) Agreements Establishing General Watercourse Commissions; (II) Agreements Concerning Single Watercourses; and (III) Agreements Concerning Specific Watercourse Projects (see Appendix 1 for treaty listing by category). Agreements within each of these categories not only serve similar functions but also, as shown later, resemble one another in terms of the degree to which they incorporate the “model” treaty components described above.

Category I: Agreements establishing general watercourse commissions

Four of the nine treaties focus primarily on establishing water commissions with some broad level of authority to oversee the management of shared watercourses. Each of the four agreements outlines the basic framework for, and functions of, the multinational water organization it creates; in two cases¹⁹ it also accords legal personality to the institutions. The geographic scope of the agreements extends to the water resources or rivers of common interest to the signatories. Where the affected watercourse includes additional, non-signatory riparians, their interests and rights are referenced in the respective agreement. Some level of functional flexibility is granted in all of the treaties through broad de-

finitions of institutional duties, or through the inclusion of clauses referencing responsibility over “such other” matters as may be assigned. None of the management structures, however, allows for public participation. Furthermore, although the water commissions established by each of the agreements are tasked with developing water-appropriation criteria, the Category I treaties do not actually contain specific water-allocation or prioritization schedules. Finally, in terms of the distribution of benefits and conflict-resolution components, none of the treaties addresses the former component and only one, the South Africa–Swaziland Joint Water Commission agreement, contains detailed conflict-resolution measures.²⁰

Category II: Agreements concerning single watercourses

The Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System (ZACPLAN) and the Okavango River Basin Commission (OKACOM) agreement constitute the second category of SADC treaties. The OKACOM agreement establishes a permanent water commission for the Okavango River with delegates from all riparian nations except Zimbabwe (a topographic but rarely hydrologic riparian), whose interests are considered in the agreement. The duties of OKACOM, like those of the general watercourse commissions described above, are broad-based and provide functional flexibility by allowing for OKACOM’s assumption of additional duties as deemed necessary. The ZACPLAN agreement, whose signatories constitute five of the Zambezi’s eight riparian nations, with accession rights for the remaining nations, outlines a number of short-term goals and projects as well as a longer-term vision. The agreement does not firmly establish an oversight body, although suggestions are provided. The text of the ZACPLAN agreement includes several references to community participation and information dissemination – issues that are not addressed in the OKACOM agreement. With regard to the allocation of water and its utilization, although OKACOM is tasked with recommending an appropriate criteria for the “conservation, equitable allocation and sustainable utilization” of the basin’s waters, neither document specifically discusses methods to appropriate water or to prioritize or distribute benefits from its use. Finally, while the OKACOM agreement makes reference to the fact that the Contracting Parties will settle agreement-related disputes, neither document incorporates detailed conflict-resolution procedures.

Category III: Agreements concerning specific watercourse projects

Three agreements fall into the final category of water-project management. The treaties in this third category contain much more detailed

provisions and conform to a much greater extent to the four model treaty components. All three agreements establish governing bodies accorded legal personality and commissions overseeing project implementation. Although each treaty is concerned with implementing or managing a specific project, a degree of management flexibility is built into each agreement. Both the Lesotho Highlands Water Project (LHWP) on the Senqu/Orange River and Komati River basin development project, for example, utilize phased implementation formats with provisions allowing for the cancellation of future project phases. These two agreements also include language to protect the rights of other, non-signatory nations riparian to the respective river basins. The Agreement between Zambia and Zimbabwe Concerning the Utilization of the Zambezi River, while focused primarily on the management of the existing Kariba Dam, also maintains a degree of flexibility by including in its scope the possibility of managing future developments on the river in terms of water and other resources. The interests of the Zambezi's six remaining riparian nations, however, are not addressed. Water-allocation criteria are addressed in all three agreements. In the Zambezi River agreement, the distribution of power from the Kariba Dam is linked to the allocation of available water, which is to be divided equally between the two signatories. The LHWP and Komati River agreements outline very specific water allocations or formulas and take into consideration the possibility of future modifications to water needs and natural changes to hydrologic regimes. Benefits from the use of waters are addressed in two of the agreements: energy from the Kariba Dam is shared equally by the two nations under the Zambezi River agreement, and the LHWP agreement calls for South Africa to share the net benefits of the project with Lesotho through formulaic royalty payments. Finally, each of the three treaties addresses the issue of conflict resolution by detailing multi-level arbitration processes.

Although certain elements of management flexibility can be found in treaties from all three categories, only the latter category addresses sub-components from each of the four model treaty criteria (see Appendix 2). For treaties in the first two categories, clearly defined conflict-resolution mechanisms, essential for long-term treaty effectiveness, are lacking in all but one agreement. Furthermore, two additional elements visibly lacking from treaties in all three categories are allowances for public participation and water-use prioritization. Of the nine agreements, only ZACPLAN addresses any form of community involvement in its provisions. Without the involvement of local experts and input from the population as a whole, treaty negotiators run the risk of developing unrealistic – and, indeed, infeasible – goals and projects. With regard to water usage, although water-allocation methods are described in all Category III treaties, none of the agreements specifically addresses

water-usage priorities. Some of the documents refer to water-quality concerns or utilize language such as promoting “sustainable utilization,” and “efficient and equitable use of the waters,” or minimizing “waste and non-beneficial use.”²¹ In no case, however, is any precedence given to a particular water usage, nor are such terms as “sustainable,” “efficient,” “equitable,” or “non-beneficial” defined. The lack of basin-wide water-use priorities could present a problem to the Southern African nations, particularly if income levels and value judgements change asymmetrically in the region.

Effectiveness of water treaties and institutions in the SADC region

While the above evaluation of the SADC treaties highlights certain strengths and weaknesses of the region’s water agreements, one method of qualitatively measuring their actual effectiveness is to compare the region’s water-event history, both before and after the treaties were signed. In an ongoing project of the TFDD to identify “basins at risk” of future conflict,²² a data set has been developed of conflictive and cooperative water-related interactions between co-riparian countries in all the world’s international watersheds (as defined in Wolf et al. 1999) for the period 1948–1999. The data set includes, to the extent possible, every interaction²³ between two or more nations, whether conflictive or cooperative, that involves water as a scarce and/or consumable resource or as a quantity to be managed – i.e. where water is the *driver* of the event.²⁴

To date 1,831 water-related events – 507 conflictive, 1,228 cooperative, and 96 neutral or non-significant – have been compiled. Each event entry in the database includes a brief summary and source information, and was coded by date, country pair (dyad), basin, issue area,²⁵ and intensity of conflict/cooperation. For event intensity, each interaction was ranked on a scale from –7, the most conflictive (war), to +7, the most cooperative (voluntary merging of countries), where 0 denotes neutral exchanges (see table 3.1).

For the SADC region, the TFDD contains a total of 47 water-related events for the period 1948–1999.²⁶ Of these 47 events, 39 were defined as cooperative and 8 conflictive. Figure 3.1 presents graphically the average annual event intensity over the period 1948–1999 in the 13 shared watercourses named above,²⁷ together with markers representing the years in which regional institutions were developed and water agreements signed. Although the small number of overall water events in the region precludes statistical analysis, the graph does highlight certain trends in the region. For example, the vast majority of the Southern African water accords recorded in the TFDD were signed subsequent to the establishment of the SADCC in 1980. Additionally (although not

Table 3.1 Event-intensity scale

Event scale	Event description
-7	Formal declaration of war; extensive war acts causing deaths, dislocation, or high strategic costs
-6	Extensive military acts
-5	Small-scale military acts
-4	Political-military hostile actions
-3	Diplomatic-economic hostile actions
-2	Strong verbal expressions displaying hostility in interaction
-1	Mild verbal expressions displaying discord in interaction
0	Neutral or non-significant acts for the international situation
1	Minor official exchanges, talks or policy expressions – mild verbal support
2	Official verbal support of goals, values, or regime
3	Cultural or scientific agreement or support (non-strategic)
4	Non-military economic, technological, or industrial agreement
5	Military economic or strategic support
6	International freshwater treaty; major strategic alliance (regional or international)
7	Voluntary unification into one nation

Source: Modified from the COPDAB International Conflict and Cooperation Scale (Azar 1980).

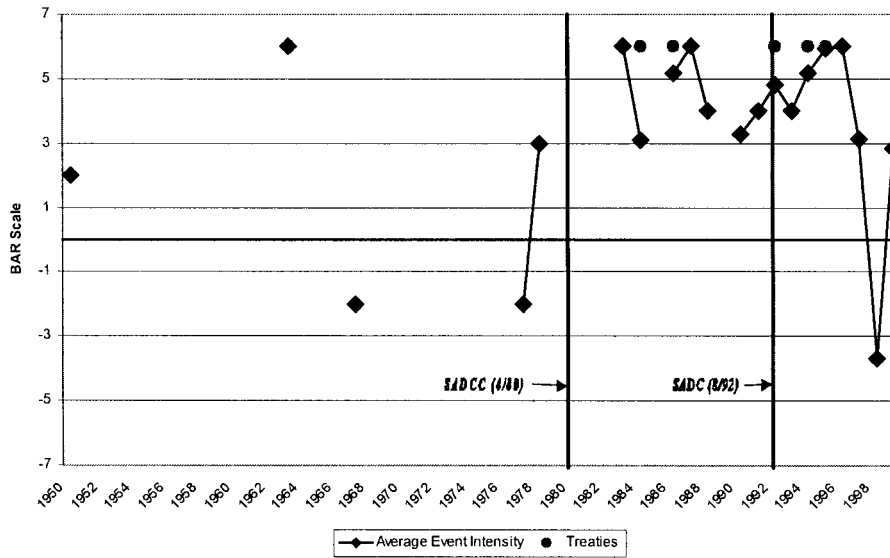


Figure 3.1 SADC average event intensity (1948–1999)

obvious from the graph alone), three water treaties and SADC's water protocol have been concluded since the founding of SADC in August 1992. Furthermore, with the exception of 1998,²⁸ the average event-intensity graph indicates overall cooperative relations in the region since the move towards more formal integration and water-treaty negotiations. This analysis suggests that regional integration has promoted an expanded use of treaties to manage the area's shared basins and may have contributed to overall positive co-riparian water relations in Southern Africa. In fact, a global analysis of event data has revealed that Southern Africa has been one of the most water-cooperative regions in the world, over the time period described.

An evaluation of the Revised SADC Water Protocol

In addition to the water agreements described above, the SADC member nations have also established a regional protocol governing shared watercourses. The original Protocol on Shared Watercourse Systems was signed in 1995 by the (then) 11 members of SADC and ratified in 1998. Modifications to the original protocol were later made, resulting in the Revised Protocol on Shared Watercourses in the Southern African Development Community, signed in 2000 by 13 of the current 14 SADC member nations.²⁹ Once ratified by two-thirds of the current SADC member states, the Revised Protocol will replace the 1995 agreement (Revised Protocol on Shared Watercourses in the Southern African Development Community 2000,³⁰ Articles 10 and 16). The purpose of the Revised Protocol is to "foster closer cooperation for judicious, sustainable and co-ordinated management, protection and utilization of shared watercourses" in the region (Revised Protocol 2000, Article 2). To carry out this objective, the Protocol endeavours to facilitate the establishment of shared watercourse agreements and institutions; to coordinate socially and environmentally sustainable, equitable, and reasonable management of shared water resources; and to harmonize associated water policies and legislation (Revised Protocol 2000, Article 2). As all of the nine treaties described in the above section were concluded prior to the original Protocol's ratification and the signing of the Revised Protocol, the impact of a regional water agreement in Southern Africa remains to be seen. Some insights, however, into the future direction of the region in terms of its cooperative management of shared water resources can be gained by analysing the terms and language of SADC's new water protocol.

One of the more notable features of the Revised Protocol is its adoption of terminology and provisions from the 1997 UN Convention on

the Law of the Non-navigational Uses of International Watercourses. The liberal usage of UN Convention language is not entirely surprising, given that eight of SADC's twelve co-riparian nations voted in favour of adopting the ILC's draft resolution, and only one nation, Tanzania, abstained from the vote (United Nations General Assembly 1997).³¹ The use of UN Convention terms and language can be found in the Revised Protocol's spatial definitions, references to non-signatory riparians, and general and specific provisions.

First, in relation to geographic scope, the Revised Protocol utilizes the term "watercourse" which, just as in the 1997 UN Convention, is defined as "*a system of surface and ground waters* [emphasis added] consisting by virtue of their physical relationship a unitary whole normally flowing into a common terminus . . ." (Revised Protocol 2000: 3). Delineating the Revised Protocol's purview as that of the "watercourse" is a modification, and a narrowing of geographic scope, from the 1995 Protocol. The original protocol utilized as its spatial reference the "watercourse system," defined as "the inter-related hydrologic components of a *drainage basin* [emphasis added] . . ." (Southern African Development Community Protocol on Shared Watercourse Systems 1995: 3).³² This terminology change follows a similar transformation in the draft articles of the ILC on the Law of the Non-navigational Uses of International Watercourses. In 1991, following a protracted debate among UN member nations, the ILC likewise removed the word "system" from its draft articles, thereby agreeing to narrow the geographic scope of the articles to the "watercourse" (Wescoast 1992).³³

Secondly, the Revised Protocol borrows language from the UN Convention in its discussion of watercourse agreements and non-signatory riparians. Just as in the UN Convention, Article 6 of the Revised Protocol outlines the rights of states not party to a particular treaty but which are riparian to the affected watercourse. The inclusion of this provision not only represents another similarity between the UN Convention and the Revised Protocol but also serves to institutionalize a practice already in place at the basin scale, as noted in the above analysis of SADC watercourse treaties.

Finally, the Revised Protocol utilizes UN Convention language in both its general and specific provisions. In its General Provisions (Article 3), for example, the Revised Protocol, like the UN Convention, employs the principle of "limited territorial sovereignty." The Revised Protocol's General Provisions require watercourse states to utilize shared waters in an "equitable and reasonable manner" while simultaneously taking "all appropriate measures to prevent the causing of significant harm to other Watercourse States" (Article 3, sections 7 and 10). To define the "equi-

table and reasonable” use of waters, the same seven factors contained in the UN Convention are applied.³⁴ Again like the UN Convention, neither are these seven factors, prioritized nor is any weight attached to the inherently conflicting principles of “equitable and reasonable” use and the prevention of “significant harm.”

In terms of the Revised Protocol’s Specific Provisions (Article 4), the UN Convention clearly served as a model, as nearly every clause within this section mirrors an article found in the UN document. UN Convention language can be found in provisions concerning planned measures, environmental protection and preservation, management of shared watercourses, prevention and mitigation of harmful conditions, emergency situations, and the establishment of shared watercourse agreements. The adoption of these specific functional standards, as well as the general principle of “limited territorial sovereignty,” represents a marked formatting and contextual change from the original 1995 Protocol.

An additional feature of the Revised Protocol, unrelated to the UN Convention language, is its use of existing SADC institutions for implementing the terms of the agreement and resolving potential disputes. Article 5 of the Revised Protocol describes the functions of the SADC organizations, including the Water Sector Coordinating Unit cited above, responsible for carrying out the terms of the Protocol. Individual watercourse institutions are required by the Revised Protocol to conform to the principles of the Protocol and regularly to advise the appropriate SADC organization of their progress in implementing both the terms of the water protocol and the provisions in their own respective agreements. Disputes over the “interpretation or application” of the Protocol’s provisions are addressed in Article 7, which states that signatory nations should endeavour to uphold the 1992 SADC Treaty principle of “peaceful settlement of disputes” by amicably resolving conflicts or by referring to the existing SADC Tribunal.

The Revised Protocol thus incorporates both general and specific principles from the 1997 UN Convention as well as existing regional goals and institutions developed by the SADC member nations as a whole. Utilizing much of the UN Convention standard language, the Revised Protocol outlines a general framework and standards for shared watercourse management. To this general framework, SADC nations are then accorded flexibility to add specialized terms in order to devise basin-level agreements and organizations that meet the unique conditions of the countries and watercourses involved. Furthermore, the Revised Protocol’s employment of existing SADC traditions, principles, and institutions to implement the terms of the Protocol and to avert and resolve disputes, forms a strong regional foundation that should help the SADC countries

move closer towards their goal of cooperative water-resource management.

The Revised Protocol, however, does not appear to address adequately the three general weaknesses noted in the nine basin-level treaties analysed above: these are inconsistent application of conflict-resolution tools and a lack of public participation and water-usage prioritization components. Although the Revised Protocol does include an article concerning dispute resolution, the article's focus is on disagreements concerning the "interpretation and application" of the Protocol's provisions. Given that certain conflict-resolution mechanisms already exist within the SADC organization, encouraging references to (and uses of) these institutions may help to strengthen the region's transboundary water accords. In terms of public participation, while SADC's founding treaty encourages "the people of the Region ... to take initiatives ... and participate fully in the implementation of the programmes and projects of SADC," this same level of encouragement is not explicit in SADC's water protocol nor, as noted in the above treaty analysis, is there a regional precedence for such involvement (SADC Declaration and Treaty 1992, Article 5 (2b)). Finally, on the basis of global experience concerning water allocation, it does not appear that the Revised Protocol's adoption of the UN Convention's generalized principles of "limited territorial sovereignty" will encourage regional or basin-level water-use prioritization. Reliance on the UN Convention's seven, unweighted factors to determine reasonable and equitable use provides little guidance for strengthening this particular treaty component.

Conclusions

Southern Africa, like many other regions of the world, has established a strong record of water-resource cooperation. Over the past two decades alone, the member states of the SADC and its predecessor organization, the SADCC, have drafted a broad-based water protocol and negotiated at least nine transboundary water agreements. A review of these agreements, together with the corresponding water-related events in the region, clearly indicates an overall commitment among the Southern African states to cooperate over water resources. At the basin level, SADC riparian nations are negotiating agreements establishing joint water commissions and institutions to manage individual watercourses and water-development projects collaboratively. At the regional level, SADC's water protocol institutionalizes and encourages this trend by offering a general framework for creating joint water-resource networks

and policies based on both UN Convention principles and existing regional institutions.

Although these developments are, indeed, positive, a review of SADC's water-coordination efforts also highlights certain areas of potential weakness in the region's current management instruments and structures. Conflict resolution, public participation, and water-use prioritization all are institutional components deserving of further attention both at the basin and regional level. Judging by the global water-treaty experience, emphasis on these particular components may strengthen not only the region's water agreements but also the projects and institutions they create. SADC, a regional institution with designated functions concerning shared water resources, offers an ideal forum for promoting these three particular areas. The SADC Treaty, for example, already contains certain regional conflict-resolution mechanisms, references to which, at the very least, should be encouraged in all basin-level bilateral and multilateral agreements. The SADC Treaty also encourages the public to participate in regional integration programmes, a general provision that could be easily extended to water-resource matters specifically via the regional water protocol. Finally, in a region in which 12 economically disparate nations exclusively share 13 international basins, the establishment of regional water-use priorities would appear essential for both social and environmental reasons. One means of achieving this would be the establishment of clear water-use precedents within the SADC water protocol, allowing for refinements at the basin level to meet local needs and conditions. By continuing to rely upon the UN Convention's vague and unprioritized water-use principles, the SADC region runs the risk of two undesirable outcomes – continued inaction or, as in the global experience, a set of disparate inter-basin (or, worse yet, intra-basin) water-use prioritizations – either of which leaves open the possibility of future disputes.

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Notes

1. The Transboundary Freshwater Dispute Database is located on the Internet at the following address: <<http://terra.geo.orst.edu/users/tfdd>>
2. The following discussion is drawn from Giordano and Wolf, forthcoming.
3. The following discussion is drawn from Wolf 1999.
4. *ILC Draft Articles on the Non-navigational Uses of International Watercourses 1994*. UN Document A/CN.4/L492 (1994). For history and commentary, see *United Nations Yearbook of the ILC* from 1974 to 1991.
5. The final text of the Convention adopted by the UN General Assembly is contained in document A/RES/51/229 of 8 July 1997.
6. These factors include the following: geographic, hydrographic, hydrological, climatic, ecological, and other natural factors; social and economic needs of each riparian state; population on the watercourse; effects of use in one state on the uses of other states; existing and potential uses; conservation, protection, development, and economy of use, and the costs of measures taken to that effect; and the availability of alternatives, of corresponding value, to a particular planned or existing use.
7. The following discussion is drawn from Wolf (1999) and Giordano and Wolf.
8. International freshwater treaties that focus on watercourses as boundaries or fishing rights have not been incorporated into the TFDD.
9. The Mekong Committee used the Helsinki Rules definition of “reasonable and equitable use” in formulating its Declaration of Principles in 1975, although no specific allocations were determined. However, although this is the sole case of the Helsinki Rules definitions being used explicitly in treaty text, the concept of “reasonable and equitable use” is quite common.
10. For a more detailed discussion see Wolf (1999).
11. It is important to distinguish between “rights” in terms of a sense of entitlement, and legal rights. Obviously, once negotiations lead to allocations, regardless of how such allocations are determined, each riparian has legal “rights” to water, even if the allocations were determined by needs.
12. It should be pointed out that not everyone’s needs were considered in the Nile Agreements, which included only two of the ten riparian states – Egypt and Sudan, both minor contributors to the river’s flow. The notable exception to the treaty, and the one that might argue most adamantly for greater sovereignty, is Ethiopia, which contributes between 75 and 85 per cent of the Nile’s flow.
13. Water subsidies within each party’s territory are not covered by the agreement and will probably continue.
14. Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Zambia, and Zimbabwe.
15. The four additional members and their year of accession to the SADC Treaty are Democratic Republic of Congo (1998), Mauritius (1995), South Africa (1994), and Seychelles (1998). It should be noted that Mauritius and Seychelles are island nations, so are not included in any discussions concerning transboundary river basins.
16. The Nile and Congo river basins include both SADC and non-SADC member riparian nations.
17. The TFDD includes treaties where water is treated as a scarce and/or consumable resource or as a quantity to be managed. Excluded are treaties where water is incidental to the agreement, such as those concerning fishing rights, access to ports, transportation, or river boundaries.
18. The other seven treaties include former colonial governments as signatories.

19. The two cases are the 1992 agreement between South Africa and Swaziland and the 1996 South Africa and Mozambique agreement.
20. It should be noted that the South Africa–Swaziland Joint Water Commission was established in conjunction with the project-specific Treaty on the Development and Utilization of the Water Resources of the Komati River Basin, described below.
21. Example text is from the Agreement between the Governments of the Republic of Angola, the Republic of Botswana, and the Republic of Namibia on the establishment of a Permanent Okavango River Basin Organization (OKACOM); Agreement between the Republic of Zimbabwe and the Republic of Zambia concerning the utilization of the Zambezi River; and Treaty on the development and utilization of the water resources of the Komati River Basin between the government of the Kingdom of Swaziland and the Government of the Republic of South Africa, respectively.
22. Described in Wolf, Yoffe, and Giordano.
23. To compile these riparian interactions (or “events”), three primary sources were utilized: (1) Foreign Broadcast Information Service (FBIS), 1978–2000. The FBIS is an agency of the US Central Intelligence Agency (CIA), which has been translating foreign news sources since 1978. (2) Conflict and Peace Data Bank (COPDAB), 1948–1978. This dataset, directed by Professor Edward E. Azar, codes inter-state and intrastate events for approximately 135 countries. (3) Global Event Data System (GEDS) Project, 1979–1994. GEDS tracks day-to-day interactions among nation-states and other international actors using online news reports. Directed by John Davies, at the University of Maryland, GEDS builds on the COPDAB and contains data archives with over 300,000 event records from 1979 to 1994.
24. Excluded are events where water is incidental to a dispute, such as those concerning fishing rights, access to ports, transportation, or river boundaries. Also excluded are events where water is not the driver, such as those where water is a tool, target, or victim of armed conflict.
25. Event issue areas were defined as quantity, infrastructure, joint management, hydro-power, quality, flood control, technical cooperation, irrigation, border issues, general economic development, and navigation. In order to be included, however, water had to be treated as a scarce and/or consumable resource or as a quantity to be managed. For example, navigation events were included *only* if the issue involved a quantity of water required to allow for ship passage, not if it involved only rules of conduct or tonnage.
26. The SADC events enumerated here relate to co-riparian interactions within the 13 basins shared exclusively by SADC members (i.e. events in the Nile and Congo basins, the riparians to which include both SADC and non-SADC nations, are excluded).
27. As the focus of this chapter is on the SADC region and its member states, events including former colonial governments were excluded from this analysis.
28. The year in which South Africa deployed troops to Lesotho, in part to protect its water-infrastructure interests on the Orange River.
29. The Democratic Republic of the Congo has not yet signed the Revised Protocol.
30. Hereinafter Revised Protocol 2000.
31. The SADC riparian nations voting in favour of the draft resolution on the Convention on the Law of Non-navigational Uses of International Watercourses were Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, and Zambia. Swaziland, Democratic Republic of Congo, and Zimbabwe were absent from the May 1997 General Assembly vote (United Nations General Assembly 1997).
32. Hereinafter Protocol 1995.
33. For a thorough description of ILC’s process of defining the geographic scope of international watercourse law, see Wescoat (1992).
34. See note 6.

Appendix 1: Categorization of SADC water-related agreements

Table 3.1A Category I: Agreements establishing general water commissions

Name of treaty	Year	Signatories
Agreement between the Government of the RSA, the Government of the Kingdom of Swaziland, and the Government of the People's Republic of Mozambique relative to the establishment of a TPTC	1983	South Africa, Swaziland, and Mozambique
Agreement between the Government of the Republic of Namibia and the Government of the RSA on the establishment of a Permanent Water Commission	1992	Namibia and South Africa
Treaty on the establishment and function of the Joint Water Commission (JWC) between the Government of the RSA and the Government of the Kingdom of Swaziland	1992	South Africa and Swaziland
JWC terms of reference	1996	South Africa and Mozambique

RSA, Republic of South Africa.

Table 3.2A Category II: Agreements concerning single watercourses

Name of treaty	Year	Signatories
Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System	1987	Botswana, Mozambique, Tanzania, Zambia, and Zimbabwe
Agreement between the Governments of the Republic of Angola, the Republic of Botswana, and the Republic of Namibia on the establishment of a Permanent Okavango River Basin Water Commission (OKACOM)	1994	Angola, Botswana, and Namibia

Table 3.3A Category III: Agreements concerning specific water projects

Name of treaty	Year	Signatories
Treaty on the Lesotho Highlands Water Project between the Government of the RSA and the Government of the Kingdom of Lesotho	1986	South Africa and Lesotho
Agreement between the Republic of Zimbabwe and the Republic of Zambia concerning the utilization of the Zambezi River	1987	Zambia and Zimbabwe
Treaty on the development and utilization of the water resources of the Komati River basin between the Government of the RSA and the Government of the Kingdom of Swaziland	1992	South Africa and Swaziland

RSA, Republic of South Africa.

Table 3.4A Southern African water treaties signed by non-SADC members

Name of treaty	Year	Signatories
Exchange of notes constituting an agreement between Her Majesty's Government in the United Kingdom of Great Britain and Northern Ireland and the Portuguese Government providing for the Portuguese participation in the Shire Valley project	1953	Great Britain and Portugal
Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland (on their own behalf and on the behalf of the Government of the Federation of Rhodesia and Nyasaland) and the Government of Portugal with regard to certain Angolan and Northern Rhodesian natives living on the Kwando River	1954	Great Britain (Rhodesia, Nyasaland) and Portugal

Table 3.4A (cont.)

Name of treaty	Year	Signatories
Agreement relating to the Central African Power Corporation	1963	Southern Rhodesia and Northern Rhodesia
Agreement between the Government of the Republic of South Africa (RSA) and the Government of Portugal in regard to Rivers of Mutual Interest and the Kunene River Scheme	1964	Portugal and South Africa
Untitled Agreement between South Africa and Portugal relating to hydropower development on the Zambezi River	1967	Portugal and South Africa
Agreement between the Government of the RSA and the Government of Portugal in regard to the first phase of development of the water resources of the Kunene River basin	1969	Portugal and South Africa
Agreement between the governments of Portugal, the People's Republic of Mozambique, and the RSA relative to the Cabora Bassa project	1984	Portugal, Mozambique, and South Africa

Table 3.5A SADC water protocols

Name of protocol	Year	Signatories
Protocol on Shared Watercourse Systems	1995	Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe
Revised Protocol on Shared Watercourses in the Southern African Development Community	2000	Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe

Appendix 2: Model treaty components and SADC water-related agreements

Table 3.6A Category I: Agreements establishing general water commissions

Treaties	Model treaty components						
	Adaptable management structure			Clear/flexible allocation criteria			
	Public participation	Changing basin priorities/new information or technologies	Consideration of non-signatory riparians	Fixed or formulate water-allocation criteria	Prioritization of water use	Equitable distribution of benefits	
						Detailed conflict-resolution mechanisms	
Agreement between the Government of the RSA, the Government of the Kingdom of Swaziland, and the Government of the People's Republic of Mozambique relative to the establishment of a TPIC		X	X				
Agreement between the Government of the Republic of Namibia and the Government of the RSA on the establishment of a PWC		X				X	

Table 3.6A (cont.)

	Model treaty components						
	Adaptable management structure			Clear/flexible allocation criteria			
	Public participation	Changing basin priorities/new information or technologies	Consideration of non-signatory riparians	Fixed or formulaic water-allocation criteria	Prioritization of water use	Equitable distribution of benefits	Detailed conflict-resolution mechanisms
Treaties on the establishment and function of the JWC between the Government of the RSA and the Government of the Kingdom of Swaziland		X	X				X ^a
JWC terms of reference		X					X

RSA, Republic of South Africa; TPTC, Tripartite Permanent Technical Committee; PWC, Permanent Water Commission; JWC, Joint Water Commission.

^a It should be noted that the South Africa–Swaziland JWC was established in conjunction with the project-specific Treaty on the Development and Utilization of the Water Resources of the Komati River Basin.

Table 3.7A Category II: Agreements concerning single watercourses

Treaties	Model treaty components						
	Adaptable management structure			Clear/flexible allocation criteria			
	Public participation	Changing basin priorities/new information or technologies	Consideration of non-signatory riparians	Fixed or formulate water-allocation criteria	Prioritization of water use	Equitable distribution of benefits	Detailed conflict-resolution mechanisms
Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River System	X	X	X				
Agreement between the governments of the Republic of Angola, the Republic of Botswana and the Republic of Namibia on the establishment of a Permanent OKACOM		X			X		

OKACOM, Okavango River Basin Water Commission.

Table 3.8A Category III: Agreements concerning specific water projects

Treaties	Model treaty components						
	Adaptable management structure			Clear/flexible allocation criteria			
	Public participation	Changing basin priorities/new information or technologies	Consideration of non-signatory riparians	Fixed or formulaic water-allocation criteria	Prioritization of water use	Equitable distribution of benefits	Detailed conflict-resolution mechanisms
Treaty on the LHWP between the Government of the RSA and the Government of the Kingdom of Lesotho		X	X	X		X	X
Agreement between the Republic of Zimbabwe and the Republic of Zambia concerning the utilization of the Zambezi River		X			X	X	X

Table 3.8A (cont.)

	Model treaty components						
	Adaptable management structure			Clear/flexible allocation criteria			
	Public participation	Changing basin priorities/new information or technologies	Consideration of non-signatory riparians	Fixed or formulaic water-allocation criteria	Prioritization of water use	Equitable distribution of benefits	Detailed conflict-resolution mechanisms
Treaties on the development and utilization of the water resources of the Komati River basin between the Government of the RSA and the Government of the Kingdom of Swaziland		X	X	X			X

LHWP, Lesotho Highlands Water Project; RSA, Republic of South Africa.

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Institutional aspects of international water-system management

Mikiyasu Nakayama

Introduction

More than a decade has passed since the Zambezi Action Plan (ZACPLAN) was adopted by five riparian states of the Zambezi River. Implementation of the ZACPLAN has suffered a long delay, or even an impasse (Nakayama 1997). However, to the surprise of even the author (who was involved in the formulation of the ZACPLAN as a programme officer of the UNEP from 1986 to 1988), the ZACPLAN is still regarded as the guiding document of the basin. The ZACPLAN is composed of action plans for the purpose of environmentally sound management of the basin, including the proposal for an institutional framework for implementation of such plans (David 1988). The institutional scheme then proposed for the ZACPLAN implementation seems still to have a firm basis, not only for the Zambezi River basin in particular but also for international water systems in general.

As for the existing institutional mechanisms for international water systems, the Mekong Committee set up in relation to the lower Mekong River basin in South-East Asia, has often been cited as a model to be followed by other international river systems. The Mekong Committee has many reasons to be applauded, although it has not always come up to expectations. This chapter describes the functions that a river-basin organization (RBO) might reasonably be expected to perform, in partic-

ular by comparing the proposals set out in the ZACPLAN and the proceedings of the Mekong Committee.

Roles of river-basin organizations

It very often happens that those in downstream regions within one river system are in confrontation with those in upstream areas over sharing of their common water resources. Various regional institutions have been established to deal with some specific multilateral issues such as trade. Water resources in international water systems should be regarded and dealt with, by definition, as a multinational issue. Experience has shown that the establishment of issue-specific intergovernmental organizations should be instrumental for conflict abatement and resolution among riparian states.

Such intergovernmental institutes have been established in many international water systems, which are often referred to as river-basin organizations (RBOs). The question is what kind of roles should be played by RBOs under circumstances prevailing in the real world, rather than in an ideal world. It has been shown that an RBO may play one or more of the following roles for the sake of promoting collaboration among basin countries.

Provision of a common arena for member states to meet regularly and to discuss issues related to their shared water resources

In cases where no RBO exists, riparian countries should deal with any issue related to their shared water resources (in an international river basin, lake basin, or aquifer) through the usual diplomatic channels on a case-by-case basis. Providing riparian countries with a common and regular arena should be instrumental in giving each basin country an opportunity (1) to meet their counterparts in other riparian states from time to time, (2) to make representatives familiar with the way of thinking of other representatives, and (3) to promote mutual understanding and trust among participating parties. Most RBOs thus have periodic meetings among member states as a major activity.

Having an RBO, however, will not automatically promote such movements. In one particular existing RBO in South Asia, for example, the only item on the agenda of any regular meeting for more than a decade has been to determine the date and venue of the next meeting. This is because one of the member states does not want to discuss any substantial matter at the meeting of the RBO and has, in practice, vetoed any substantial agenda. Not surprisingly, that RBO has existed for years

without producing any visible results regarding improvement in the management of the shared water resources. In another RBO in Asia, member states always blame the behaviour of other basin countries, chiefly as regards the inequitable use of shared water resources; as a result, practically no attempt has been made to resolve conflicts by riparian states. Efforts by all member states are apparently needed in this case to prevent an RBO from becoming defunct.

In Africa, some RBOs have provided member states with only the chance to meet, but no substantial progress has been made in relation to management of the shared water resources. For example, although the Lake Chad Basin Commission (LCBC) in N'Djamena, Chad, has been in existence for about 30 years, no discernible progress has been made in terms of managing Lake Chad, in which the water level has significantly decreased for more than two decades. Although the United Nations Environment Programme (UNEP), in the late 1980s, gave assistance to the LCBC for development of an action plan to mitigate the effects of the decreasing water level on the environment, the member states did not seem to have the motivation to elaborate such a plan (Balek 1992); as a result, only the "diagnostic study" was developed by UNEP, in which the situation of the lake basin was described from various environmental aspects. Despite the fact that some international organizations showed their willingness to support development and implementation of an action plan after the diagnostic study, this plan was never formulated, owing to lack of support from the riparian states.

Promoting information sharing among various countries and agencies

It is probably fair to say that a basin country usually is not well informed about other riparian states, especially with regard to such fundamental information as meteorological and hydrological data. A basin country tends to be suspicious about any data offered by other riparian states. Resolution of the dispute between India and Pakistan in the 1950s over the sharing of water resources in the Indus River basin experienced many years of delay because one party did not trust meteorological and hydrological data provided by the other, and sent repeated requests for more and more data from the other. Having a common data and knowledge base among basin countries (which should be shared also with donor countries and aid agencies as well as with the general public) should be instrumental in avoiding or alleviating distrust among basin countries regarding the reliability of data. As the development and management of water resources in a catchment area should be based on a common understanding of the meteorological and hydrological aspects of

the basin, possession of a common, transparent database appears to be a prerequisite to motivate basin countries towards collaborative management of the shared water resources.

The impacts of information disclosure may be examined by comparing the situation regarding the Mekong River with that of the Ganges River. In the former, the Mekong Committee (now the Mekong River Commission) has been instrumental as a focal point for disseminating information about the basin for the last four decades. It amasses and makes available meteorological and hydrological data in the basin, the results of various studies previously conducted for development and management of the basin, minutes and notes of discussions held in the Committee or Commission, and articles published in journals and newspapers. This de facto information disclosure policy in the Mekong basin presumably was established by United Nations agencies as major donors in the early days of the Mekong Committee. The policy has proved successful in promoting support from donor countries and organizations for economic development of the basin countries. It has also resulted in numerous academic research projects in and for the basin by many international academic researchers, which were offered in practice at no cost to the riparian states. The basin has thus become one of the most well-studied international water systems.

Conversely, in the Ganges River basin, the hydrological data in India has been ranked as classified information and no organization functions as a focal point for information disclosure. Thus, not surprisingly, much less support has been offered by donors for management of the Ganges River system, simply because “outsiders” are unable to obtain sufficient information about the Ganges River system to enable them to develop ideas for their own projects. Thus, graduates of the Asian Institute of Technology (in Bangkok, Thailand) have developed many theses about the Mekong River basin, whereas (in marked contrast) few theses have ever been developed about the Ganges River system. This suggests that the intellectual resources of this highly advanced engineering college in Asia have not been used to benefit the Ganges River basin, whereas the Mekong River basin has been able to profit from these resources.

Developing coordinated water-resources development and management schemes

The development of a coordinated water-resources development/management scheme is often the major aim of harnessing riparian states, as in many cases in the past. A realistic basin-wide management scheme may be developed only through collaboration of riparian states. Having such a scheme may serve, for other countries – in particular, donor countries

and aid agencies – as a proof of collaboration among riparian states: it implies that the riparian countries are in good terms to the extent that they have developed the scheme through collaboration; it also implies that the basin countries are ready to implement the scheme in a coordinated manner.

The development scheme of the Mekong River basin in South-East Asia is also a good example of this type of collaboration. The Mekong Committee was established in 1957 by four riparian countries (Cambodia, Laos, Thailand, and Viet Nam) in the lower part of the basin to promote, coordinate, supervise, and control the planning and investigation of water-resources development (Caponera 1966). It was then envisaged that development and management of water resources in the Mekong River basin – for hydropower generation, irrigation, and flood control – would spur socio-economic development of the basin countries and would lift the region out of poverty (Jacobs 1995); leading industrialized countries therefore supported the idea of comprehensive international development of the Mekong River basin. Various studies were launched on hydropower, irrigation, navigation, fishery, and flood control within the framework of the Mekong Committee (Hori 1993).

In 1970, the Mekong Committee published a detailed report on the “Indicative Basin Plan.” This report outlined the framework for the development of the basin over the next three decades, with emphasis on integrated development of water resources for the sake of improving the quality of life of the growing population in the basin countries (Mekong Secretariat 1989). The Indicative Basin Plan identified 180 possible projects in the basin: of these, the idea of constructing seven cascades of dams in the main stream was the major component. The aims of constructing these dams were mainly for power generation and irrigation: with seven dams, the total effective storage was to be 140,550,000 m³, with a power-generation capacity of 18,900 MW. The intention was to irrigate about 40,500 km² of farmland (Kawai 1984). However, the large-scale development scheme envisaged in the 1970s did not materialize, owing to changes in the political regimes of three member states and increased environmental concern over the huge development plan. The Mekong Committee nevertheless functioned as the coordinating mechanism of the basin countries for more than 30 years, even through such changes in political regimes. The continuing collaboration among basin countries has led to much economic development in the region. The Mekong Committee has been instrumental in formulating the development of the basin, albeit not according to the massive development scheme envisaged in the 1970s but as combined efforts in the shape of small to medium-sized projects in various fields.

Elaboration of the Zambezi Action Plan (ZACPLAN) both by ripar-

ian states of the Zambezi River basin and by the United Nations Environment Programme (UNEP) in the 1980s (UNEP 1986) may be seen in the same context. The ZACPLAN was developed between 1984 and 1987, under the stewardship of UNEP, with participation of basin countries of the Zambezi River system. The ZACPLAN was one of the initial agreements to address specifically the environmental aspects of an international freshwater body. The objective of the ZACPLAN was to promote development and implementation of the environmentally sound water-resources management of the entire river system; it was developed as the first pioneering enterprise of the UNEP in the field of managing international water bodies.

The first stage of development of the ZACPLAN was preparation of the "Diagnostic Study" on the current status of environmental problems and water management in the Zambezi River basin, as a basis for an action plan to be developed later (UNEP 1986). The draft ZACPLAN was developed on the basis of the findings of the Diagnostic Study, so that the existing problems could be overcome through implementation of the ZACPLAN. It was considered to be crucial to bring about environmentally sound water-resources management of the entire basin. The draft ZACPLAN included 19 projects, which were selected by the Working Group based on the following guidelines: they should (a) be subregional, affecting at least two basin countries; (b) be closely related to intergovernmental cooperation; (c) have training, demonstration, and information components; (d) improve environmental health; and (e) promote a sustainable basis for socio-economic development (David 1988).

A Conference of Plenipotentiaries on the Environmental Management of the Common Zambezi River System was convened by the UNEP and hosted by the Zimbabwean government at Harare in May 1987. The ZACPLAN was then adopted by the plenipotentiaries (ministries mainly responsible for water and/or environmental matters) of the five basin countries (Botswana, Mozambique, Tanzania, Zambia, and Zimbabwe). Although implementation of the Zambezi Action Plan has been subject to a prolonged delay, and only a couple of the proposed projects have been implemented (Nakayama 1999), the ZACPLAN is still regarded by the basin countries as the guiding document of the catchment, in terms of an integrated management scheme of the entire basin with due emphasis on the environmental aspects.

Securing assistance from donor countries and development aid agencies

Having a basin-wide development or management scheme may motivate donor countries and aid agencies. More financial and other types of as-

sistance may be given to the basin countries, to help such a scheme to be implemented. In many cases, obtaining resources from outside is the only foreseeable and realistic way of transferring a scheme from theory into practice. To this end, a development or management scheme should be very well founded and feasible. However, in the real world, elaborating a realistic scheme (as a team effort of all the basin countries) tends to be much more difficult than developing an unrealistic scheme. This is because the interests of each riparian state may not be fully reflected in a realistic scheme, whereas the representatives of each country may put whatever they wish into an impractical scheme; thus, ironically, the latter is much more easily agreed upon than the former.

The ZACPLAN formulation process may by no means be regarded as a success story with regard to donor support. During the drafting process, although UNEP organized meetings for potential donors of funds for implementation of the ZACPLAN, only a few donor countries and international organizations participated in these meetings, without making any substantial pledge of funding; this suggested that they had very limited interest in the ZACPLAN. This lack of interest was presumably because (a) donors had already developed good relationships with the riparian countries and did not need the ZACPLAN as a “matchmaking” mechanism; (b) the projects listed under the ZACPLAN were too general to arouse the interest of donor countries and organizations; and (c) ZACPLAN was regarded as an “anti-South Africa” movement of the border countries, which was not necessarily appreciated by donors, in particular by developed countries (Nakayama 1997).

The aforementioned problems encountered by the ZACPLAN may be a common pitfall in developing an action plan in collaboration with basin countries, as such countries tend to suggest everything they want to see in an action plan. It is much easier to accept whatever basin countries request than to reject their wishes; however, an action plan tends to lose its focus and impetus if formulated in such a manner, and little support by donor countries may be anticipated for such a plan.

Resolution of conflicts among member states

Resolution of conflicts is often regarded as the basic rationale for establishment of an RBO, similar to the supposed role of the United Nations in curtailing or resolving conflicts between nations. Having a common arena for basin countries, within the framework of an RBO, is intended to be instrumental for the avoidance, mitigation, or resolution of conflicts between these countries. In some previous cases, a third party has been needed as a mediator to resolve such conflicts: for example, the World Bank acted as a mediator between India and Pakistan during the dispute over the Indus River basin in the 1950s. Sharing the water in the Indus

River basin had long been a matter of dispute. Until the Indian subcontinent was partitioned between India and Pakistan in 1947, the Sind and Punjab provinces of undivided India had been in dispute over the allocation of water in the Indus River system. Partition into two independent countries drew the border across the river system: Pakistan was given the position as the downstream country, while the headworks of two of the main irrigation canals for Pakistan were left on the Indian side of the border. The sharing of the river water thereupon became an international issue between India and Pakistan, and was a principal cause of the strained relations between these two countries.

The President of the World Bank proposed that the two countries might be able to resolve their differences regarding the use of the Indus waters, through the good offices of the World Bank. Although India and Pakistan accepted his suggestion early in 1952 (World Bank 1960), it was apparent by early 1954 that two countries would not be able to run an integrated system. The World Bank noted the wide gaps between the positions of the two nations on almost all issues, and concluded, early in February 1954, that it had not yet been possible to reach agreement and that, in the absence of some new development, there was no prospect of further progress (Michel 1967). Nevertheless, the basin countries did not want the World Bank to withdraw from the scene, and asked for an independent proposal, which was subsequently put forward by the World Bank, for consideration by the two basin countries. After 6 years of negotiation, with the World Bank as the mediator, India and Pakistan signed the Indus Water Treaty in September 1960, thus marking the end of a critical and long-standing dispute between these countries. The Indus Water Treaty has been regarded not only as a remarkable example of the successful resolution of conflict between two sovereign countries (Kirmani and Le Moigne 1997) but also as a landmark in the role of the World Bank as an international mediator (Kirmani and Rangeley 1994).

The International Court of Justice (ICJ) gave its judgement, at the request of the basin countries, regarding the conflict between Hungary and Slovakia over the construction of dams in the Danube River basin. The idea of asking the ICJ for a judgement over a conflict between basin countries is not new: as far back as the 1950s, Pakistan had suggested to India that they should leave their dispute over the Indus River to the judgement of the ICJ, but this proposal by Pakistan was turned down by India. As the ICJ could judge an issue only when all the countries involved agreed for it to do so, it was unable to be instrumental in the Indus River issue.

The prime ministers of Hungary and Czechoslovakia in September 1977 signed the International Treaty on Building and Operating the Gabčíkovo–Nagymaros System of Water Works; the governments of

these basin countries then ratified the treaty, which envisaged construction of two dams, one in Czechoslovakia and the other in Hungary. Construction of the Gabčíkovo–Nagymaros project started in June 1978. However, in both Czechoslovakia and Hungary, public environmental movements emerged in the late 1980s; these were not so much movements on environmental issues but represented the citizens' opposition to the totalitarian governments in these countries. The political regime of Hungary underwent a drastic change, from totalitarian regime to democratic system, in May 1989. The Gabčíkovo–Nagymaros project was then regarded as a symbol of the old regime and became the most visible target of the anti-totalitarian activists. Following such a movement, the Hungarian government in the same month decided to halt all construction work on the planned Nagymaros Dam and associated water works. The Czechoslovak government strongly deplored the decision by Hungary and insisted that the treaty adopted in 1977 should be observed. Despite this claim by Czechoslovakia, Hungary in July 1989 stopped all work on the Gabčíkovo Dam. Czechoslovakia observed the end of its totalitarian regime in November 1989; the new government did not intend to interrupt construction of the Gabčíkovo Dam, which therefore continued; however, in May 1992, Hungary unilaterally cancelled the treaty. After the break-up of Slovakia and the Czech Republic in 1993, Hungary and Slovakia continued their discussions and a special agreement was finally elaborated between Hungary and Slovakia in July 1993. The issue was left to the judgement of the ICJ, which gave its judgement to Hungary and Slovakia on 25 December 1997. For the first time in history, the ICJ was enabled to give its judgement over an issue in an international water system.

An RBO is intended to be instrumental in the resolution of conflicts among member states; however, this has not always been the case. A notable example was the failure of the Mekong Committee to resolve conflicts between the two member states of Thailand and Viet Nam in the early 1990s. Plenipotentiaries from Cambodia, the Lao PDR, Thailand, and Viet Nam had signed an Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin in April 1995, which laid down principles for the sustainable development, utilization, management, and conservation of the water and related resources of the Mekong River basin and for institutional, financial, and management issues relating to the mechanism of coordination between the member countries (MRC 1996). The agreement-negotiation process among the riparian countries was unique in that the United Nations Development Programme (UNDP) had a mediatory role as a third party.

The disputes between Thailand and Viet Nam had effectively impaired the function of the Interim Mekong Committee, which had been faced

with the impasse since January 1992. The UNDP was worried about the possible “disappearance” of the Interim Mekong Committee as it had invested a great deal of money in keeping the Committee functional during the dark days from 1975 to the early 1990s. The UNDP therefore organized informal meetings among the four riparian countries, with the aim of discovering whether riparian countries were still willing to maintain the (Interim) Mekong Committee as a mechanism for mutual collaboration. The riparian countries agreed, through these informal consultations, to maintain this mechanism for collaboration and it was also agreed that a Working Group should be established with representatives of the four riparian countries under the chairmanship of the UNDP to look into the future framework for cooperation. After five meetings of the Working Group in 1993 and 1994, the draft Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin was developed and was subsequently signed by the plenipotentiaries in April 1995. Thus, the UNDP successfully played the role of mediator in this case.

Conclusions

Obviously, the establishment of an intergovernmental organization with participation of all basin countries should be useful in the context of the provision of a common arena for member states to meet regularly and to discuss issues related to their shared water resources. In this context, the Mekong Committee (which is now the Mekong River Commission) was a model for other international water systems: it has constantly provided member states with opportunities to meet and to discuss issues, even when some member states were experiencing difficulties from the late 1970s to the early 1990s as a result of political instability both within and between these countries.

Experts from the riparian states of the Zambezi River basin held a meeting during the development of the ZACPLAN; this meeting proved useful, not only for the collection of information to elaborate the diagnostic study but also to enable these experts to talk to each other, thereby enhancing their mutual understanding and trust. However, although the ZACPLAN development enabled these experts to meet from time to time, this was not the case with decision makers from the same riparian states, as no preparatory meeting was held during the ZACPLAN formulation; the arena thus exists only for experts, not for decision makers. It is probably fair to say that the lack of such an arena for decision makers may, to a large extent, be attributable to political problems, as seen in the meeting of plenipotentiaries: the decision that they were

supposed to arrive at (namely, an implementation mechanism for the ZACPLAN) was fairly political and they were reluctant to make a decision at the meeting; lack of understanding and trust among decision makers apparently was a major cause of the impasse. It was ironic that the ZACPLAN intended to create an arena for decision makers to meet periodically, but the absence of such a mechanism proved to be a great obstacle to the ZACPLAN itself.

An RBO should be instrumental in promoting information sharing among basin countries as well as other parties – which include donor countries, international agencies, non-governmental organizations, research institutes, and private firms. This may take place, however, only if member states believe in the concept of information disclosure and the assumption that transparency of information is a most effective tool in promoting the rational management of international water systems. The Mekong Committee has maintained meteorological and hydrological monitoring since the 1960s through collaboration of member states, because such a reliable monitoring scheme did not exist in the basin in the 1950s, when the Mekong Committee started its work towards basin-wide development of water resources. The fact that the Mekong Committee has maintained the monitoring system, by having assistance from basin countries, has given rise to transparency in data gathering and distribution – such data are universally available for the cost of their reproduction. The transparency of these data has apparently motivated many researchers to assess the hydrological status of the basin and has also been instrumental in fostering various projects on the use of water resources, at both national and regional level. It is fair to say that the availability of hydrological and meteorological data is much greater in the Mekong River basin than in other international water systems and this has led to the development of many projects by both riparian countries and donors.

Lack of reliable basin-wide data was a major problem in developing the diagnostic study for ZACPLAN: the experts' meetings were held mostly for the sake of data collection and compilation and this difficulty caused such high priority being given to the ZACPRO5 "Development of a basinwide unified monitoring system related to water quality and quantity" in ZACPLAN (David 1987). Deterioration of the monitoring system, compared with that in the colonial period, was reported in some countries and lack of monitoring stations was apparent in many countries. Installation of a monitoring system in every basin country was thought to be indispensable for the motivation of riparian countries towards an integrated water-resources management scheme, which was the very objective of ZAPLAN. Although the delay in implementation of ZACPLAN has so far failed to enable an improved monitoring system

to be installed in the basin, the true spirit of ZACPRO5 should be embodied in any scheme to be elaborated for the Zambezi River basin. Making information universally available, as is the case in the Mekong River basin, should also be a major objective of any new scheme.

Development of a coordinated water-resources development and management scheme has the highest priority of coordinated efforts by many basin countries. This may be achieved by securing assistance from donor countries and development aid agencies. Basin countries should take pains to make such a development or management scheme realistic, rather than illusionary, to the extent that other parties (particularly donor countries and agencies) could be confident of its feasibility. The Indicative Basin Plan elaborated by the Mekong Committee was successful in getting basin countries harnessed towards an integrated development scheme of the catchment. However, it is still a matter of conjecture whether the content of the Indicative Basin Plan was sufficiently realistic to make donor countries and aid agencies confident of its feasibility.

Launching a major development scheme, such as the Indicative Basin Plan of the Mekong River basin, was not envisaged in the ZACPLAN, the aim of which was the harmonization of development plans of each riparian state. The first project within ZACPLAN (ZACPRO1) thus called for "up-to-date compilation of all completed, ongoing and planned development projects" in the basin. To the knowledge of the author, in no international water system has compilation of development plans been conducted systematically in each basin country. The ZACPLAN was developed in the mid-1980s, when far fewer people had faith in major development schemes than they did in the 1950s or 1960s. It is probably true to conclude that the spirit of ZACPLAN reflected the change in people's minds between the 1950s and the 1980s, and that the aim of the ZACPLAN was to obtain assistance from donor countries and organizations not for a major transnational development scheme but for national projects on a smaller scale that could be implemented in a harmonized manner.

With regard to the resolution of conflicts among member states, past experience has shown that resolving such confrontations is not easy, even if a river basin is within a single administrative unit (e.g. state, canton, prefecture). Conflict resolution is much more difficult if a river basin comprises territories of more than one nation. The case of the Mekong Committee (i.e. failure to resolve conflicts between member states) should not cause undue alarm, although it is fair to say that possession of an RBO does not automatically solve all possible problems among basin states. The ZACPLAN had no provision for resolution of conflicts among riparian states, partly because political issues were to be addressed by the

built-in mechanism of the Southern African Development Coordinating Conference (SADCC) rather than the planned implementation mechanism for ZACPLAN; in other words, riparian countries were assumed to be in a collaborative atmosphere throughout the implementation phase of ZACPLAN – the emergence of conflicts between riparian states was simply not envisaged. Considering that the Mekong Committee had failed to resolve the conflict between Thailand and Viet Nam in the early 1990s (Nakayama 1997), it may be that an RBO is not a suitable mediator for conflict resolution. It was thus correctly assumed that the implementation scheme for ZACPLAN was not intended to embark on conflict resolution, such a political issue, rather, being left in the hands of the SADCC mechanism then in existence.

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Building the bridge between decision-support tools and decision-making

Kazimierz A. Salewicz

Introduction

Many areas of contemporary science, including water-resources management, are sometimes criticized for their lack of both practical relevance and connection with real-life problems. At the same time, however, scientists complain that decision makers and managers responsible for the development and operation of various water systems, especially in developing countries, are reluctant to apply and use tools and methods offered by the science. Who is right in this dispute? What factors inhibit the use of information technology and decision sciences in the everyday practice of water-resources management? What should be done to resolve this dilemma? In an attempt to answer these questions, I discuss various aspects associated with the application of decision-support tools to the management of water resources in the Zambezi River basin. In further sections of the chapter I discuss and explore possibilities for better arrangements concerning decision-making processes in river basins belonging to the South African region.

This chapter is based on my first-hand experience over a period of several years, when confronted with real problems associated with the management of a large international river. During this period, efforts were made to find methods and tools capable of solving some of the practical problems and to provide decision makers with appropriate ways of tackling their challenges.

EMINWA and Zacplan: Basis for cooperation

In 1986, after some time spent on internal preparations, the United Nations Environment Programme (UNEP) officially launched a new comprehensive programme for freshwater bodies under the name of the Environmentally Sound Management of Inland Waters (EMINWA). This programme has been designed to assist governments to integrate environmental considerations into the management and development of inland water resources, with a view to reconciling conflicting interests and ensuring the regional development of water resources in harmony with the water-related environment throughout entire water systems (David, Golubev, and Nakayama 1988).

The idea of the EMINWA programme originated from UNEP's success in its Regional Sea Program, under which a number of governments (often including traditional adversaries) signed agreements and developed specific action plans to protect their common interest, namely the regional seas. The Executive Director of UNEP believed that the same approach was possible and appropriate for freshwater systems (Tolba 1987).

The EMINWA programme was designed to deal with three sorts of freshwater systems – rivers, lakes, and groundwater aquifers. Both national and international water systems were targeted within the framework of the EMINWA programme, the first priority of which was to give assistance to countries sharing freshwater systems, so that they could develop their shared resources in a sustainable manner without conflicts between basin countries.

The idea of the ZACPLAN (Zambezi River Action Plan) emerged in 1984 through a series of consultations between the Executive Director of UNEP and three riparian countries of the Zambezi River basin, namely Botswana, Zambia, and Zimbabwe. These three countries were among “major shareholders” of the Zambezi River basin in terms of their basin area: Zambia occupies 40.9 per cent of the entire basin area, while Zimbabwe and Botswana had 6.3 and 19.0 per cent of the “share” respectively (UNEP 1986). Of these countries, Zimbabwe took the leading role through the subsequent development phase of the ZACPLAN.

The development of ZACPLAN was influenced by the following factors: (a) the pre-existing mode of cooperation between the basin countries was rather sector specific (e.g. the agreement between Zambia and Zimbabwe regarding hydropower production); (b) the idea of integrated management of the common river basin had not yet occurred to decision makers in the riparian countries; and (c) a framework was therefore needed to deal with the shared water resources in a coordinated and comprehensive manner to avoid future conflicts between basin countries.

No basin-wide legislative framework, for the sake of the shared water resources, existed, in fact, in the Zambezi River basin. Only Zimbabwe and Zambia, in the 1950s and 1960s (when these countries were part of the Federation of Rhodesia and Nyasaland) formulated agreements about the construction and operation of the Kariba Dam.

A major aim of developing the ZACPLAN was (although not spelled out in any official document) to enhance the collaboration of so-called border countries around South Africa, then under the rule of the apartheid government. Only Malawi had diplomatic relations with South Africa at that time, although all the basin countries had some economic ties with South Africa. These countries were member states of the SADCC (Southern African Development Coordination Conference, which is now SADC – the Southern African Development Community). SADCC in itself was the coalition of border countries against South Africa.

UNEP established in 1985 a project to assist basin countries for the purpose of developing the ZACPLAN; this was the first project under the EMINWA programme.

The first task to be conducted towards development of the ZACPLAN was preparation of the “Diagnostic Study” on the current status of environmental problems and water management in the Zambezi River basin, as a basis for an action plan to be developed later (UNEP 1986). The objectives of the Diagnostic Study were (a) to define specific environmental problems and their impacts, at that time and in the foreseeable future; (b) to help basin countries to formulate activities for incorporation of environmental concerns into the management of water resources; (c) to strengthen the awareness of the various governmental institutions involved in socio-economic development of the potential impacts of these developments within the basin; and (d) to encourage possible donor countries to contribute to the implementation of the projects (David, Golubev, and Nakayama 1988).

The working group of experts conducted the Diagnostic Study in order to prepare the ground for further efforts and initiatives. This working group consisted of representatives from basin countries, international organizations, intergovernmental organizations, and national governmental organizations. Once the study and the draft of ZACPLAN had been prepared by those “technical people,” it was intended that riparian countries should approve officially the contract of the ZACPLAN and its implementation scheme. An official meeting of the representatives from basin countries was thus convened as the next and final step of the ZACPLAN formulation (Nakayama 1997). The plenipotentiaries of the five countries (Botswana, Mozambique, Tanzania, Zambia, and Zimbabwe) of the Zambezi River basin signed the International Agreement on

the Action Plan for Environmentally Sound Management of the Common Zambezi River System (ZACPLAN) at Harare, Zimbabwe, in May 1987 (David, Golubev, and Nakayama 1988). A very extensive and detailed discussion of the political aspects associated with creation and implementation of the ZACPLAN has been provided by Nakayama (1999).

The precise aim of the ZACPLAN was environmentally sound and coordinated management of the Zambezi river basin. However, when the ZACPLAN was being developed, there were very few (if any) efforts to manage the water resources of the catchment in an integrated manner. For instance, at that time there were two major dams for hydropower production (the Kariba and Cahora Bassa dams) along the main stream of the Zambezi River. Construction of additional dams, in both the main stream and tributaries, was then planned in some riparian countries, while transboundary transfer of water was also envisaged. Both existing and planned additional uses of water resources were intended to have an effect, in one way or another, on basin states. The UNEP thus initiated a pilot study, together with the International Institute for Applied Systems Analysis (IIASA), in order to show how integrated management of the catchment can be performed in a beneficial manner for all the riparian states.

It should be mentioned at this point that the political climate of those days, owing to the apartheid form of government in South Africa, was not favourable to large-scale development schemes in the Zambezi River basin. However, in the opinion of those in UNEP, a tool was needed to evaluate the consequences of various development scenarios on the hydrological regime of the Zambezi River and thus to provide basin countries with the common ground and understanding needed for their discussions about future water use.

Large international rivers project

The IIASA, located in Laxenburg, Austria, in response to the UNEP initiative and in cooperation with the UNEP and the Ford Foundation, set up a research project entitled “Decision Support Systems for Managing Large International Rivers” (Salewicz 1991). The primary focus of this project was the identification of specific management problems or transboundary conflicts and to prepare data and applications addressing (or relevant to) these issues.

The research conducted in the framework of this project focused on two rivers as case studies – the Danube and Zambezi rivers. Selection of the latter reflected the direct interests and objectives of UNEP in assist-

ing riparian countries to achieve environmentally sound management of the water resources and to provide these countries with methodologies and analytical tools to solve management problems.

The project approached the problems of transboundary river-basin management from the viewpoint of those who are trained in applied systems analysis and who have direct experience of the use of systems-analysis methods to assist water resource-management agencies. Project activities took place in parallel to the implementation of ZACPLAN. The latter was proceeding fairly slowly; the immediate objectives of its managers were as follows:

- to maintain and enhance current political will for cooperation among basin states;
- to improve on existing data and understanding of basin processes, and
- to build analytic capability to evaluate, and improve upon, proposed joint development projects and management arrangements.

The intention of the IIASA project was to contribute directly to the third objective, but also, indirectly, to contribute to the other two, since one of the most important first steps in joint management involves cooperation in collecting data and modelling river processes.

An extensive study conducted by Pinay (1988) not only provided an extensive description of the hydrological and environmental conditions in the basin but also pointed to one of the most important water-management issues in the region – the operation of existing hydropower schemes, such as Lake Kariba and Cahora Bassa. Given the context of issues (hydroelectric-power generation, land degradation, etc.) and problems (lack of data and necessary depth of scientific/professional expertise), the IIASA project undertook support activities in addition to its development of the interactive river-system simulation package IRIS (IIASA 1989). These additional activities were aimed to achieve a successful transfer of the methodology and software developed at IIASA to basin countries. The actions taken were based on:

- developing institutional connections with potential users and research institutions from Zambezi basin countries in order to establish an active, constructive role as a third-party analyst within the basin;
- collecting relevant data sets and models, and conducting research focused on critical management issues associated with the operation of the storage reservoirs.

As far as the first group of activities is concerned, it is fair to say that the development of institutional connections was a long and gradual process demanding a great deal of patience and goodwill from all parties involved. The main institutional contact has been established with the SADCC Soil and Water Conservation and Land Utilization Unit. As the result of the joint efforts of IIASA and SADCC, a training workshop

for professionals from the Zambezi basin and SADCC countries was organized in Kariba, Zimbabwe, in June 1989. The key objectives of the workshop were as follows:

- to create mutual understanding among professionals from the regional countries and also between this group and IIASA staff involved in this study;
- to discuss management problems in the basin;
- to review existing mathematical and software tools (i.e. IRIS) that might be useful in solving the problems identified; and
- to prepare the ground for further collaboration.

Workshop participants comprised 19 representatives from the Zambezi basin and SADCC countries; however some countries (Angola, Zambia, and Namibia) did not send any representatives.

Although the Kariba workshop was a significant event in the (otherwise, very slow) implementation of ZACPLAN, and although it transferred some knowledge and technology to the basin states, it could not by itself transfer deep insights into the methods and tools that were presented. Consequently, SADCC and IIASA agreed to organize further extensive training at IIASA for selected professionals from the basin. The course took place at IIASA, Laxenburg, Austria, between 14 January and 15 March 1990. The curriculum of the course covered a very broad range of topics, varying from an introduction to computer technology, through interactive river-basin modelling, up to the organizational aspects of water-resources management. Before returning to their countries and home organizations, course participants received samples of professional literature and an executable version of the IRIS package, together with user's documentation.

Representatives of four countries (Malawi, Mozambique, Tanzania, and Zimbabwe) participated in the course. The overall evaluation of the course by participants was very high, and the course was given an equal evaluation by IIASA and SADCC. Unfortunately, owing to the lack of further funding, the IIASA Large International Rivers Project was terminated in June 1990 and no follow-up activities were organized.

Operation of Zambezi River reservoirs

As already mentioned, a significant part of the research efforts conducted at IIASA focused on studies dealing with the operation of storage reservoirs in the Zambezi River basin. This research was motivated by the recognition of the economic and environmental importance of the existing reservoir systems for the basin countries, on the one hand, and, on the other hand, of the lack of available tools and methods that would

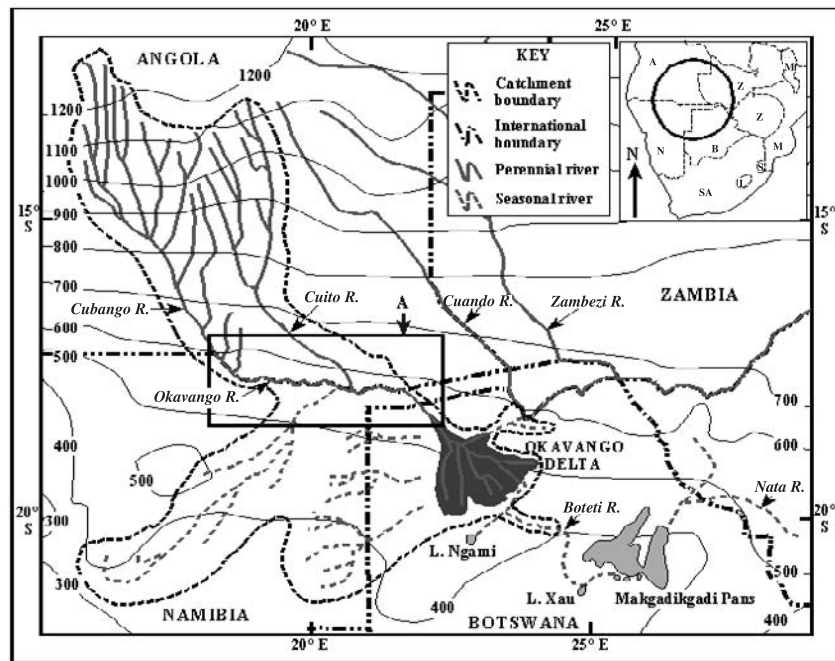


Figure 5.1 Zambezi River basin

enable policy and decision makers to evaluate the consequences of possible decisions and/or to propose solutions to decision makers that would improve the performance of the existing facilities.

The Zambezi is situated south of the Equator between latitudes 12 and 20 degrees S, and is the largest of the African rivers flowing into the Indian Ocean (fig. 5.1). Its length is about 2,500 km from its source in the Central African Plateau to the Indian Ocean (see Balek 1977; Balon and Coche 1974). Its total catchment is about 1,300,000 km² and it is shared by eight countries, for some of which the river constitutes the main water resource. Although the catchment possesses large development potentials, the main water uses have been limited to the construction of three large hydroelectric schemes – Kariba and Cabora Bassa on the Zambezi itself, and the Kafue Gorge–Itezihitezhi scheme on the Kafue River, one of the Zambezi's main tributaries. Zambia and Zimbabwe rely for more than 70 per cent of the generating capacity of their interconnected electricity supply system on Kariba and the Kafue Gorge–Itezihitezhi scheme (ZESA 1986). The catchment area upstream of Kariba Gorge is approximately 664,000 km² (Santa Clara 1988), and the lake itself covers an

area of more than 5,600 km² at the maximum retention level. The storage capacity of Lake Kariba is about 70 km³.

Main objectives of Lake Kariba management

Since its construction, the Kariba scheme has been the main source of energy for the Zambian–Zimbabwean interconnected electricity supply system. Since 1977, when the North Bank power station was fully commissioned, the scheme has supplied a monthly average of about 600 GWh, with an almost constant distribution through the year. In the control of the lake level, a balance has to be maintained between the need to maximize the hydropower output and that of maintaining a safe capacity at the beginning of the rainy season to avoid peak discharges through the floodgates. In order to allow formal (quantitative) analysis of the reservoir-management problem, certain numerical indicators (performance indices) have to be used. Since the main objective of the management is to maintain a fixed level of energy production, as a good indicator of the performance of the reservoir operation, the difference between this desired level and the energy actually generated can be used.

Opening of the floodgates is, on the other hand, extremely inconvenient, for three main reasons:

- from the power-generating point of view, the rise in tailwater level with the opening of one floodgate reduces the net head by about 5 m, and thereafter by about 3 m with every additional gate that is opened;
- from the dam-safety point of view, the vibrations induced by very high discharges through the floodgates should be avoided as far as possible;
- extremely large releases may endanger the population living downstream and create problems with the Cahora Bassa Dam.

Therefore, as the second performance indicator, the value of the total monthly release both through the turbines and the spillgates has been selected in relation to the risks associated with peak discharges.

Gandolfi and Salewicz (1990) have analysed problems associated with the operation of Lake Kariba and proposed a method to improve the performance of the hydropower scheme.

Optimization of the control policy for Lake Kariba

In order to tackle the problem of determining the control policy of the Kariba scheme, a heuristic approach (Guariso, Rinaldi, and Soncini-Sessa 1986) was applied. The main feature of the method is that the solution (control policy) is derived from the characteristics of the past management. The management of the Kariba scheme has been based on a rule curve, which relates release from the reservoir to actual amount of water

stored in the reservoir at any given period. This curve gives an a priori pattern of the desired storage volumes in every month of the year. According to this curve, the volume stored should gradually be reduced between July and January to provide sufficient storage capacity for the annual flood, which is expected to fill the reservoir in the following months. On the basis of analysis of historical operational data, Gandolfi and Salewicz (1990) proposed a piece-wise linear form of the control policy and optimized parameters of this policy with respect to two performance criteria:

- minimization of the maximum value of the monthly energy deficit; and
- minimization of the maximum value of the total monthly release.

As a result of the optimization analysis, a set of Pareto operating rules was determined, some of which were analysed in detail. The performance of the proposed operating rule was compared with the results of historical management: it transpired that the proposed rule was superior both in terms of average annual energy production (8,000 versus 7,200 GWh) and of minimum monthly production (562 versus 428 GWh). Moreover, the maximum monthly release decreased from 17.1 billion m³ (BCM) to 11.6 BCM/month and the number of months in which the floodgates had to be opened fell from 22 to 12.

Further development of decision-support system tools for managing Lake Kariba

The results of the study conducted by Gandolfi and Salewicz demonstrated potential benefits that resulted from the application of modern analytical methods to derive an operation policy for the operation of the Lake Kariba hydropower scheme. At the same time it became clear that, owing to methodological constraints of the approach applied, it was not possible to make better (more flexible and dynamic) use of the hydrological information available.

This motivated Rios Insua and Salewicz (1995) to initiate studies based on the concepts and methodology of decision analysis to encourage the development of more flexible decision-making schemes. The research undertaken by these authors combined two elements:

- development of the inflow forecasting model based on a Bayesian dynamic linear model (see West and Harrison 1989);
- derivation of the operating policies using maximization of the expected utility function associated with a release policy.

The analyses performed showed that it is possible to operate the Lake Kariba reservoir more efficiently and more safely than could be achieved by any other policies tested so far for operating this hydropower scheme.

Despite these very encouraging results obtained by Rios Insua and

Salewicz using decision analysis, it appeared that this approach requires significant computing power and very specific and excellent skills in the area of decision analysis, optimization, and Bayesian modelling. Therefore, in what was, to some extent, a competitive effort, Stam and colleagues (see Stam, Salewicz, and Aronson 1998) devised another method for formulating an operating policy for the Lake Kariba hydropower scheme. The Box–Jenkins seasonal autoregressive integrated moving average (ARIMA) time-series model (Box and Jenkins 1976) had been applied to predict monthly inflows to the reservoir; the release policy has been derived using interactive, staged simulation and analysis of the consequences of operational decisions made for the inflow scenarios considered and for selected variants of the operating policy. As the computational basis for the implementation of an interactive decision-support system (DSS), the Interactive Financial Planning System (IFPS) package (Gray 1988; IFPS 1995) was used. This approach also demonstrated the ability to derive an operating policy, which has shown a significant improvement over historical operational results.

The tools developed as the result of the research activities described above have enabled demonstration of the extent to which the efficiency and capacity of power production could be ultimately improved (assuming that the appropriate institutions and decision-making structures have been established and used correctly).

These tools and models have been developed with the intention of their application in solving real-life problems. However the reaction of their potential “users” was more than a little discouraging. Institutions involved in the management of water resources and respective facilities expressed only little interest and indicated that they might consider an attempt to use these and other tools and methods only if they were to be appropriately rewarded for their efforts. Organizations and institutions supporting the research did not intend to (and could not) fulfil such expectations; for this reason there has been no further contact with users. However the problems facing the decision makers and countries of this region have remained and, as is abundantly clear (Chavula 1998; Ndamba and van der Zaag), no significant progress concerning water-resources management has been made during the last decade.

Development of DSS tools: current status

During the implementation of the Large International Rivers Project, one of the main problems faced by the research team was related to the significant effort necessary to develop and implement interactive interfaces between the users and the decision-support tools. Another group of problems was associated with the computational performance of the

available hardware and the limitations imposed by operating systems. Recent years have brought significant advances in technology and the methods used to develop decision-support tools. Technological factors hindering the development of DSS in the late 1980s and early 1990s [central processing unit (CPU)] frequency not exceeding 30 MHz; 2–4 MB RAM; maximum 100 MB hard-disk space; no multitasking operating systems on PCs; very limited graphics and display capabilities] no longer exist; currently, a typical Windows-based workstation is characterized by a CPU frequency exceeding 800 MHz, 128 MB RAM, 20 GB hard disk, and excellent graphical capabilities. Owing to rapid advances in software engineering and the resultant increasing availability of various software tools, the main difficulty associated with the development of decision-support tools and systems has been constantly shifting from the development of individual, technical components of the DSS system (numerical routines, graphical user interfaces, display routines and functions, etc.) towards efficient integration of various components into “intelligent” systems capable of describing and modelling the reality. As a consequence of this development, the type and amount of effort needed to develop a DSS has changed: much less very “technical” effort (low-level programming) is needed; instead, the knowledge of various ready software packages is required, together with the ability to integrate them into a meaningful system capable of addressing the needs of decision makers. The total effort currently necessary to develop a decision-support tool similar to (or even exceeding the capabilities of) IRIS should not exceed 2 man-years, whereas the development of the original version of this program required an effort of about 7 man-years, excluding the development of graphical libraries. Progress in the technology of databases enables storage and easy management of large amounts of various data, which in turn allows models to process significant amounts of various, supplementary data; these capabilities were not available 10–12 years ago.

Currently the main barriers associated with decision-making processes in water-resources management do not result from any deficiencies in technology, or lack of tools and methods, that could be applied to support decision-making processes; the main obstacles can, rather, be attributed to the “soft” side of water-resources management – political, institutional, and policy factors. The further development of water-resources management depends not so much on the availability of models and tools to describe and analyse various processes and phenomena but primarily on the ability of politicians and decision makers to articulate and formulate sustainable economic, social, and institutional policies for the further development of respective regions and countries – which then could be “translated” into the reality of water-management systems.

Policy issues and what can be done

In the previous sections of this chapter, a number of issues that hindered effective implementation of the ZACPLAN in the late 1980s have been mentioned. Despite recent significant political changes in the region, which were caused primarily by the change of political system in the Republic of South Africa, the overall political and economic situation in the region remains difficult. The problems of this region should be seen and analysed from various aspects – global, regional, and national; they can be also seen from the sectoral perspective, taking into account socio-political, economic, and demographic factors. The scope and complexity of issues and factors involved is so overwhelming that the author of this chapter cannot venture to address all of them. In order, therefore, to attempt to discuss the constraints that prevent the rational operation of water-management systems, we need both caution in addressing these issues and focus on those subjects that are most relevant and closest to our competence and experience.

As is very well known, the availability of water significantly contributes to economic development. As Turton (1997) has observed, even economically developed states in Southern Africa are all at the point at which water availability is already a significant constraint on future development. Water is, therefore, becoming strategically important for all these countries, and recognition of this fact requires the creation of development policies based upon the notion of sustainability and which should secure sustainable future development. According to Turton, the following major factors have an inhibitory role in development of the water-resources management in the region:

- a critical shortage of intellectual capacity in the Southern African water sector, as identified by Turton (2000) but also directly experienced by the author of this chapter during his involvement in work on implementation of ZACPLAN;
- a lack of proper institutional structures and capacity to tackle institutional aspects of water management in the region (i.e. Turton 2000; Kapinga and Mukono 1997; Scheibal, Pruitt, and Zobrist 1996);
- scarcity of financial resources and capacity.

In the author's opinion, the main source of the problem lies in the political sphere. Years of experience have shown that issues of sustainable development, protection of natural resources, and sustainable water management do not figure (or are not of the highest importance) in the political agenda of the rulers or ruling establishments in the region. Other experience from many areas of economy, industry, technology, and management clearly shows that the use of effective decision-making methodologies and genuine search for improvements in related sectors

takes place only in such situations in which there is real political will or strong economic incentives and/or interests, or when the personal success or failure of decision makers is dependent upon the quality and efficiency of the decision-making process. Unfortunately, the whole area of natural resources – and of water resources in particular – suffers from a deeply rooted attitude that treats all processes and events taking place in this area as immediate consequences of natural, uncontrollable forces. Thus, Nature is perpetually blamed for many disasters caused by humans. Because insufficient research is directed towards the identification of causes of various negative developments, there is no possibility of quantifying the true causes of these events. Sometimes, owing to political factors, the causes of many negative developments are not disclosed. This tendency to blame natural forces for negative developments is typical of the whole world; however, in a situation where water – a basic natural resource needed for life and development – is scarce, the impact of such an attitude is much greater and much more persistent. Therefore, only significant changes in the priorities and attitudes of political leadership in the region towards natural resources and water-resources management will be able to lead to visible and tangible progress. When the protection of natural resources takes on high priority, then a change in the allocation of funds will take place, there will be progress in institutional and legislative arrangements, existing intellectual capacities will be better utilized, and new intellectual and professional opportunities and capabilities will grow. This process of changing the mind-set and changing attitude of the political establishment will not come overnight and requires a great deal of time and patience.

What can be done in such a situation?

In the author's opinion, the only practical and plausible approach leading to overall improvement of the situation can be implemented by applying the so-called "small steps policy" – that is, a policy involving incremental and gradual improvements not only in the area of water-resources management but also in the political sphere.

At this point of the discussion it is useful to recall some of the direct experiences amassed by the author during the implementation of the IIASA Large International Rivers Project and educational activities provided for decision makers from the countries of the Zambezi River basin. During the workshops or training programme it was hoped to encourage the decision makers to experiment with computer models and to use these models initially for educational purposes. The first reaction of the participants, when they were in a single group, was negative, close to rejection of the whole initiative. However, when we had divided the group

into very small teams according to nationalities and the formal (official) position of individual participants, and then started our classes once again in these small teams individually supported by instructors, we could see a dramatic change: our students, who in their organizations hold very high and prestigious positions, had forgotten about their “official” burden and had demonstrated a genuine interest (and even passion) in following the classes; in some cases we had to “force” them to end the exercises. This has shown us how important it was for participants not to “lose face” before colleagues from other countries or before people lower in the organizational hierarchy. This, and other psychological and cultural factors, must be also taken very seriously into account when discussing broad initiatives aimed at improvement of the water-management policies and practices in the region. When relations between scientists and decision makers are considered, the following steps are recommended to establish a basis for good communication and improved understanding with decision makers:

- scientists should try to identify and formulate research activities according to the practical importance of the issue to be studied, and not to its theoretical elegance;
- tools and models should be developed that are able to address and answer practical problems facing the decision maker and formulated as closely as possible to the way the decision maker “sees” the problem (i.e. how can I improve water supply to farmers in area XYZ?);
- during the presentation of tools and models to decision makers, the focus should be on their practical side and not on their formal elegance or theoretical value;
- scientists should try to avoid overwhelming decision makers with theoretical concepts, following a “Look, how simple it is!” way of presentation, rather than one of “Look, how clever I am!”;
- scientists should also try to establish working (possibly, frequent) contacts with decision makers to maintain communication and mutual interest.

As a first step in creating a new type of relationship between decision makers and scientists, a relatively uncomplicated case study of practical relevance could be selected, in an effort to create a common ground for understanding and joint problem-solving in a series of analytical and screening sessions with the participation of scientists and decision makers. A similar “mechanism” has been used very successfully in software engineering for the development of Management Information System and Decision Support Systems; this is known as Joint Application Design (Hoffer, George, and Valacich 1996).

A very important step leading to improvement of the overall situation in the region has to do with the maintenance of support for all types of

initiatives in the scientific area, at the level of local and national policies. Donor and supporting organizations must not “compete” among themselves to raise the interest of potential recipients of the aid; their efforts should be mutually coordinated, monitored, and evaluated. On the other hand, there should be elements of competition and initiative on the part of aid recipients. Donors and aid agencies, instead of coming up with their own research topics, research agendas, programmes, and objectives, and “forcing” aid recipients to accept them, should invite potential future aid recipients and collaborators to submit their own formulations of programmes, projects, and research activities that are most appropriate from their local point of view, and then to allocate available funds and aid according to the merit of proposals. Once again, this recommendation is based on practical experience: in the framework of contacts with officials from the Zambezi River basin countries during the implementation of our project, on some occasions we were told that so many donor agencies had been eager to provide assistance that there was no need to worry about getting their support. This caused lack of motivation and negation of the whole notion of help and assistance.

Current technology has one very powerful instrument to offer – the Internet. This instrument should be seen and used as the most efficient medium for providing scientific communities of the Zambezi River basin countries (and also other developing countries) with access to information, literature, models, data, etc. Currently, access to important scientific journals (e.g. *Water Resources Research*) is “protected” by user IDs and passwords granted to those subscribers able to pay appropriate subscription fees. In order to allow scientists from developing countries to access the information contained in such journals, one possibility would be to create “open” and free-of-charge accounts to members of the scientific community in such countries.

It is very encouraging to see scientific communities and various interested groups from the developing countries taking the initiative and creating their own Internet pages. Several already provide information about their activities, publish reports, offer data and information, etc. The most prominent of such Internet pages is the African Water Page (Abrams 2000), which has been in existence since December 1996.

Organizational and structural aspects of water management in South Africa

Analysis of current issues associated with the management of water resources in the South African region invites a number of questions and also requires answers to these questions.

The very first, and natural, question concerns which basins could be under international management. If we understand an “international management” situation to exist when riparian countries jointly resolve all management issues arising in the framework of the existing organizational and institutional arrangements, then all river basins shared by two or more countries should be under joint, international, management. If, however, by the term “international management” we understand the situation where the basin is managed by a specially established international institution created by the riparian countries, with eventual participation/involvement of independent third parties, and when sovereignty of individual countries is, to some extent, limited, then the Zambezi River seems to be a natural candidate for such a choice. Having said that, we must also take into account the real situation: although the Zambezi basin, owing to its truly international character and importance for the riparian countries, is in need of international management, at the same time there is no existing institutional and organizational basis to build upon. None of the riparian countries alone has the capacity and potential to initiate the process and take the first steps towards creation of an international management organization. Even if such a country were to exist, it is hard to envisage the other riparian countries following this initiative: rather, they would fear that the leading country could impose its will and subordinate other countries to achieve its own particular interests. Therefore there is only one feasible possibility – the full involvement and initiative of an unbiased “third party,” who could initiate and lead the process. This role could be taken by UNEP, as the initiator and facilitator of the ZACPLAN. Although the riparian countries did not accept the leading role of UNEP in the implementation of the ZACPLAN in the late 1980s, objectively speaking, there is no other current, plausible alternative to revitalization of the ZACPLAN by the UNEP. Because of its status and prestige, UNEP could undertake an active role in initiating and supporting activities leading to creation of an international management system. To achieve success, however, these activities would have to be supported by respective structures within the SADC. In such a setting, involving the active and joint participation of UNEP and SADC, UNEP should play the role of initiator and facilitator, while an institutional basis for the international management of the Zambezi River basin should be established, based on or within the framework of SADC. Additionally, UNEP could act as a “broker” between organizations newly created in the framework of SADC and potential donor countries and agencies. The current capabilities both of the UNEP and within SADC are far from adequate to undertake such a challenge. Moreover, neither of these organizations has envisaged its role in the way proposed here. If creation of the international management of

the Zambezi River basin should take place in a framework of active cooperation between UNEP and SADCC, therefore, strategic political decisions would initially have to be made within these organizations to accept this direction; subsequently, technical activity could take place. During the implementation of the ZACPLAN in the late 1980s, dedicated staff at UNEP did not exceed two programme officers involved in supporting ZACPLAN activities, while the staffing of the SADCC Unit in Lesotho, responsible for the implementation of ZACPLAN, did not amount to more than four programme officers and specialists (some of whom were expatriates). Experience showed very clearly that such limited staffing was completely inadequate for the needs and challenges posed by the ambitious objectives of the ZACPLAN. If, therefore, activity aimed at the creation of international management of the Zambezi River were to be restarted, from the outset it would be necessary to establish a solid organizational structure and to secure a "critical mass" of professionals capable of undertaking and implementing planned activities efficiently.

The second question is whether transboundary water transfer is the only reason for the "internationalization" of the basin. Water transfer can be considered as the highest form of the internationalization of the basin, since water transfer from a basin belonging to one country reduces water resources in the source country and enhances water resources in a recipient country. However, this is not the only reason for "internationalization": in fact, any form of joint use of water resources shared by two or more countries calls for cooperation of the countries involved. Even very superficial analysis of the issues facing countries of this region shows how many different aspects of the "internationalization" of their water resources they have to deal with: examples such as those of the Okavango River, Lesotho Highlands Water Project, Sedulu/Kasikili Island in the Chebe River, and the Kunene River demonstrate how important it is to create and establish mechanisms and institutions capable of dealing with such cases. As the prospect of creating an organization involving integrated management of the Zambezi River basin seems to be still fairly distant, initial efforts towards the creation of foundations for international river-basin management in the region could take the form of the establishment of bilateral agreements/organizations dealing with "isolated" issues such as those mentioned previously. Such bodies, "limited" in scope and competence, not only could help to resolve disputes between individual countries but also could be seen as "pilots" of staged efforts to prepare the ground for the establishment of multilateral institutions involved in the joint management of water resources.

The next question is whether integrated management of water resources is feasible/desirable in major water systems in the region. Whereas the

integrated management of water resources in shared/international river basins is desirable (and even necessary), for many political and economic reasons it is not always feasible. As already discussed for the case of the Zambezi River, the existing legislation and institutional structures are, unfortunately, unable to address issues as they arise, or to respond to changing needs. Progress can be achieved only in a situation where organizations such as UNEP and SADC, even on the basis of existing agreements (ZACPLAN), undertake an active role. So far, their performance in this area cannot be described as satisfactory (in the late 1980s and currently). Both of these organizations have the mandate to act; however, fulfilment of this mandate requires political will and determination, both of which are still lacking.

If we assume that integrated management will be established in certain (possibly all) river basins, then the question arises whether river-basin organizations (RBOs) are necessary for better management. Experience in many areas of human activity has clearly shown that, without dedicated organization and infrastructure, management processes cannot be implemented and management does not work. Setting up dedicated RBOs is, therefore, imperative for better management of shared water resources. However, these organizations must be properly staffed and supported.

The main opportunity for RBOs arises from the fact that, in the whole region of Southern Africa, there is a burning need to establish and create an effective system of managing water resources on regional, international, and national levels. The main obstacles result from political factors (lack of willingness, fear of losing/limiting sovereignty) and also from economic and human factors (lack of resources, lack of skilled staffing, lack of tradition).

In this situation, the transparency of information, access to information, and public participation is of paramount importance: through growing public involvement and through liberal access to accurate and objective information, many obstacles that hitherto have hindered the formulation of sustainable development policies and the creation of mechanisms and institutions allowing for rational management of available water resources can be, if not eliminated, then at least weakened. This should clear the path for positive changes and the gradual creation of institutions and mechanisms for the harmonized and rational utilization of available resources. Positive changes in the region cannot take place without the participation and active involvement of various “third parties” – international political organizations, financial institutions, and scientific and educational organizations. All these organizations (acting according to their primary mission and objectives) should and can support countries and organizations in the region in building institutional

foundations; in increasing skills; and in the initiation of projects aimed at the gradual creation of sound and effective management structures and organizations capable of coping with the problems of development planning, utilization, protection and management of water resources in the region. In this context, of particular importance is a role for impartial and non-biased scientific organizations, such as the United Nations University; such organizations can support local intellectual resources by providing access to literature, by contacts with renowned specialists from other regions, and by undertaking joint scientific projects addressing issues of vital importance to the countries in the region.

In a previous section of this chapter the role of the Internet, as a medium for providing scientific communities in the region with information and as a platform for sharing information, has already been mentioned. The Internet can be also perceived and used as a medium enabling and extending public participation in the evaluation of the consequences of various development and construction projects. We can envisage a situation in which a particular development project is considered with regard to various alternative solutions, and where each of these alternatives is described by a specific model showing (numerically and graphically) the relationship between certain decisions to be made (parameters to be selected) and the consequences of these decisions. Through the creation of an interactive Internet interface between the “Web user” and the model (and, consequently, between the model and the Internet), any interested person having access to a specific Web site could experiment with the model, to review and personally to evaluate the consequences of various alternatives. Access to information, and the ability to perform “individual” assessments of the consequences of possible solutions, could significantly contribute to resolution of the various disputes that are usually associated with new development projects or with existing, but still controversial, facilities. Plausible “candidates” for such case studies might be the Kariba Dam, the Cahora Bassa Dam, or water transfers.

Conclusions

When the elements of the DSS for the Zambezi River basin were being developed (as described in the previous sections), their real value could not be assessed correctly. The main reasons for the lack of ability of decision and policy makers to assess correctly the value of these methods and tools were political: at that time, various plausible scenarios of water use were considered and were deemed impossible to implement in the region, owing to political constraints. Even some infrastructures already in existence (such as the power line from the Cahora Bassa power station

to South Africa) were non-functional because of political instability. In the same context, transboundary water transfer into South Africa was not open to discussion among riparian states.

With the current new political scenario, many options regarding future water use within the catchment now seem more feasible than they were in the mid-1980s. The true value of the DSS may now be assessed, through simulating various potential water-use scenarios both within and exterior to the Zambezi River basin.

The development of the DSS, planned by the UNEP and implemented by the IIASA, in a sense materialized rather prematurely, even before riparian countries became aware of their need for such a system for planning purposes. In the case of the UNEP, although it advocated the concept of the “environmentally sound management of water resources” in the 1980s, it then did not have a viable tool or methodology by which it could show its member states that managing resources in an environmentally sound way is really advantageous. The DSS could have been instrumental in this connection, if Southern African states had not been in difficult political settings.

The political situation in the region today differs completely from that in the 1980s. Moreover, riparian states seem now to be more concerned than before about the future environmental consequences of possible water-use scenarios. The true value of the decision system should be assessed, from now on, in the light of the new political situation of the region and of worldwide enhanced environmental awareness, for we still do not possess a concrete method of examining the consequences of many possible scenarios in a major international river basin such as the Zambezi. The time has come to act, perhaps little by little but on a broad front.

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Disclaimer

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An overview of the hydropolitical dynamics of the Orange River basin

Anthony R. Turton

Introduction

The Orange River basin provides the hydropolitical analyst with a number of interesting issues and anomalies, which are mostly misunderstood and usually inaccurately presented in the general media. The purpose of this chapter is to present a detailed analysis of this basin by focusing on certain unique aspects that confront water-resource managers, politicians, engineers, and hydropolitical analysts. Two of these aspects are rather unique in nature and are highly relevant to a deeper understanding of the hydropolitical dynamics of the basin. The first relates to the fact that one of the riparian states (Botswana) contributes no stream flow to the river, yet has the legal right to participate in international river-basin organizations (RBOs) by virtue of its geographic position within the overall basin. It will be argued that this provides considerable diplomatic manoeuvrability for Botswana, where it can use this position to form alliances with other basin states for the purpose of leveraging hydropolitical advantage elsewhere, making Botswana considerably more powerful than initially anticipated. The second relates to the large number of inter-basin transfers (IBTs) of water within South Africa; this is supported by South African legislation and is driven by the skewed development pattern within that country. As such, it poses a significant challenge to existing notions of the management of river basins as inte-

gral units, with particular implications for downstream riparian states. This aspect also provides spatial linkage with many other river basins in South Africa and its neighbouring states. It will, therefore, be argued that one of the best ways to understand the hydropolitical dynamics of the Orange River basin is to view them in terms of a hydropolitical security complex because of various cross-cutting linkages.

Physical description of the basin

South Africa has the most developed economy in the entire Southern African Development Community (SADC) region, and shares four international river basins with its less-developed neighbours. These four basins – Orange, Limpopo, Incomati, and Maputo – contribute approximately 32 per cent of the South African mean annual run-off (MAR); support 70 per cent of the South African gross national product (GNP); contribute 90 per cent of the South African electricity supply (which is about half of the electricity generated on the entire African continent); support almost all of the mining activity on which the economy is based; and have irrigation as an important component in all cases (Basson 1999: 3). These four basins are also in close proximity to each other, in all cases sharing a common watershed that runs through the Gauteng (previously Johannesburg) area, where the vast majority of the economic activity is located. All of these shared river basins cover approximately 60 per cent of the total South African land area and generally represent the most developed transboundary watercourses in the entire SADC region (fig. 6.1

South Africa is the third driest country in the SADC region and is also the most highly developed in both economic and infrastructural terms. The fact that these river basins are shared is significant for a number of reasons, one of the most important being that two of these riparian states (Namibia and Botswana) are the driest in the SADC region. Thus, one is confronted by a situation where three of the driest countries in the SADC share the Orange River basin – the largest and most important basin for South Africa. Two of those countries (South Africa and Botswana) also share the Limpopo River basin, which is the second most important basin from a South African perspective, while being the most important from the perspective of Botswana. This is very significant, because four of the most economically developed countries in the entire SADC Region – South Africa, Zimbabwe, Botswana and Namibia – are all linked by these two river basins and have a heavy dependency on the water that those basins provide. The strategic significance of this fact

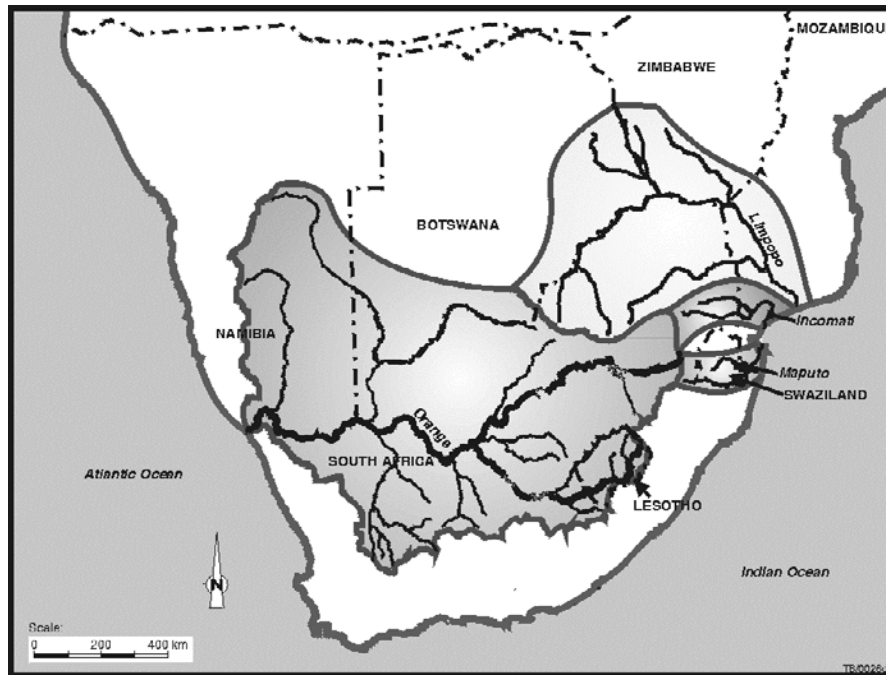


Figure 6.1 Map of the four international river basins found in South Africa, showing their relative size and relationship to one another (Source: Basson 1999: 3)

comes into sharp focus when viewed against the fact that all of South Africa's water resources will be fully allocated by the year 2020 under current development conditions (Basson 1999: 4). In fact, water use in South Africa already exceeds the yield potential of the Limpopo basin by more than 800 million cubic metres (MCM) per year, necessitating transfers from the Vaal to the Crocodile (which is part of the Limpopo) (Basson 1999: 6). Table 6.1 presents an overall comparison of these four river basins. Attention is drawn to the fact that, in all of these basins, South Africa occupies the largest portion of surface area and contributes the greatest volume of surface flow.¹ Alternative data are shown in parentheses. Attention is drawn to the fact that the data for the Orange River are the least contested of all the shared river basins in South Africa.

The mean annual precipitation (MAP) in the Orange River basin is around 400 mm/a, which is arid by world standards. This is unevenly distributed, however, with the upper basin areas in the Lesotho highlands having a MAP of around 2,000 mm/a (with a potential evaporative loss

Table 6.1 Comparative statistics of South Africa's international river basins

Statistics	Orange	Limpopo	Incomati	Maputo
Total basin area (km ²)	964,000	183,000	50,000	35,000
Average MAR ^a for the whole basin (MCM) ^b	11,200	5,750	3,600	3,900
Basin area for South Africa (%)	62 (59) ^c	45 (44)	62 (61)	56
MAR contribution by South Africa (%)	55 (56) Uncontested	81 (66) Contested	81 (64) Contested	56
Basin area for Botswana (%)	9 (11)	20 (21)	Nil	Nil
MAR contribution by Botswana (%)	0 (0) Uncontested	3 (6) Contested	Nil	Nil
Basin area for Zimbabwe (%)	Nil	15 (15)	Nil	Nil
MAR contribution by Zimbabwe (%)	Nil	7 (16) Contested	Nil	Nil
Basin area for Mozambique (%)	Nil	20 (19)	33 (33)	10
Mozambique contribution to MAR (%)	Nil	9 (12) Contested	6 (16) Contested	6
Basin area for Swaziland (%)	Nil	Nil	5 (6)	34
Swaziland contribution to MAR (%)	Nil	Nil	13 (20) Contested	38
Basin area for Lesotho (%)	4 (3)	Nil	Nil	Nil
Lesotho contribution to MAR (%)	41 (40) Uncontested	Nil	Nil	Nil
Basin area for Namibia (%)	25 (27)	Nil	Nil	Nil
Namibia contribution to MAR (%)	4 (4) Uncontested	Nil	Nil	Nil

Source: Adapted from Basson (1999).

^a MAR: mean annual run-off.

^b MCM: million cubic metres.

^c Data in parentheses are from Savenije and van der Zaag (1998: 30) and are used to illustrate the contestable nature of data in some hydropolitical settings. Significantly, Orange River basin data are relatively uncontested, unlike the data for the Limpopo and Incomati basins.

of 1,200 mm/a), in comparison to the MAP at the river estuary of around 50 mm/a (with an evaporative loss of a staggering 3,500 mm/a) (Conley and van Niekerk 1998: 143). The temperature range across the full length

of the river is 60 °C (−10 °C at the source and +50 °C at the estuary), with habitat types varying from alpine grass in the highlands to desert dunes at the estuary, with the majority of the area being covered by Karoo scrubland (Basson, van Niekerk, and van Rooyen 1997: 40). For long reaches, therefore, the river can be regarded as a linear oasis in the desert. This is particularly true for the last 600 km, where it is shared as a common border with Namibia. Just before reaching this point, the basin is linked to Botswana via endoreic rivers such as the Molopo that drain into the general direction of the main watercourse (Basson 1999: 2), but which cease as surface flow before reaching the Orange River (Basson, van Niekerk, and van Rooyen 1997: 41). There are 24 large dams in the Orange Basin (Pallet 1997: 60); of these, the Gariep (formerly H.F. Verwoerd Dam with the largest storage capacity in South Africa), when combined with the Vanderkloof Dam, is used to regulate irrigation flow, divert water to the drought-prone Eastern Cape, and generate hydroelectric power. The Katse Dam is the highest in Africa and, combined with the Mohale Dam, forms the key component of the Lesotho Highlands Water Project (LHWP). The Welbedacht Dam on the Caledon River supplies water to the city of Bloemfontein, while the Hardup and Naute dams provide water to various consumers in Namibia (Basson, van Niekerk, and van Rooyen 1997: 42). Groundwater is extensively used for stock watering and domestic supply in rural areas, but is generally low yielding as a result of the limited recharge rates in the arid portions of the basin. Groundwater mining occurs in many instances, so sustainability is a key management issue.

The Orange River carries approximately 20 per cent of the total river flow in South Africa, with the Vaal being the most important tributary (Basson, van Niekerk, and van Rooyen 1997: 40). The Vaal River is regarded as being a river basin in its own right and provides Gauteng with all of its water. Gauteng, on the other hand, houses approximately 40 per cent of the South African population, generates around 50 per cent of the country's wealth, and generates around 85 per cent of the electricity in the country (Conley and van Niekerk 1998: 146). The Vaal River now has links to eight other basins in a complex web of IBTs that range from the Limpopo in the North to the Sundays in the South.

Table 6.2 lists some of the largest IBTs, showing the volume of water involved in each case. Attention is drawn to the linkage between the Orange and Limpopo Basin, and the central role that the Orange River plays in these complex IBTs, all of which are considered to be of strategic importance to South Africa. The significance of this is illustrated in figure 6.2, which shows the proportion of gross geographic product (GGP) that is supported by IBTs in each of the nine South African provinces.

Table 6.2 Various transfers of water involving international river basins in South Africa

Transfer scheme	Source inter-national basin	Recipient inter-national basin	Average transfer (MCM/year)	Use
Vaal–Crocodyle	Orange ^a	Limpopo	615	Industrial, domestic
Vaal–Olifants	Orange	Limpopo	150	Industrial (ESCOM) ^b
Olifants–Sand	Limpopo	Limpopo	30	Pietersburg
Crocodyle–Limpopo	Limpopo	Limpopo	6	Gaborone
Komati–Olifants	Incomati	Limpopo	111	Industrial (ESCOM)
Usuthu–Olifants	Maputo	Limpopo	81	Industrial (ESCOM)
Assegaai–Vaal	Maputo	Orange	81	Industrial, domestic
Buffalo–Vaal	Thukela	Orange	50	Industrial, domestic
Thukela–Vaal	Non-inter-national basin	Orange	630	Industrial, domestic
Orange–Buffels	Orange	Non-inter-national basin	10	Industrial, domestic
Orange–Lower Vaal	Orange	Orange	52	Irrigation, domestic
Orange–Riet	Orange	Orange	189	Irrigation
Orange–Fish	Orange	Non-inter-national basin	643	Irrigation, domestic, industrial
Fish–Sundays	Orange via Fish	Non-inter-national basin	200	Irrigation, domestic
Caledon–Modder	Orange	Orange	40	Industrial, domestic
LHWP (1A)	Orange	Orange	574	Industrial, domestic
LHWP (1B)	Orange	Orange	297 (by year 2003)	Industrial, domestic

Source: Adapted from Basson, van Niekerk, and van Rooyen (1997: 54).

^a All transfers involving the Orange basin are shown in **bold type**.

^b ESCOM: Electricity Supply Commission (Republic of South Africa institution).

Brief historical overview

In 1652, the Dutch established a replenishment post at what is now known as Cape Town. The Dutch therefore developed the first water-management capacity in modern times because the Cape Town area has winter rainfall, so water needs to be stored for the summer months. Colonel Gordon, the garrison commander at the Dutch East India Com-

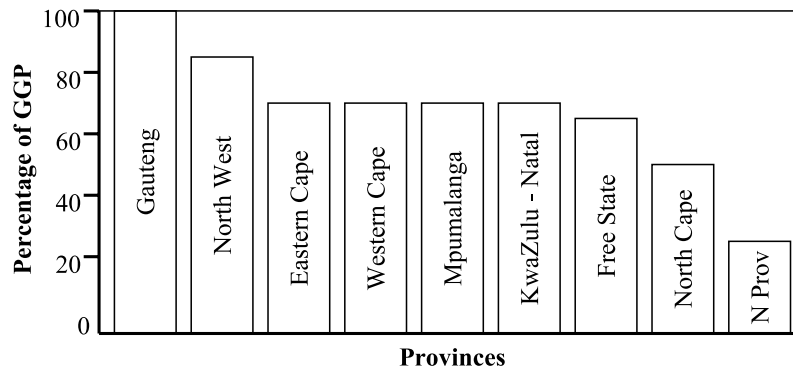


Figure 6.2 Graph showing the proportion of the gross geographic product (GDP) that is supported by the inter-basin transfer (IBT) of water for each South African province (Source: Basson, van Niekerk, and van Rooyen 1997: 55)

pany settlement, went on a reconnaissance expedition where, in 1779, he “discovered” a large river which he named the Orange, in honour of the House of Orange in the Netherlands (Conley and van Niekerk 1998: 144).

In 1844, what was then known as South-West Africa became a German protectorate. This status changed after the First World War, when it was subject to South African administration in terms of a League of Nations mandate. In 1966, the United Nations General Assembly attempted to end this mandate, renaming the country Namibia. South Africa resisted this, continuing with what was regarded by some as an illegal occupation. From 1989 it fell under joint South African and United Nations administration, attaining full independence in 1990 (Esterhuysen 1992: 41). It has a current population of 1.6 million people (Conley and van Niekerk 1998: 145).

In 1868, a British Protectorate was declared in Basotuland in response to the Basotho King’s request for protection from Boer expansionism (Conley and van Niekerk 1998: 144). This situation lasted until 1884 when it became a British Colony. From 1931 to 1966 it was a High Commission Territory, ultimately becoming self-governing in 1965 with full independence as the Kingdom of Lesotho in 1966 (Esterhuysen 1992: 41). It has a current population of 2.1 million (Conley and van Niekerk 1998: 144).

In 1885, Bechuanaland was declared a British Protectorate as the result of Boer intrusion from the adjacent Transvaal Republic (Conley and van Niekerk 1998: 144–145). For many years there were strongly articulated ideas within South Africa that Bechuanaland should be incorporated into South Africa, but these ideas were dashed when the Republic of

Botswana gained its independence from Britain in 1966. It has a population of around 1.5 million people (Conley and van Niekerk 1998: 144) but, owing to the skewed nature of population distribution, is heavily reliant on water from the Limpopo and Okavango basins. At present, around 80 per cent of the population are dependent on the Limpopo basin.

Diamonds were discovered in Kimberley in 1868, followed by gold in what is now Gauteng (formerly Johannesburg). Both of these events placed heavy demands on the Vaal River system, and can be considered as trigger events of sorts, resulting in what can be described as the South African Hydraulic Mission (Turton and Meissner 2000). In 1903, some irrigation was started in the Orange basin and, after the Act of Union (1910), a Mr A.D. Lewis of the newly formed South African Irrigation Department did an extensive reconnaissance of the lower Orange basin in 1912 by donkey and on foot (Conley and van Niekerk 1998: 145). During the 1920s and 1930s there was a major drought in the region. This was accompanied by the Great Depression which, combined with the so-called "Poor White"² problem of the time, saw the South African government launching a nation-wide poverty-relief programme. This can be regarded as being the second fundamental component of the South African Hydraulic Mission because it saw the construction of large-scale labour-intensive irrigation projects along the Vaal and Orange rivers that today consume around 50 per cent of the total water demand in South Africa (Conley and van Niekerk 1998: 144). In 1928, Lewis proposed the development of a tunnel to take water from the Orange River to the drought-prone Eastern Cape; this was transformed into the Orange River Project (ORP) in 1968, which had as its banner "Taming a River Giant."³ Significantly, a major impetus to the development of the ORP can be traced back to the 1960 Sharpeville massacre, which undermined investor confidence in South Africa (WCD 2000: 170). A fundamental element of the ORP is therefore related to the desire to demonstrate national capacity and to "restore international confidence in the country's development and investment potential" (WCD 2000: 170); this became part of the subsequent South African hydraulic mission. Components of the ORP are the Gariep Dam (completed in 1971), which is the largest in South Africa in terms of volume (5,500 MCM) with a crest height of 88 m; Vanderkloof Dam (130 km downstream of Gariep), which was completed in 1977 with a crest height of 107 m and a live storage capacity of 3,200 MCM; the Orange–Fish tunnel (82.8 km long and 5.35 m in diameter), which was completed in 1975; and the Welbedacht Dam, which has a greatly reduced storage capacity (from 115 to 16 MCM) as the result of excessive sedimentation over a 20-year period (Conley and van Niekerk 1998: 145).

During the years of increasing apartheid isolation in South Africa, the then President P.W. Botha proposed a so-called Constellation of Southern African States (CONSAS). The basic rationale was to use the South African development advantage to leverage diplomatic contact with (what were then called) the Front Line States (FLS). In partial response to this initiative, six of the so-called FLS – Botswana, Tanzania, Mozambique, Zambia, Zimbabwe, and Angola – in conjunction with Lesotho, Malawi, and Swaziland, established the Southern African Development Coordination Conference (SADCC) in April 1980. The underlying rationale was to counter Botha's CONSAS initiative and progressively to reduce their joint economic interdependence on, and military vulnerability to, South Africa (Baynham 1989: 88). This sentiment has become a fundamental political driving force within the region and elements of this are still felt in modern times. In the wake of the demise of apartheid after the successful round of talks in the Convention for a Democratic South Africa (CODESA) that started in 1991, SADCC met in 1992 and changed itself into the Southern African Development Community (SADC). With its first democratic election during 1994, South Africa became a fully fledged member of SADC. During August 1995, the SADC Protocol on Shared Watercourse Systems in the SADC Region was signed; this was the first protocol to be developed within SADC. In November 1995, South Africa hosted the first meeting of SADC ministers dealing with water. As a result of these activities, the SADC Water Sector was launched in 1996 (Conley and van Niekerk 1998: 154). Because the SADC Water Protocol is a development instrument, there is a need to harmonize actions between states, institutions, and various government departments (Basson 1999: 19); this is a massive task, which is sometimes hampered by the inherent mistrust⁴ of South Africa that is still evident in some quarters of the region.

During 1987, the Orange River System Analysis (ORSA) was started. It was in the context of the emerging spirit of democracy and peaceful coexistence that the South African Department of Water Affairs and Forestry (DWAF) launched the expanded Environmental Task Group as part of the Orange River Replanning Study (ORRS) (DWAF 1999) in 1990, including representatives from Lesotho and Namibia (Conley and van Niekerk 1998: 153). This was triggered by the earlier ORSA initiative, part of which was the establishment of instream flow requirements (IFR)⁵ for the reach, 1,400 km long, of the Orange River downstream of the Vanderkloof Dam. In 1994, South Africa became a democracy, which ushered in a new era of water management based on cooperation with all riparian states. The National Water Act (36/98) places water that is subject to agreement with co-riparian states in a special category that has to be honoured before local allocations can be made. In 1995 there was an

environmental review⁶ of the entire Orange River Basin involving all riparian states (except Botswana), resulting in a refinement of the IFR regime in 1996 (Conley and van Niekerk 1998: 153). This whole process thus became a functional foundation for future cooperative work between all major role-players in the basin and demonstrates the value (and problems) of cooperation. This is also reflected in the relatively uncontented nature of the hydrological data shown in table 6.1. Initially, the South African invitation caused some misgiving in Namibia and Lesotho because the proposed study was not being conducted under some joint international forum; for this reason, they eventually carried out their own studies, but with other riparian states as observers (Conley and van Niekerk 1998: 152). This became a strong indicator of the need for an RBO and gave added impetus to the desire to form the Orange River Basin Commission (ORACOM)⁷, which was formally established under the official title of the Orange–Senqu River Commission (ORACOM 2000).

Existing international developments within the basin

For ease of presentation, the existing international developments are described here separately, but under the headings of the upper-, middle-, and lower-basin developments.

The upper basin: South Africa and Lesotho

The need for upper-basin development was initially expressed in an investigation (Ninham Shand 1956) into the feasibility of harnessing the water of the Orange River to supply the gold mines in what was then known as the Orange Free State (Meissner 2000: 25). An element of this study was the so-called “Oxbow Scheme.” This study found that supply from the Vaal was a cheaper option. A major drought in the mid-1960s focused attention on the need for developing a long-term supply of water from the Lesotho highlands. In 1967, a report entitled “The Oxbow Scheme Consolidated Proposal” was presented to the Government of Lesotho. Negotiations between Lesotho and South Africa in the early 1970s failed to reach consensus on the issue of royalty payment, so negotiation was terminated and the Thukela–Vaal transfer was developed instead. In 1975, negotiations were reopened; however, as the result of the political upheaval in South Africa caused by the Soweto riots and subsequent government retaliation, talks were again broken off in 1976. In 1978, the Joint Technical Commission was formed to conduct a joint pre-feasibility study, which was published a year later. In 1983, a new and refined project layout was launched and this phase was completed in

1986; this study regarded 70 m³/s as the maximum transferable volume of water.

A series of politically relevant events again became manifest at this time. South Africa accused Lesotho of harbouring guerillas from the (then) banned African National Congress (ANC) armed wing *Mkonto we Sizwe* (MK). There was a military coup in Lesotho, and Major-General Justin Metsing Lekhanya overthrew Chief Leabua Jonathan on 20 January 1986 (Esterhuysen 1992: 46). Shortly after this, the treaty on the Lesotho Highlands Water Project was signed on 24 October 1986 by the South African Minister of Foreign Affairs R.F. Botha and Colonel T. Letsie (LHWP 1986), under the terms of which various volumes of water⁸ had to be delivered to South Africa over a specific time period. The rapid sequence of these two events – the military coup and the subsequent signing of the treaty – has led some authors to conclude that there was a direct linkage (Homer-Dixon 1994: 19); however, this has never been proven and therefore remains speculative (Meissner 2000: 26). The subsequent armed intervention⁹ in 1998 under the banner of a SADC peacekeeping force that saw military action near the Katse Dam has reinforced this view in the popular media.

The Joint Permanent Technical Commission (JPTC)¹⁰ was established as a result of the treaty on the LHWP between South Africa and Lesotho (Chenje and Johnson 1996: 164; LHWP 1986; Pallett 1997: 70). Two other functional structures fall under the JPTC: the Lesotho Highlands Development Authority (LHDA) is responsible for the development aspects of the project (handling 87 per cent of the total project value), whereas the Trans-Caledon Tunnel Authority (TCTA) is responsible for the management of the delivery tunnel that terminates in the Ash River Outfall. The objective of this initiative is to meet the growing water demands on the Vaal River sub-basin and to generate hydropower for Lesotho (Chenje and Johnson 1996: 158). Recently, the JPTC has been changed into the Lesotho Highlands Water Commission (LHWC) in terms of Protocol VI (LHWP 1999). In view of the highly complex nature of this project, the LHWC meets every two weeks and can be regarded as representing functionalism at its best (Meissner 2000: 27). In keeping with the magnitude of the project, the agreements are lengthy and extremely complex, with a number of subsequent protocols having been added over time. Protocol V deals with the issue of taxation of the items related to the LHWP in Lesotho (Meissner 2000: 27). This level of complexity is an important issue to be taken into consideration when it comes to the establishment of an RBO.

The LHWP is a development project with a clearly defined set of goals (Conley and van Niekerk 1998: 146): these include a gravity feed of water to the Vaal Dam; sharing of the cost saving (from the alternate Caledon

Cascade Scheme) between both countries; avoidance of air pollution that would result from the use of coal-fired electricity to pump the water in the Caledon Cascade Scheme; development of a degree of economic self-sufficiency in Lesotho; acceleration of socially and environmentally appropriate development in Lesotho; and meeting the needs of a rapidly growing population. Owing to the activities of an aggressive environmental lobby group, special attention is paid to the social and environmental impacts of the project. Another interesting and generally unreported aspect of the LHWP is the fact that a “no objection” agreement was reached with the South-West Africa People’s Organization (SWAPO), who were effectively the “Namibian Government in exile” at the time, which was subsequently endorsed by the Government of Namibia on gaining independence (Conley and van Niekerk 1998: 153). This is in keeping with international standards on financing large water projects, and is limited to Phases 1a and 1b of the LHWP. This illustrates the powerful effect of functional cooperation in technical areas of water-resource management, because this agreement was reached during times of heightened political tension in the region, with a state of war between the South African Government and the ANC/SWAPO alliance. It also shows the constructive effect of third parties such as the World Bank in times of political tension. The Memorandum of Understanding (MOU) that was reached between the LHDA and local interest groups (who were protesting over some of the unintended social impacts of the project) in May 1998 (Meissner 2000: 27) also provides evidence of the spillover and enmeshment effects of technical cooperation, in this case resulting in a strengthening of civil society in a setting where a democratic culture has not yet been fully established. This has served to institutionalize the conflict potential in the LHWP, making it easier to manage.

The middle basin: South Africa and Botswana

Development of the middle-basin reach of the Orange River is mostly within South Africa. At the international level, an agreement between South Africa and Botswana was reached in 1983 and embodied in the JPTC¹¹ (Conley and van Niekerk 1998: 150). This has subsequently been replaced by the Joint Permanent Technical Commission on the Limpopo Basin by mutual agreement in June 1989 (Chenje and Johnson 1996: 164; Pallett 1997: 70). The regular deliberations within this forum have covered groundwater, transboundary transfers, infrastructure on the Limpopo River, the hydrology of the Nossob and Molopo systems (as endoreic tributaries of the Orange), and other technical assistance (Conley and van Niekerk 1998: 150). This technical engagement took place over a period of great political tension that sometimes involved cross-

border raids by elements of the South African Defence Force (SADF), which again attests to the positive value of cooperation in the water sector.

The lower basin: South Africa and Namibia

The development of the lower basin is very recent, given the fact that Namibia gained its independence only in 1990; previous developments were treated as if Namibia was a province of South Africa. The build-up to independence saw the issue of the border between Namibia and South Africa becoming relevant. This issue is centred on a historic series of events dating back to the former colonial powers of Germany and Great Britain, where the demarcation of the border was taken as being the northern bank of the Orange River. During colonial times, this was driven by political considerations¹² aimed at denying the German territory access to water and thereby creating an inhospitable buffer zone (Hangula 1993: 116). Immediately prior to the first democratic elections in South Africa, however, the outgoing minority government moved the border to the central line of the river, invoking the *medium filum fluminis aquae* (middle of the river) rule. This, in turn, has opened up a whole host of unintended issue areas, which “need to be resolved fairly and speedily if the problem is not to become a lingering administrative nightmare” (Ashton 2000: 88). However, the 1991 agreement between South Africa and Namibia has never been finalized, and a technical commission of experts is currently at work with the aim of establishing the profile and demarcating the boundary¹³ line (Hangula 1993: 117–118). Namibia accepts that the matter has been resolved, and the thorny issue of paying compensation for lost rights thus becomes relevant. This is being exacerbated by a current land claim in the Richtersveld between an ethnic group that was dispossessed during the colonial period and is now seeking legal redress in terms of the new South African constitution. The November 2000 announcement, by a spokesperson for the South African Department of Foreign Affairs, that the Organization of African Unity (OAU) Charter regarding borders is to be respected (Kashweka 2000; PANA 2000; SAPA 2000) indicates that the issue is still unresolved, despite Namibia’s belief to the contrary.

The Violsdrift and Noordoewer Joint Irrigation Scheme (VNJIS) was established by agreement between South Africa and Namibia on 14 September 1992 at Noordoewer, Namibia (Chenje and Johnson 1996: 165). This created a parastatal known as the Joint Irrigation Authority (JIA) that is responsible for the management of an irrigation project located on both banks of the Orange River at Violsdrift and Noordoewer (Pallett 1997: 70) covering 800–1,000 ha. The JIA is currently investigating the

viability of building a new reservoir at Vioolsdrift for the purpose of giving Namibia increased assurance of supply for the development of irrigation, a proposed copper mine, and other industrial uses (Conley and van Niekerk, 1998: 153).

The Permanent Water Commission (PWC) that was also established by agreement between South Africa and Namibia on 14 September 1992 at Noordoewer, Namibia (Chenje and Johnson 1996: 165) has, as its main goal, the development and utilization of "common interest" reserves of water. The PWC currently allocates around 15,000 m³/ha annually for irrigation purposes. Since the reintegration of Walvis Bay with Namibia in 1994, the PWC has concentrated more on the establishment of ORACOM (Pallett 1997: 70). A meeting in August 2000 was intended to witness the signing of a formal agreement establishing ORACOM, but this failed to materialize. One of the issues causing the delay was the status of the name "Senqu," on which the Lesotho negotiators are insisting; this has subsequently been resolved, with the recognition of the issue in the now formally established Orange–Senqu River Commission (ORACOM 2000). It is known that the Lesotho delegation want ORACOM to supercede the existing bilateral agreement between South Africa and Lesotho on the LHWP; however, this is not viable, given the highly complex nature of that specific project, which necessitates a degree of interaction that is probably excessive for a normal RBO in an international river basin. It is significant that Namibia has become instrumental in promoting ORACOM: the high level of diplomatic skill that Namibia has brought to bear on the issue supports this; the fact that Namibia is vulnerable¹⁴ in terms of water resources, and that it is the downstream riparian on the most highly developed river in Africa, also adds to this diplomatic incentive.

The Orange River basin within the broader regional setting

Hydropolitical development within the Orange River basin falls under the broad framework of the Protocol on Shared Watercourse Systems in the SADC Region involving the majority of the SADC member states. One of the objectives of this protocol is to establish closer cooperation between all riparian states within an international river basin, with regard to the development of permanent river-basin commissions or operating authorities (Pallett 1997: 71), of which ORACOM is an example. It should be noted, however, that riparian states are likely to be reluctant to transfer any sovereign competence to such a body (Conley and van Niekerk 1998: 151). There is also the feasibility study of the Caledon Cascade Scheme, involving South Africa, Lesotho, and Namibia; the focus of this study is to determine the feasibility of transferring water

from the Orange River to the Gauteng Region of South Africa through a series of 26 dams along the Caledon River (Chenje and Johnson 1996: 158).

Critical issues within the basin

From an analysis of the Orange River basin, four distinct hydropolitical drivers can be isolated, which act as fundamental components of the dynamic process. For greater clarity, each is dealt with separately.

National interest

It is evident that the major development in the basin has been driven by national interest, most of which occurred during a period of apartheid-related policies in both South Africa and Namibia, which in turn had consequences for the other riparian states. In fact, a unique aspect of the Orange basin is that three of the driest counties in the SADC are riparian states in one form or another. Arguably, the most important manifestation of this national interest is the South African Hydraulic Mission, which has two fundamental components: the first of these is manifest in the development of major irrigation infrastructure, much of which is located in the arid reaches of the middle and lower basin where evaporative demands are extremely high and sustainability is therefore a key issue; the second manifests as a series of complex IBTs, largely as the result of thermal power generation in the Mpumalanga and Northern Province region adjacent to Gauteng, where there are significant deposits of low-grade coal. This has resulted in the linking of almost every river basin in South Africa, including the four international basins (refer to table 6.2), with one another as part of a complex strategic plan designed to safeguard the energy needs of South Africa in a system that is flexible enough to guarantee assurance of supply in times of localized drought (Pallet 1997: 61). This is being exacerbated by the National Water Act (36/98), which regards water as a national asset to be moved around the country as needed and in the national (public) interest. A high level of dependence on IBTs for economic security has resulted (fig. 6.2) from this practice. The heavy reliance by South African on IBTs clashes with other legal systems (Basson 1999: 18), which may regard a river basin as being a coherent whole, with the water therein belonging to the riparians of that specific river. IBTs therefore complicate the issue of equitable and beneficial use of water in an international river basin (Pallet 1997: 78). This also introduces the aspect of water as an object of a security complex¹⁵ for developing countries' semi-arid areas in which shared river

basins are closed, i.e. no utilizable water is left (Seckler 1996). A basin is said to be facing closure when all the available water has been allocated to some productive activity and there is no more water to be allocated (Svendsen et al. 2001).

The issue of national interest is not unique to South Africa, however: Lesotho is an impoverished country with limited natural resources, a large and growing population, and a mountainous terrain that presents complex problems for development. The LHWP can, therefore, be seen as a viable way for Lesotho to add value to the water that would otherwise flow onto South African soil and, by so doing, generate a viable source of revenue for itself while providing water to Gauteng by gravity. Lesotho also has plans to irrigate some land, but these are limited in scale and are unlikely to have a major long-term impact; the lack of sanitation facilities in Lesotho is regarded as being a greater problem (Basson 1999: 17).

Namibian national interest is only now starting to become manifest because of its recent independence. This is based on securing rights to the lower Orange, which in turn is linked to the establishment of the international border in the middle of the river – a process that has been initiated but not yet finalized because of technicalities relating to compensation for grazing rights, diamond concessions, and other issues. South Africa is resisting this, however, as the November announcement on the status of the South African–Namibian border attests (Kashweka 2000; PANA 2000; SAPA 2000). Good diplomatic skills are ensuring that Namibian strategic interests are still being taken care of, with ORACOM being one example of how this is being executed. The border issue is, therefore, not closed, despite South Africa's opinion that it is. Development in the Fish River sub-basin is based on irrigation and municipal use, but this is modest in terms of the overall development in the South African portion of the Orange Basin (Conley and van Niekerk 1998: 146).

Botswana offers an interesting twist in this national-interest issue. In the case of the Orange basin, Botswana is a legal riparian, even though it contributes no stream flow and derives no direct benefit from that river system. In this case, Botswanan national interest is manifest in the diplomatic bargaining position that it would be able to manipulate – which, if cleverly done, can see coalition formation with other riparian states in return for concessions in other areas of strategic interest to Botswana. One example could be Botswana and Namibia cooperating in ORACOM in return for a concession on the Okavango River, which is currently the source of tension between the two countries. Another example could be Botswana supporting South Africa within ORACOM in return for a concession in the Limpopo basin, or in return for South African diplomatic support in the Okavango case. On balance, therefore, Botswana is

clearly not as weak and powerless as it first appears when one examines the hydrological data presented in table 6.1 within the context of a security complex; in fact, Botswana can be regarded as being an important balancer of power in the overall *rapport de forces* (to use Lowi's terminology; Lowi 1990) situation in both the Orange and Limpopo river basins.

As a direct result of these competing national interests, the development of ORACOM as an overarching RBO may well be inhibited, as fears of the erosion of sovereign control over a strategic natural resource take root, mitigating rapid regime creation.

Ecological issues

As noted above, the National Water Act (36/98) regards water as a national asset to be moved around South Africa at will in order to satisfy competing needs. The same legislation also regards the environment as a legitimate user of its own water and protects this by right as part of the so-called "reserve," which has to be met before any other allocations can be made. The significance of this issue is threefold. First, it implies that, within the shared river basins in South Africa alone, an additional 8 per cent of the mean annual run-off (MAR) will be needed to maintain ecosystem health (Basson 1999: 4); this in turn means that this volume of water will not be available for other competing use. Secondly, water quality in the lower basin now becomes important, especially in view of the recently declared Ramsar site at the estuary. In order to manage this Ramsar site, an Orange River Mouth Interim Management Committee has been established, linking government and private-sector interests in both South Africa and Namibia (Conley and van Niekerk 1998: 151). The extent of each country zone and management responsibility is dependent on the final outcome of the border demarcation, again bringing this issue into perspective; a ramification of this is that water will have to be left in the Orange River by South Africa in order to meet the estuary flow requirement (EFR). Thirdly, it raises the thorny issue of the beneficial use of scarce water versus environmental conservation (Basson 1999: 11).

Ecological issues can, therefore, have a beneficial effect in terms of inducing improved river basin cooperation, if correctly managed. They also serve to link water-scarce states in arid regions facing basin closure into a security complex.

SADC Protocol on Shared Watercourse Systems

The SADC Protocol, which was amended in March 2000 to become the "Revised Protocol on Shared Watercourses in the Southern African De-

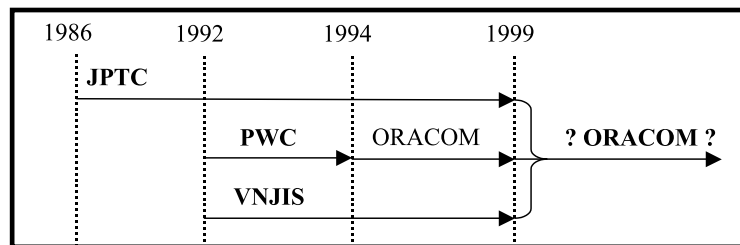


Figure 6.3 Schematic representation of regime creation within the Orange River basin over time

velopment Community Region” (Mokuoane 2000), envisages the establishment of RBOs that will overlap with existing technical and standing commissions. This will imply the need to amend the statutes of some structures, or the dissolution of existing bilateral agreements (Basson 1999: 18). It is not yet clear how this will be done, and the protocol itself sheds little light on the subject, leaving it to member states to drive the process as needed. This gives rise to scientific speculation as to the future of the existing bilateral agreements in the Orange River basin. Figure 6.3 is a schematic representation of a possible future scenario, where existing bilateral agreements are incorporated (in some form or another) under the newly created ORACOM.

This, in turn, raises a fundamental political issue – how to create an RBO such as ORACOM without surrendering too much sovereign control over a strategic natural resource. Clearly, international cooperation has not yet reached a stage where technical–operational, legal–institutional, and political processes are in balance (Conley and van Niekerk 1998: 155). Most advances have been made in technical–operational matters, but other cooperation is starting to grow. Cooperation around the ORRS is an example of what can be accomplished and it is hoped that the political climate within the SADC will ultimately allow the entire structure to be brought into some form of sustainable equilibrium. An area where this can be managed fruitfully is in the generation of uncontested data: table 6.1 shows that there is a considerable area for cooperation in this endeavour, and third-party organizations such as the World Bank, the United Nations and its various structures, donor agencies, academic institutions, and other role-players can have an important hand in this. Recent work in the contested Incomati River basin has shown the value of third-party involvement (Turton and Quinn 2000).

Efforts will have to be made in the balancing of incompatible development goals, in which the Helsinki Rules will be tested – particularly regarding the notion of “equitable use” and the establishment of more

formalized water-sharing agreements between riparian states. Given the existing economic, infrastructural, and other developmental inequality that is evident in the various riparian states, water can become a lead sector in establishing a common foundation on which future SADC integration can be based. An example of this is the benefit that has been derived from royalty generation in Lesotho. A component of this can also be the trade in Virtual Water (within SADC in general and in the Orange basin in particular), in an effort to balance inequity further (Turton 2000a).

Good neighbourliness

The cessation of political hostilities after the demise of the cold war has resulted in the outbreak of negative peace¹⁶ in the SADC region. An element of this is the “good neighbourliness” policy that is now enshrined in the National Water Act (36/98) in South Africa, in terms of which “allocations agreed for downstream countries should be respected” (Conley and van Niekerk 1998: 150). This, in turn, raises the issue of how to define “equitable sharing” in terms of allocation, trade-offs, and the existence of numerous IBTs in South Africa (Basson 1999: 20). The indisputable facts are that South Africa has most control over the Orange River and that Namibia is the hardest hit. This also raises the question regarding the wisdom of continuing with major irrigation projects in the middle and lower basin, some of which are producing low-value crops that can easily be purchased on the global market as part of a possible Virtual Water trade policy within SADC, and all of which are generally experiencing large losses as the result of delivery inefficiencies. There is clearly room for improvement here, and water can be made available to Namibia as a result. Recent indications that growth in the Gauteng area may be lower than current projections is also encouraging, but it is not yet known if this growth is being offset elsewhere in South Africa (Basson, van Niekerk, and van Rooyen 1997: 47). A natural mitigating factor against future LHWP development is the fact that additional transfers of water have a negative effect on the hydropower-generation capacity of the Gariep and Vanderkloof dams (Basson 1999: 17).

We are, therefore, confronted by the coincidence of two key issues that are likely to result in increased cooperation with Namibia. The first is the legal (and moral) requirement for good neighbourliness that is inherent within the post-apartheid South African political culture. The second is the legal requirement to leave sufficient water in the river for the maintenance of ecological functioning. In terms of this, higher allocations are made for ecologically sensitive reaches of the river, of which the

Augrabies Falls Reserve and Ramsar wetland at the estuary are important elements.

The Orange River basin as a component of a hydropolitical security complex

The concept of a hydropolitical security complex is useful in analysing the Orange River basin. Buzan (1991: 105–115), Buzan and Rizvi (1986), and Buzan, Waever, and de Wilde (1998: 12) suggest the use of a “regional security complex” under conditions where states are linked by common security-related issues (Schulz 1995: 92). Although the South African Minister of Water Affairs and Forestry, Mr Ronnie Kasrils, is on record as saying that water is not a major security issue (Turton 2000b: 44), the context in which this was framed was viewing hydraulic installations as targets of aggression. The strategic importance of a secure water supply as a fundamental component of economic stability within a river basin that is reaching closure, and in a region that is rapidly reaching a condition of water deficit, is self-evident; it has also been demonstrated in this chapter (table 6.2; fig. 6.2), by showing the extent to which the GGP in each of the nine South African provinces is dependent on IBTs, many of which are linked to the Orange River in some way. In terms of this argument, the Orange River basin can be regarded as being an immature regional security complex, because not all of the actors have yet realized the strategic implications of water scarcity on their respective long-term economic growth and prosperity. In purely technical terms, it can be regarded as being a specific type of heterogeneous security complex, which assumes that different actors interact across two or more sectors and state borders (Buzan, Waever, and de Wilde 1998: 16).

A hydropolitical security complex (HSC) can be regarded as being a special form of regional security complex of the heterogeneous type. In this regard, an HSC is defined as existing when those states that are geographically part “owners” and technically “users” of shared rivers start to consider the rivers as a major national security issue (Schulz 1995: 97). Buzan (1991: 225) notes that security complexes can be treated as objects for policy in the sense that problems can be resolved only within the context of the relevant complex as a whole (Schulz 1995: 96). Security interdependence is also markedly more intense among states inside such complexes than among states outside them (Buzan, Waever, and de Wilde 1998: 11). Thus, while some role-players within the Orange basin do not yet regard water as being a national security concern (at least in public pronouncements),¹⁷ the fact that the problems occurring within the basin can be resolved only within the context of cooperation

within that same basin means that an HSC exists.¹⁸ This is even more so when one considers the considerable room for diplomatic manoeuvre possessed by Botswana (should it choose to use it) in the newly established ORACOM, raising the importance of second-order resources in the overall context of developing countries in conditions of water deficit as hypothesized by Turton and Ohlsson (1999) and Ohlsson and Turton (1999). This will clearly link the Orange to other shared river basins in SADC, such as the Okavango and Limpopo, as depicted in figure 6.1.

The usefulness of an HSC as a concept is that it enables linkages between various actors within a given river basin to be mapped out and analysed in greater detail. In this regard, a series of both horizontal and vertical linkages can be identified. Vertical relationships within the context of the Orange River basin are centred around the high degree of reliance of each of the respective political economies on water from the basin. South Africa is the best example, where a high level of GDP activity within the various provinces is evident, with dependency in excess of 60 per cent being shown in seven of the nine provinces (fig. 6.2), many of which are linked to the Orange basin. In the case of Namibia, the future development of the southern portion of the country is predicated on secure access to the Orange River. For Lesotho, the royalties that are being derived from the sale of water to South Africa are a significant component of the total fiscal income. For Botswana, diplomatic leverage that it can generate for use in other contested river basins is highly relevant, with this aspect increasing the hydro-political relevance of the province to a significant extent, making this national-interest component a unique aspect of the case of the Orange River basin. Horizontal linkages are also clearly evident. The first of these is the unique nature of South African water law, which regards water as a national asset to be moved wherever it is needed. This, in turn, affects all other shared river basins in one way or another, establishing a clear horizontal relationship across basins. The relative advantage that Botswana can exert in other river basins such as the Limpopo and Okavango is also a clear horizontal linkage across various basins in the SADC region. The same also holds true for South Africa, if it chooses to engage in diplomacy at a level higher than the Orange River basin; this aspect alone makes South Africa and Botswana potentially the most powerful role-players in the basin (fig. 6.4).

This is even more relevant in terms of the thinking that national security should also include an ecological dimension for developing states facing water scarcity (Buzan, Waever, and de Wilde 1998: 10; Schulz 1995: 92). In this regard, sustainable development, as distinct from development, has to be connected to the concept of national security (Schulz 1995: 117). Cooperation among states to share the costs of sus-

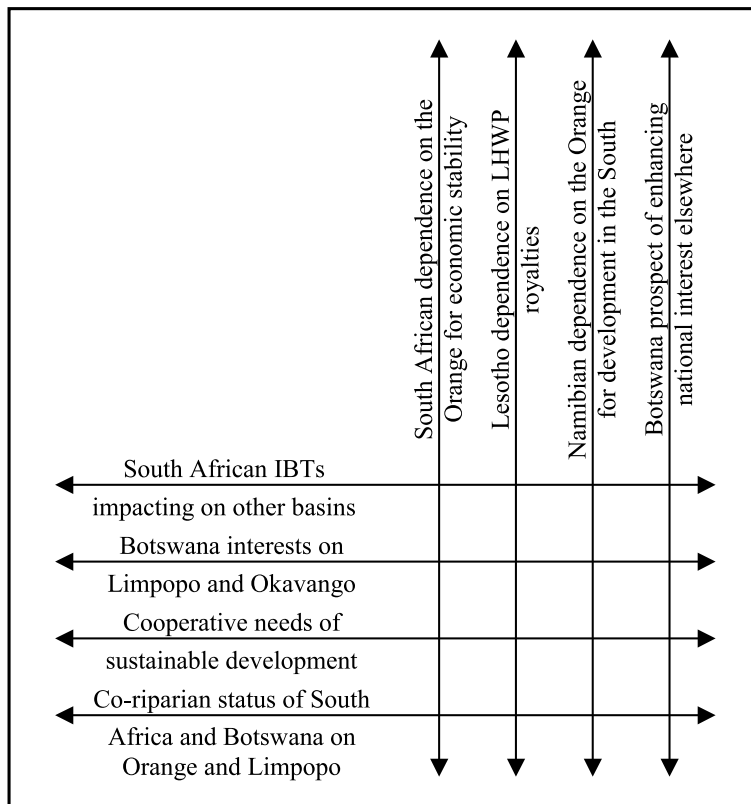


Figure 6.4 Schematic rendition of the Orange River basin hydropolitical security complex showing some of the vertical and horizontal linkages

tainable development is thus necessary – and is now starting to become evident in the Orange River basin. It is, therefore, correct to conclude that the transnational flow of rivers across borders thus creates an opportunity for alliances to be built on environmental concerns, as suggested by Lindholm (1995: 89), making this concept valid in areas where high levels of acute political violence have not yet become linked to water scarcity as in the case of the Middle East.

Conclusions

It is quite evident that the Orange River basin is unique in hydropolitical terms, where it can be regarded as being an immature regional security complex. This makes it a strong candidate for the development of an

RBO, but there are also mitigating factors at work. In this case, the transboundary water transfer is not the only reason for the internationalization of the basin: the high level of internal IBTs, especially within South Africa, does have an adverse effect on downstream riparians in other adjacent river basins such as the Incomati and Maputo. Integrated management is desirable and, with the level of sophistication that has already developed around the LHWP, combined with the existence of the SADC Water Protocol as an enabling instrument, such management is both desirable and feasible. The opportunity for the establishment of an RBO has presented itself in the form of ORACOM. Namibia, the downstream riparian, is driving this and has shown itself to possess strong negotiating and diplomatic skills. This will help the RBO to become established and will also obviate the need for South Africa to become a front-line role-player – a situation that would immediately create suspicion, given the inherent mistrust of South Africa within the SADC region. The one obstacle is the inherent fear that the respective riparians have of surrendering sovereign control over a strategically important natural resource, which probably means that ORACOM will develop slowly and incrementally rather than in one stroke of the pen. This is a healthy condition, however, and will make for a more sustainable regime in the long term. One of the features of this basin is the existence of relatively uncontested hydrological data that are not evident in other shared basins in South Africa. Attempts at generating transparency are already evident in the form of the ORRS. Evidence from the Incomati River basin suggests that there is a significant role for third-party organizations, specifically within the field of data generation and the management of knowledge systems. Certain elements make the Orange River basin relatively unique in hydro-political terms: one of these is the apparently anomalous situation where a riparian state, producing negligible stream flow, can in fact negotiate itself into a highly favourable position if it chooses to view the problem from the perspective of an HSC and generates sufficient diplomatic support with which to execute the task at hand. The basin is rapidly becoming closed, which in turn adds a strong impetus towards the recognition of the existence of an HSC on the Orange River.

Notes

1. In hydro-politics, data are almost always contested – in particular, figures relating to stream-flow contribution. There is no exception in this case, where data that have been collected from other sources by Savenije and van der Zaag (1998: 30) show a lower stream-flow contribution for South Africa in other shared basins. This becomes relevant

during negotiations around “fair and equitable” allocations between countries. Significantly, the data in the Orange Basin are relatively uncontested, as the result of co-operation during the ORRS. There is a lesson to be learned here, as a result.

2. The “Poor White” problem was the result of the scorched-earth policy that was adopted by the British during the Anglo-Boer War, which left large numbers of Afrikaans-speaking refugees who were poorly educated, unskilled, and without access to land or capital. This element of South African history became a fundamental driving force of Afrikaner Nationalism that ultimately manifested itself as the policy of apartheid (Turton 1999).
3. Such slogans are commonplace in settings with a strong hydraulic mission and can be regarded as a form of hydropolitical ideology. A common element is the desire to “make the desert bloom” or to “reclaim” land from nature.
4. This can be understood as being similar to the “mistrust” that Canada has for the United States of America, which exists in spite of cordial relations between the two countries. Such mistrust is driven by fears of being disadvantaged by the skewed economic development between the two countries.
5. The IFR is part of the legal requirements of the National Water Act (36/98) in which the aquatic ecosystem is entitled to its own water by right, in order to maintain ecosystem functioning.
6. This whole process involved four formal meetings, three regional workshops, and an Orange River documentation field trip (Conley and van Niekerk 1998: 153).
7. At the time of writing, this has still not been formally established, but negotiations are under way between all riparian states. The stumbling-block at present is the official name, with Lesotho wanting the word “Senqu” included in the overall title (Senqu is the name of a tributary of the Orange River in Lesotho).
8. By 1995, 57 MCM had to be supplied, becoming 398 MCM in 2000, 1,183 MCM in 2010, and 2,139 MCM in 2020 (LHWP 1986: Annexure II).
9. This was codenamed “Operation Boleos” and consisted of soldiers from South Africa and Botswana combined under the SADC flag. It has been widely condemned in many quarters. Boleos was launched at the written request of the elected government of Lesotho, which was being threatened by a military coup; the rationale, therefore, was to prevent this from happening and to restore security. The fact that fighting occurred at the Katse Dam has been said by some commentators to be evidence of a “water war.” The author refutes this conclusion, however, as the fighting was not over the resource itself. It is logical for a country such as South Africa to wish to protect large infrastructural developments (such as the LHWP) during times of internal political upheaval, for two good reasons: first, South Africa is strategically dependent on the LHWP (a possible water-war argument); secondly, South Africa paid for the entire cost of the project (with the exception of the Muela Power Station), which is situated in another country, so she has a vested interest in protecting a major investment from possible sabotage. The author does agree that the operation was a failure, however, with undisciplined South African forces acting in an aggressive fashion that was not commensurate with the peace-keeping nature of the mission. There are still feelings of animosity amongst the public in Lesotho at the time of writing. During the whole incident, the JPTC continued to function well, showing the enduring nature of such relationships.
10. This is not to be confused with the structure by a similar name that was established between South Africa and Botswana in 1983; refer to note 11.
11. It must be noted that this differs from the JPTC between South Africa and Lesotho. The confusion caused by similar nomenclature has now been rectified, with the transformation of the South Africa–Lesotho JPTC into the LHWC; refer to note 10.
12. This is an excellent example of the use of water as a political tool or weapon.

13. The main outstanding issue is the resource-rich offshore zone, where diamonds and natural-gas deposits are significant sources of revenue and job creation.
14. Namibia has no river flowing on its own soil, with the small exception of the Okavango which flows for a short distance only and is highly problematic to develop, raising the potential for conflict between Namibia and Botswana. The only rivers of any significance are on the northern or southern borders of the country (Ashton 2000: 77) and, in almost all cases, are difficult to develop. All other rivers within Namibia are ephemeral in nature (Jacobson, Jacobson, and Seeley 1995).
15. A security complex is defined as “a set of states whose major security perceptions and concerns are so interlinked that their national security problems cannot reasonably be analyzed or resolved apart from one another” (Buzan, Waever, and de Wilde 1998: 12). The land invasion in Zimbabwe is an example, where insecurity in one country spills over into neighbouring states in the form of fears of similar action by disaffected, landless people, the loss of investor confidence, etc., and which actually has nothing to do with water.
16. Negative peace is the mere absence of hostilities, whereas positive peace is the existence of confidence in the region to the extent that economic growth and social stability can be assured. This is largely absent in Southern Africa at the time of writing.
17. This is also a common factor in hydropolitical analysis, where public pronouncements by key role-players may well be an inaccurate view of reality. These are usually offered in public forums and are designed to placate a specific constituency. This is most evident in the Virtual Water discourse.
18. Security complexes are about the relative intensities of interstate security relations that lead to distinctive regional patterns shaped by both the distribution of power and historical relations of amity and enmity (Buzan, Waever, and de Wilde 1998: 11–12).

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The search for an equitable basis for water sharing in the Okavango River basin

Peter Ashton

Introduction

Escalating water scarcity in Southern Africa is widely accepted as posing the greatest challenge to sustainable development in the region (Conley 1995; Falkenmark 1989; SARDC 1996; Shela 1996). The situation is particularly acute in the more arid portions of the subcontinent, where water scarcity and associated increases in water pollution are often also linked closely to poverty, hunger, and disease (FAO 2000; Gleick 1999; Pallett 1997). Where water supplies are insufficient to meet human needs or are unreliable, the circumstances become difficult to resolve in situations where sufficient water is also needed to maintain the functioning of sensitive aquatic ecosystems and to protect the integrity of water resources (Ashton 2000a; Falkenmark 1994, 1999). These apparently conflicting needs (human needs versus ecosystem needs) have led to increasing competition for progressively scarcer water resources (Khroda 1996). A further complication is that most of the larger river basins within Southern Africa are shared by more than one country (e.g. the Zambezi, Okavango, Orange, and Limpopo rivers). The question of who should be allowed to use how much water, and for what purpose, becomes extremely sensitive under these circumstances (Ashton 2000a; Biswas 1993; FAO 2000).

The diversity of water users in the countries making up the Okavango River basin, together with their current and future needs, provides an

ideal example of the complex and conflicting demands between human-development interests and ecological interests (Ashton 2000a). In particular, considerable local and international attention has been focused on the unique ecosystems making up the Okavango delta, as well as the possible consequences that may adversely affect these ecosystem components if the water resources are not managed sensitively and cautiously (Greenpeace 1991; IUCN 1993; Ramberg 1997). Clearly, both human and ecosystem perspectives must be taken into account if an equitable and sustainable solution is to be found (Ashton 2000b; Ellery and McCarthy 1994).

It is vitally important that the water resources of the Okavango River basin are managed in a sustainable way so that the current and projected future needs of the three basin states (Angola, Botswana, and Namibia) can be met in an equitable and sustainable manner, while still retaining the diverse array of ecosystem services and goods that are derived from the system. In order to achieve this, the individual basin states need to reach consensus on three critical issues, namely:

- the specific water requirements needed to sustain the sensitive aquatic ecosystems;
- the quantities of water that each country can justifiably claim for their own (consumptive) use; and
- the manner in which the water resources will be managed in future.

This chapter examines the geographical and political context of water-resource management in the Okavango River basin and highlights a series of possible options for consideration by water-resource managers in the governments of the three basin states concerned. The anticipated consumptive water needs in each basin state are quantified, although the specific water requirements of the aquatic ecosystems in the Okavango River and delta have not been defined here.

The geographical and hydrological context

The catchment of the Okavango River basin straddles a transitional rainfall region located between the intertropical convergence zone (ITCZ) in the north and the subtropical high-pressure zone (STHPZ) in the south. Year-to-year shifts in the boundaries of these two zones, plus the influence of the El Niño southern oscillation (ENSO) system, account for a large proportion of rainfall variability. Rainfalls across the Okavango catchment are highly seasonal and occur during the austral summer months, usually as high-intensity convective thunderstorms (McCarthy et al. 2000). Average rainfalls over the catchment are low in the south, increasing almost fourfold to higher rainfalls in the north (fig. 7.1). The

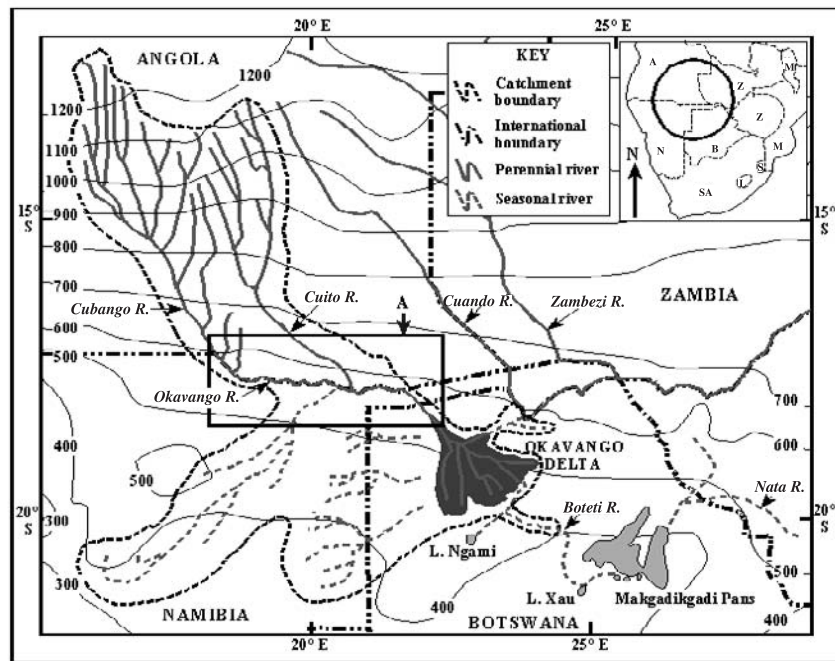


Figure 7.1 Sketch map of the Okavango River catchment, showing the distribution of mean annual rainfall isohyets (mm) and the different tributary rivers of the Okavango system. Rivers indicated by dashed lines do not provide surface run-off to the Okavango delta. Inset shows the position of the Okavango River catchment in Southern Africa. Inset box 'A' indicates the area enlarged in figure 7.2.

variation in rainfall over the catchment gives rise to correspondingly wide differences in the relative contributions to run-off that each basin state provides to the Okavango River (Ashton 2000a,b; CSIR 1997). The contributions made by each basin state to the surface run-off and flows entering the Okavango delta are summarized in table 7.1.

The Okavango River rises in the central highlands of Angola as two main tributary systems, the Cubango and Cuito rivers. These flow in a south-easterly direction through progressively drier terrain towards north-eastern Namibia where they meet to form the Okavango River (fig. 7.1). From the small towns of Katwitwi in the west to Mukwe in the east (fig. 7.2), the international border between Angola and Namibia is located in the centre of the main Okavango River channel. At Mukwe, the Okavango River turns southwards, flowing across the narrow Caprivi strip of Namibia, before entering Botswana and emptying into the Okavango delta (fig. 7.2).

Table 7.1 Summary table showing the areas of the three countries comprising the Okavango delta catchment and their individual contributions to inflows and the overall Okavango delta water balance^a

Basin country	Component catchment area (km ²)	Average rainfall (mm)	Annual contribution to delta inflows		Inputs to total delta water balance (%)
			(MCM)	(%)	
Angola	151,200	873	9,572	94.45	71.76
Botswana:					
• River only	58,350	480	265	2.62	1.99
• Direct rainfall onto delta only	15,844	486	3,205	–	24.03
Namibia	123,560	427	297	2.93	2.22
Totals:					
• Basin only	333,110	639	10,134	100.00	–
• Basin + delta	348,954	632	13,340	–	100.00

^a Figures for average rainfall and delta inflow have been rounded off.

Along its course from the foothills of the Angolan highlands to the Okavango delta, the Okavango River and its major tributaries function as a “linear oasis” in an otherwise relatively arid area (Ashton 2000a). During years of exceptionally high flows in the Okavango River, outflows from the Okavango delta feed the Boteti River and, ultimately, the Makgadikgadi pans in Botswana (Wilson and Dincer 1976). The Makgadikgadi pans are also fed by seasonal and episodic flows from the Nata River in western Zimbabwe (fig. 7.1). Other, smaller, tributary rivers rise

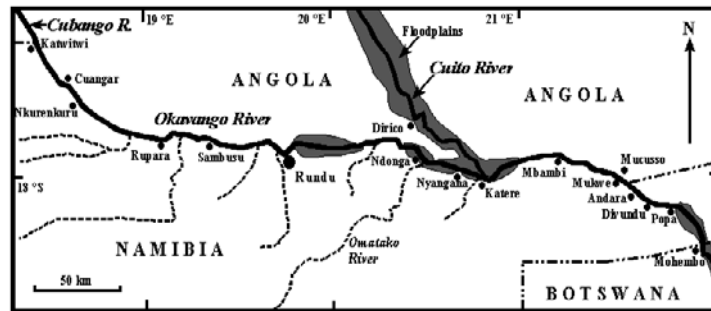


Figure 7.2 Sketch map of the north-eastern portion of Namibia, showing the location of the Cubango, Cuito, and Okavango rivers in relation to local towns and international boundaries. The extensive flood-plain areas along the rivers are shaded for emphasis; seasonal or ephemeral rivers are indicated by dashed lines

in north-eastern Namibia but have not carried surface flows into the Okavango River or delta in living memory (Ashton and Manley 1999; CSIR 1997). They are shown in figure 7.1 for completeness, since they indicate that the catchment segments they drain do not contribute inflows to the Okavango delta (Ashton 2000a; Ashton and Manley 1999).

The catchment of the Okavango delta comprises some 331,110 km², with an additional 15,844 km² contributed by the wetland area of the Okavango delta plus its islands. Some 42.5 per cent of the catchment area is considered to be “non-functional,” since it receives very low rainfalls and, because of high potential evaporation rates, contributes no surface run-off or groundwater inflows to the Okavango delta (CSIR 1997; table 7.1). Recent estimates indicate that direct rainfall onto the Okavango delta contributes an additional 3,205 million cubic metres (MCM) (24 per cent) of water to the Okavango delta, with the remaining 10,134 MCM (76 per cent) provided by surface water and groundwater inflows via the inflowing Okavango River (Ashton 2000a; McCarthy, Bloem, and Larkin 1998; McCarthy et al. 2000). Overall, the Angolan portion of the Okavango catchment provides some 94.5 per cent of the total run-off in the Okavango River, while some 2.9 per cent originates in Namibia and the remaining 2.6 per cent is contributed by Botswana (CSIR 1997; table 7.1).

Prolonged periods of severe drought during the 1980s and 1990s reduced average annual flows in the Okavango River by between 15 and 45 per cent (McCarthy et al. 2000). Flows in almost every Southern African river system have shown similar patterns of declining flows during the last 20 years. This pattern seems likely to be part of an 80-year cycle of high and low flows that has been experienced in every Southern African river system (McCarthy et al. 2000).

The socio-economic and political context

In the Okavango River basin, the prolonged droughts have resulted in rural communities becoming progressively more impoverished. Consequently, many people have migrated towards urban centres along the Okavango River and the fringes of the Okavango delta in search of drought relief. There is a clear and pressing need to relieve the problems faced by these people and to provide adequate water supplies for their growing needs. In addition to the need to provide water for domestic purposes, there is also an urgent need to expand the agricultural sector so that additional food can be grown to meet the needs of the increasing population. This situation is particularly acute in Angola (FAO 1995b, 1997), where the prevailing civil war has prevented any form of or-

ganized agricultural development in the Angolan segment of the Okavango catchment.

The northern border regions of Namibia are relatively remote from the main centres of development and population, and Namibia currently uses very little water from the Okavango River (Ashton 2000a). At present, the few small-scale irrigation schemes located along the Okavango River in Namibia are insufficient to meet local food needs and will need to be expanded in future. Namibia has also communicated its intention to withdraw water from the Okavango River along the Namibian border with Angola, to meet the growing water deficits in the central areas of Namibia (Heyns 1995a, b; Republic of Namibia 2000). Clearly, any such water abstractions will need to be arranged in collaboration with the other two basin states (Ashton and Manley 1999). Recent Angolan military activities along Namibia's northern border with Angola have forced many Namibian communities to leave the Okavango River and to move southwards to areas where hand-dug wells provide the main (or only) sources of water.

Small-scale irrigation developments (approximately 25 hectares in total area) located alongside the "panhandle" section of the Okavango delta in Botswana currently use relatively little water. However, there are plans to expand the irrigated area to over 150 ha, and possible options are being examined to initiate additional irrigation schemes in areas where suitable soils occur (P.J. Ashton, field observations and unpublished data). In addition, more attention is being focused on the use of surface water and groundwater for domestic purposes in the small towns and communities located around the fringe of the Okavango delta (MGDP 1997). Recently, small pipelines have been installed along the western fringes of the Okavango delta and panhandle to provide potable water to communities in this region (P.J. Ashton, personal observations, August 2001). Clearly, this type of development is essential if the growing domestic needs for water are to be met in Botswana. Nevertheless, despite the very small quantities of water that are currently used from the Okavango River, the Botswana Government and a variety of non-governmental organizations (NGOs) remain concerned that proposals for new water developments in the upper and middle reaches of the Okavango River, as well as those within Botswana, may pose a serious threat to the ecological integrity and functioning of the Okavango delta (Greenpeace 1991; IUCN 1993; Ramberg 1997).

Once peace has been restored in Angola, growing populations and potential future agricultural developments and water-abstraction schemes in the three basin states will be accompanied by escalating demands for water. This will place progressively greater pressure on the governments concerned to reach some form of new consensus around acceptable levels

of water exploitation from the Okavango River system. In turn, this will require each of the three states to reach agreement on the issue of exactly what constitutes a “fair and equitable” share of the available water to which each state may claim a right.

Water rights versus water needs

International law (ILA 1966; ILC 1994; UN 1997) technically entitles Angola, Botswana, and Namibia to develop water systems that flow within the boundaries of their territories or to which they are riparian, provided that such developments do “. . . not cause appreciable harm” to other states that share portions of the same river basin. This right is confirmed in terms of the SADC Protocol on Shared Water Course Systems (Heyns 1995a; SADC 1995). As the lowermost basin state, Botswana is in a “vulnerable” position and would clearly like to ensure that its interests are not unduly prejudiced by any developments that may take place upstream in Namibia and Angola (CSIR 1997; IUCN 1993). At present, the quantity of water needed by the Okavango delta in Botswana (in terms of ecological flow requirements) cannot be defined precisely, yet must represent a very large proportion of the total flows in the Okavango catchment. In effect, therefore, although Botswana provides a small quantity of water from within its own territory, the ecosystem “needs” of the Okavango delta will undoubtedly represent the single largest water use in the catchment.

The governments of Angola, Namibia, and Botswana see the judicious (small-scale) use of water from the Okavango River (Angola and Namibia) or delta (Botswana) as entirely legitimate from a territorial sovereignty viewpoint (Heyns 1995b; Republic of Botswana 1990; SADC 1995). To date, none of the proposed water-abstraction schemes (Heyns 1995b; SMEC 1987; UNDP 1976) have been implemented and each country continues to rely on existing (small-scale) run-of-river abstractions and on the exploitation of nearby groundwater supplies (MGDP 1997).

The Government of Botswana has long recognized that the Okavango delta is a unique and valuable resource, particularly in terms of its conservation and tourism value (IUCN 1993; Ramberg 1997), and through its provision of a wide variety of ecosystem services and goods to local residents (FAO 2000). Local and international NGOs strongly support this view and their concern is reflected in the designation of the Okavango delta as a Ramsar site¹ (Ramberg 1997). Concern by Botswanan and international organizations to conserve the unique ecosystems that make up the Okavango delta underpinned opposition to earlier Nami-

bian plans to abstract water from the Okavango River and Botswana plans to increase outflows from the Okavango delta (Greenpeace 1991; IUCN 1993; Ramberg 1997). Although it can be argued that this support has strengthened Botswana's otherwise "unfavourable" position as the lowest riparian state in an international river basin, this strategy has also effectively limited the range of development options that are open to Botswana (Ashton 2000a).

The question of "equity" lies at the centre of almost all disagreements over water sharing. Essentially, this issue should be the basis upon which waters in a river basin will be shared (UN 1997). However, because the term "equity" is vague and often undefined in international law, it has been applied in a variety of ways, with different degrees of success (FAO 2000; van der Zaag, Seyam, and Savenije 2000; Wolf 1999). For example, some countries sharing a river basin have argued that water resources should be apportioned on the basis of "the rights of prior (established) use"; other countries take the view that water "shares" should be based on the proportion of run-off contributed by each of the states forming the river basin (Mwiinga 2000). The variety of possible positions makes it difficult for individual states to reach agreement. Legal mechanisms, similarly, are seldom available to enforce whatever principles of equity may have been agreed upon by the different parties (van der Zaag, Seyam, and Savenije 2000; Wolf 1999).

More recently, there has been increasing acceptance that the application of the principles inherent in "equity" requires parties to move away from claims for water based on various real or perceived "rights" to one where the parties motivate their "needs" for specific quantities of water. There seem to be several reasons why this move has occurred, but it is important to note that it is far easier for a country to quantify and justify its *needs* for water, than to provide the same level of support for its real or perceived *rights* to water (Ashton 2000a; van der Zaag, Seyam, and Savenije 2000; Wolf 1999).

In the Okavango River basin, a needs-based approach to water sharing offers a far greater prospect of the basin states reaching agreement on each state's fair and equitable share of the basin's water resources than does a "rights-based" approach. To achieve this, it will be important for each of the basin states to agree on the mechanisms that will be acceptable for:

- deriving quantitative estimates of each country's *needs* for water;
- the basis for estimating or (preferably) calculating the "fair and equitable" share of the catchment's water that each country can reasonably expect to receive; and
- the procedural and institutional mechanisms whereby the water resources of the catchment will be managed in the future.

Estimates of water needs in the basin states

In any attempt to estimate and evaluate the water needs within a river basin, it is important to distinguish between the supply of water (usually as direct rainfall onto the catchment surface) that is required to maintain essential terrestrial ecosystem services and their associated ecosystem goods, and the water that is subsequently available in river (and ground-water) systems for direct utilization by people and for the maintenance of aquatic ecosystems (Falkenmark 1999). In the past, most attention has been paid to the second of these two categories, the so-called “blue water”; this water is relatively easy to manipulate, manage, and allocate by means of conventional engineering solutions. In contrast, the so-called “green water” consists predominantly of the water in soils and vegetation that can be manipulated or influenced only through changes in land use (Ashton 2000a; Falkenmark 1999; FAO 2000; Rockström et al. 1999; van der Zaag and Savenije 2000).

Increasing attention is now being paid to understanding the dynamic interrelationships between “green” and “blue” water that underpin essential terrestrial and aquatic ecosystem services (Falkenmark 1999; FAO 2000). The available evidence indicates clearly that all “green” water and a proportion of “blue” water are needed to sustain terrestrial and aquatic ecosystem structures and functions and to maintain sustainable water supplies (Ellery and McCarthy 1994; FAO 2000). The two key implications here are that:

- virtually none of the “green” water should be considered as available for re-allocation and alternative use within a basin state, except where the “green water” can be made available through changes in land use; and
- although most of the “blue” water should be considered as available for allocation and direct use by society, a proportion must always be reserved for the maintenance of essential ecosystem functions and services (Falkenmark 1999; FAO 2000).

Against this background, estimates of the consumptive water needs of the three basin states comprising the Okavango River basin (Angola, Botswana, and Namibia) have been based on projections of population numbers and growth rates, as well as data on current land-use patterns (Ashton 2000a; CSIR 1997; FAO 1995a, b; UNAIDS 2000a, b, c). The population data and projections presented in table 7.2 reflect the most recent estimates for the population growth rates of the three countries (Ashton and Ramasar 2001; FAO 1995a; UNAIDS 2000b) and take into account the dramatic implications of the HIV/AIDS pandemic that is sweeping Africa (Ashton and Ramasar 2001; Karim 2000; Lurie 2000; UNAIDS 2000a, b, c; Whiteside and Sunter 2000; World Bank 2001),

Table 7.2 Anticipated population-growth trajectories in the Angolan, Botswanan, and Namibian segments of the Okavango catchment until the year 2020

Basin country	Annual population growth (%)	Total basin population (millions in year)		
		2000	2010	2020
Angola	2.15	849,882	1,051,338	1,300,547
Botswana	0.76	119,616	129,024	139,172
Namibia	1.57	143,675	167,895	196,197
Basin total	–	1,113,173	1,348,257	1,635,916

although they do not account for possible immigration or emigration due to the Angolan civil war (Ashton 2000a). The available data indicate that population growth rates in the three basin states (table 7.2) have declined by between 32 (Angola) and 71 per cent (Botswana) during the last two years as a direct result of the extraordinary increase in HIV/AIDS prevalence recorded in each country (Ashton and Ramasar 2001; UNAIDS 2000a, b, c).

The population estimates for Namibia and Botswana appear to be reasonably reliable, as they are based on confirmed census data (UNAIDS 2000b, c). In contrast, the population estimates for Angola are uncertain because of the civil war raging in that country. Nevertheless, the Angolan estimates presented here have been derived from information presented by the FAO (1995a, b, 1997) and are the best available.

From table 7.2 it is estimated that some 76 per cent of the Okavango River basin's total population is located within the Angolan segment of the Okavango basin, while the Namibian and Botswanan segments of the basin contain 13 and 11 per cent of the basin population, respectively (CSIR 1997; FAO 1995a). Within the Angolan segment of the basin, virtually all the population is concentrated in the uppermost reaches of the Cubango and Cuito sub-catchments, in the eastern and southern portions of the Huila, Huambo, and Bié provinces (fig. 7.3). The population here is particularly concentrated around the many towns and villages in this region where population densities exceed 700 persons/km² (FAO 1995a). Very few people occupy the drier south-eastern segment of the Angolan catchment, in the Cunene, Moxico, and Cuando–Cubango provinces, where population densities are less than 2 persons/km² and are mostly concentrated along the Cubango and Cuito rivers (FAO 1995a). In Botswana and Namibia, most of the people who live within the Okavango River basin boundaries are located along the Okavango River in Kavango Province (Namibia) or around the fringes of the Okavango delta in Ngamiland (Botswana) (CSIR 1997).

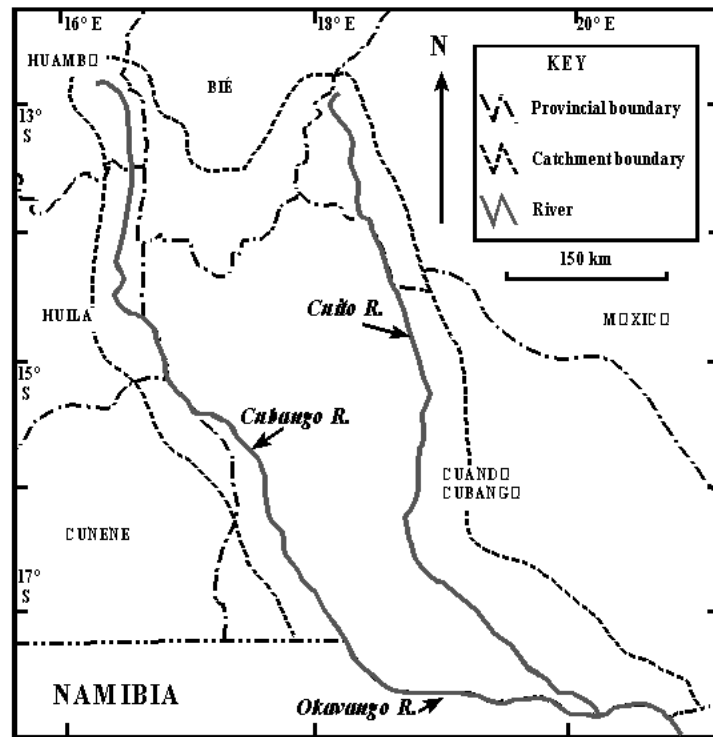


Figure 7.3 Sketch map of the Angolan segment of the Okavango catchment, showing the positions of the Cubango and Cuito rivers and provincial boundaries in Angola

The latest population estimates for 2000, shown in table 7.2, have been combined with data on land-use activities drawn from earlier surveys (CSIR 1997) and published sources (FAO 1995a, b), to provide the basis for estimating current patterns of water use for each land-use type, within each of the three basin states. In each country, subsistence water needs were estimated at 50 litres per person per day in accordance with World Health Organization recommendations (FAO 1997; Gleick 1999). The calculated water-demand data for each country are shown in table 7.3. These data suggest that the total water needed within the catchment during 2000 was likely to amount to some 23.2 MCM/year; this is approximately equivalent to 0.23 per cent of the mean annual run-off recorded at Mohembo, the primary inflow point to the Okavango delta. Of this total, Angola would require 13.8 MCM (approximately 60 per cent), while Botswana and Namibia would need approximately 4.1 MCM (18 per cent) and 5.2 MCM (22 per cent), respectively. It is important to note

Table 7.3 Breakdown of existing water-consumption demands in the Angolan, Botswanan, and Namibian segments of the Okavango catchment, by water-use sector, for 2000, based on land-use patterns^a

Water-use sector	Angola	Botswana	Namibia
Subsistence use (rural)	5.646	1.484	1.266
Domestic use (urban)	7.445	0.699	0.813
Stock watering	0.250	0.267	0.145
Industrial activities	0.000	0.025	0.060
Agricultural activities	0.500	1.220	2.830
Tourism facilities (e.g. lodges)	0.000	0.418	0.100
Catchment total	13.841	4.113	5.214

^a All values in million cubic metres (MCM) per year.

that these estimates are purely for consumptive water needs and exclude any allowance for the quantity of water likely to be needed to maintain essential ecosystem services within the Okavango River or delta.

Within each of the three basin states there are small, yet subtle, differences in the water-use patterns. In Angola, rural and urban populations account for some 95 per cent of all the water used, primarily for subsistence and domestic use. This reflects the almost complete absence of irrigated agriculture in the Angolan segment of the Okavango basin (FAO 1995b, 1997) as a result of the ongoing civil war. In contrast, the rural and domestic water-use sectors use considerably less water in Namibia and Botswana, whereas agricultural activities (principally small-scale irrigation and subsistence agriculture) consume between 30 (Botswana) and 54 per cent (Namibia) of all the water used.

Against this background, it is important to estimate the likely future needs for water that each of the basin states may have in the medium term (20 years). To achieve this, two scenarios were selected:

- A. no change in the current patterns of water use within each water-use sector; water needs increasing only as a result of population growth, taking into account the reduced population growth rates attributed to the HIV/AIDS pandemic, and not enhanced by new developments; and
- B. the same rates of population growth in each basin state as listed in Scenario A, but with additional (new) developments (specifically new irrigation water needs in each basin state and additional water for transfer out of the Okavango basin in Namibia only).

The additional quantities of water referred to in scenario B consist of the following specific quantities of water:

- An additional 100 MCM/year required for new irrigation developments in Angola, based on the available area of arable land suitable

for irrigation (FAO 1997). This development has been assumed to increase gradually and evenly from zero, over the 20-year period, reaching full scale in 2020.

- An additional 50 MCM/year, comprising some 45 MCM/year required for additional irrigation developments along the panhandle zone of the Okavango delta in Botswana. This estimate is based on discussions with officials from the Botswana Department of Agriculture in June 2000, plus an estimated need for 5 MCM/year for additional water supplies for domestic and light industrial use around the town of Maun and for smaller communities around the western fringe of the Okavango delta. Again, this development has been assumed to increase gradually and evenly from zero, over the 20-year period, reaching full scale in 2020.
- An additional 120 MCM/year required for transfer from the Okavango River to the central areas of Namibia around Windhoek, to meet projected water shortfalls in that region. This estimate is based on published information (Heyns 1995a; Republic of Namibia 2000) and represents the only volume of water that Namibia proposes to transfer out of the Okavango basin. Once again, this development has been assumed to increase gradually from zero over the 20-year period, reaching full scale in 2020. Importantly, this proposed water transfer from the Okavango River represents only a proportion of the estimated volume of water required to meet Namibia's future needs for water: the Namibian Government intends to meet the remaining water demand in Namibia by improved water-demand management, additional recycling and reuse of effluents, desalination of sea water, and transfers from Namibia's other border rivers (Orange, Cunene, Cuvelai, and Zambezi).

The estimated water needs for each of these two scenarios are presented in table 7.4 and were based on field observations (P.J. Ashton, CSIR, unpublished data) and published information (CSIR 1997; FAO 1995b, 1997; Heyns 1995a; Republic of Namibia 2000). These provide preliminary estimates of possible lower (scenario A) and upper (scenario B) limits for the quantities of water likely to be needed by each basin state over the next 20 years. Clearly, the projections of future (domestic) water needs depend heavily on the rates of population growth; these rates may alter dramatically if the HIV/AIDS pandemic worsens even further in the three basin states.

In the lower estimate (scenario A), water needs would be anticipated to increase by approximately 44 per cent between 2000 and 2020 if there is no change in the current patterns of water use. The amount likely to be needed in 2020 (33.3 MCM) is equivalent to 0.33 per cent of the mean

Table 7.4 Projected growth in water-consumption demand in the Okavango catchment under two scenarios: [A] where the existing patterns of water demand remain and demand grows only as a result of population growth (as shown in table 7.2); [B] where existing patterns of water demand are supplemented by new developments such as transfers out of the basin, or new agricultural (irrigation) developments

Basin country	Total water-consumption demand (MCM/year)		
	2000	2010	2020
[A]			
<i>Existing demand patterns with no new developments</i>			
Angola	13.841	17.352	21.750
Botswana	4.113	3.984	4.328
Namibia	5.214	6.130	7.206
Basin total	23.168	27.466	33.284
[B]			
<i>Existing demand patterns plus potential new (transfers + irrigation) developments</i>			
Angola	13.841	67.352	121.750
Botswana	4.113	28.984	54.328
Namibia	5.214	66.130	127.206
Basin total	23.168	162.466	303.284

annual flow at Moheumbo, where the Okavango River enters Botswana (fig. 7.2). The implications of this estimate are that the growing populations living within the three basin states would not change their current level of development and would therefore not require larger daily volumes of water per person.

In contrast, scenario B suggests that the potential increased quantities of water needed to meet possible irrigation developments in the three countries, plus possible water transfers out of the Okavango River basin within Namibia, could lead to a 13-fold increase in the total quantity of water needed each year. For comparison, the total quantity of water listed in scenario B (303.3 MCM; table 7.4) is equivalent to 3.0 per cent of the mean annual flow at Moheumbo. Of this amount, the consumptive needs in Angola would amount to 40.2 per cent, while the consumptive needs in Botswana and Namibia would amount to 17.9 and 41.9 per cent, respectively. While there is clearly a highly significant difference in the quantities of water needed in scenarios A and B, scenario B is likely to represent the *maximum* quantity of water (i.e. the worst-case scenario) needed from the Okavango basin by the three basin states within the 20-year time-frame evaluated.

The volumes estimated for current use in irrigation agriculture are

based on estimates provided for small-scale irrigation developments in the Kavango Province of Namibia (CSIR 1997), as well as irrigation-water estimates for different rainfall regions provided by FAO (1995b, 1997). The volumes of water used in tourist facilities were obtained from field studies in the Kavango Province of Namibia and the Okavango delta in Botswana (CSIR 1997). The projected volumes of additional water shown in scenario B (table 7.4) are based on published estimates of proposed water-transfer schemes in Namibia (Heyns 1995b; Republic of Namibia 2000) and estimates of irrigation potential for each basin state (FAO 1997). In combination, these estimates are based on the best available information and are therefore considered to be “reasonable,” rather than overestimates or “excessive.” Overall, therefore, the projections of water needs contained in table 7.4 are considered to be slightly conservative, though reasonable, estimates for the different water-use sectors in the Okavango basin.

Given that natural flows in the Okavango River have varied by between 10 and 45 per cent of the mean annual flow (McCarthy et al. 2000), a decrease in mean annual flow of 3 per cent may not appear to be significant and, indeed, may seem to be well within the “normal” range of variation in inflows (Ashton and Manley 1999). However, the absence of sufficient information regarding the scale, significance, and resilience of ecosystem responses within the Okavango delta to decreased inflows of this magnitude makes it extremely difficult to predict with any accuracy or certainty the likely scale of responses to a *sustained* decrease in inflow. However, it is clear that a sustained decrease in inflows to the Okavango delta will reduce the flooded area of this wetland (Ashton 2000a; Ramberg 1997). The probable extent and implications of such a decrease must be fully evaluated before any decisions are taken.

Despite the relatively small size of the potential decreases in inflows to the Okavango delta (about 3 per cent), several individuals and NGOs (e.g. Greenpeace 1991; Ramberg 1997) have expressed concern that declining inflows could have catastrophic consequences for the structure and functioning of the Okavango delta. However, this perception is unlikely, given the large scale of natural variation in inflows that the Okavango delta has experienced in recent years (Ashton and Manley 1999; McCarthy et al. 2000). Nevertheless, it is essential that the basin states collaborate to derive acceptable estimates of the volumes of water to which each state may justifiably lay claim. In addition, it will be essential for the three basin states to ensure that all water abstractions are carefully controlled and managed (Ashton 2000a), while any resulting impacts on the Okavango delta are monitored and evaluated as vigilantly as possible.

Deriving a “fair and equitable” basis for water sharing

The rational and efficient management of the water resources in a shared river basin depends heavily on the joint realization and acceptance by the basin states concerned that water-resource management should be fully integrated across the different parties (van der Zaag and Savenije 2000). This relatively simple statement masks a great deal of underlying political, social, economic, ecological, and institutional complexity. Truly integrated water-resource management of a shared river basin should be based on a whole-basin approach (Heyns 1995b; Savenije and van der Zaag 1998, 2000). In addition, each basin state needs to collaborate closely with its neighbours and reach agreement as to what proportions of the water resource can be equitably and reasonably allocated for specific uses in each country, and how the resource will be managed.

Against this background, however, it is important to examine possible options that the basin states could consider as an appropriate basis for deciding what volumes of water would constitute “fair and equitable” shares of the Okavango basin’s water resources (van der Zaag and Savenije 2000; van der Zaag, Seyam, and Savenije 2000; Wolf 1999). Here, it is essential to realize that each river basin has a range of unique political, social, hydrological, and ecological characteristics and requirements. Thus, it is difficult simply to “transplant” unchanged a set of solutions from one catchment to another and expect the solutions to work equally well in their new setting (Wolf 1999). Despite this caveat, however, the general principles for deriving estimates of “blue” and “green” water and for deriving estimates of water needs can be universally applied.

In moister regions, where mean annual rainfall over a catchment is reasonably reliable, van der Zaag, Seyam, and Savenije (2000) have suggested that a simple and elegant calculation can be made of the relative quantities of “green” and “blue” water that are needed within each basin state. Relevant principles embodied in international water law can also be built into the process by incorporating allowances for quantities of water that would ensure a downstream basin state of sufficient water to meet both its consumptive and non-consumptive needs. Each basin state can then be allocated an equitable “share” of the total water resource, based on its contribution to the basin water balance and on its needs for “green” and “blue” water (van der Zaag, Seyam, and Savenije 2000). The technical simplicity of this approach is appealing, because it allows estimates to be generated from data that are readily available. These estimates then provide the basis for open consultations and negotiations between the basin states, and the estimates can be adapted and modified until agreement is reached between these states.

However, this approach is less easy to apply in the case of a catchment such as the Okavango River basin, which is located in a transition zone between high- and low-rainfall regions. Because rainfalls are extremely variable across the catchment, large areas of the catchment in the different basin states provide little or no run-off to the river system. Consequently, there are enormous differences in the quantities of water contributed to the catchment water balance by each basin state (Ashton 2000a; table 7.1). In such a situation, it is vitally important that the basin states collaborate with each other to reach a consensus on how the water resource can be shared equitably and fairly (Ashton 2000a).

Accordingly, it is recommended that the provisional projections of water needs within the three basin states presented here (table 7.4) could provide the basis for discussions and negotiations between the three basin states. These discussions should focus initially on reaching a consensus as to the acceptability of the estimates and, where required, providing refined estimates for specified water-use sectors. In addition, careful attention must be given to the issue of defining the quantity, quality, and timing of the water flows that are needed to maintain ecosystem functions within each of the basin states. This will provide a sound basis for the basin states to reach agreement on the criteria for defining "fair and equitable" shares of water for each basin state.

Management implications and recommendations

The effective, efficient, and integrated management of water resources that are shared by several basin states requires a high degree of trust between the basin states, as well as a firm commitment to interstate collaboration and cooperation (Lundqvist 1999). These responsibilities are not easy to incorporate into the institutional structures existing within each basin state: many of the policies, priorities, and strategies that would be needed are far broader and extend beyond the line-function boundaries of conventional government departments. Past experience elsewhere in the world has shown that the establishment of a river-basin organization (RBO) that represents the interests of all basin states and can undertake integrated water-resource management across political boundaries has the greatest likelihood of success (Lundqvist 1999; Mwiinga 2000; van der Zaag and Savenije 2000).

The creation of such an RBO requires each state within the river basin to acknowledge and accept the roles and responsibilities of its partners, while committing itself to the maintenance of a spirit of harmony and goodwill among its partners (Lundqvist 1999; Pallett 1997; Savenije and van der Zaag 2000). An important part of any such international part-

nership is the full realization that the rights and obligations of each party are mutual and reciprocal, rather than unilateral (Granit 2000).

In its normal, day-to-day operations, a typical RBO will be faced with a series of problem areas that must be overcome. Typical challenges that face such an RBO include the following:

- Collecting and processing appropriate and comparable information (hydrological, physical, land-use, social, economic) that will facilitate effective decision-making, and enable basin-state residents to be correctly and promptly informed and consulted;
- The development of effective and efficient water-use plans and water-management plans for each basin state, within the framework of an overall (basin-wide) water-management plan, to ensure that the water resources are protected, utilized, managed, and controlled in a responsible manner;
- The development of appropriate disaster-prevention/mitigation plans that will allow the organization to deal effectively and promptly with any unforeseen consequences of natural disasters (e.g. floods and droughts) in their area of jurisdiction;
- The development of appropriate institutional frameworks, structures, and processes that promote public participation and transparency, as well as facilitating water-resource management within each basin state;
- The development and expansion of appropriate technical and managerial capacity within the basin states to ensure the effectiveness and efficiency of integrated water-resource management at all levels and in all basin states;
- The joint development of suitable protocols and processes that can form the basis for dispute-prevention strategies, as well as the formalization of procedural issues for the resolution of any disputes that may arise between the basin states;
- The development of appropriate reporting protocols and procedures, so that the relevant government departments within each of the basin states can be informed of the RBO's activities, achievements, and concerns, as well as any failures that may have occurred; and
- The enforcement of the provisions of international water law and basin agreements that have been signed and ratified by the basin states, together with the provisions and requirements of appropriate agreements and treaties amongst the SADC states.

Ideally, an RBO should comprise only executive members who have been drawn from the basin states concerned. Each basin state should have equal representation on the RBO and no basin states should be excluded, for any reason. The executive members would be appointed to the organization by their respective governments because of their technical or management skills, or the level of integrative skills they are

able to provide. Once it has been constituted formally, the RBO will be able to bring in or contract external parties and individuals to deliver specific services or functions. The financing of all RBO activities should be approved by the basin states concerned; the respective governments would also be responsible for ensuring that the RBO is provided with skilled personnel and physical facilities.

External parties, governments, and NGOs should not, ideally, form part of the executive membership of an RBO; instead, the involvement of these parties should be limited to offers of advice and training, as well as technical and financial assistance when required. This arrangement will, first, help to strengthen the management and decision-making capability within the RBO, while simultaneously reducing the possibility that external organizations can be charged with directing or manipulating the RBO or its officers and officials.

Charting the way forward

In 1994, the governments of Botswana, Namibia, and Angola jointly launched the tripartite Permanent Water Commission on the Okavango River basin (OKACOM) to investigate ways in which the legitimate water-needs of each of the three countries could be accommodated in a sustainable manner without prejudicing the needs of neighbouring riparian states (OKACOM 1994). This commission seeks to develop an integrated water-management strategy for the entire Okavango River basin. Several investigations have already been launched to provide the basis for estimates of water availability and patterns of current use (OKACOM 1995). The estimates of projected water needs in each of the basin states shown in table 7.4 provide a useful basis from which to initiate further discussions.

Once the basin states have reached agreement on the mechanisms that will be used to derive quantitative estimates of each country's "share" of the water resource, this will need to be formalized in the form of an international agreement. In addition, it will also be necessary for the basin states to agree on an appropriate institutional structure that will be responsible for day-to-day management of the basin's water resources. Once an agreed institutional structure has been formalized, the basin states can instruct this organization to ensure that agreed management strategies are followed, with the prime aim of ensuring that each basin state benefits equitably.

The existing institutional arrangements, in the form of the OKACOM Commission, provide the most logical framework for initiating discussions and negotiations between the basin states. Clearly, these discus-

sions and negotiations will require extreme care and tact because of the enormous sensitivities that have developed over the issue of using water from the Okavango River (e.g. Greenpeace 1991; Ramberg 1997). The OKACOM institutional structure also provides the logical starting point for the development of a formal RBO to manage the water resources of the Okavango system.

An important caution that should be borne in mind is that advice from other multistate RBOs in other parts of the world should be carefully scrutinized and evaluated before it is accepted. This is because, to date, none of the multistate RBOs elsewhere have been able to prevent conflict over competing uses or abuses of the water in their areas of jurisdiction. This fact alone should alert the parties concerned to be extremely careful in all aspects of their deliberations. A final point that is worth noting is that, once riparian states agree on the extent and justification of their needs for water, and then confirm these in a river-basin agreement, these needs will then become formalized as the “rights” of each country in law (Ashton 2000a). At this point, each signatory to such an agreement shares a mutual responsibility to uphold both the spirit and intention of the agreement.

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Note

1. The Ramsar Convention on Wetlands of International Importance seeks to promote international awareness and cooperation in the conservation of threatened wetland ecosystems, particularly where these ecosystems support unusually large numbers of specific species or an unusually wide diversity of species. Wetlands that are considered to have special significance in an international or global context are judged to be of particular importance.

Botswana has ratified the Ramsar Convention and, among the key provisions embodied in its charter, the Ramsar Convention requires each Contracting Party (country) to:

- designate at least one wetland to be included in the “List of Wetlands of International Importance”;
- formulate plans that promote the conservation and wise use of wetlands in their territory;
- consult with other contracting parties regarding the implementation of the convention’s obligations, especially where a designated wetland and its associated water system extends over the territories of more than one contracting party.

In accordance with these requirements, Botswana registered and declared the Okavango delta as a “Wetland of International Importance” in 1996. The designated area of this site (65,000 km²) makes it the largest designated Ramsar Site in the world. The site encompasses the 15,844 km² Okavango delta and its islands, plus a wide area of peripheral drainage and associated terrestrial ecosystems that are some three times larger than the Okavango delta itself.

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Hydropolitics and the quest of the Zambezi River-Basin Organization

Munyaradzi Chenje

Introduction

This chapter looks at two sides of the same coin – the hydropolitics and hydrodiplomacy of the Zambezi basin, the largest river basin in the Southern African Development Community (SADC) and involving the fourth largest river on the continent after the Nile, Congo, and Niger rivers. The Zambezi basin is shared by eight member states – Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe.

For the purposes of this chapter, hydropolitics includes both individual national and collective basin interests. At both national and basin levels, hydropolitics is about benefits, self-interest, security, cooperation, compromise, coercion, and conflict. Hydrodiplomacy, on the other hand, is a conscious process by the stakeholders involved to pursue, either individually or collectively, their self-interests without threats against others.

In discussing hydropolitics in the Zambezi basin, it is important to give an overview of the prevailing circumstances in the basin, including climate, population, water-resources distribution and management, including management of wetlands, and land-use practices. It is important to look at both the natural and human factors, which are critical to the hydropolitics in the basin. These factors should be analysed from the local, national, basin, and SADC regional levels, highlighting policy, legal, and institutional frameworks. It is also important to look at the constraints

and the opportunities, and to scrutinize the politics of water – a scarce resource in most parts of the basin and generally across Southern Africa.

This chapter also attempts to address the following questions:

1. Does the basin need transition into international management?
2. Is transboundary water transfer the only reason for “internationalization” in this region?
3. Is “integrated management” feasible/desirable in this major water system?
4. Does the Zambezi water system need a river-basin organization (RBO) for better management?
5. What obstacles/opportunities have existed to establishing an RBO?
6. Is transparency of information/public participation feasible/desirable?
7. What is the role of non-state actors? How is this going to be implemented?
8. What is the appropriate role of third parties such as the World Bank, SADC, Asian Development Bank (ADB), and United Nations University (UNU)?

Background

The Zambezi basin lies between latitudes 8°–20°S and longitudes 16.5°–36°E, draining an area of about 1.385 million square kilometres (sq km) – more than 15 per cent of the total land area of the 14 SADC members. Much of the Zambezi basin comprises plateaux that lie at an altitude of between 1,000 and 1,500 m above mean sea level (amsl) (Chenje 2000). Annual renewable water resources in the Zambezi average about 3,600 m³/s or 87 mm of equivalent rainfall (Shela 1998).

The Zambezi River, its network of tributaries, and associated ecosystems constitute one of Southern Africa’s most important natural resources. The basin is an SADC regional centre of endemism owing to its vast terrestrial biodiversity in Malawi, Zambia, and Zimbabwe, and some parts of Angola, Botswana, Mozambique, and Tanzania. The flora of the Zambezian unit is reportedly the richest and most diverse in Africa, with more than 6,000 species of flowering plants, 650 species of birds, and 200 species of mammals (Timberlake 1999).

In the words of Mozambican President Joaquim Chissano:

The Zambezi basin represents the best of what we have in SADC in terms of our natural capital. Within the basin’s large expanse, we have our water resources, land and soils, forests, and wildlife. All these resources define our economic activities, which range from agriculture and forestry, manufacturing and mining to conservation and tourism, and scientific monitoring and research.

As the most shared resource in the SADC region, the Basin provides a litmus test in terms of meeting one of the objectives of the SADC Treaty. Article 5 (Chenje 2000) commits us all to, among other objectives, “achieve sustainable utilisation of natural resources and effective protection of the environment.”

Current situation

The prevailing constraints in the Zambezi Basin include the following:

- climate, including water distribution and drought;
- Rapid population growth, averaging 2.9 per cent annually;
- poverty;
- limited options for further supply-side projects;
- weak legal and institutional framework, including monitoring and enforcement;
- centralized management systems, including fragmented water-management approaches and institutions;
- lack of comprehensive knowledge of the water resources available;
- Pollution of the water resources available.

Climate

The Zambezi basin is generally semi-arid or arid, with the annual rainfall averaging between 600 and 1,200 mm. The driest parts of the region include the southern parts of Zimbabwe and a small part of Mozambique; the wettest parts include northern Zambia and central parts of Angola. Rainfall is the most crucial climatic element, as its abundance or deficiency strongly affect the welfare of the people of the basin. Year-to-year rainfall variability is high in the basin countries, with the 1970s being relatively wet and the period 1980–1990 relatively dry.

Drought is the single most crucial natural disaster to affect the Zambezi basin. Research shows that droughts occur every 10–15 years in the basin countries. In the twentieth century, eight drought spells of more or less than nine years alternated with similar periods of rainfall that was below normal. These spells, however, did not always occur at exactly the same time in each country nor did they affect all countries equally, which makes the trends difficult to follow.

The droughts of the 1980s and 1990s had a markedly adverse effect on the Zambezi basin states. For example, the lake level at Kariba on the Zambezi River fell from 487.5 m amsl in 1981 (maximum retention level: 488 m amsl) to 475.9 m amsl (minimum retention level: 475.5 m amsl) in 1992, reflecting a drop of 11.6 m water within a decade (Muchinda et al. 1999).

Rapid population growth

The Zambezi basin's population of more than 40 million people, representing about 20 per cent of the total SADC population of more than 200 million, is mainly concentrated in Malawi, Zambia, and Zimbabwe. About 22 per cent of that population is in Zambia and 29 per cent in Zimbabwe; thus, more than half of the basin population is in these two countries. About 90 per cent of the people in Malawi live in the basin, representing 31 per cent of the total basin population. More than 70 per cent of the population of Zambia and 72.1 per cent of that of Zimbabwe live within the basin; almost 33 per cent of the total population of the basin states live in the basin (Chenje 2000).

In addition to the 20 million inhabitants, the rest of the SADC population depends in one way or another on the basin in terms of water, energy, and other resources. The importance of the Zambezi basin to the rest of the SADC region cannot, therefore, be overemphasized.

The basin's population is growing rapidly: the average population growth rate for the basin is about 2.9 per cent annually, although rates for individual countries vary. If the present growth rates of population are sustained, the population will double within the next generation.

Population density in the basin states averages 28 people per km². However, countries in the basin have skewed population-distribution patterns. Population densities in most basin states, except for Malawi, are relatively low; Malawi is the most densely populated country in the basin, with 105 persons per km², followed by Tanzania with 36; Zambia, 13; and Zimbabwe, with 28.5 people/km².

Poverty

The Human Poverty Index, introduced by the United Nations Development Programme (UNDP) in 1997 to measure poverty in developing countries, shows that 40 per cent of the people in SADC live in poverty. Of the eight basin states, Mozambique has the highest level of human poverty, with two-thirds of the people affected. Malawi and Tanzania are second and third, with 47.7 and 39.8 per cent, respectively (Chenje 2000).

People overexploit the environment for survival, worsening environmental degradation and reducing their own ability to derive a living from the same environment. The result is increased vulnerability at the household level and increased poverty generally. Poverty in resources due to overexploitation translates into human poverty.

Poverty among the people of the basin states is due to rapid population growth, slow economic growth, and a fragile natural-resource base. The

majority of the people, who are mainly rural, are poor: in Tanzania, for example, all indices of poverty show rural people to be more disadvantaged than those in urban areas. The World Bank (1992) estimates, based on income for Malawi, show that 55 per cent of the people live in poverty, 98 per cent of whom are in rural areas. Food insecurity has become common, especially among smallholder households with less than a hectare of land.

Poverty is both the cause and the result of environmental degradation. Rapid population growth in a situation of limited livelihood options is a major factor in growing poverty and environmental degradation in the basin. Once a community is subjected to poverty, there is a vicious poverty–environment circle, which is difficult to break. Efforts to reduce the poverty–environment circle in the Zambezi basin states are hampered by slow economic growth and development and a fragile natural-resource base.

Limited options for further supply-side projects¹

The demand for water in Southern Africa is increasing as human population grows and the countries become more industrialized and urbanized. Already, countries such as South Africa have identified that their internal water supplies (including imports from Lesotho) will not meet demand by the year 2030; the city of Bulawayo in Zimbabwe will need to augment supplies soon; Botswana may import water by 2020.

Although Angola and Zambia have adequate water supplies for the future, the rest of the basin states are either facing problems now or will be doing so in less than three decades. Namibia has no perennial inland rivers and has great difficulty in mobilizing available water to meet its current demand. Botswana is a dry country surviving on groundwater, which is insufficient to meet the demand of the growing population. Although Zimbabwe has reasonable water resources at present, the country will suffer water stress by the year 2025, along with Mozambique and Tanzania.

Whereas, in the past, many options existed to build dams and other infrastructure to meet growing demand, viable dam sites in the basin are now limited.

Pollution

Pollution of surface and groundwater resources and the atmosphere, as well as improper dumping of both solid and liquid waste, are becoming major environmental problems in the basin. Although the severity and

effects of the pollution have not been well researched and documented, it is believed that the quality of vegetation, soils, and water is adversely affected by the pollution.

Urban areas such as Harare and Lusaka are facing serious problems of air pollution caused mainly by industrial activity and the over-dependence on fossil fuels. Sulphur dioxide, suspended particulate matter, nitrogen oxides, carbon monoxide, and lead are the most common air pollutants in the basin. If the growth in demand for energy and vehicular transport is to be met using current technologies, the Zambezi basin will witness emissions from thermal power stations increasing 11-fold and from vehicles 5-fold by the year 2003 (World Bank 1992). The use of mainly leaded fuel in vehicles throughout the basin is a major concern as this, coupled with the ageing fleet of cars, is worsening the levels of lead pollution in the basin.

The major sources of pollution are point source and non-point source. Point-source pollution includes sewage effluent, industrial processes, power generation, and mining activities; pollution from non-point sources includes natural pollution, storm-water run-off, agricultural activities, leachate from landfills, soil erosion, and gold panning.

Legal and institutional framework

At the beginning of the 1990s, the basin states, under the auspices of SADC, admitted at the 1992 UN Conference on Environment and Development (UNCED) that they have inadequate environmental monitoring, research, and planning capabilities. SADC countries also said they had “inadequate institutional arrangements, legal framework and enforcement measures for environmental protection and improvement” (SADCC, 1991); they also admitted that their (then) policies on development were weak.

The Zambezi basin has been managed as disparate parts within eight national boundaries defined during colonialism. Until recently, those eight national parts, together totalling about 1,321,900 km², were not seen as part of a whole but as independent components able to survive outside the natural unit that is represented by the basin. The result was that the Zambezi River and/or its tributaries were seen as beginning and ending within national boundaries.

Most basin countries have an array of environmental standards and regulations to regulate developments that affect the environment, to monitor human impacts, and to help enforce environmental laws. However, the enforcement of the various well-intended laws and regulations is hampered by lack of resources and poor coordination, among other factors.

Although the basin states face many constraints in the management of this important resource, developments over the past decade provide many opportunities, which include:

- review of both legal and institutional framework at the national level, for example, Zimbabwe's 1998 Water Act and the establishment of the Zimbabwe National Water Authority (ZINWA);
- adoption of the SADC integrated water-resources management strategy and action plan;
- adoption in 2000 of the Revised Protocol on Shared Watercourses in the SADC region;
- adoption of water-demand management principles;
- willingness to expand stakeholder participation, including communities and non-governmental organizations;
- greater interest by both bilateral and multilateral donors to invest in the water-resources sector.

The constraints and opportunities facing the Zambezi basin today are major factors in terms of how the basin states deal with the management of the resource for mutual benefit. In trying to determine the possible ramifications of today's decisions and how they are likely to influence events, it is important to go back in the history of the basin, particularly in terms of hydropolitics.

Hydropolitics: Lessons from history

Hydropolitics within the Zambezi basin is not restricted to the basin level only, but is replicated at the local, national, and regional levels. The issues are determined and influenced by the scarcities or abundance of water resources (or both) and depend on priorities at all those different levels. The priorities at the national level influence the basin-level hydropolitics and, ultimately, the SADC regional-level hydropolitics. Just as much as local hydropolitics feeds into those at national level, then into basin and regional levels, so decisions made at the highest level also trickle down to the lowest. The hydropolitics in the Zambezi basin has been defined by the various distinct political developments that have characterized the region, particularly since the Berlin conference. Such political developments include:

- colonialism;
- the establishment of the Federation of Rhodesia and Nyasaland and its subsequent dissolution;
- the struggle for (and attainment of) independence;
- the destabilization of the region, particularly by apartheid South Africa;

- the establishment in 1980 of, first, the Southern Africa Development Coordination Conference (SADCC) and in 1992 its successor, the Southern African Development Community (SADC);
- the democratization of South Africa; and
- general SADC regional integration.

Colonialism and hydropolitics

The scramble for Africa and its subsequent partition at the Berlin conference (1884–1885) is arguably the most important single event that laid the foundation for modern hydropolitics in the Zambezi basin. The Berlin Conference defined the spheres of influence of the colonial powers, laying down the rules for the navigation of rivers such as the Congo and Niger. Britain and Portugal were the dominant colonizers in Southern Africa, and the Zambezi River was one of their prized assets.

In less than 10 years after the Conference, Britain and Portugal signed the Anglo-Portuguese Convention on the Zambezi River in Lisbon in 1891. The convention covered not only the main river but also its tributaries. “The tributaries themselves have tributaries, and so on ad infinitum” (du Toit 1949).

The significance of this convention became more apparent as the settler communities in the Rhodesias (Northern and Southern), Nyasaland, and Portuguese East and West Africa began to grow, and the vast area opened further for industrial development. The establishment of colonial governments in these areas facilitated greater consultation and cooperation in the basin. For example, the colonial states referred to above and South Africa held the Conference on Use and Control of the Zambezi River in August 1949, during which the establishment of the Zambezi River Authority (ZRA, involving all basin states) was discussed. The proposed ZRA was going to have more powers than the current one established by Zambia and Zimbabwe in 1987.

According to the minutes of the 1949 conference held in Johannesburg, the proposed ZRA was necessary:

... partly owing to the obscurity of present international agreements on the question of diversion of waters ... Such an Authority would include in the terms of reference the function of apportioning the waters of the Zambezi River between its riparian states. If established, it would have to consider any project involving diversion of water from what was eventually agreed to be a “Zambezi river system” and to decide how much water could be taken from that system for any project, which the constituent governments wished to implement. (Benson 1949)

Unfortunately, the proposed ZRA was never established. South Africa, which chaired the conference probably because of its governance of Na-

mibia, was against the ZRA, fearing that it would influence similar developments in the Limpopo basin. The South African position was summarized in a letter to the Secretary to the Prime Minister of Southern Rhodesia by A.E.T. Benson of the Central African Council, as follows:

You may care to have a point of explanation about the Union's aversion of the proposal to establish a Zambezi River Authority. Though it was never stated, remarks dropped in the course of the discussion make me believe that their reason was that: they have considerable plans for using the Limpopo: the Limpopo, like the Zambezi, flows out through Portuguese territory; if the Union government gave full support to the establishment of a Zambezi River Authority, which would have full powers in determining what might be done by upstream riparian territories, they would naturally have to be consistent as regards the Limpopo; and they do not wish to see any Limpopo River Authority established. This is not to say that they do not propose to keep the Portuguese fully informed and consulted about their plans: their representatives at the meeting, however, were clearly apprehensive about anything which might derogate in this way from national sovereignty. (Benson 1949)

It is important to note that national sovereignty and setting precedent are major factors in terms of how a country or countries engage themselves in hydro politics. In terms of the Nile, for example, the late Egyptian President Anwar Sadat was quoted at one time commenting on Ethiopia's interests in Nile waters as follows:

Any action that would endanger the waters of the Blue Nile will be faced with a firm reaction on the part of Egypt, even if that action should lead to war. (Kendie undated, <http://addistribune.ethiopiaonline.net/Ar>)

With so many national interests at play, the ZRA as proposed in 1949 was never established, but many other initiatives have been proposed over the past century and these include:

- the Victoria Falls Power Company, which was registered, in October, 1906 "to generate, develop and accumulate electrical power at the Victoria Falls in Rhodesia, at the Witwatersrand Goldfields districts and elsewhere, and transmit, distribute and supply such power throughout Rhodesia, the Transvaal, for example (Victoria Falls Power Company 1906);
- an international "commission," which would have had its headquarters in Livingstone and comprising Rhodesia (Northern and Southern), South Africa, England, Belgian Congo, Angola and Mozambique, and Portugal;
- a (Rhodesia and Nyasaland) Federal Water Court proposed to control the use of water in all major rivers and lakes, and to adjudicate in the use of water from these resources (Federal Power Board 1960);

- Zambezi Valley Authority, proposed for Cahora Bassa with the membership of Portugal, the Federation, and the Union of South Africa along the lines of the Tennessee Valley Authority in USA (Federal Ministry of Power 1960);
- a Zambezi Hydrological Council, which was proposed by Portugal and South Africa as part of the development of the Cahora Bassa (Federal Ministry of Power 1960);
- the Central African Power Corporation to manage the Kariba Dam, and its power-generating activities (the corporation was established between Zambia and Zimbabwe, but is now defunct).

In addition to the institutions listed above, high-level conferences were held to discuss the Zambezi River. An example is the Technical Conference on the Development of the Zambezi River in May 1950, which was attended by Portugal, Southern Rhodesia, Northern Rhodesia, Nyasaland, the Central African Council, and the Inter-territorial Hydro-Electric Power Commission.

With the establishment of the Federation of Rhodesia and Nyasaland, coordination of development projects in the basin became more centralized, reducing (to some extent) representation at meetings regarding the Zambezi. An example is the Zambezi Information Bureau (which had been proposed by the Federation), with the membership of the Federation, the United Kingdom in respect of the Bechuanaland Protectorate (now Botswana), Portugal, and South Africa in respect of the Caprivi Strip. Even though Portugal agreed in principle to its establishment, it was concerned about representation. According to the Federal Ministry of Power:

The Portuguese government has accepted the idea in principle but appears to be concerned at the prospect of being outvoted by a British bloc. By the nature of the Bureau's limited functions, there should be no cause for concern, but as a possible solution to the problem, the Northern and Southern Rhodesian governments have been asked to say whether they would forego individual membership if membership were offered to Angola and Mozambique. (Federal Ministry of Power 1958)

Although consultation among the countries in the basin and their colonial powers was strong, national interests were a serious factor that influenced some decisions. When consulted about the construction of the Cahora Bassa and its possible benefits in terms of more power supplies for the Federation and possible impact on the development of the new Kafue scheme, a Federal Ministry of Power official advised:

Regarding the Federation's needs being met from Cahora Bassa, it is never entirely satisfactory to have to depend on supplies from another country. Regard-

less of what guarantees may be given, factors influencing generating capacity should, as far as possible, be under the control of the authority responsible to the consumers. (Federal Ministry of Power undated)

It is also important to note that, despite the varied institutions that were proposed before and during the Federation, no comprehensive basin-wide agreement or institution was ever established, apart from those dealing with the individual power-generating schemes. This is an example of the many false starts that have characterized the development of a legal and institutional framework for the management of the Zambezi basin.

Struggle for independence and post-independence period

The period described in this section stretches from the dissolution of the Federation of Rhodesia and Nyasaland in 1960 to today. The early 1960s saw the independence of Malawi and Zambia, and then Botswana, re-defining not only the geopolitics of the region but also the hydropolitics. The unilateral declaration of independence in 1965 by a minority settler regime in Rhodesia strained relations between Zambia and Rhodesia to such an extent that the future of the Kariba Dam was threatened. President Kenneth Kaunda was forced to call on the British government to send troops to guard the dam, following information that saboteurs on the payroll of the Rhodesian government had been assigned to destroy it. Even though the dam was never destroyed, relations between the countries remained strained until Zimbabwe's independence in 1980. The independence of Zimbabwe also saw the establishment of the SADCC in Lusaka in 1980, the main objective of which was to isolate apartheid South Africa and reduce economic dependency on Pretoria.

Perhaps one of the major successes of SADCC was the adoption of the Zambezi River Action Plan (ZACPLAN) in 1987 after two years of negotiations under the auspices of the United Nations Environment Programme (UNEP). The ZACPLAN objectives were to:

- prepare an inventory of existing and potential development, evaluate the environmental impact of major projects, and initiate the basin-wide exchange of information;
- develop regional legislation necessary for management of the Zambezi and the minimum national legislation required by riparian states for enforcement;
- develop human resources, administrative and institutional structures, and technical capabilities in riparian states to enable the aims of ZACPLAN to be achieved;
- develop a basin-wide unified monitoring system related to water quality and quantity;

- develop an integrated water-development and water-management plan for the Zambezi;
- promote environmental education and public participation in ZACPLAN;
- establish minimum standards for drinking-water and wastewater disposal (SADC 1999).

Despite its ambitious programme, the success of ZACPLAN has been limited. However, efforts are under way to revitalize the action plan.

In the same year that the ZACPLAN was established, Zambia and Zimbabwe created the ZRA to manage (mainly) the Kariba Dam. The passage of the enabling act in both national parliaments helped to ameliorate a long-standing dispute over the assets of the Central African Power Corporation, a precursor to the ZRA.

However, these successes belied a raging war of destabilization fanned by apartheid South Africa against its independent African neighbours. Mozambique was to bear the brunt of apartheid South Africa's destabilization as the latter trained and armed rebels of the Mozambique National Resistance Movement (RENAMO). One of the favourite targets of RENAMO (which had been established by Rhodesia to destabilize Mozambique before Zimbabwean independence) was the power lines carrying electricity from Cahora Bassa to South Africa. The sale of Cahora Bassa electricity to South Africa provided an opportunity for huge foreign-currency earnings from Pretoria, and apartheid South Africa was determined not to see this happen. In the mid-1980s, Mozambique lost about US\$560 million, "comprising lost Cahora Bassa export sales, actual physical damage, and foreign currency imports of electricity from South Africa" (Johnson and Martin 1989).

War has been a major hindrance to closer basin ties, particularly during the 1980s. Virtually all the eight countries of the Zambezi basin have suffered many years of armed conflict, which have seen the destruction of environmental-management structures in some countries and massive injection of scarce financial resources into military hardware. For example, at the height of the struggle against apartheid South Africa, the SADC countries lost US\$60 billion between 1980 and 1988 "through lost exports and investments, forced high defence expenditures and infrastructure damage as a result of economic destabilisation and sabotage. The countries lost US\$10 billion in 1988 alone" (Johnson and Martin 1989).

The SADC region has developed a familiar pattern in terms of war and control of major dams. The Kariba Dam provided the first case where hostilities between two states – Zambia and Zimbabwe – threatened its future. Since then, apartheid South Africa has weakened Mozambique by, *inter alia*, disrupting power supplies from Cahora Bassa. The more recent cases involve the Inga Dam in the Democratic Republic of Congo

(DRC) and the Katshe Dam in Lesotho. When invaders of the DRC tried to topple President Laurent Kabila in 1998, one of their prime targets was the Inga Dam until they were repelled. In the case of the Lesotho Dam, it is widely believed that South Africa intervened to quell civil unrest in that country to protect its interest and investment in the Katshe Dam. South Africa imports water from Lesotho to serve the Gauteng Province.

The future: Sharing the Zambezi basin

Historically, development projects in the basin are, first and foremost, undertaken within the national rather than regional context, particularly following national independence. This is a recipe for disaster, not only today but in future, as the competing interests of the water resources become more pronounced with growth in population, agriculture, tourism, mining, manufacturing, and other sectors.

In trying to analyse how the basin states should share the Zambezi Basin resources, it is important to answer the questions listed in the Introduction to this chapter (p. 190). If history is anything to go by, the situation in the Zambezi basin is unlikely to change significantly in the short term. However, the foundation has already been laid, with the basin states already discussing the possibility of creating a Zambezi River Commission (ZAMCOM). It is no longer a question of *if* ZAMCOM should be established, but *when* it is going to start operating.

The proposed ZAMCOM should chart a new course in terms of river-basin institutions. Historically, these institutions have tended to be composed only of officials from water departments of the countries involved. ZAMCOM should be multidisciplinary, bringing in officials from various ministries as well as other non-government stakeholders.

The challenge is to ensure that ZAMCOM does not become an unwieldy bureaucracy. The danger is that each of the eight countries could assign a total of about six officials (from departments such as water, environment, development planning and finance, transport and energy, local government, justice and agriculture), making the commission large, difficult to manage, and very costly. Perhaps the solution lies in having national-level structures – for example, committees, which could then feed into a particular line department, such as that of water.

The establishment of sub-basin catchment committees could also facilitate further stakeholder participation at the country level. Such catchment committees in all the basin states could facilitate stronger public and community participation in various issues related to the management of the Zambezi basin. Some experts have even suggested that sub-basin

committees could, in future, become national-level administrative units instead of the present rural or urban councils, whose current boundaries are mainly administrative.

Another challenge is the ZAMCOM mandate *vis-à-vis* those of existing national and bilateral institutions. If the Kariba area is considered as an example, the following institutions are involved in managing the area in one way or another:

- urban and rural district councils in both Zambia and Zimbabwe;
- departments of national parks and wildlife in both countries;
- the ZRA;
- the SADC Lake Fisheries Project;
- the University of Zimbabwe Lake Kariba Research Station.

In addition to these local-level institutions, national-level institutions are involved in the basin in one way or another. At the national level, many of the institutions often have competing mandates and interests. The question is how ZAMCOM will fit into this. Perhaps the Murray River in Australia provides some critical lessons (see appendix 1). The difference, of course, is that in the case of the Murray, sovereignty is not an issue, unlike the situation in the Zambezi basin.

ZAMCOM, as a single institution, can never be a panacea for effective management of the Zambezi basin. Strong national-level institutions are necessary, in both the short and long term. What is required is stronger synergy at various levels – from local and national to basin and regional. The complexities of the issues involved may actually see the basin countries agreeing to a piecemeal approach to the issue – meaning that, once established, ZAMCOM will remain weak in the short term (i.e. the next 10 years).

In addressing the question of whether the basin needs transition into international management, it is critical to analyse the role being played by the ZRA. As already indicated, the ZRA is a bilateral institution established by Zambia and Zimbabwe with specific objectives within a fraction of the basin. The ZRA has, however, been given the task of taking a leading role in the establishment of ZAMCOM. There may be a conflict of interest here, particularly if the future of the ZRA is at stake under an all-embracing ZAMCOM; however, it is unlikely that both Zambia and Zimbabwe would support its dissolution. Another mechanism to facilitate the creation of ZAMCOM may be necessary and the ZRA should be taken as one of the stakeholders.

Internationalization of the Zambezi

Although transboundary water transfer (particularly when a non-riparian country such as South Africa is factored in the equation) is an important

factor in the internationalization of the Zambezi, there are many other equally important issues. Chief among them is the geography of the basin – it extends across the national boundaries of eight states. Within each of these states is a growing demand for the resources of this basin to meet both human and environmental needs. Often, these interests are competing at both the national and basin levels. The non-internationalization within an appropriate framework for the management of the basin may eventually lead to heightened friction and open hostility among some of the riparian states. The Nile River provides a good example of what is likely to happen if the Zambezi basin states are not proactive in internationalizing the management of the basin: a serious crisis exists between the riparian states, particularly between Egypt and Ethiopia.

Integrated management

Integrated management in the Zambezi basin is not only feasible but desirable. However, the challenges of implementing integrated management are overwhelming. These range from resource issues, including both surface water and groundwater, and resources such as biodiversity, to legal and institutional issues, including the participation of various stakeholders at different levels. Integrated management means expanding the line players from solely water planners and engineers from the traditional departments of water and of energy to include other ministries such as those of local government, of lands and agriculture, and of environment. The challenge is to establish the necessary structures, which should be lean enough to be effective and representative enough to articulate the interests of the numerous stakeholders.

Transparency and public participation

Zambezi basin states should review their institutions with a view to making them responsive to international trends. They should encourage transparency and involve as many stakeholders as possible. Although attempts have been made in the past (and continue to be made) to involve other players, the ministries of water and their departments are generally secretive about their activities. A good example is the negotiations aimed at establishing the ZAMCOM: this activity has, to date, been limited to ministries of water with virtually little input from other ministries, apart from those dealing with legal issues. Non-governmental representation has not been accommodated. There is a critical need to change this approach and to involve the other stakeholders. This need not be at the negotiation level, but at the national level. The ministries involved should organize national-level consultations so that they can get input from the

stakeholders who are affected by such agreements. The national water forums being established under the Global Water Partnership could be the vehicle for such initiatives.

This approach would avoid the shortcomings of the process that led to the adoption of the 1995 SADC Protocol Shared Watercourse Systems. The protocol was virtually stillborn, with several countries registering reservations even before the ink was dry. Even though the protocol was eventually ratified by the required two-thirds SADC membership, it has since been revised. Although the Revised Protocol on Watercourses in SADC, which was signed in August 2000, addressed the concerns of members, negotiations leading up to its adoption were closed to national stakeholder input. As a result, one of its glaring omissions is provision for strong public participation and information dissemination.

Negotiations on ZAMCOM have continued for more than two years and, by various accounts, it seems as though agreement is years away. The obvious bottleneck is strong national interests over basin-wide interests. Concluding an agreement of such a nature requires vision extending beyond national boundaries: it requires sacrifice of some national sovereignty. It has been argued in the past that countries should relinquish some degree of decision-making to regional institutions for regional cooperation to produce significant benefits. For example, for a free trade area to work in the region requires "major institutional steps and loss of sovereignty." This would also be true of cooperation in all other sectors, particularly in the Zambezi basin. This is unlikely in the short term, and may hamper efforts to regard the basin as one unit. The result would be that national interests would continue to dominate, contributing to unsustainable policies and strategies.

Role of other organizations

In today's global village, there are many benefits in getting input from as many other institutions as possible. These benefits could be in the form of funding, investment, capacity building, technology transfer, research, and sharing of experience. United Nations agencies, development banks, and RBOs from other jurisdictions are important in helping the Zambezi basin states to establish a strategic and effective ZAMCOM that is responsive to their needs. It is important that this be carried out under the auspices of the SADC, since all the basin states are members and, as a block, are the majority in the 14-member grouping. Moreover, SADC has been involved in the process, particularly during that leading up to the adoption of the ZACPLAN.

At this point, it is necessary to assess the achievements of the SADC as an institution. For the first 10 years of its existence as SADCC, the orga-

nization was a political entity whose main thrust was the political isolation of apartheid South Africa. Even though one of the objectives was to reduce economic links with apartheid South Africa, SADCC did not record many successes, as the economies of many of the then members were strongly tied to that of South Africa. Even today, the South African economy is ten times the size of the other SADC members combined.

With its transformation from SADCC to SADC in 1992, the 14-member economic grouping has started to focus on regional integration. It has scored many successes, including the establishment of the SADC free trade area and adoption of a number of critical protocols, including those on water, energy, mining, trade, and transport; a protocol on environment is already being drafted.

Despite these successes at the regional level, a great deal remains to be done at the national level, including domesticating some of these regional agreements. Many of the national institutions are virtually still operating under the same agenda adopted before the regional protocols. Water policies have generally tended to focus on the supply side, planning for the ever-increasing demand. As a result, this area has been dominated by planners and engineers, with little input from other areas of expertise – for example, social scientists, environmental managers, ecologists. With the adoption of the SADC integrated water-resources management strategy and action plan, water policies should reflect this development.

Conclusions

It has been forecast repeatedly that new water wars in some parts of the world are inevitable, owing to rising and often conflicting interests over water among neighbours. Although the Zambezi basin is, theoretically, one of the possible water-war “hot spots,” it also offers the eight riparian states an opportunity to strengthen cooperation by concluding the necessary legal and institutional framework for the sound management of the basin. The eight countries already have many facets in common – geographical and historical, and cultural and legal. They are all members of the SADC as well as of the Organization of African Unity and the United Nations. These organizations have various mechanisms in place that aim to facilitate greater cooperation in water-resources management and other areas.

The establishment of an RBO for the Zambezi is long overdue. Further delays can only serve to enhance their differences rather than their strengths, particularly when pending water and energy projects are taken into account. About 30 energy projects have been identified within the basin. The success of SADC in concluding the ZAMCOM can only en-

hance its profile in terms of water-resources management in the SADC region. ZAMCOM would also provide a model for other basin organizations planned in Southern Africa.

Note

1. This section is based on the findings reported in Chenje (2000).

Appendix

The Murray–Darling Agreement

The governments of Australia, New South Wales, Victoria, and South Australia signed in 1915 the River Murray Waters Agreement. Two years later, the River Murray Commission was established to implement the agreement. Both the agreement and the commission have been described as pioneering, ahead of their time. The commission regulated the main stream of the Murray, ensuring that each of the three riparian states, and especially South Australia, received their agreed shares of the Murray's water.

Because of mounting new problems not envisaged in the original agreement and the commission's terms of reference, an October 1985 meeting of ministers responsible for land, water, and other environmental resources from the governments of New South Wales, Victoria, South Australia, and the Commonwealth discussed the resource and environmental problems of the Murray–Darling Basin. The meeting was followed by two years of intensive meetings and negotiations by politicians and bureaucrats from the four governments.

At both interstate and intrastate levels, the people involved came to know each other in a way that had never occurred before. The outcome was the Murray–Darling Basin Agreement. The agreement was the foundation for the Murray–Darling Basin Initiative, which put in place a process for the effective management of the water, land, and other environmental resources on a basin-wide basis. In the relatively short period of time since it commenced, this process has resulted in substantive achievements.

The 1987 Murray–Darling Basin Agreement, which is administered by the Murray–Darling Basin Commission, has enabled the coordination of natural-resources management across state boundaries and on a catchment-wide basis. The Murray–Darling Basin Initiative is the largest integrated catchment-management programme in the world, covering more than a million square kilometres.

A Murray–Darling Basin Ministerial Council, which normally consists of 12 ministers holding portfolios for land, water, and environmental issues within the Commonwealth, New South Wales, Queensland, South Australian, and Victorian Governments, is the driving force behind the initiative.

The Murray–Darling Basin Commission works with the five governments involved in the Murray–Darling Basin Agreement, and the basin community, to manage natural resources across state borders. It is responsible for:

- distributing the waters of the River Murray to the States of New South Wales, Victoria, and South Australia;
- advising the Murray–Darling Basin Ministerial Council on environmental management issues throughout the Murray–Darling Basin;
- administering the Natural Resources Management Strategy, which provides funds and framework to help coordinate the work of governments and communities in the management of natural resources throughout the Murray–Darling Basin.

The Murray–Darling Basin commissioners are the heads of the land, water, and environmental departments in the four states and the Commonwealth. This structure encourages cooperation and has enabled a small Commission with a staff of 38, to cover a huge geographic area by working with existing government departments throughout the basin.

Source: South Australian Water Corporation (1996).

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Joint development and cooperation in international water resources

*Abdullahi Elmi Mohamed*¹

Introduction

Water – a basic human necessity² – is a critical resource for all aspects of human existence, environmental survival, economic development, and good quality of life. The UN Panel of Futurologists (1998) identified lack of fresh water as one of the major problems facing humanity. The whole issue of global food security is closely linked to water availability (Falkenmark 1997). Moreover, the increasing population puts greater demand on freshwater supplies. As, in general terms, water-resources management becomes increasingly critical and as new local and national sources of water become scarce, limited, expensive, and difficult to exploit (Delli Priscoli 1998), many countries in the arid and semi-arid regions that are facing a water crisis (Biswas 1996) will increasingly be forced to consider the possibilities of utilizing the water that is available in international river basins.

Globally, fresh water constitutes only 2.5 per cent of all water on this planet, and most easily available freshwater resources exist in rivers and lakes (Shiklomanov 1997) that are shared by one or more sovereign states (Biswas 1981; World Bank 1998). The concerns relating to the use of these shared waters are becoming increasingly more important and complex. Worldwide, there are 261 international river basins, covering 45.3 per cent of the global land area (Wolf et al. 1999). In terms of land area within international basins, Africa has the greatest percentage (62

per cent) and 60 shared watercourses (Wolf et al. 1999). The lack of integrated management on the basis of cooperation for most of the continent's transboundary water bodies could be a potential threat to regional stability. The issue of international shared water resources, which is highly political in its nature (Nakayama 1997), is currently a subject of considerable debate internationally. Some have stressed the apparent inevitability of serious interstate conflict over competition for shared water resources, whereas others believe that it will provide an opportunity and instrument for greater cooperation among countries and reasons to search for common security and peace. No interstate war, however, has ever been fought for access to water that is internationally shared (Delli Priscoli 1998; Wolf 1997); nevertheless, it is difficult to make political predictions based only on historical facts.

The factors outlined above are certain to affect the Southern African region because of its water crisis (Pallett 1997), which has arisen for many reasons. The region's rapidly growing and urbanizing populations have caused increasing water scarcity and water pollution.

Objectives, scope, and methodology of this chapter

This chapter deals with the management of international freshwater resources, with special focus on the institutional and legal aspects of two international river basins in Southern Africa – the Limpopo and the Orange. The overall purpose is to analyse cooperation between basin countries, and the chapter presents some aspects of interaction between basin countries. The analysis is based on the interrelated factors shown in figure 9.1, which are assumed to have a major influence on the joint management and development of shared water resources in international river basins. Issues specifically addressed in the study include:

- differences and similarities in the physical and developmental aspects of the two river basins;

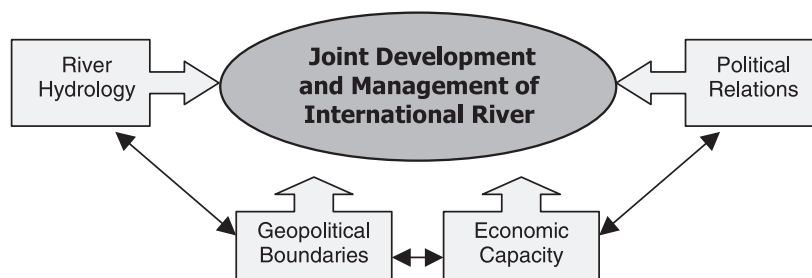


Figure 9.1 Factors influencing management of international river-water resources

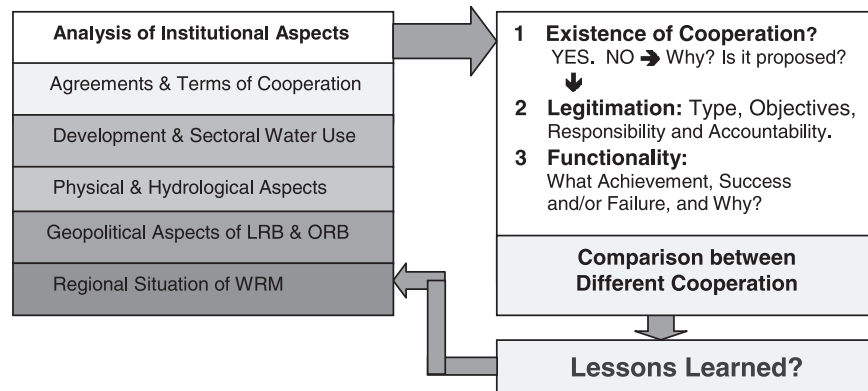


Figure 9.2 Systems approach for analysis of institutional aspects of shared river basins (LRB, Limpopo River basin; ORB, Orange River basin; WRM, water-resources management)

- factors influencing cooperation regarding shared rivers, and the differences between bilateral and multilateral cooperation highlighted through comparing the various joint institutions in the case studies;
- joint water projects on international rivers and the factors that make it possible to implement them.

Literature reviews and interviews with relevant organizations and people in the countries of the two basins were carried out in close collaboration with the University of Pretoria, South Africa. In order to comply with the purposes of the study, a special approach was developed, as shown in figure 9.2. On the basis of descriptions and presentations, the joint institutions and cooperative measures established for the two selected shared river basins are systematically analysed, using three inter-related parameters (fig. 9.2). Different types of cooperation in the two cases are compared, and any obstacles to the proposed multilateral commissions are also analysed.

SADC water resources

Introduction to the SADC framework for cooperation

In 1980, the Southern Africa Development Coordination Conference (SADCC) was established in Lusaka, Zambia as a regional organization for economic cooperation following the adoption of the Lusaka Declaration (*Southern Africa: Towards Economic Liberation*). The SADCC, established by nine countries,³ was politically motivated, being founded

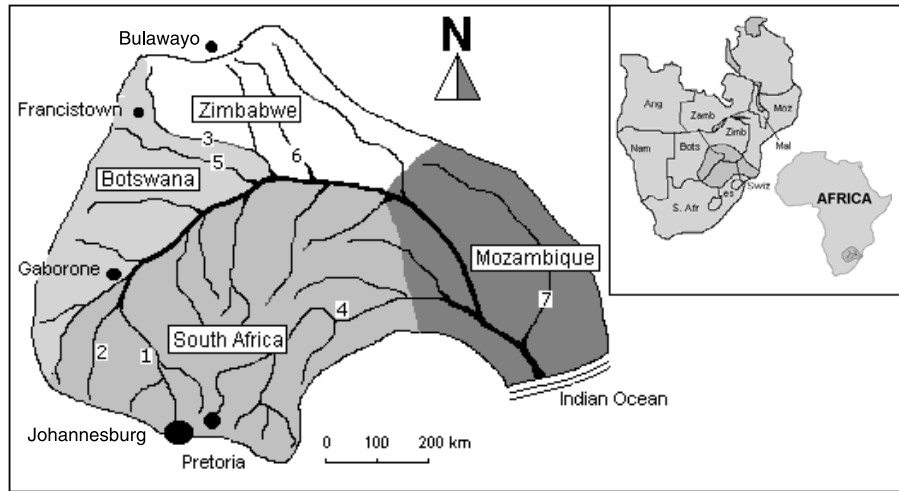


Figure 9.3 The Limpopo River basin in Southern Africa (major tributaries: 1, Crocodyle; 2, Marico; 3, Shashe; 4, Olifants; 5, Lotsane; 6, Umzingwani; 7, Changane)

in opposition to South Africa to reduce economic dependence on that country. SADC was replaced by the Southern African Development Community (SADC), with ten member states signing the SADC Treaty at the summit in Windhoek, Namibia in 1992. Each member state has the responsibility of coordinating one or more sectors on behalf of the SADC. Figure 9.3 shows the SADC region.

South Africa and the Democratic Republic of Congo (DRC) joined the SADC in 1994 and 1998, respectively (SADC 2000), after their political changes in 1994 and 1997. Mauritius and the Seychelles – two island states – also joined the SADC. Now comprising 14 member states, the SADC as an organization for regional cooperation appears to be the strongest such body in the entire African continent.

Climate and water availability

Southern Africa has great variations in climate. Tropical rain forests abound in the northern part of the subcontinent, whereas deserts characterize the south-western region. The climate of the region is greatly influenced by the intertropical convergence zone (ITCZ), which is formed by the confluence of the south-east trade winds and north-east monsoons, where warm air rises and produces rain (Pallett 1997; SARDC 1996). Between November and April, rainfall in the region comes almost entirely from evaporation from the Indian Ocean (SARDC 1996). Deadly

droughts as well as devastating floods are increasing, becoming typical features of the Southern African climate, putting pressure on water resources and food security.

Population development in the SADC region

Population growth and distribution is an important factor and a driving force in water issues (UN/SEI 1997). The region's current population is estimated as 208 million, and may increase to 388 million by 2025 (UNFPA 1992; PAI 1993; UNPD 1996). The annual rate of population growth is, on average, over 3 per cent, doubling in just 25 years, while the rate of urbanization is 6.5 per cent, putting different pressures on social services including water supply and sanitation. The rapid population growth is a threat to sustainable development as it is the first challenge facing humanity and the environment. As the population increases, demand for water in all sectors will grow commensurately. However, a significant percentage of the population in the region is affected by HIV/AIDS, which is increasing the rate of mortality (UNPD 1998).

Water-resources management

Because of the climatic conditions, population growth, and other factors, most countries in the region are moving from conditions of water scarcity to those of water stress or absolute scarcity (Conley 1996; Falkenmark 1989, 1993; Gardner-Outlaw and Engelman 1997; Pallett 1997). Another aspect of water scarcity is *technical water scarcity*.⁴ According to UN/SEI (1997), the region is currently displaying a very low withdrawal-to-availability ratio (referred to as the mobilization level), indicating a high level of technical water scarcity. As water becomes an increasingly scarce resource in the region, competition for shared water resources will intensify (SADC-WSCU 1999).

Water is a valuable input to production in most, if not all, Southern African economies. On the basis of his concept of *social resource scarcity*, Ohlsson (1999) found that all SADC countries except South Africa had a low adaptive capacity. South Africa, the region's greatest irrigator, uses 60 per cent of the total water in the region (Chenje and Johnson 1996); thus 60 per cent of the water in the region is used for agricultural purposes (irrigation). In response to urbanization and industrialization, however, domestic and industrial water demand is the fastest-growing sector, at a rate of 3 per cent per year, this increasing water demand being driven by population growth and the need for food security. Currently, water-resources management is generally weak across the region, owing to a fragmented and weak institutional and legal framework (Granit 2000). Demand management (DM)⁵ is becoming essential.

International river basins in the SADC region

In the SADC there are 15 international river basins, occupying 70 per cent of the region's total land area. The largest rivers include the Congo, the Zambezi, the Orange, the Limpopo, and the Okavango. Although they have different profiles, these rivers share important characteristics (Heyns 2000a), influencing their development potential and affecting international cooperation. These characteristics include:

- run-off generated in other countries;
- seasonal and variable run-off;
- low flows and large floods;
- rivers located far from development centres;
- potential irrigation with less water available.

The region's rivers are not fully developed; for large-scale future water developments to be realized, joint institutions with legal backing will have to be in place.

Namibia and Botswana, with extremely dry climates, share most large river basins with their neighbours. Mozambique has the most shared rivers and also is situated at the outflow end of nine rivers. Although water stress and the desire for water developments could create tensions between basin countries, these shared rivers can motivate basin states to cooperate in the cause of common security in the future and the use of the shared waters for such developments and opportunities, to their mutual benefit.

In the opinion of Asmal and Vale (1999), shared water resources bind the region's communities much more tightly than do political structures. Because it is clear that the region's scarce water resources must be shared between different basin states, the only assurance that no harm is done to the interests of any party lies in the process of negotiation and cooperation.

The SADC protocol on shared watercourse systems

In 1995, a Protocol on Shared Watercourse Systems was adopted by the SADC at the August SADC Summit in Pretoria.⁶ The protocol, the first to be signed in the SADC framework (SADC 2000), has originated from the ZACPLAN,⁷ which seems to have been instrumental in enabling the SADC to develop the Protocol (Nakayama 1999). The protocol is the outcome of negotiation initiated as a result of the debate on the ZACPLAN's second project, which was for development of regional legislation for management of the Zambezi River. However, the efforts of UNEP eventually led to a promising regional initiative of the Protocol on Sharing Watercourse Systems in the SADC Region (Nakayama 1999).

This demonstrates the positive effects of third-party involvement in negotiations concerning a shared freshwater system; the protocol was later ratified.

The protocol had gone through an amendment and negotiation process, for several reasons:

- the influence of the UN Convention,⁸ which came after the protocol and encouraged the SADC states to bring the protocol into line with the UN Convention;
- changes in some of the concepts and provisions;
- focus on the responsibility of specific countries for specific activities.

The reluctance of Angola and Mozambique to accept the protocol was an important cause of these amendments. A Revised SADC Protocol on Shared Watercourses was signed at the SADC Summit in Windhoek, 2000 (SADC 2000). Despite the absence of any major changes in the principles, the revised protocol is stronger than the original, mainly because of obligations to watercourse states. The SADC Water Sector Co-ordination Unit (SADC-WSCU), in Maseru, Lesotho, is jointly responsible with other national water agencies for the implementation of the SADC Protocol on Shared Watercourses and for water issues in the region.

Existing agreements on shared watercourses

In the SADC there are currently a number of agreements between different basin countries for cooperation in common water systems, but not all these agreements function effectively. Most river basins have either bilateral or no joint commissions, and most cooperation is technical, based on bilateral agreement, even in the multinational river basins. Several of the proposed river commissions are not yet in place and have not progressed from the level of negotiation and principle to action and solid commitment. Van Wyk (1998) and Turton (1999) argue that the states may feel that their sovereignty is threatened or could be eroded by stronger regional integration in the course of close cooperation. However, the fundamental issues forcing countries in the region towards cooperation over shared rivers could be the water deficit and the need for development.

Inter-basin water-transfer schemes (IBWTS)

In the SADC there are several IBWTS, mostly confined to those international river basins with South Africa as a member of the same river basin. These IBWTS are for industrial, domestic, and irrigation purposes (DWAF 1997a). The reason behind these transfers is the hydrological

situation in the region, which creates difficulties in water availability and distribution. Other IBWTS are planned.

South Africa's economic activity in all nine provinces is already supported to some extent by water imported from other river catchments within or outside the country (Muller 2001). Transfer schemes are unlikely to be a panacea to water scarcity in Southern Africa, because there is likely to be conflict between donor and receiving basins as the use of water increases so that supplies in the donor basins are threatened. Such threats of conflict and of discontinued water flow provide a shaky foundation for sustainable development. To solve such a conflict in future water-transfer schemes, South Africa's White Paper on Water Policy in 1997 (DWAF 1997b) notes that inter-basin transfers will have to meet special planning requirements and implementation procedures (such as proper future planning in the donor catchment, and demand management and water conservation in the recipient catchment).

However, as populations grow and demands for water increase, the region may find itself at an impasse: to move these resources or to move people (Asmal and Vale 1999). Owing to imbalances in the spatial distribution of demand and supply, as already noted, the transfer of water on an even larger scale is likely to be required in future, making rivers more international. Worldwide, water transfers are becoming more common as local sources are used up and people look to more distant sources. IBWTS may become very thoroughly assessed economically and technically, but poorly assessed in terms of their potential ecological and social impacts.

The physical, hydrological, and economic aspects of the river basins

The Limpopo River basin

Physical and hydrological aspects

The Limpopo River basin (fig. 9.3) in south-eastern Africa runs from an altitude of about 2,300 m in the mountainous Witwatersrand region of northern South Africa. The main stream of the river is about 1,700 km from the source to the mouth. The river flows generally north-east between Botswana and South Africa, forming the border between them, then east between South Africa and Zimbabwe, again forming the entire border between the two countries, and finally through alluvial plains in south-east Mozambique before entering the Indian Ocean. The Limpopo River basin covers an area of about 415,500 km² and is shared by the

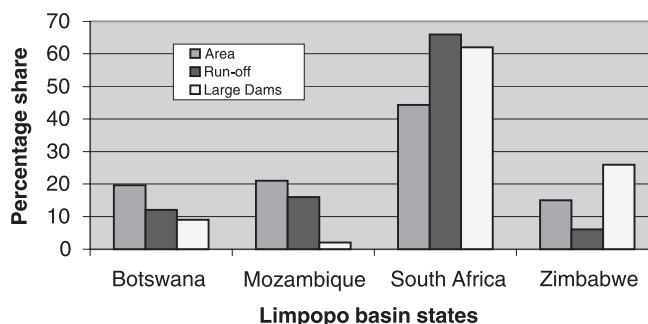


Figure 9.4 Share of co-basin countries in drainage area, run-off contribution, and large dams in the Limpopo River basin

four countries Botswana, Mozambique, South Africa, and Zimbabwe (Wolf et al. 1999). All four basin countries have access to the main river.

The basin's climate varies from arid to semi-arid, with a few semi-humid pockets in the centre, particularly in South Africa (Boroto and Görgens 1997; WRC 1994). The mean annual precipitation of the basin is, however, around 520 mm (Pitman and Hudson 1994). Most of the rains (77 per cent) arrive during the period between November and March, mainly as a result of the summer low pressure (JPTC 1991a). The mean annual evaporation is generally about 1,400 mm at the source, rising to 2,000 mm along the main river (JPTC 1991a). In the basin, drought and flood are increasingly becoming contrasting aspects of the basin's climate: the latest (and greatest) floods in the basin have severely affected Mozambique.

Along the middle reaches of the main stream of the river there are significant losses by transmission (Boroto and Görgens 1999; JPTC 1991a): the total mean annual run-off has been estimated as 7,330 MCM (Conley 1995); South Africa's share is 66 per cent of the total (WRC 1994). Other basin countries contribute the following run-off: Botswana 6 per cent; Mozambique 12 per cent; and Zimbabwe 16 per cent of the total run-off (Savenji and van der Zaag 1998). Figure 9.4 portrays South Africa's dominance in the basin.

Economic and sectoral aspects of water use

Although the Limpopo basin states are characterized by diverse economies, in all of them agriculture predominates as the main sectoral activity for water use. The basin population has been estimated as 14 million (Savenji and van der Zaag 1998), most of which is in South Africa, while the greatest proportion of the population of Botswana is in this basin.

Although there are no dams in the main stream, many major develop-

ments have been implemented on almost all the Limpopo tributaries. In the basin, 44 large dams with annual storage capacities of more than 12 MCM have been built (4 in Botswana, 28 in South Africa, 1 in Mozambique and 11 in Zimbabwe). The main purposes of these major dams are irrigation, and domestic and industrial water supply, as well as hydro-power generation; they also function as flood-mitigation structures.

Being the bulk user of the Limpopo water, South Africa is economically much dependent on the Limpopo tributaries, which serve the industrial heartland of South Africa – the Gauteng Province, which currently houses 42 per cent of the country's population and generates over 50 per cent of its gross national product (GNP) (LHWP 1994). The river supplies eastern Botswana, the most urbanized part of the country, and also supports a major irrigation scheme in southern Mozambique. In Zimbabwe, the river has been developed to almost its full potential (Heyns 1995).

Water use in urban-related activities is the fastest-growing sector, at an annual growth rate of 3 per cent. All basin states have plans for further development. The trend is for Mozambique to receive less water from the river in future, and that water will probably be more polluted. Eventually, greater floods during the heavy rains and any future major development will have substantial impacts on the main stream and on Mozambique; the basin faces an inevitable future crisis.

The Orange River basin

Physical and hydrological aspects

The Orange⁹ River (fig. 9.5) rises in the Lesotho Highlands at 3,300 m above mean sea level. The river, known in Lesotho as Senqu, forms the border between Namibia and South Africa (450 km) before emptying into the Atlantic Ocean at Alexander Bay. The total length of the Orange River is about 2,300 km (DWAF 1999; Heyns 1995; Pallett 1997; WRP 1999). The Orange is also the largest and longest river in South Africa, covering about a million sq. km (Wolf et al. 1999).

The basin covers portions of four states – Botswana, Lesotho, Namibia, and South Africa. Lesotho,¹⁰ landlocked and entirely surrounded by South Africa, lies totally in the basin. The largest tributaries are the Vaal, the Caledon, the Fish, and the Molopo, occurring in the Kalahari Desert between Botswana and Namibia. At its mouth, the river has the richest coastal wetland in the region, supporting migratory and resident birds (Hines and Kolberg 1997).

The basin's climate varies widely. At the source in the mountains of the Lesotho Highlands, the average annual rainfall is about 1,800 mm,



Figure 9.5 The Orange River basin in Southern Africa (Source: WRP 1999)

decreasing westward (DWAF 1999) to reach about 25 mm (WRP 1999). The average annual potential evaporation, on the other hand, increases in a westerly direction, rising from 1,100 mm in the Lesotho Highlands to over 3,000 mm in lower areas of the basin (WRP 1999). However, the overall mean annual precipitation over the entire basin is estimated as 330 mm (Conley, 1995; Pitman and Hudson 1994). The natural mean annual run-off¹¹ of the Orange River is estimated at 11,200 MCM (DWAF 1997a, 1999; WRP 1999).

The water resources of the Orange Basin are unevenly distributed among basin states. Theoretically, Botswana is a part of the drainage basin; however, owing to its physical characteristics and climatic conditions, the Molopo tributary in Botswana has not contributed any surface run-off to the main river within living memory (Stoffberg pers. comm. 1999; Van Niekerk pers. comm. 1999). Figure 9.6 shows that South Africa again dominates the basin in terms of land area, run-off contribution, and dam developments.

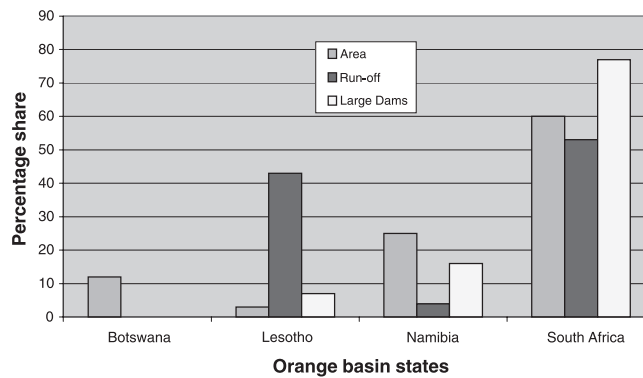


Figure 9.6 Share of co-basin countries in drainage area, run-off contribution, and large dams in the Orange River basin

Economic and sectoral water-use aspects

In the basin, the population has been estimated as 13 million (Savenji and van der Zaag 1998). South Africa is the country with the largest industrial, agricultural, and population base in the basin, and also has the largest urbanized population situated in the basin.

During the late 1950s, the development of the entire river had increasingly become a priority for South Africa. Certainly, the increasing population growth and improving standard of living must have created a demand for rapid development of the water resources. As a result, some of the largest and most ambitious water projects to be undertaken in Africa are situated on the Orange River (DWA 1999). In South Africa, development of the river was implemented under three massive projects. These are:

- The Orange River Project (ORP), launched in 1962 mainly to irrigate thousands of hectares in the Eastern Cape, Northern Cape, and Free State. The ORP key structures include the Vanderkloof and Gariep dams, the largest in South Africa.
- The Vaal River Development, such as Vaal Dam (52 m) and others.
- The massive Lesotho Highlands Water Project (LHWP) with Lesotho. The Katse Dam (185 m high) is the most important component of the LHWP. The LHWP was launched in the 1980s to transfer water from Lesotho to South Africa and is the largest project in the entire region.

A total of 29 large dams with an annual storage capacity of more than 12 MCM were built in the basin for domestic, industrial, irrigation, and energy-production purposes: there were 2 in Lesotho, 5 in Namibia, and 22 in South Africa (Pallett 1997; WRC 1994). In Lesotho, the water de-

mand is relatively low (DWAF 1999). As there are both increasing demands for water and potential for further development, plans had already been proposed in South Africa (DWAF 1999) and Namibia. However, it remains uncertain whether the LHWP will continue along the lines planned in 1986; this is because South Africa is currently re-appraising whether alternative national sources are available, or if DM is being applied to such an extent that the demand could be controlled. As (so far) the most-developed river of Africa, the Orange River is currently nearly fully exploited for a variety of purposes, and South Africa is the country most dependent on its water.

Cooperation between basin states over the two river basins

The Limpopo River basin

Multilateral cooperation

On 15 June 1986, all Limpopo Basin States signed, in Harare, Zimbabwe, an agreement establishing the Limpopo Basin Permanent Technical Committee (LBPTC). This was set up to advise the parties on a number of issues regarding the Limpopo; however, it did not function.

A second meeting of the LBPTC was held in Pretoria, South Africa, in August 1995, at which it was agreed to reactivate this organization, which had been “dead” for about 10 years. Discussions concentrated on mutual interests regarding the common river. A joint hydrological study of the main river was agreed, on the basis of cost sharing; the aim was that this study would be the first step towards a basin study. In 1999, the study with its crucial recommendations was completed (Boroto and Görgens 1999). After the second LBPTC meeting in 1995 a rotating meeting was started, the third and fourth meetings being held in 1998 and 1999 in Gaborone and Maputo, respectively. The latter concentrated on the legal issue of the Limpopo River Commission proposed at the second meeting in Pretoria. Little progress was made because of disagreement, mainly between Mozambique and the other basin states; Zimbabwe was not represented at either meeting (Triebel pers. comm. 1999). A fifth meeting in Harare was planned but was rescheduled twice, owing to the domestic crisis in Zimbabwe (Havenga pers. comm. 2000; Tombale pers. comm. 2000); however, it was held in September 2000, although little progress was (again) made, as Mozambique brought to the meeting new proposals that raised a number of legal issues (Havenga pers. comm. 2000), which needed to be resolved (Sobekwa pers. comm. 2000).

Bilateral cooperation between Botswana and South Africa

Long before the LBPTC had been set up, Botswana and South Africa had signed a number of bilateral agreements concerning sharing of the Limpopo waters. Cooperation on that part of the Upper Limpopo Basin that is shared by Botswana and South Africa started in 1967 (JPTC 1991b). A Joint Permanent Technical Committee (JPTC) between the two countries was established in 1983 to make recommendations on matters concerning rivers of common interest (e.g. the upper Limpopo). In 1988, an agreement was reached on the apportioning of water from the Marico River – particularly, the Molatedi Dam on the Marico – in South Africa. In the agreement, 7.5 MCM of water of the Molatedi Dam was allocated annually for Botswana via pipeline transfer from the dam to Gaborone City for domestic needs. In 1989, a memorandum of understanding on the utilization of water from the river was also signed. Delegates in the JPTC meet regularly on a yearly basis to discuss technical issues.

The most notable outcome of the JPTC framework for cooperation is the joint study in 1991 – the Joint Upper Limpopo Basin Study (JULBS) – which the two countries agreed to undertake in 1989. The JULBS was a pre-feasibility study (a) evaluating the water availability and its present utilization, (b) determining the potential and demand for water development, and (c) determining and evaluating the most successful and cost-effective method of regulating the main stream in order to stabilize existing water use and promote further development (JPTC 1991b). The study concluded, however, that the development of dam projects on the main river was not viable, for both technical and economic reasons (JPTC 1991a).

Bilateral cooperation between Mozambique and South Africa

Before Mozambique became independent in 1975, there was an agreement between Portugal (of which Mozambique was a former colony) and South Africa on common rivers in October 1964. In February 1983, an agreement between Mozambique, South Africa, and Swaziland led to the establishment of the Tripartite Permanent Technical Committee (TPTC); however, this has not been functioning, mainly for political reasons. The TPTC covers only river basins that are jointly shared by the three countries (i.e. the Incomati, Maputo, and Umbeluzi basins). During the 1980s and 1990s, the political situation was not favourable to real cooperation between the two countries on shared water resources. In 1996, after the political change in South Africa, the two countries signed an agreement establishing a Joint Water Commission (JWC) in Maputo, Mozambique. The JWC has advisory functions on technical matters relating to their common waters, including the Limpopo.

Establishment of the proposed Limpopo River Commission

At the second LBPTC meeting in Pretoria in 1995, a proposal to elevate the LBPTC to a multilateral river commission was put forward. Mozambique, which was already demanding revival of the LBPTC (Carmo Vaz and Lopes Pereira 1998), welcomed the idea. A draft agreement (*The Limpopo River Commission*) was prepared. The main objectives were as follows:

- to develop a monitoring policy for the river;
- to promote the equitable utilization of the river;
- to formulate strategies for the development of the river;
- to monitor the execution of the integrated water-resources management (IWRM) in the river.

Table 9.1 gives a brief summary of the findings regarding Limpopo River basin cooperation.

*The Orange River basin**Bilateral cooperation between Namibia and South Africa*

In 1992, the Namibian and South African governments signed an agreement to establish a Permanent Water Commission (PWC) at Noordoewer.¹² In the agreement, the main objective of the PWC is to act as a technical adviser to the parties on matters relating to the development and utilization of water resources of common interest to the parties. The PWC takes all decisions on a consensus basis and meets twice a year. These countries signed, in 1992, another agreement establishing a joint irrigation authority. This joint irrigation scheme (known as the Vioolsdrift and Noordoewer Joint Irrigation Scheme) along the river banks irrigating 800–1,000 ha, was in operation even before Namibian independence as a South African scheme; after Namibia became independent, the scheme became international. The PWC has a subcommittee to deal with and manage joint irrigation and planning tasks. An interim government, instituted in 1980 in Namibia, agreed with the South African government in 1987 to cooperate on the utilization of the Orange River (Heyns 1995).

The PWC has positive achievements to its credit; these include the joint irrigation scheme. In addition, the PWC has made recommendations on the issue of the border between the two countries. During the period (1919–1990) when South Africa was in charge of Namibia, the border between the two was somewhere on the northern bank of the Lower Orange River, but the precise location of the borderline was uncertain.¹⁴ After independence in 1990, Namibia became concerned about this issue of setting the position of its border along the river (Conley and

Table 9.1 Brief assessment and summary of Limpopo basin cooperation

Type of cooperation	Bilateral – JPTC	Bilateral – JWC	Multilateral – LBPTC
Objectives	Advises the governments on issues relating to the overall management of the common water resources	Advises the governments on technical matters relating to their common waters	Advises the governments on issues about the overall management of the Limpopo water resources
Accountability Functionality	To their respective governments Functioning satisfactorily, because it delivers its objectives	To their respective governments Newly established and not yet in force or operation	To their respective governments Functional currently, but ineffective and problematic and needs revival; it did not deliver its objectives Joint Hydrometric Study on the Limpopo main stream, completed recently
Successes	Apportioning of dam water; joint sub-basin study; information and data exchange; meets regularly	Newly established and not yet in force or operation	Not operational and did not deliver its objectives for 10 years, for political reasons, and currently very slow; has no secretariat
Failures	Failed to realize the anticipated international water project, which the JULBS found infeasible	Newly established and not yet in force or operation	Terms of water sharing and allocation, information release and exchange
Issues in disagreement	No serious or major disputes have been identified in the cooperation	Newly established and not yet in force or operation	

Van Nierkerk 1998). Its 1990 Constitution provides, *inter alia*, that “its southern boundary shall extend to the middle of the Orange River.” Negotiations between Namibia and South Africa to confirm the exact position of their common border along the river have progressed satisfactorily, although the details have not yet been formalized in a treaty document. By bringing the border between Namibia and South Africa back to the middle of the main stream of the Orange River, Namibia won the right to access the main stream of the Orange.

The possibility of a major dam at Vioolsdrift has been suggested and is currently being investigated by Namibia and South Africa (WRP 1999). Decision on a joint study of the lower Orange River was reached in 2000. The objective of the study is to investigate measures to improve the management of the lower Orange River. The study will, in particular, investigate the potential of water-demand management along the lower Orange River and the need for (and feasibility of) new storage reservoirs as identified during the Orange River Replanning Study (ORRS; DWAF 1999). The study will fall under the control of the PWC, which will nominate a study management committee to perform the detailed management of the study on behalf of the PWC.

Bilateral cooperation between Lesotho and South Africa

The development and utilization of Lesotho’s water resources for transfer to South Africa has been a subject of intensive debate and negotiations since the 1950s (LHDA 1989). The drought in 1965 renewed interest in a Lesotho-based scheme to divert water into the Vaal sub-basin. A report of a preliminary study entitled “The Oxbow Scheme Consolidated Proposal” was presented to Lesotho in 1967, a year after Lesotho independence. A further report in which a hydropower component was found not to be economically viable was published.

However, Lesotho and South Africa failed to reach agreement in 1972 on the royalty and negotiations were terminated (Roux 1989). This led South Africa to embark upon a national transfer scheme, through which it was possible to satisfy demand in the Vaal River supply area until 1992, but if no further development takes place in this region there will be a shortage of water by the year 2010. It was against this background that negotiations with Lesotho to transfer from the upper Orange to the Vaal River system were re-initiated in 1975 (Roux 1989). Table 9.2 summarizes the chronological events relating to the Lesotho Highlands Water Project (LHWP).

Throughout the negotiations, Lesotho insisted on two conditions:

1. All projects to be considered should include a hydroelectric power development for Lesotho itself.
2. No layouts should involve the Caledon River, because it was a conquered territory.

Table 9.2 Chronological events relating to the LHWP

Year	Parties	Events	Content
1972	Lesotho, South Africa	Failed to reach agreement	Owing to disagreement on the royalty to be paid to Lesotho
1975	Lesotho, South Africa	Negotiations were re-initiated	Owing to increasing demand
1976	Lesotho, South Africa	Negotiations were interrupted	As a result of the Soweto riots
1978	Lesotho, South Africa	Joint Technical Commission (JTC)	Joint pre-feasibility study
1979	Lesotho, South Africa		Report of the study
1983	Lesotho, South Africa	Preparation of feasibility study	The scheme, LHWP
1986	Lesotho, South Africa	Completed feasibility study	

The feasibility study was conducted in the light of these provisions. In April 1986, the final feasibility study was completed and the LHWP was identified as a multi-purpose project, entailing the least expense for transference of 70 m³/s of water from Lesotho in five phases to South Africa for domestic and industrial use.¹⁵

In parallel to the study of the Lesotho water-transfer scheme, an alternative national scheme was considered, known as the Orange–Vaal Transfer Scheme (OVTS) (fig. 9.7). The OVTS involved transference of water from a dam on the Orange River outside the border between South Africa and Lesotho to the Vaal River through a pump station, canal, and pipeline network along the Lesotho border, without involving Lesotho. Compared with the LHWP, the OVTS had several disadvantages, as shown in table 9.3. In addition, the OVTS causes air pollution from the coal burnt to power pumps (Conley and Van Nierkerk 1998). However, in the negotiating process with Lesotho, the OVTS had an important role to play for South Africa.

Immediately after the political change¹⁶ in Lesotho in 1986, the LHWP Treaty was signed by the two governments in Maseru on 24 October 1986. According to the treaty, the purpose was to provide for the establishment, operation, and maintenance of the LHWP. The overall purpose of the LHWP was to transfer the specified quantities of water from the Senqu/Orange inside Lesotho (by using structures delivering water) to the designated outlet point in South Africa for use in Gauteng Province, and to generate hydroelectric power in Lesotho.

Under the terms of the treaty, South Africa is responsible for the full

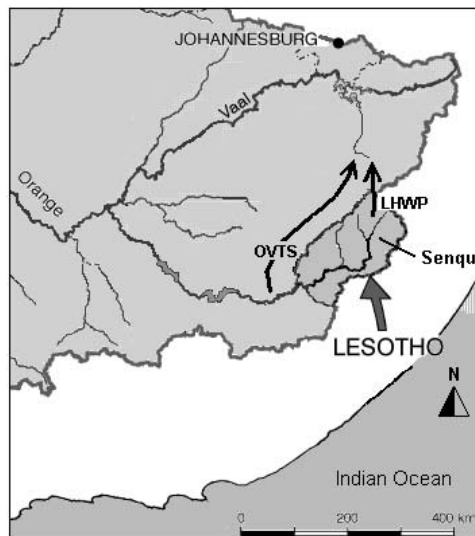


Figure 9.7 Routes of the two water projects – the OVTS and the LHWP (Source: DWAF 1999)

Table 9.3 Advantages and disadvantages of the two schemes (LHWP and OVTS) from South African perspectives

Water project	Advantages	Disadvantages
LHWP	<ul style="list-style-type: none"> • Water is transferred by gravity • Less capital cost than the OVTS • Better water quality after transfer 	<ul style="list-style-type: none"> • More actors are to be involved, which makes the process much more complex
OVTS	<ul style="list-style-type: none"> • It is a national scheme that does not require any agreement with co-basin State (Lesotho) • More rapid and shorter decision process 	<ul style="list-style-type: none"> • Requires energy to pump the water • More capital costs than the LHWP • Lower quality of water than the LHWP (the shorter the distance water is diverted from its source, the purer it is)

cost of the LHWP, while Lesotho pays for the cost of the hydropower component in its territory (which is about 5 per cent of the total cost of the LHWP). Under the treaty, the countries agreed to share the difference in cost (termed the net benefit) of the LHWP over its alternative scheme, the OVTS, in a ratio of 56 per cent to Lesotho and 44 per cent to

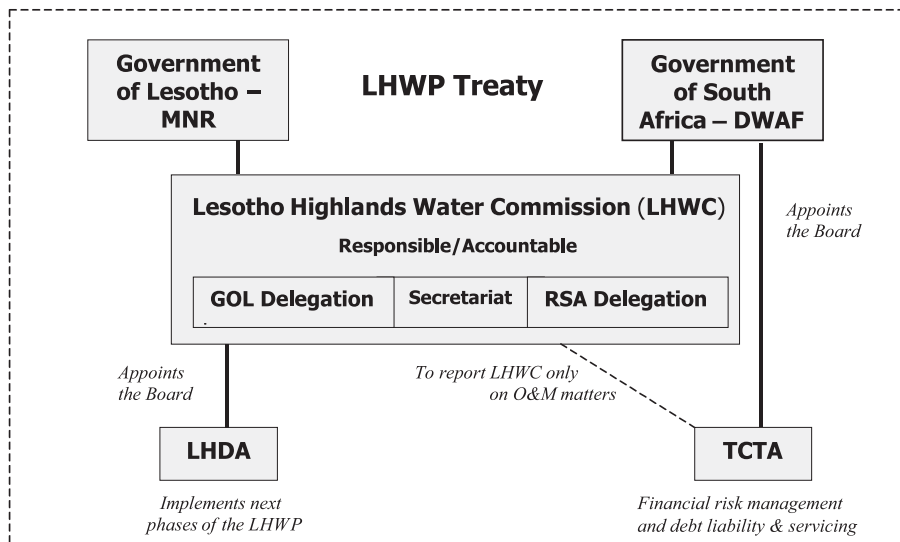


Figure 9.8 The new governance model of the LHWP since June 1999 (Source: DWAF 1999; protocol VI of the LHWP Treaty)

South Africa. Lesotho's share of net benefits to be obtained by using the LHWP is known as the "royalties"; South Africa's share is referred to as "cost savings" (DWAF 1999).

On the basis of the treaty, three institutions were set up simultaneously – one bilateral and two implementing agencies. A Joint Permanent Technical Commission (JPTC)¹⁷ was established to monitor and oversee the treaty. In addition, two implementing agencies with autonomous status – the Lesotho Highlands Development Authority (LHDA) and the Trans-Caledon Tunnel Authority (TCTA) – were established and entrusted to take on the responsibility of implementing the project in Lesotho and South Africa, respectively. The LHWC is responsible and accountable for water transfer and hydropower and has monitoring and advisory powers relating to the activities of the LHDA and TCTA. The LHWC consists of two delegations, one from each party; the two governments appoint their LHWC delegates. The LHWC is functional and productive in terms of its objectives.

There are already four protocols attached, to deal with issues in more detail than considered under the original negotiations of the Treaty. Of these, two (protocols V and VI) that were signed in 1999 in Pretoria by water ministers are resolving disputes in the project. Protocol V ends a

lengthy dispute on the taxation of LHWP activities in Lesotho; protocol VI was intended to address governance of the LHWP in its tripartite organizational structure. At the end of phase 1A, there were substantial differences between the LHWC and LHDA, particularly in the reporting relations and authority lines. Figure 9.8 shows the current structure of the overall governance of the LHWP and the relations between the three institutions with their two governments.

There are currently two outstanding unresolved disputes between the parties in the LHWP. The first has to do with the employment policy in the LHDA, which does not employ South Africans; the second outstanding dispute concerns interpretation of the Senqu river hydrology, as royalties paid by South Africa to Lesotho are based upon definite hydrology of the Senqu River. However, the two countries have now appointed a neutral body to arbitrate and solve the latter dispute. Under the terms of the LHWP Treaty, the decisions of the arbitrator will be final and binding.

Table 9.4 summarizes current results of the cooperation in the Orange River Basin.

Table 9.4 Brief assessment and summary of the Orange basin cooperation

Type of cooperation	Bilateral: PWC	Bilateral: LHWC
Objectives	Advises the governments on matters relating to the development and utilization of common waters (i.e. the lower Orange River)	Monitors and oversees the LHWP Treaty and the associated activities in both countries, and advises both governments
Accountability	To their respective governments	Accountable to the parties in the LHWP Treaty
Functionality	Functions satisfactorily in the eyes of the parties in the cooperation; it delivers its established objectives	Functioning well because it has delivered and fulfilled its main objectives, which were to transfer water and generate hydropower
Successes	Information and data exchange; joint scheme and management; water allocation	Information and data exchange; joint development
Failures	None	None
Issues in disagreement	None except some minor disputes as a result of border change	Data on river hydrology and employment in the LHDA

Comparative analysis of the two cases

Differences and similarities in geopolitical, physical, and developmental aspects

In geopolitical terms, the Limpopo and the Orange are two international river basins that have the same number of basin states. Each river forms parts of (or entire) geopolitical boundaries between the states sharing it. The Limpopo forms a mutual border between three of the four riparian states. The river basins have, however, different geopolitical settings. In both cases, South Africa is the only co-basin state bordering with the other three states in both basins. This makes the two river basins important in South Africa, as they are the most important water systems in the country. South Africa could be regarded as being a downstream as well as upstream riparian in both basins. In their respective basins, Mozambique and Namibia are located the furthest downstream, which is the least favourable position in hydropolitical terms, as an upstream state can theoretically divert and pollute the water in the river. All except Botswana have access to the main stream of the Orange River; in the case of the Limpopo, all have access to the main stream. Botswana and South Africa are riparian in both river basins.

Located in the same geographical region of Southern Africa, the two river basins have almost similar climatic conditions, where the river hydrology is subjected to great variations during the year. The Orange River originates in the Lesotho Highlands, with the highest altitude and rainfall in the region. On an annual basis, both river basins have much higher evaporation than rainfall, which gives them a water deficit. In terms of long-term average annual run-off, the Orange generates more run-off (11,200 MCM) than the Limpopo (7,300 MCM). In both river basins, South Africa contributes the largest run-off and occupies the largest drainage area, as the two river basins cover a total of 65 per cent of the country's land area. The two river basins are of the same order in terms of population size, and the greater proportion of their population live in the upstream areas around the water divider. This is partly attributable to the mining areas in Guateng Province in South Africa, which historically attracted most people to reside near these areas of economic activity because of the job opportunities there. This is why the sources for water (i.e. the main streams of the rivers) are a long way from the major human settlements and areas of development. In normal historical terms this is not the case, because people usually reside alongside the rivers for cultivation purposes. Most of the population of Botswana lives in the Limpopo basin; this makes Botswana greatly dependent on the water resources of the Limpopo.

Having almost the same order of annual run-off, the two rivers have almost similar levels of infrastructure development. Both rivers have been extensively exploited: the Limpopo has more large dams (43) than the Orange (29), but the storage capacity of the dams on the Orange is greater because they are larger. Being the most important water systems in South Africa, most dam developments on the Limpopo and Orange rivers are to be found in that country, which indicates its economic capacity. The Orange and the Limpopo rivers are among the most-developed rivers of Africa. The water resources of both river basins are developed mainly for irrigation and the supply of water for urban use, which is growing rapidly. The levels of infrastructure development and economic capacity between the countries sharing the two river basins differ significantly, with those of South Africa being by far the greater. The numerous water-transfer schemes, either importing or exporting water, in the two river basins may complicate the principle of equitable and beneficial utilization of these shared watercourse systems.

Since the main stream of the Limpopo River, unlike that of the Orange, forms the political borders between three riparian states, its development requires special agreement between the states, which makes internationalization of the basin of major significance. No country has, therefore, the right to develop the main river unilaterally. The basic concept here is that no development of a river that acts as a common political border can take place without agreement and cooperation, and this is why there is no major development on the Limpopo main stream. The Limpopo has more tributaries than the Orange; for this and other reasons, developments on the Limpopo Basin concentrate on the tributaries in the upstream areas. The reason why the Orange has several major dams and inter-basin transfer schemes has to do with its geopolitical setting: it runs mainly within the interior territories of South Africa. The high level of development on the Limpopo tributaries, unlike the Orange, has significant impacts on the hydrology of the main stream: the reduced flow of the main river has caused salt-water intrusion, resulting in ecological problems for Mozambique.

There are few developments in the downstream riparian states, particularly Mozambique and Namibia. This is not the case with many rivers in the world, where the downstream users depend historically on river water and therefore create developments at a much earlier stage. Mozambique has lacked both the economic capacity and political stability to make much use of the Limpopo water, while Namibia did not have access to the main Orange River until recently, and previously did not exist as a state. Given the existing level of water development and use in upstream areas of the Limpopo basin, it is certain that Mozambique is suffering through this process.

*Joint water cooperation between the riparian states**Comparison between different types of cooperation over the Limpopo and Orange river basins*

For both the Limpopo and the Orange river basins, efforts have been made to reach a cooperative arrangement for the utilization of the water in the basins. Two bilateral and one multilateral cooperative projects in the Limpopo basin and two bilateral cooperative projects in the Orange basin were established. The multilateral framework of the LBPTC, from which Botswana took its initiative (Triebel pers. comm. 1999), did not function during its first ten years of existence (1986–1995), for mainly political rather than technical reasons (Tombale pers. comm. 1999). These mainly concerned problems regarding the tense relations and political upheaval between South Africa and Zimbabwe during the apartheid period; moreover, Mozambique was either in the middle of, or recovering from, a long civil war (Triebel pers. comm. 1999; Paolo pers. comm. 2000), which severely devastated the country. Lack of financial resources, of a common vision, of identified issues, and of a clear framework are also reasons why the LBPTC could not function. Because the initiative that established the LBPTC did not define specific issues to address, no mutual interests were identified that could have bound all basin states. No progress on any aspect of cooperation was made, therefore, and the objectives of the cooperation have not been achieved.

However, the LBPTC was reactivated after the second meeting in 1995 as an immediate result of political change in South Africa in 1994; this demonstrates the impact of the political factor on the functionality of an existing cooperation. The Joint Limpopo hydrological study is the one and only achievement of the LBPTC in about 13 years.

Botswana and South Africa, on the other hand, have a good relationship with each other on data exchange and water sharing, and both states have been enjoying a long history of cooperation and understanding on the matters relating to the waters that are common to them – those of the upper Limpopo. This cooperation started before Botswana became independent in 1966 and became easy to operate. Botswana has been the only Limpopo riparian to cooperate with South Africa even during the apartheid era. Over the years, Botswana and South Africa have reached a series of understandings about the way in which waters of the upper Limpopo are to be shared and administered. Owing to its longer history and more favourable political environment, the JPTC has been more functional and effective than the LBPTC. The JPTC has had several successful achievements: Botswana's capital Gaborone receives transferred water from a dam – the Molatedi Dam on the Marico River – located in a very dry area of South Africa, without giving any compensation;¹⁸

Table 9.5 Benefits from the LHWP to the two countries (Lesotho and South Africa)

Parties in LHWP	Benefit from the LHWP
Lesotho	<ul style="list-style-type: none"> • Financial stream in the form of royalties in 50 years • Hydroelectric power generation for Lesotho • Job opportunities • Infrastructures
South Africa	<ul style="list-style-type: none"> • Water at lower cost

however, in return, Botswana contributes the operation and maintenance of the dam (Tombale pers. comm. 1999). The joint basin study (JULBS) increased confidence between Botswana and South Africa in data sharing and information exchange, although the anticipated joint development project on the upper Limpopo did not materialize.

In contrast to the LBPTC, bilateral cooperation between Lesotho and South Africa in the form of the Lesotho Highlands Water Commission (LHWC) has very specific issues – water transfer and hydropower generation. The LHWC is a bilateral institution with a development-oriented and project-specific scope, rather than basin-wide cooperation with overall management of the shared water resources. The LHWC, with its LHWP treaty, became possible after the change in political regime in Lesotho; again, this illustrates the impact of political factors on the establishment of cooperation over international freshwater resources. The LHWP treaty and the bilateral LHWC served the two countries well, so that no major disagreement resulted. Despite its limited scope, therefore, the LHWC has proved to be an effective and functional forum for inter-governmental cooperation and coordination.

Both countries, Lesotho and South Africa, have benefited from the LHWP (table 9.5). The overall benefit to the economic base of Lesotho is significant, as it could otherwise have been in recession (LHDA 1996). It became possible for Lesotho to develop self-sufficiency with regard to hydroelectric power and thus to abolish its dependence on power supplies imported from South Africa; on the other hand, South Africa receives water at low cost for its growing demands, and has made significant savings.

The bilateral cooperation of the Permanent Water Commission (PWC) between Namibia and South Africa has been satisfactorily operational since its establishment in 1992. The PWC is functional in the sense that it attains its objectives and that no major and serious disputes have occurred between the cooperating countries. Its achievements include the joint irrigation scheme; the PWC recommended that the availability and use of water should be investigated. The smooth function of the PWC

Table 9.6 Comparison between the LBPTC and the LHWC

Issues to compare	LBPTC	LHWC
Established in (year)	1986	1986
Type of arrangement	Multilateral	Bilateral
Objectives	Overall management	Specific issue
Secretariat	No	Yes
Functionality	Non-functional (1986–1995) and slow since 1995	Functional (attaining its objectives)

may be attributable to good relations between the countries, as well as to their mutual interest in their joint undertakings in the lower Orange River. The cooperation has worked well with regard to information exchange and data sharing as well as to the allocation of water. The PWC is therefore classified as functioning satisfactorily in the eyes of the parties. The countries are currently in the process of carrying out a joint study in the lower Orange River to investigate measures to improve its management; the result may lead to a joint water development.

In comparison with the multilateral cooperation of the LBPTC, the other three bilateral cooperations are effectively functional with different levels of achievements. The first identifiable difference is the type of cooperation arrangement (i.e. multilateral or bilateral). Table 9.6 compares two joint institutions, one from each river basin: the LBPTC and the LHWC, both established in the same year (1986), show different levels of achievement depending on their different structure, objectives, and functionality.

The JWC between Mozambique and South Africa is the first bilateral cooperation and joint institution established after the demise of the apartheid regime in South Africa. During the 1980s and early 1990s, the political environment between the two states was not inductive or favourable to cooperation over shared water resources. Nevertheless, the JWC is unlikely to bring about any dramatic gains to the parties, before the lack of trust between the two countries in shared water issues has been addressed.¹⁹ Relations between Mozambique and South Africa have been complicated, particularly in view of their long history of mistrust. However, with regard to their shared water resources, Mozambique and South Africa have three overlapping institutional arrangements (i.e. the LBPTC, TPTC, and JWC) which are multilateral, trilateral, and bilateral, respectively. Two of these (the LBPTC and the JWC) deal with the Limpopo River; this is a clear sign of fragmentation in the cooperation system. Water is a significant issue determining overall relations between Mozambique and South Africa.

Bilateral and multilateral frameworks for cooperation

In both the cases mentioned above, four bilateral frameworks for cooperation (but only one multilateral framework) were identified for the two multinational river basins. In the previous section it was concluded that bilateral cooperation in the two case studies is more practical and functional than multilateral cooperation.

In the negotiation process of establishing a joint institution for a river shared by several countries, difficulties increase and the process becomes more prolonged as the number of riparian participants increases. In order to avoid these difficulties and prolongations, riparian countries that are ready to institute water developments and find it difficult to wait for an overall agreement covering the entire basin, prefer to cooperate on a bilateral basis. Such is the case for South Africa regarding their approach to the development of shared water resources during the apartheid era. This approach of bilateralism in multilateral basins indicates that the river is not treated as a single unit. The river-basin²⁰ approach is a relevant, fundamental, natural, economic, and planning unit of management in water sharing in order to maximize the utilization of the resource. Although bilateralism in multilateral basins ignores the river-basin concept, it operates on a more practical level. This should not be taken as suggesting that states sharing multinational basins must cooperate on the basis of bilateral agreement rather than a multilateral framework; however, it indicates that, in the bilateral framework, there are only two interests to satisfy, whereas in the multilateral framework there are too many and various interests, which complicate the process and the framework. Another obstacle in the establishment and functionality of a multilateral framework for cooperation over a shared river is when one or more of the parties concerned do not attend meetings, which impairs performance, disappointing other parties that may have an interest in the cooperation. This is exactly what is happening in the current process of establishing river commissions for the two river basins.

Using three parameters, table 9.7 shows the advantages and disadvantages of bilateral and multilateral frameworks for cooperation over multinational river basins. It suggests that it is easier for co-basin countries to cooperate on the basis of a bilateral framework, whereas the functionality of multilateral cooperation is problematic – but advantageous, if possible. With a free flow of information between the parties in a multilateral framework, long-term planning and prediction of possible effects could be possible and also could take into account the economy of the parties, owing to its long-term perspectives. If, on the other hand, one or two of the co-basin countries are ready to make use of the water

Table 9.7 Advantages and disadvantages of the bilateral and multilateral frameworks

Parameters	Type of framework	
	Bilateral	Multilateral
Governance (functionality)	Easier to operate	Problematic but advantageous, if possible
Technical cooperation	Easier	Difficult but advantageous
Time considerations	Suitable for shorter term	Necessary for longer term

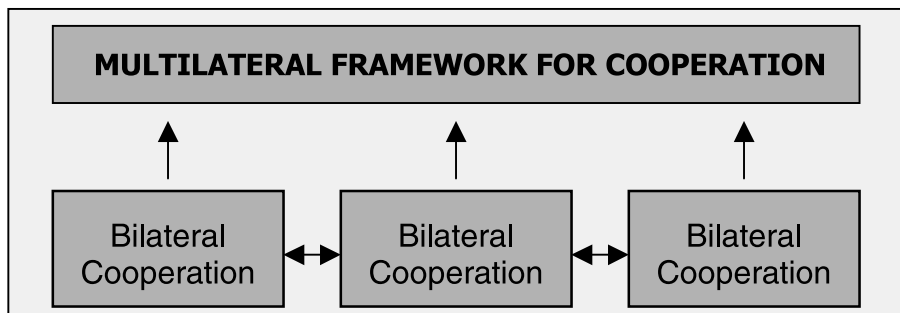


Figure 9.9 Framework combining bilateral and multilateral elements

available, this could be accomplished more easily on a bilateral basis, but does not give long-term benefits based on sustainability.

The three main factors that, therefore, differ for the two types of cooperation – bilateral and multilateral – are (a) the establishment process, (b) satisfaction of individual interest, and (c) the conduct of meetings. In order to manage the dilemma and put the river-basin concept in a better light, the framework could be structured as shown in figure 9.9: a bilateral cooperation as part of a multilateral framework could be implemented at basin level; issues concerning two of the basin states could be solved on a bilateral basis, with information passed to the multilateral forum.

Obstacles to, and disagreements on, the two proposed multilateral river commissions

As sustainable development for entire river basins needs to be approached from a comprehensive basin overview rather than from individual national viewpoints or on a bilateral basis, a process to establish a

multilateral river commission has been started in the two basins after the political change in South Africa in 1994. The two cases are similar as far as the newly proposed multilateral river commissions are concerned. The two river basins are now in the process of creating a multilateral river commission, and problems delaying the establishment of the commissions are more or less the same, as the basin states are finding it difficult to establish the river commissions.

In the case of the Limpopo basin, several LBPTC meetings were held to discuss the establishment of a basin-wide commission, but as yet without fruitful results, and the co-basin countries are finding it difficult to reach agreement. The process has been delayed by the possible status of the commission – particularly, if the level of integration were to be so high that riparian states would have to transfer the power to make decisions from their government departments to such a commission (which most states would be reluctant to do). This means, among other things, that the commission should have what is termed as an international legal personality (ILP) in both cases. The aim of the ILP is to ensure that the proposed Limpopo River Commission (LRC) receives a mandate from the co-basin states. The current constraint on establishing the LRC has mainly to do with hesitation of the downstream riparian, Mozambique, which is concerned about its riparian position and economic capacity and may want to see a clear-cut allocation within the basin. Mozambique also requires that the LRC should supersede all existing bilateral agreements – which is both illegal and impractical for Botswana and South Africa. Countries clash also over concepts and terminology (such as river basin versus watercourse). Zimbabwe, with its domestic crisis, has not been represented in the meetings convened on the establishment of the LRC, apart from the last one.

In the case of the Orange basin, the proposal to create a multilateral river commission was delayed mainly by two issues – disputes over the name of the proposed commission and over its status. South Africa and Lesotho are in conflict over the name of the commission – Orange or Senqu – their arguments being strongly related to the sovereignty of the states. As in the case of the LRC, the states could not agree on some of the provisions in the draft agreement, such as the future status of the commission. Despite having no recorded run-off contribution to the main Orange River, Botswana has the legal right to be a party to the negotiation process. According to rational thinking, as well as in international water law, run-off contribution is not a condition for participation in such a process: the most important factor is to be geographically part of the drainage basin, irrespective of run-off contribution, human settlement, economic activities, etc.

States, therefore, lack adequate terms of reference to create the commissions. Nevertheless, cooperation on this aspect to create multilateral river commissions for the river basins in the study does not seem to progress from the level of meeting, discussion, negotiations, and principle to action and commitment. In order to facilitate and promote the establishment process of the multilateral river commissions, the involvement of a third party, such as the SADC, might be useful. Because one identifiable feature in these processes of commission establishment is a lack of understanding of negotiation skills and of the whole nature of diplomacy, the role of a third party could be to promote these issues.

Main factors affecting establishment and functionality of cooperation

As shown by the two case studies, the factors that influence functionality include (a) the type and structure of cooperation – bilateral or multilateral, (b) the objectives and scope of the cooperation, (c) the interest(s) of individual co-basin countries in the cooperation, and (d) trust between the cooperating parties. It is essential that the functions and objectives of cooperations are clear and specific, if concrete results are to be achieved. In the case of the LHWP, the aim was to transfer a certain amount of water from Lesotho to South Africa, in return for royalties and hydropower for Lesotho. In many river basins, integrated-management schemes are discussed with less tangible results. Integrated water-resources management (IWRM) is necessary but infeasible because it may mean that every issue should be discussed; this requires the cooperation to be broader than merely concerning water. Interest in terms of mutual benefit is another major factor and key issue influencing the functionality of the entire cooperation. This is where economic benefit comes into the picture. Lesotho and South Africa have been engaged in their LHWP cooperation to share the benefit from their undertakings; the countries have, therefore, been talking about joint benefits and mutual interest. Trust is another important factor and fundamental issue in the functionality of cooperation over shared water resources, and has mainly to do with the norms and value systems of individual states. Above all, political will and commitment is a decisive factor in the whole question of cooperation over international rivers, because if there is a will there will always be a way for a crisis on any subject. In any negotiation, establishment, or functionality of a cooperation, two issues are influential: (a) who will pay the cost or receive the benefit, and (b) when? In the case of the LHWP, these events were simultaneous and mutual.

In addition, droughts, floods, and water pollution give riparian states added motivation towards cooperation.

*Joint water-development projects on international rivers**Factors that enable the implementation of joint water projects on international rivers*

In the Limpopo and Orange rivers there have been two international water projects – the LHWP and the project investigated by the JULBS. The former has materialized, whereas the latter did not produce the project that was anticipated to be undertaken jointly by Botswana and South Africa. Pre-feasibility studies of the two projects were undertaken by bilateral institutions – the JTC and the JPTC. Implementation of these joint projects was influenced mainly by three factors:

- physical aspects of the river (topography and hydrology);
- economic interests of states in terms of benefits; and
- political relationships between basin states.

The LHWP became viable because of these factors. In comparison with South Africa's national project of the OVTS, the LHWP had advantages in terms of its physical aspects (mainly the topography and hydrology of the Senqu River). In view of these physical advantages, which imparted significant cost savings to South Africa by employing gravity, the two countries discussed how they could benefit economically from a joint undertaking. In addition to their cost savings, the local economy of South Africa, with its increasing demand for water, needed a reliable long-term source of water. Lesotho was also able, through the LHWP, to prevent the loss of (and to exchange) its natural resource – water, the “white gold of Lesotho” – into a long-term source of income for the nation and a cheap renewable source of energy – hydropower; thus, the interest of the two states was mutually satisfied. The joint project became possible to implement when it became politically viable in 1986 after a change of political regime in Lesotho. In the event of negotiations failing with Lesotho, South Africa would implement the OVTS as a national scheme, despite the physical and economic disadvantages compared with the LHWP.

This is exactly what Botswana did when the JULBS concluded that joint dam projects with South Africa on the upper Limpopo River were not viable for both technical (physical) and economic reasons. Technical reasons included the fact that the dam sites were very flat, necessitating wide dams and a large capital investment; the yield would have been relatively low, as the area is very hot so the evaporation losses would have been very high; the sediment load of the river is very high and the storage capacity would have had to be increased in order to maintain a specific yield. The economic analysis showed that a scheme based purely on irrigation is unlikely to be justifiable in economic terms. Nevertheless, the

results of the study were in accord with Botswana's interests in both urban and irrigation supply, but not in South Africa's interest in irrigation as it could not meet the development cost. The decision (not to build dams) was basically an economic one, but was very much influenced by the fact that the dam basins along the Limpopo are very unfavourable and thus would confer very high unit costs on the water, which irrigation bodies could not afford (Van Rooyens pers. comm. 1999). The cost-benefit ratio of the dams was not advantageous to South Africa, as these schemes would call for a substantial subsidy for its irrigated land.

Despite the good relations between Botswana and South Africa, their individual interests could not merge in economic terms. Botswana then proceeded to build a dam (Letsibogo)²¹ of its own on the Motloutse River (a tributary of the Limpopo in Botswana) in its national territory and South Africa was given notice of this; thus, Botswana transformed the anticipated but infeasible joint project into a national project.

Future inter-basin water-transfer schemes and joint water projects

As the use of the limited water resources in national territories is dwindling, and as almost all economic dam sites have already been developed, the utilization and joint development of water resources in international rivers are becoming more important. If joint developments on shared rivers are to be undertaken, the factors analysed in the previous section should be given great consideration. In terms of time, an inter-basin water transfer scheme takes longer: the LHWP took 40 years from the time of its original initiative in 1950s before it transferred water out of Lesotho to South Africa to make that dream a reality. Lesotho and South Africa are two riparians of the Orange basin; this project would have been more difficult, if not impossible, if one of the states had not been a riparian to the basin.

This is a good pointer for any future plan to divert water from the major water-abundant rivers located north of the Limpopo and the Orange basins. In order of magnitude, these are the Zambezi (to which South Africa has no legal claim) and the Congo (to which none of the countries in the Limpopo and the Orange basins has a legal right). However, the issue of inter-basin water transfer is an important factor in the quest for cooperation over, and development of, shared river systems.

Conclusions

The management of water resources in international river basins is becoming increasingly critical and important from the developmental, political, institutional, and environmental perspectives. Much of the SADC

region is water scarce and most countries in the region lack significant alternative sources of water to the shared rivers. These shared rivers make water one of the most important factors for cooperation and regional integration. Despite the promising, recently revised text of the SADC Protocol on Shared Watercourses, comprehensive and coordinated joint management and planning of shared rivers in this water-scarce and water-dependent region remain problematic. The great degree of regional cooperation necessary calls for difficult decisions to be made by all SADC member states with regard to the management and development of shared waters. The formation of an institutional structure probably represents one of the greatest obstacles that river-basin states need to overcome. It is safe to conclude that international water resources can be managed effectively and utilized optimally in the presence of a well-established and well-operated legal and institutional framework for cooperation in the form of an RBO, of which all basin countries are permanent and active members, if common security is to be achieved. Cooperation between states concerning international water resources is crucial, not only for the management of a scarce resource but also as an instrument to build and strengthen bridges between nations and to maintain functional communication; it is also required for the securing of financial support from donor and international communities. Multilateral cooperation over shared water resources may pave the way towards settlement of more contentious issues. In line with this argument, international water cooperation can be a confidence-building exercise, as it can set the stage for greater dialogue between nations, possibly leading to increased political, scientific, and diplomatic contacts.

The Limpopo and the Orange River basins are international river basins located in water-scarce but developing regions with an increasing demand for water. Supporting areas of economic activities, the water resources of the two basins are adequately developed for a variety of purposes; further developments are also planned and inevitable.

In both river basins, efforts have been made to establish a collaborative mechanism for cooperation and joint development. Identifying four bilateral and one multilateral examples of river cooperation, it was found that countries cooperate more on a bilateral than on a multilateral basis. Despite fragmented systems of institutional mechanism, bilateral cooperation functioned better than a multilateral framework, as basin countries find it easier to cooperate on a bilateral basis. Although it is not a sustainable framework for shared river cooperation in the long term, bilateralism represents coordination rather than integration and confers short-term benefits. The bilateral organization has practical (technical) advantages, whereas the multilateral one (if materialized) has political advantages. The LHWC and LBPTC, established in the same year, have

different achievements. This may be because the LHWC is bilateral and the LBPTC is multilateral; however, more importantly, the LHWP had specific issues to address (i.e. the LHWP), whereas the LBPTC was covering a wide range of issues of no immediate economic benefit or interest to the basin countries. The structure/type of cooperation, the objective, and the individual riparian interests in the cooperation therefore seem to be the main factors influencing the establishment and operation of a cooperative project in a shared river basin.

Because previous perceptions and policies based on bilateralism are now changing, stronger political commitments are necessary in order to establish a basin-wide multilateral framework. The two cases clearly demonstrate the difficulty in finding a common platform to establish a basin-wide commission for collaboration between all basin states. International collaboration in the two river basins has yet to reach the stage where the technical-operational, legal-institutional, and political processes are well balanced. Although countries in the two basins have agreed, in principle, to create basin multilateral river commissions, in practice their cooperation does not appear to make any progress from meetings and discussion. This also shows that establishment of a multilateral river commission requires a long period of preparation. In future, it may be more difficult to operationalize such bodies.

Socio-economic and political conditions have a major influence on the establishment as well as on the operation of joint institutions in international river systems. Political factors have a significant impact on the establishment and functionality of a cooperative venture regarding international fresh water. The LHPW was needed for the economic development of South Africa but was implemented only when the political conditions became favourable. Political differences between the Limpopo basin countries and lack of specific objectives have hampered the development of the LBPTC. The establishment of the LBPTC was not economically motivated, which is why it could not function for about a decade. South Africa's political change in 1994 had a positive effect on the shared-water situation in the case study area, as it reactivated the LBPTC. Despite the fact that IWRM is essential, cooperation should address specific issues, such as hydropower development or water transfer. On such a basis of specific issues, Lesotho and South Africa have jointly implemented the LHWP and benefited economically through sharing the cost and benefits from the cooperation. This approach emphasizes a shift from water right to benefit sharing on the basis of the needs.

The LHWP became possible because of (a) the physical advantages of the Senqu River in Lesotho, (b) the economic benefits to both countries, and (c) the good political relations between the two. In any joint water project on an internationally shared river, these three factors should be

taken into account. It seems difficult to find a situation where all these factors are dealt with, which is why, worldwide, there are few joint projects on shared river systems. If an anticipated joint water project becomes infeasible, a nation will transform it into its own national project; water-development projects on international rivers and inter-basin water-transfer schemes take longer. In addition to the three above-mentioned factors, environmental and social issues associated with water-resources development projects are also increasingly coming to the fore.

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Notes

1. PhD candidate and Department of Civil and Environmental Engineering of the Royal Institute of Technology (KTH), 100 44 Stockholm, Sweden.
2. The Holy Quran, particularly version 35 in Chapter 21 (Surah Anbiyaa), version 45 in Chapter 24 (Surah Nur). Many verses of the Holy Quran scientifically discuss the water and its role in the human existence and physical environmental survival.
3. These nine countries are Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe. Namibia was not then independent, but after independence in 1990 it joined the SADCC.
4. Technical water scarcity is one of the three modes of water scarcity, indicating the difficulty in meeting increasing water needs by further water-resources development (Björklund and Falkenmark 1997). Other modes are natural and demographic scarcities (*ibid.*).
5. DM is a policy for the water sector that stresses making better use of existing supplies, rather than developing new ones (Winpenny 1997). Through various incentives and approaches, DM aims at water conservation by controlling its demand.
6. Angola did not sign it until 1999 (SADC 2000) because of its political crisis, whereas Mozambique did sign (*ibid.*), but with reservations (Ramoeli 2000).
7. The Action Plan for Environmentally Sound Management of the Zambezi River System (ZACPLAN) was developed in 1987 under the stewardship of the UNEP with participation of basin countries of the Zambezi River (Nakayama 1999).
8. The United Nations (UN) Convention on the Laws of the Non-navigational Uses of International Watercourses adopted by the UN General Assembly in 1997.
9. According to Water-Resources Planning and Conservation (WRP) 1999, contrary to popular belief, the Orange River was not named after the reddish-orange colour of

its silt-laden water; it was, in fact, named in 1779 by Colonel Robert Gordon, the commander of the Dutch East India Company's garrison (Cape Town) during a reconnaissance into the interior, in honour of the ruling Dutch House of Orange (Conley and van Niekerk, 1998; WRP, 1999). The Orange River is also known as Gariep or Dragon River by the Bushmen.

10. Lesotho, with its high mountains and deep valley, is known as the "Roof of Africa."
11. In 1988, the wettest recorded year, it was estimated at 26,000 MCM, while the average annual flow for the two driest years was estimated at only 1,100 MCM (Conley and Van Niekerk 1998: 2).
12. Noordoewer is a small town on the border (river) between the two countries but on the Namibian side.
13. These are based on my discussions with various senior members of staff at the DWAF in South Africa during my study visit, including Claus Trieble, Frans Stoffberg, Peter van Niekerk, and Peter Pyke. I also had discussions with members of the Department of Water Affairs (DWA) within the Ministry of Agriculture, Water and Rural Development of Namibia, where I made contact with Mr Piet Heyns, who is a director of the DWA and a permanent member of the PWC.
14. In a Treaty between Germany and Great Britain, the southern border of South-West Africa (now Namibia) was laid down as commencing at the mouth of the Orange River and ascending the river to the point of its intersection by the longitude 20°E. However, South Africa moved it to the northern bank of the river to keep the Germans away from direct access to the river, which could give the legal right to abstract and divert water. However, the earlier definition of the border along the Orange River was not according to internationally accepted principles (Heyns 2000b).
15. As measured in the river at the border between Lesotho and South Africa, 70 m³/s is almost half of the total water resources available in Lesotho.
16. In 1986, Lesotho's defence force seized power by means of a bloodless *coup d'état*. Many authors believe that South Africa's desire for access to additional water resources was the ultimate motive behind South Africa's support for the *coup d'état* in Lesotho in 1986. They cited the fact that after 30 years of fruitless negotiations with Lesotho to provide water to South Africa's industrial complex, after the *coup* the two governments reached an agreement on the LHWP. After the political change, relations were improved and the final obstacles to the LHWP were removed. The LHWP Treaty was signed by South Africa's apartheid government and Lesotho's military regime, but is now accepted by the two democratic governments in power.
17. According to Protocol VI, signed in 1999 by the two countries, the name of the Commission, JPTC, has been changed to the Lesotho Highlands Water Commission (LHWC).
18. According to Wolf (1997b: 11), in the 1964 agreement, Iraq "gives" water to Kuwait without compensation.
19. The perception in Mozambique is that the upstream more powerful state, South Africa, was over-utilizing shared waters in the Limpopo River (Mutembwa 1998), and this made Mozambicans suspicious about any step taken by South Africa.
20. The river-basin concept is one of the key principles of integrated water-resources management (IWRM). The IWRM approach can not be achieved and implemented in a fragmented institutional set-up. The 1992 UN International Conference on Water and Environment (Dublin) and the 1992 UN Conference on Environment and Development (Rio) called for IWRM, using river basins as the focus.
21. The Letsibogo Dam is an important component of the North-South Carrier Project transferring water from the north of the country to the south, mainly to supply Gabarone.

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Interaction and existing constraints in international river basins

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Introduction

Living in an arid region, one is always aware of the importance of water and how it can affect the socio-economic development of a state or region. In Southern Africa, with its various climatic conditions, water is certainly one of the most important resources. The physical environment of a region can determine the population settlement of people in such a territory: for example, lands that are deficient in moisture, such as Namibia, are sparsely settled (Stutz and de Souza 1998: 53). Furthermore, Gray (1988: 9, cited in Gabriel 1994: 109) says that “physical geography largely governs economic geography, which determines social geography, which in its turn is a major influence on the evolution of political forms.” Although Gray (1988) said this within the context of superpower rivalry during the Cold War, there seems to be some merit in his view and in the connection he makes between the physical space we live in and our political behaviour.

One should be cautious about ascribing population distribution and political behaviour to natural elements alone, however. To argue that only natural elements control the location of people and groups and the manner in which they interact politically is deterministic. Climatic extremes, such as inadequate or low rainfall, can present difficulties for human habitation and cultivation; however, given the forces of technology, such deficiencies of nature can increasingly be overcome. Water storage

and irrigation are examples of the extensive measures that technology offers to residents of otherwise harsh environments (Stutz and De Souza 1998: 53). Namibia, again, is a case in point. The country is situated in a very dry climatic region of Southern African, with a relatively low mean annual precipitation (MAP) relative to its neighbours – in fact, it is the driest country in the Southern African Development Community (SADC) (Devereux and Naeraa, 1996: 427–428). It would appear that Gray and Stutz and De Souza have a point and that they argue from the same principle: one cannot ascribe the foreign policy decisions of a state to only one attribute, whether it be geographical or political. It would appear that the best way to go about such matters is to look at some of the major influences on foreign policy from a holistic point of view, incorporating both geographical and political factors. Sprout and Sprout (1965: 27 cited in Dougherty and Pfaltzgraff 1990: 53), indeed, state that the international political milieu cannot be fully understood without reference to the “whole spectrum of environing factors, human as well as nonhuman, intangible as well as tangible.” They have given the following definitions regarding the environment: “Environment may be defined as a generic concept under which are subsumed all external forces and factors to which an organism or group of organisms is actually or potentially responsive; or environment may be limited to the material and spatial aspects of the surrounding world, to the exclusion of the commotion of human social relations” (in Dougherty and Pfaltzgraff 1990: 76). Aristotle, furthermore, believed that people and their environment are inseparable, and that we are affected by both geographical circumstances and political institutions (Dougherty and Pfaltzgraff 1990: 53). There is, therefore, a relationship of dependency between humans and their environment. Nevertheless, the physical environment not only limits human conduct but also provides opportunities (Dougherty and Pfaltzgraff, 1990: 59); the same can be said for the political dimension.

What are we, as political scientists, to make of such constraints and/or circumstances that nature and society impose on us? Humans are, after all, part of nature in the sense that we are natural beings. Furthermore, humans are not in any politically relevant respect non-natural (Hayward 1998: 8). Humans, like any other life forms, constantly face the myriad of problems of adaptation to the conditions of life on earth. Adaptation, for humans, means discovering and inventing ways and means to deal with nature and other humans (Sabine and Thorson 1973: 1). This implies a sort of a dualism: while we are natural beings, we are also political creatures. In fact, it was Aristotle who said that “man is by nature a political animal” (Heywood 1997: 7). It is, therefore, entirely appropriate that we study such natural and political constraints and opportunities regarding

our relationship with one of the most important resources on the face of the earth – water. More specifically, and closer to the issue at hand, what impact do such factors have on the foreign policy of Namibia regarding the waters of the Kunene River¹ system? Another important question to be answered in this chapter is what may happen in the near future under these restrictions in this small but important river system. In this regard, it should be noted that foreign policy and politics, as such, are purposeful activities. Foreign policies are designed to sustain or change a current object, condition, or practice in the international environment. Although some policies are designed to change conditions abroad for their own sake, most are intended to promote some domestic purpose. The search for security, welfare, autonomy, and prestige – the things that all governments pursue – arises primarily from domestic needs (Holsti 1995: 250) and this may have an influence on the foreign policies of governments.

This implies that a number of constraints and opportunities can have an impact on the way in which a country utilizes its river systems, and how it interacts with the neighbours with which it shares an international river. This chapter takes a closer look at such aspects regarding the Kunene River and how they manifest themselves in the interaction of copararian states in the river basin – Namibia and Angola. It is argued that the water politics of the Kunene River moves in a direction opposite to that of conflict: the Kunene River seems to be the antithesis of the traditional assumptions about conflict in international river basins in arid regions. It is traditionally assumed that, in arid parts of the world, conflict over water at some point is almost inevitable.

In order to address these issues this chapter is divided into four parts. The first section offers a geographical description of the Kunene basin. The delimitation of the river basin is in accordance with international legal principles as outlined by the International Law Commission (ILC) of the United Nations (UN). This identifies the states sharing and utilizing the river and puts the study into perspective. Secondly, the existing sociogeographical constraints and opportunities that could have a bearing on future relations between the riparian states are outlined. Thirdly, a brief hydropolitical history is sketched in order to place the interaction of the riparian states in context and to evaluate the impact of the political constraints and opportunities on water politics within the basin. From this, a pattern is likely to emerge that might shed some light on the future political interaction between Namibia and Angola. In the last portion of the chapter a conclusion is drawn, outlining this likely future mode of political intercourse. A number of future research topics are also identified.

Delimitation of the river basin

The ILC of the UN defines an international river as a watercourse of which parts are situated within a number of states. This definition includes the main stream of a river or stream that crosses a border, as well as tributaries of such watercourses or lakes that transcend a border; groundwater resources that are linked with the international river are also included in the definition (McCaffrey 1995: 154). From this definition one can recognize three types of international rivers – one that traverses a border, one that forms the border between two states, and a river that has a combination of these two characteristics.

The Kunene River is an international river in that it forms part of the north-western frontier between Namibia and Angola and its drainage basin covers part of both of these countries' territories. The Kunene River rises in the central highlands of Angola near Nova Lisboa, where the annual rainfall is in the region of 1,500 mm. It enters the Atlantic Ocean at Foz da Cunene, where the discharge is in the order of 15 km³/year. Precipitation decreases from north to south in its drainage basin. The Kunene is 1,050 km long and has a catchment area of 110,000 km². The last 340 km of the Kunene make up the border between Namibia and Angola. The area where the Kunene has its source is quite mountainous. After it forms the border between Angola and Namibia, the flow accelerates and, for 30 km, it runs through ravines and over rapids and waterfalls. The Kunene River is non-navigable, with a number of cataracts making commercial transport on the river impossible. The largest of these cataracts is Ruacana, which is about 122 metres high. Matala Falls, a cataract near Sa da Bandeira in Angola, is utilized for a 27,000 kilowatt (kW) hydroelectric installation. It is estimated, from an engineering perspective, that the Kunene River has a surplus of water (Conley 1995: 7). These physical characteristics also mean that the Kunene River has hydroelectric potential (Best and de Blij 1977: 327), which could form the backbone of Angola and Namibia's economic development.

Existing constraints

It should be made clear from the outset that monocausal theories explaining the "why" in foreign policy are inadequate, because a major trend or direction of foreign policy is seldom chosen for a single reason or purpose (Holsti 1995: 252). In other words, to explain the type of interaction in the Kunene basin along the lines of climatic conditions in Namibia only will not be a sufficient answer to why the Kunene River system is experiencing cooperation rather than conflict. Governments

operate in highly complex external and domestic environments, which contexts offer both opportunities and constraints. Policy makers have to respond to them constantly by making choices, all the time trying to protect or advance their nations' interests, however they define them. Very seldom is it just a single circumstance that compels policy makers to reduce their field of choice (Holsti 1995: 252) and to opt for a certain action in an international river basin. It is to this end that a number of key constraints and opportunities can be identified that have had an impact on the hydropolitics in the Kunene River and may, in future, still have a significant influence. These constraints can be divided into two groups and are as follows:

1. Geographical

- climatic conditions
- population growth and urbanization
- hydroelectric imperative
- the location of large settlements relative to permanent water resources
- the nature of Namibia's international rivers
- Namibia's riparian position;

2. Political

- Angola's civil war
- the Himba community and the future development of the Kunene River.

It should be kept in mind that these constraints should not be seen as risks that can propel the game of water politics, within the basin, into the direction of conflict; they also hold much opportunity. These limitations can have an impact on the hydropolitics of a river basin, in that they can give rise to greater collaboration and functional cooperation between riparian states. Most of these constraints are also of a geographical and topographical nature. Although population growth and urbanization and the hydroelectric imperative, for instance, have been chosen as constraints, they are ultimately influenced by geographical and topographical conditions. For this reason, Holsti (1995: 256) says that "socio-economic and security needs are clearly related to geographical and topographical characteristics. Natural endowments are distributed unevenly around the world. Witness the Middle East's vast oil reserves, while it is at the same time a water scarce region. It is not difficult to expand at length on the opportunities, vulnerabilities, and constraints that geographic and topographic characteristics have on different countries' security, welfare, and autonomy problems. As in all policy, there are choices. Geographic and topographic features can substantially narrow and condition these choices, but they rarely determine them." Is this the case with the policy choices taken by Namibia and Angola regarding the Kunene River basin

or is there more to it? In the next section I discuss these geographical and topographical constraints as they relate to Namibia in a detailed account in order to shed some light on this question.

Climatic conditions

Although the greater part of Namibia lies in the tropics, the climate of the country is typical of a desert country, with hot days and cool nights. The cold Benguela Current modifies temperatures, reduces rainfall, and causes fog along the coast (Leistner, Esterhuysen, and Malan 1980: 1). Rainfall is irregular and torrential and its effectiveness is further reduced by the high rate of evaporation. The MAP decreases from more than 500 mm in the north to 350 mm at Windhoek and less than 100 mm in the south (Leistner, Esterhuysen, and Malan 1980: 1) of the country. The average MAP for the entire country is approximately 284 mm (Devereux and Naeraa 1996: 427–428) and the total surface-water reserve stands at around 4.1 billion cubic metres (BCM)/year. Of the total rainfall, 83 per cent (between 2,600 and 3,700 mm) evaporates immediately after it has fallen, while the other 17 per cent is carried away as surface run-off. Of this remaining 17 per cent, 1 per cent percolates into the ground to replenish groundwater resources and 14 per cent is lost to evapotranspiration; only 2 per cent remains to be stored (Food and Agriculture Organization 1997). This does not leave Namibia much room for manoeuvre as regards the development of its internal surface-water resources.

The climatic conditions of Namibia give rise to one of the true deserts on the continent south of the Sahara – the Namib Desert. This covers an area of some 270,000 km² and played a significant role in discouraging and delaying colonial penetration from the coast to the Namibian interior until late in the nineteenth century. The coastal strip of the desert receives less than 20 mm/year (Wannenburgh 1984: 60), while in other parts no rain may fall for years on end (Leistner, Esterhuysen, and Malan 1980: 1); water is thus of the utmost importance in this part of Namibia. Namibia is, therefore, dominated by deserts, and this has a great influence on human settlement patterns.

An example of how climatic conditions in Namibia can influence the settlement of people is to be found in a section of the history of the Herero people. A severe drought during 1829–1830 forced the Herero, who are primarily cattle breeders, further southwards from the area around the Etosha Pan (where they had settled earlier) to the present Okahandja and Windhoek areas (Leistner, Esterhuysen, and Malan 1980: 5–6). The climatic conditions and subsequent limited availability of water resources in the interior of the country have largely determined the pat-

tern of settlement of peoples within the country. Most towns can be found in the north of the country, mainly because of the higher rainfall.

Many nineteenth- and twentieth-century scholars (among them Henry Thomas Buckle² and Ellsworth Huntington³) were convinced of the importance of climate as a conditioner of political behaviour among actors in political societies and world politics (Dougherty and Pfalzgraff 1990: 56). However, it would be rather limited to ascribe the international political behaviour of Namibia, as regards the water resources of the Kunene River, to climatic conditions only: climate is an important aspect in this equation, but it is not the sole determinant in the hydropolitics of the Kunene River; other factors also play a considerable part in the international relations of the Kunene River.

Population growth and urbanization

Namibia has an estimated population of 1.62 million people (SADC 1999: 230). The country has the lowest population density in Africa (1.7 people per km²); the average population density is around 2 people per km² in the north and less than 0.3 people per km² in the south. The annual population growth rate stands at about 3–3.5 per cent (FAO 1997), which is relatively high if compared with international standards. According to the 1991 census, about 27 per cent of the population live in urban areas (SADC 1999: 230); The largest portion of the population, therefore, lives in the rural areas. However, urbanization could increase in the near future, because people are no longer restricted to the homelands that were set up by the South African government in the 1970s and 1980s. This could place more pressure on Namibia's internal water resources; it could also mean that Namibia will look increasingly to its international rivers to supply water to the growing urban population (Moyo, O'Keefe, and Sill 1993: 178–179). Because most urban centres are situated in the north of the country, Namibia is more likely to turn to its northern rivers – the Kunene and Okavango – to supply water to the urban areas.

Hydroelectric imperative

In 1995 the Royal Dutch Shell Oil Company announced that a large reserve of methane gas had been discovered in the Kudu Gasfield, 130 km offshore from the Orange River mouth. It is estimated that the field holds between 85 and 284 BCM of gas (African Review 1997: 157). Namibia is, at present, in conjunction with the South African utility ESCOM, building a thermal power plant that will be powered by this gas. This power

plant will have a capacity to produce 750 MW electricity and is expected to come online in 2001 (*Engineering News*, 20–26 June 1997). This power plant will have a limited capacity to generate electricity for the foreseeable future. A hydroelectric power station on the Kunene River at the site of the Epupa Waterfall could generate electricity for Namibia's mining sector for a much longer period of time (P. Heyns, pers. comm. 25 September 2000). Namibia is not very rich in coal reserves and is, therefore, dependent on South Africa for its electricity needs, which it is importing at great expense; a new hydroelectric power installation on the Kunene River, together with the Ruacana and Calueque schemes, will make Namibia self-sufficient with regard to electricity, which means that it will no longer have to look to its southern neighbour for its electricity needs.

The nature of Namibia's internal and international rivers

Ephemeral rivers criss-cross Namibia's interior. The flow of these rivers is unreliable, short in duration, and uneven, at best. The total surface-water reserve from these rivers is only 200 million cubic metres (MCM)/year (Hay 1995: 1). Evapotranspiration is the main culprit in this equation, owing to the nature of Namibia's climate. Namibia is very dependent on groundwater reserves, which help to alleviate the water scarcity within the country.

The only perennial rivers in Namibia are international rivers on which Namibia is also very dependent for a number of needs (Ashton 2000: 77–78). These rivers include the Orange, Okavango, Kunene, and Zambezi rivers. Because of Namibia's dependence on these surface-water resources, international agreements between Namibia and its neighbours are necessary to develop these rivers (Moyo, O'Keefe, and Sill 1993: 178–179) as is the case with almost all international rivers across the world. This fact was reiterated by Heyns when he said that "Namibia is in a constant process of negotiations with its neighbours regarding the utilisation of its international rivers" (P. Heyns, pers. comm. 25 August 1997). International surface-water resources constitute one of the most important aspects of Namibia's foreign policy. Because Namibia is so dependent on international rivers, the country has no alternative but to negotiate agreements continually with its neighbours regarding these river systems.

Namibia's riparian position

Namibia is the downstream riparian state in nearly all the international rivers it shares with its neighbours; this is true for the Orange and Ku-

nene rivers. This geopolitical downstream position in the Kunene River system continues to have an influence on Namibia's diplomatic activities. Namibia was also the first state involved in other river basins, such as the Orange and Okavango, to moot the idea of an integrated river-basin commission (RBC). This certainly gave Namibia much status and prestige in the Southern African region as regards diplomatic conduct and water resources. This positive diplomatic conduct is also felt in the Kunene River, although an integrated RBC has not yet materialized in the basin. Possible reasons for this are the number of riparian states sharing the Kunene, the international relations between Namibia and Angola, and the numerous agreements and functional organizations already in place in the Kunene basin (see pp. 258–268).

As regards Namibia's foreign relations with Angola, the two countries have, in the past, enjoyed a very good relationship, which was established during the struggle by the South-West Africa People's Organization (SWAPO) for Namibia's independence. During Angola's civil war and its violent conflict against South Africa and the National Union for the Total Independence of Angola (*União Nacional para a Indêpendência Total de Angola*; UNITA), much-needed support was given to SWAPO, which is today the ruling party in Namibia. In return for the support given by Angola to SWAPO in the past, Namibia has aided the Angolan government's civil war against UNITA in recent times. This mutual support has given rise to a number of agreements in the 1990s between Namibia and Angola regarding the utilization of the Kunene River basin (see Kunene's hydropolitical history, pp. 258–268).

The location of large settlements relative to permanent water resources

Long-distance water-transfer schemes have been undertaken to supply remotely located development centres. The Eastern National Water Carrier (ENWC) is an example of such a scheme. All development initiatives in Namibia must appraise the accessibility of water resources; any development that requires large quantities of water has to be carried out along Namibia's international rivers. Development in the central area (Grootfontein, Karibib, Usakos, and Omaruru) must consider that water will, in future, have to be imported at great cost from the perennial border rivers. The cost of water will also increase in the central coastal area (Swakopmund and Walvis Bay), where sea water is desalinated to supply fresh water (SADC 1999: 250). Thus, in future, Namibia could look more to its international rivers and unconventional water sources such as desalinated sea water to supply the growing water needs of the country. The question that needs to be looked at now is whether these constraints

and/or opportunities are the only determinants of interaction in the Kunene River basin.

A hydropolitical history of the Kunene River

Because Namibia is not very richly endowed with internal water resources, the states that had control over Namibia in the past (Germany and South Africa) and the present legitimate government came up with a number of coping strategies which followed adaptive behaviour. Adaptive behaviour is defined as a manifest response to water scarcity and can take any one of a number of forms, perhaps the best example being the undertaking of large water projects to alleviate water scarcity. A coping strategy can be defined as an initiative by the decision-making élite, usually in the form of some coherent policy or set of strategies such as water-demand management, that seeks to manage the water scarcity in one way or another (Turton and Ohlsson 1999: 3). Adaptive behaviour and coping strategies have been part of the dynamics of water politics in the Kunene River in the twentieth century and beyond, and usually take the form of large-scale water projects to step up the supply of water and electricity in different areas of Namibia. For instance, at around the turn of the nineteenth century, the German colonists Brincker and Gessert first suggested damming the Kunene River to supply water to German South-West Africa (Deutsch SüdwestAfrika). Later, when South Africa held sway over Namibia,⁴ development of the Kunene River was undertaken in order to facilitate overall development (Christie 1976: 31). This took the form of a hydropower station at the Ruacana Falls, a regulation dam at Calueque, and a canal from the Calueque Dam into Owamboland. Dirk Mudge, South African Member of the Executive Council (MEC) and acting administrator of Namibia in 1976, held the following view regarding the development of the Kunene River and what it holds for Namibia: "The Kunene scheme is very important, for one just cannot develop these territories without water and electricity ... We need a strong economy to provide jobs in the southern sector for people from the native homelands. One cannot have a strong economy without infrastructure" (Christie 1976: 40, personal interview with D. Mudge). Mudge's statement is a clear indication of the coping strategies and adaptive behaviour followed by South Africa in relation to the Kunene River.

Because the Kunene River is an international river, it was necessary for the entities that controlled Namibia and Angola in the past, and for those who do so at present, to come up with some agreement on the sharing of the river's water. International agreements and cooperation

regarding the waters of the Kunene River formed part of the coping strategies envisaged by Namibia and Angola. However, it was not always plain sailing to develop the Kunene River, for international political factors had (and, in part, still have) a profound impact on these projected plans. In the next section a closer look is taken at the time span during which these agreements were concluded and in which conflict occurred in the river basin.

From cooperation to conflict: 1926–1988

Cooperation on the issue of the joint management of the waters of the Kunene River can be traced as far back as 1926. On 1 July in that year, the Union of South Africa and the Republic of Portugal signed an agreement to regulate the use of the waters of the Kunene River for the purposes of generating power, inundation, and irrigation in the mandated territory of South-West Africa (SWA) (Agreement 1990; Christie 1976: 31). It was envisaged by Ernest Oppenheimer that one of his companies would build a dam on the Kunene River to supply the mining industry in SWA. At the same time, Jan Smuts tried to redraw the Angolan border to include in the territory of South Africa the dam site at Calueque, but with no success. No substantial infrastructural developments were undertaken after the 1926 agreement. However, the Kunene Water Commission was established to investigate the possibility of damming the Kunene and diverting its water into Owamboland, with a survey undertaken in 1927 (Wellington 1938: 26). However, no development took place at that time, because SWA and Angola were in no great need of water; the ground was, nevertheless, prepared for future cooperation.

In 1962, the government of South Africa established the Odendaal Commission to draft a report on the socio-economic potential of SWA and the measures to be taken to stimulate the rate of development. The final report of the commission was published in 1964; one of its conclusions was that the waters of the Kunene River should be utilized for the generation of electric power. This kind of development could provide a substantial economic contribution to the increased and accelerated development of SWA. A utility, the SWA Water and Electric Corporation (SWAWEK), was set up to develop the power and water potential of the Kunene River (Olivier 1977: 125). This is a clear example of a coping strategy being implemented in the form of an authority to address the energy needs of the territory. This utility was established to enhance the functional operation and utilization of the Kunene River by South-West Africa.

In the same year, a second agreement was reached between South Africa and Portugal regarding rivers of mutual interest to both Angola

and SWA and involving the Kunene River scheme. In 1969 a third agreement was signed between South Africa and Portugal regarding supply-side management projects to be constructed on the river. This development included the following: a dam at Gove in Angola to regulate the flow of the river; a dam at Calueque upstream from the Ruacana Falls for further regulation in conjunction with the requirements of the power station to be built at Ruacana; a hydroelectric power station at Ruacana with a capacity to generate 240 MW of electricity; and a pumping station and canal at Calueque for irrigation purposes in Owamboland. A fourth dam at Matala in Angola was built outside the agreement with a view to generating electricity. In other words, four dams are at present in existence on the Kunene River (Conley 1995: 14). A Permanent Joint Technical Commission (PJTC), which is still functioning today, was established as part of the agreement to oversee the implementation of the different projects (Best and de Blij 1977: 380; Olivier 1977: 128). Functional cooperation is therefore well established in the Kunene River basin, with the possibility of future further collaboration.

Once the infrastructural projects were nearing completion, it was realized that the Kunene River had further untapped hydroelectric potential because of the number of cataracts and waterfalls. After the completion of the Gove and Calueque dams, the Kunene was more easily regulated and it was therefore technically viable to continue with the development of the power potential of the river downstream from the Ruacana hydropower plant. In the late 1970s, SWAWEK estimated the future potential of the river to be 1,560 MW of electricity that could be generated at eight sites along the river (Olivier 1977: 128). This forms the backdrop to current developmental plans for another hydroelectric power station at the site of the Epupa Waterfall.

The infrastructural plans were short-lived. Immediately after Angola gained independence on 11 November 1975, a civil war broke out with the participation of both internal and external forces. The war is still raging today (McGowan 1999: 233) between the government of Angola and UNITA. This has had a profound impact on the dynamics of water politics in the Kunene River. Not only was the fighting concentrated in the southern part of Angola and, in particular, in Angola's Cunene province, but the Ruacana hydropower complex was also seen as an important strategic asset by the warring parties. This was highlighted in 1975 when the civil war was still in its early stages.

South Africa, under Prime Minister John Vorster, was very reluctant at first to become involved in the civil war in Angola.⁵ The reason for this was that South Africa did not want to offend Portugal and international opinion by interfering directly in what was still a Portuguese affair (Barber and Barratt 1990: 191). However, after Cuba became engaged in the

war, on the side of the Angolan government, South Africa became very alarmed. According to Barber and Barratt (1990: 189), the Cuban factor had a critical impact on South Africa's decision to become militarily involved. Throughout the conflict, the Cuban issue was central to South Africa's policy on both Angola and Namibia. South Africa's first military incursion into Angola was in August 1975, when the South African Army intervened to protect the joint Kunene River project at Calueque.⁶ Clashes between the Popular Movement for the Liberation of Angola (*Movement Populaire de Libération de Angola*; MPLA) and UNITA, and harassment of workers at the dam site by the MPLA and UNITA, drew South African troops into Angola to occupy and defend the dam⁷ (Barber and Barratt 1990: 191; Christie 1976: 31). The harassment of workers led to work on the Calueque Dam being halted and this gave rise to the possibility that water to Owamboland would be cut (Steenkamp 1990: 37). This would have had a severe impact on the economy of the region, which is predominantly agricultural.

The action by the South African Army highlights the strategic importance of the Ruacana–Calueque scheme for SWA/Namibia and South Africa's hold on the territory, at that time. South Africa intervened in the Angolan conflict, not to take possession of Calueque or to defend the water resources of SWA/Namibia; the reasons why South Africa initially interceded had to do with South Africa's own security concerns. Three aspects had an impact on this concern – Soviet and Cuban involvement, the threat to Namibia, and the threat also to the Kunene River project. The underlying motive, according to Barber and Barratt (1990: 194), “was to ensure a non-hostile, co-operative Angola, with no Soviet influence, which would not threaten Pretoria's dominance in Southern Africa, particularly in Namibia.” The August 1975 Calueque incident was possibly the catalyst to South Africa's involvement in Angola, for it gave South Africa a foothold in that country, but it certainly was no water war. The main reason for this was that other countries also became involved in the Angolan conflict at that time – the Soviet Union, Cuba, the United States, Zambia, and Zaire. The Angolan conflict was therefore a classic example of a cold war proxy military conflict, fought along the ideological lines of the East–West divide, with the Kunene playing a small role. In addition, a number of African leaders – who also feared communist expansion – supported and appealed to South Africa to become involved in Angola: these were, most notably, Kenneth Kaunda, Mobutu Sese-Seko, Houphouët-Boigny, Julius Nyerere, and Leopold Senghor (Barber and Barratt 1990: 188, 191–192). With the exception of an incident in 1988 (see below), no action took place at the Calueque Dam for the remainder of the war but it was always a source of friction (Steenkamp 1990: 42). Be that as it may, the outbreak of war in Angola and subse-

quent South African involvement had a very negative effect on the cooperative endeavours between South Africa and Angola regarding the Kunene River project. The war is a very good example of a political constraint that can have a negative impact on cooperation in an international river basin.

Furthermore, by 1979, SWA/Namibia considered extending its electricity supply-lines to South Africa. The reason for this was that the Ruacana hydroelectricity scheme was not running at full capacity because of the war raging in Angola. The direct cause was that the South African and Angolan governments could not agree on the operation of the project, and work on the project was suspended. Angola refused to close the sluice gates of the Ruacana Dam and to complete the work on the Calueque Dam. As a result, the power plant at Ruacana could run at only 120–160 MW capacity because of the suspension of the project (*Financial Mail* 24 August 1979: 739). The power grid between South Africa and Namibia was completed in the early 1980s after Ruacana proved incapable of producing electricity at full capacity (*The Cape Times* 22 February 1980: 1). This showed how dependent SWA/Namibia was on South Africa for electricity and also the importance of the Kunene River project for the country at that time. During the 1980s it was still not possible to tap the full potential of Ruacana and Calueque because of the antagonistic relationship between South Africa and Angola. The same thing happened with the Cabora Bassa hydroelectric scheme in Mozambique after the civil war broke out there (*Business Day* 23 March 1987: 6). It is obvious that the Angolan government used the Ruacana and Calueque dams as a lever to strengthen their position in the war against South Africa.⁸ Not completing the project meant that water to Owamboland and electricity to the rest of SWA/Namibia could not be delivered. This presented difficulties for South African operations in the war. However, South Africa's extension of its power grid northwards into SWA/Namibia had a balancing effect on Angola's leverage.

The strategic importance of the Ruacana–Calueque scheme was again emphasized in June 1988 when Cuban and Angolan forces launched an armed attack on the Calueque Dam. During the attack, considerable damage was inflicted on the dam wall and the power supply to the dam was cut; the water pipeline to Owamboland was also destroyed. This was at a time when Owamboland was suffering a severe drought, and negotiations between South Africa, Cuba, and Angola were held at different venues in London, Brazzaville, Cairo, Geneva, and New York (Barber and Barratt 1990: 342; *Die Burger* 29 June 1988: 1) in an attempt to end the conflict.

During the Brazzaville Round of talks, South Africa held negotiations with the Angolan delegation on the status of the Kunene River scheme.

The importance of the project to the drought-stricken Owamboland was emphasized by South Africa. The Angolan side reacted positively to this notion and undertook not to cut water and power to Owamboland (*Die Burger* 29 June 1988: 1); however, the attack took place after Angola's assurance that the water and power would not be cut. The explanation for this could be the Cuban factor: the Cubans probably wanted to inflict as much damage as possible on the South African forces and convinced Angola to attack the Ruacana–Calueque scheme jointly. At the time, a military expert, Mr Helmoed-Rohmer Heitman, declared that the objective of the attack on the dam was to put it totally out of commission. Heitman added that "what is happening is that the Cubans have added to the bill [of South Africa] for defending Namibia. Perhaps they think if they keep on adding to it, the cost will become so great that South Africa will pull out" (*The Star* 30 June 1988: 5). The assurance from Angola not to disrupt the scheme indicated that, as talks to end hostilities progressed, so did steps to cooperate on the development of the Kunene River. It also showed the importance of the Ruacana–Calueque scheme, not only to Namibia but also to Angola. Bilateral cooperation in the Kunene River could start anew after the withdrawal of South African and Cuban forces from Angola. However, the spectre of Angola's continuing civil war, and the involvement of interest groups, added a new dimension to water-resource cooperation in the Kunene River basin during the 1990s.

Outbreak of peace and renewed cooperation: 1989–2000

After peace broke out in Namibia and Angola in April 1989 with the implementation of the United Nations Resolution 435 and the election of the Namibian constituent assembly seven months later (Barber and Barratt 1990: 344), the two countries were very quickly out of the starting blocks to rejuvenate the Ruacana hydroelectric scheme. Delegations from Angola and Namibia met in Windhoek in May 1989 to reactivate the 1969 agreement between South Africa and Portugal. The purpose of the meeting was to discuss the setting-up of a Joint Technical Committee (JTC) and to formulate plans to repair the Gove Dam, which was damaged during the war (*Business Day* 23 May 1989: 3). A second meeting in Luanda in June 1989 set out to discuss the damage to the Gove Dam and to discuss foreign assistance for the repair of the structure, for it was difficult for Angola to raise the money internally because of the war-ravaged economy (*Die Burger* 24 May 1989: 15; *Die Republikein* 13 June 1989: 3). In July 1989, the Administrator-General of SWA/Namibia approved the Namibian component of the JTC. The JTC met for a third time that same month to start planning the reactivation of Ruacana (*The*

Windhoek Advertiser 12 July 1989: 3). Thus, as the constraint of war was removed, cooperation could start anew.

After Namibia had gained independence in 1990, the stage was set for greater cooperation between the two bordering countries regarding the Kunene River. The two governments could start with the socio-economic reconstruction of Angola and Namibia, as they saw fit. The government of Namibia realized that the country needed electricity to power its numerous mining operations and to deliver employment to its people, and a number of coping strategies were considered in order to achieve this. These coping strategies also required written agreements with Namibia's neighbours.

On 18 September 1990, Namibia signed two separate agreements with Angola concerning cooperation over the Kunene River and cooperation in general between the two countries. One of the agreements concerned the reactivation of the three previous agreements between South Africa and Portugal in 1926, 1964, and 1969, respectively. This agreement had a number of purposes:

- To conclude the uncompleted Ruacana–Calueque water transfer and hydroelectric scheme.
- To establish a Joint Operating Authority with the task of ensuring the maximum beneficial regulation at Gove that was needed for optimum power generation at Ruacana and to control the withdrawal of water along the middle reaches of the Kunene. Also, to ensure the continuous operation and adequate maintenance of the water-pumping works at Calueque and the diversion weir at Ruacana.
- To allow the PJTC, established in the 1969 agreement, to evaluate the development of further schemes on the Kunene in order to accommodate the present and future needs for electricity in both countries (Agreement 1990a: 1–2).

This agreement is a clear example of a coping strategy devised by Namibia and Angola regarding scarce water resources. It also shows the opportunities that can arise from joint cooperation between riparian states. The other agreement between Namibia and Angola created the Angolan–Namibian Joint Commission of Co-operation (Agreement 1990b). The commission was to deal with joint cooperative endeavours on a number of issues, one of which was water. This commission was a response to the friendly relations that existed between Angola and SWAPO in the years prior to Namibia's independence (Agreement 1990b: 2). Thus, five written agreements on shared water resources exist between Namibia and Angola, with one on general cooperation between the two countries; these agreements bode well for peaceful interaction in the water sphere in future.

The two agreements demonstrate not only the importance of inter-

national rivers to Namibia's socio-economic well-being but also the relationship between the two countries. The linkage between these two agreements also highlights the fact that the overall relationship between countries sharing a river can be a decisive factor in determining the kind of interaction one can expect between them when it comes to the sharing of the river's resources. In this case, Namibia and Angola's friendly relationship meant that cooperation in the field of water resources would follow as a matter of course.

With these agreements in place, Namibia and Angola could start with joint coping strategies in the water sector to develop their socio-economic outlook. The signing of agreements between Namibia and Angola is therefore a manifestation of the very good international relations between the two countries, and not only Namibia's perilous state of water scarcity. The water politics in the Kunene River basin took an unfortunate and dramatic turn in the early part of the 1990s: first of all, the internal conflict in Angola took a turn for the worse after the breakdown of the Lusaka Accord that was signed between the belligerent parties; secondly, a new kind of actor arrived on the scene that elevated the dynamics of water politics to a new level.

Renewed conflict in Angola

The renewed fighting in Angola meant that neither Namibia nor Angola was able to implement the Epupa hydroelectric power scheme. The civil war in Angola can also be seen as a constraint on the further joint development of the Kunene River system.

After the end of the cold war and the beginning of a new era in world politics, the conflict in Angola seemed to be on the wane and the Bicesse Accords were signed in 1991 between the warring parties in Angola. The Accords were never fully implemented because UNITA challenged the result of the presidential elections held in 1992 (Boulden and Edmonds 1999: 130). The second phase of Angola's conflict started at the end of October 1992 and lasted officially until 20 November 1994, when the Lusaka Protocol was signed in the Zambian capital on behalf of President José Eduardo dos Santos and Dr Jonas Savimbi. Negotiations regarding the Protocol had taken just over a year, following UNITA's announcement of a unilateral cease-fire in Abidjan on 14 September 1993 (Cleary 1999: 145).

When the cease-fire broke down, renewed fighting erupted between the FAA (*Forças Armadas Angolanas*) and UNITA (Cleary 1999: 146). The renewed fighting had a devastating effect on the economy of Angola. As Cleary (1999: 146) puts it: "What little was left of Angola's economy after almost sixteen years of civil war was destroyed between 1992 and

the end of 1994. The GDP declined by seventy per cent over three years; total external debt, as percentage of GDP, almost quadrupled, as did military spending, while social expenditure was halved.” The economic problems of Angola certainly have a negative effect on the country’s water-resource management strategies. The economic situation makes it difficult for Angola to find money to launch new water-development projects, not only internally but also for international projects. Adaptive capacity is therefore at its lowest level and coping strategies cannot get off the ground – except, perhaps, if Angola goes into partnership with neighbouring countries. For instance, fresh water supplied to towns is not potable and cholera is an ever-present threat. Only 32 per cent of Angola’s population have access to safe water, and only 16 per cent have adequate sanitation facilities (SADC 1999: 127). This is a grim outlook indeed. The war, which is still raging at the time of writing, not only has had a negative effect on water-resource development across the whole of Angola but also is hampering the proposed Epupa hydroelectric scheme (Meissner 2000: 154) that holds much promise for Namibia’s energy needs. The war in Angola not only prevents the construction of the dam but also makes it impossible to come to a decision on whether to go ahead with the project at all.

The decision as to whether to build a dam at the Epupa Falls site or the Baynes Mountain site lies with the Namibia–Angola PJTC. During 1998 and 1999, numerous meetings of the PJTC to discuss the proposed projects on the Kunene had to be postponed because of the civil war (*The Namibian* 25 June 1998). The war was not the only factor delaying the decision on the Epupa Dam: the PJTC had to put off a decision in July 1998 on the project after it found that the feasibility study on the project was incomplete (*The Namibian* 10 July 1998). In 1999 the PJTC decided that a meeting should be held in 2000 to make a decision on the Epupa project. The postponement of the decision created a great deal of frustration on the Namibian side because, if the Epupa Dam is further delayed, the cost of the dam could rise and make it unprofitable. A number of projects, such as the Haib copper and Scorpion zinc mines, could be affected by this and thus also the long-term economic outlook of Namibia (*The Namibian* 23 August 1999). The civil war in Angola has therefore had an indirect impact on Namibia’s socio-economic prosperity. At the same time, Namibia and Angola have not seen eye to eye on the sites of the proposed dam: Angola favoured the Baynes Mountain and Namibia the Epupa Falls site. The Angolans’ argument is that, if a dam is built at the Baynes site, it will mean that the Gove Dam, which was damaged in the civil war, could be renovated. This in turn would bring much-needed development to Angola’s Huambo Province. Namibia, however, would like to see a dam built at Epupa: the Baynes site, they argue, is too small,

despite its environmental and social advantages. The Epupa site is regarded as a prestige site by Namibia (*The Namibian* 13 July 1998). A dam at Epupa will also be larger than one at Baynes. The Epupa Dam will be the third-largest dam in Africa, and this holds the promise of much status and prestige for Namibia (Meissner 2000: 155).

In addition, in September 1998 fierce fighting between UNITA and Angolan government police forces broke out at the Gove Dam for control of the installation (*The Namibian* 11 September 1998). The battle at Gove Dam shows that taking control of a water installation is but one of the strategies used by belligerent parties to gain the advantage in an armed conflict. Whatever the purpose of the battle, it has certainly had a severe impact on plans for a future dam at Epupa or at Baynes.

There seems to be a linkage between the damaged Gove Dam, the postponement of the decision about building a dam at Epupa or Baynes, and Namibia's sudden involvement in the Angolan conflict in December 1999. The Namibian President, Sam Nujoma, said that Namibia would back the Angolan government in its campaign against UNITA. The reason for this decision is, again, the long-term friendly relationship between Namibia and the Angolan government (*Mail & Guardian* 15 December 1999). It seems as though the cooperation between Namibia and Angola regarding the war against UNITA is pay-back for the support given by Angola to SWAPO in its struggle against South Africa and UNITA in the 1970s and 1980s. It could also become a bargaining chip for Namibia in the upcoming decision on the site of the proposed dam on the Kunene. Furthermore, the fighting in December 1999 reportedly occurred in the region of the Okavango River, more to the west and away from the Kunene River; this could have been a strategy by Namibia to contain the fighting in that area and to keep it away from the Kunene basin with its strategic water installations. Should UNITA gain ground again and move the conflict towards the Kunene River basin, it could spell trouble for any proposed project on the river. If donor agencies perceive the financing of a dam on the Kunene as a severe risk, Namibia could find it very difficult to secure money for such a project.

The war in Angola will, as long as it continues, have an impact on any international project on the Kunene River. How this constraint will be dealt with in future is difficult to say; it all boils down to the belligerent actors within Angola. The outcome of the civil war is, unfortunately, not in the hands of the Namibian authorities, although Namibia gave support to the government in its fight against UNITA. This support could be an attempt to influence Angola's decision regarding the site of the new dam on the Kunene River – whether it be Baynes or Epupa. Military confrontation is not the only type of interaction that influences hydropolitics in the Kunene River, however: in the mid-1990s, the dynamics of the hy-

dropolitical game in the Kunene River took on a new dimension with the appearance of a different kind of actor – the interest group.

Interest groups in the Kunene River basin

Another possible political constraint on the future joint development of the Kunene and the Epupa Dam is the question of the relocation of the Himba people residing in the area of the proposed dam (Meissner 2000: 119–125). This constraint is not only political in nature but also an ethical issue. The philosophical principle of utilitarianism is applicable in this instance. According to the influential philosopher John Stuart Mill, utilitarianism, based on utility or the greatest happiness principle – choose the action that creates the greatest happiness for all concerned – is the foundation of all morality (Olen and Barry 1992: 34). The principle of utilitarianism would apply in the case of the Himba and the proposed Epupa Dam. Is it in the best interests of Namibia to relocate the Himba in order to build a hydroelectric power plant that will serve the greatest number of people in Namibia? This is an issue that has been debated by environmental and human-rights interest groups across the world. The constraint for Namibia is therefore the rights of the Himba, which clashes with the need for electricity in the mining and industrial sectors of the economy. This constraint will in future be a very real one that may determine the future joint development of the Kunene River basin. It has also pitted the Namibian government against a coalition of interest groups, who are taking up the cause of the Himba people at an international level.

Conclusions

The different constraints faced by Namibia in the form of climatic conditions, population growth and rate of urbanization, the hydroelectric imperative, the location of large settlements relative to permanent water resources, the nature of Namibia's international rivers, and Namibia's riparian position seem not to be the only limitations and/or opportunities moving the development of the Kunene River in the direction of cooperation, for these constraints are not the only determinants of the nature of water politics in the Kunene: the good relations between Namibia and Angola also constitute a determining aspect. This relationship is an opportunity that will have, along with the constraints, the greatest impact on the hydropolitics of the Kunene. The question of the Himba and the ongoing civil war could place a damper on the future development of the

Kunene River; however, these two constraints are not expected to sour the relations between Namibia and Angola concerning the waters of the Kunene.

In the light of these constraints and opportunities, what can we expect to happen in future in the Kunene River? Future collaboration between Namibia and Angola on the water-resource development of the Kunene River system will remain positive. Along the last 340 km of the river's flow, development could take place that could be highly collaborative in nature once the war in Angola comes to an end. This is so because any dam that is built in this section of the river will need the cooperation of both sides. Because of Angola's upstream status, it will be in the best interests of the Angolans to involve Namibia in any project situated on Angolan territory, for a number of agreements have been signed between the two states regarding future cooperation on the Kunene River. The existing constraints and the opportunity of good foreign relations between the two riparian nations creates a possible win-win situation in the Kunene River basin.

The Kunene River has a high level of international water-resource management, especially in light of the fact that a number of agreements and commissions have been established in the basin. At this stage, it seems that a river-basin organization (RBO) is not necessary because of the already high level of cooperation between Namibia and Angola.

Public participation in the Kunene River basin not only is feasible and desirable but also is a natural outflow of citizen participation in pressing issues in river basins. This is due to the fact that democratic principles have been fostered in Namibia since independence. The Himba community has organized itself into a communal interest group with an alliance with other interest groups in Southern Africa and the rest of the world. Transparency as regards the construction of the Epupa Dam could therefore help to alleviate the tension between these interest groups and the government of Namibia. A final concluding remark regarding future interaction in the Kunene River basin: geographical constraints are fixed, but they can be overcome by technology and innovation; political constraints, such as the war in Angola, can be turned into opportunities – it all depends on the political will of the people to do just that.

Future research topics

- What is the level of public participation in international river basins in Southern Africa?
- How will such public participation impact on future interaction between the riparian states in such a river basin?

- How does the internal political milieu of a riparian state impact on water politics in an international river basin?
- Is there a place for political risk analysis (PRA) in the international water politics of international river basins?

Notes

1. Also known as the Cunene River.
2. The British historian who suggested that climate, food, and soil depend closely on each other and influenced political behaviour in hot and cold climates (Dougherty and Pfaltzgraf 1990: 56).
3. The American geographer and explorer, who found that climate is a determinant not only of health, activity, level of food production, and other resource availabilities, but of the migration of people and their racial mixture as well (Dougherty and Pfaltzgraf 1990: 57).
4. The history of South Africa's claim to South-West Africa (SWA)/Namibia is controversial. South Africa attempted to incorporate the territory into the Republic, but the UN and International Court of Justice (ICJ) were firm in their conviction that this should not take place. Under international law, South Africa had no say over the territory's political affairs and was advised by the UN to respect the independence of Namibia and its peoples. South Africa refused to do this, however, and instead opted for political control over SWA/Namibia (Barber and Barratt 1990: 22–23, 54, 169, 171, 199).
5. It was the hawkish Defence Minister P.W. Botha who insisted at a cabinet meeting held in 1978 that South Africa become more directly involved in the Angolan War. The cabinet was overwhelmingly in favour of South Africa's involvement and Vorster had to give in to the hawks (De Klerk 1998: 58–59).
6. The 1998 SADC-led incursion by South Africa and Botswana into Lesotho shows the same characteristics as the Calueque incident. One component of the Lesotho intervention was to safeguard the Katse Dam, part of the Lesotho Highlands Water Project (LHWP). It should be made clear that the SADC-led intervention in Lesotho was not for purposes of safeguarding the water supply to South Africa only; the main purpose was to quell a possible *coup d'état* and bring political stability to Lesotho's internal political situation (Meissner 1999).
7. The Portuguese ambassador to South Africa protested against the action by South Africa on the Calueque Dam, but no assurances could be given by him as regards the safety of the workers and the pump station and the South Africans remained at Calueque (Steenkamp 1990: 39).
8. This is very good example of water being used as a tool in a war. In this case it was a means to an end and not an end in itself.

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Summary of presentations and discussions

Zafar Adeel, Thomas Ballatore, and Meredith Giordano

Introduction

Southern Africa experiences great heterogeneity, both temporal and spatial, in water distribution, making effective, cooperative management of the region's 15 shared international basins vital. The Southern African riparian nations currently rely upon a number of mechanisms at both basin and regional levels to manage their shared waters. These mechanisms include numerous bilateral and multilateral river-basin agreements and institutions, the Southern African Development Community's (SADC) regional water protocol (SADC 1995) and water-sector coordination unit, the Global Water Partnership, and the 1997 UN Convention on the Non-navigational Uses of International Watercourses. Despite the relatively broad range of existing management institutions, the potential for conflict continues within several of Southern Africa's transboundary basins due to inter-riparian discord and external pressures related to water allocation, development, and environmental concerns. This potential for conflict is significant enough to merit a closer look and systematic investigation.

In previous years, the United Nations University (UNU) has undertaken research work on many international river basins with a potential for conflict. These include the Ganges–Brahmaputra basin, the Jordan river basin, the Nile basin, and the Aral sea basin (Biswas et al., 1997; Biswas and Uitto 2001; Kobori and Glantz 1998; Murakami 1995; Na-

kayama and Jansky 2001; Wolf 1995). The insights and findings on dealing with the conflict potential in those other basins can be extrapolated to the South African river basins. For this reason, the UNU organized a workshop,¹ in partnership with the International Lake Environment Committee (ILEC), to focus on a multitude of issues pertaining to transboundary water management in the Southern African region. This meeting was designed to address the need for critical evaluation of the water-management mechanisms and regional agreements in this region. More specifically, the workshop had the following primary goals:

- to analyse the cooperative water-management efforts currently being undertaken in the region;
- to identify transboundary basins that have the potential for cooperative management as well as for water-related conflicts;
- to evaluate the role that international organizations can play in ameliorating the problems and increasing regional cooperation; and
- to catalyse brainstorming among water experts from within the region and around the world on future directions for the South African region.

Dr Mikiyasu Nakayama of the Tokyo University of Agriculture and Technology (Japan) and Dr Zafar Adeel of the UNU directed the workshop. The discussions were moderated by Dr Aaron Wolf of the Oregon State University (USA). The workshop participants represented government agencies, non-governmental organizations (NGOs), research/academic institutions, and private companies located in Southern Africa and elsewhere.

Overview of the workshop sessions

Drs Nakayama and Adeel began the workshop with opening remarks. Dr Nakayama stressed the need for critical examination of Southern African water management and suggested that, from his experience, some regional agreements and their associated institutions need to be reviewed and potentially revised. Dr Adeel spoke on the global freshwater crisis, with a focus on the key role of UN agencies in its mitigation. Mr Piet Heyns provided a factual overview of the river basins in the region.

The workshop was divided into three interlinked sessions, moving from generic issues to more specific ones. The first session was dedicated to providing an overall picture of transboundary water-management issues and experiences from other river basins that could be applied to this region. The second session focused on selected river basins as case studies within the region. The nature of challenges faced by the riparian countries, the current status of cooperation, and the potential for conflict were

discussed. The third session was dedicated to discussion on specific issues, identifying river basins with potential for “internationalization” and outlining future directions.

Transboundary water-management issues

As a key starting point for discussions, the role of regional river-basin organizations (RBOs) was described from an institutional perspective. This role can be multifaceted and may vary from basin to basin. By providing a forum for discussion, information sharing can be strongly enhanced and coordinated management schemes can be developed under the umbrella of such regional organizations. An added benefit is that, by focusing and prioritizing needs in a river basin, RBOs can optimize the use of available financial support from outside the region. Such a forum is also critical in reducing the potential for conflict and in resolution of disputes that may arise. This may be achieved through sharing of benefits from, and costs for, coordinated management of the river basin. The discussion indicated that decisions taken through such mechanisms are mostly political and practical in nature but have the potential shortcoming of being suboptimal.

The role of public participation in the success of any water-management system was highlighted in the discussion. It was observed that access to and availability of information were closely linked to active public participation. This, in turn, has implications for transparency in the management process and in developing a certain level of accountability. These factors can play a key role in whether a water-resource management paradigm is successful and accepted by the general public. It was argued that, by involving the public and local experts, the region could devise more effective and resilient water agreements. Few mechanisms, however, currently exist in Africa for incorporating local expertise into water-treaty negotiation, implementation, and enforcement. The SADC Treaty, which includes information-dissemination and public-participation provisions, serves as one regional model but further progress in this area must be encouraged (SADC 1995). For instance, SADC collects information on the national level, but basin-level information is also vital. A number of ways have been suggested to improve the situation regarding information availability through both active and passive measures: these include the involvement of children in environmental-monitoring activities in the river basins and the involvement of interest groups and NGOs in the decision-making and information-dissemination process.

Two discussions have focused on the theme of analytical tools for water-resources management. The first of these entailed an introduction to Oregon State University’s Transboundary Freshwater Dispute Data-

base (TFDD), which includes cataloguing of fifty years of water-related events and treaties concerning the globe's 261 international basins (Giordano and Wolf 2002). By linking the event and agreement components of the database, TFDD allows researchers qualitatively to test treaty effectiveness by comparing event type and intensity among riparian nations both before and after water treaties are concluded. The discussion focused on the idea that natural disasters often can foster greater cooperation between previously opposed parties, as has been seen following drought in the Middle East and in improved relations between Turkey and Greece resulting from "earthquake diplomacy." A crisis in water availability could similarly lead to extensive cooperation amongst the South African nations.

The second presentation focused on decision-support systems (DSSs) and the importance of bridging the creators of such systems with the actual users. The findings from a study on a DSS designed for the managers of the Lake Kariba hydropower scheme on the Zambezi River formed the basis of the discussion (Gandolfi and Salewicz 1990; Stam, Salewicz, and Aronson 1998). The results highlighted the importance of developing practical, user-friendly tools that meet not only the decision-maker's specific resource objectives but also their technical capabilities.

South African case studies

This session was devoted to participant presentations and collaborative discussions concerning basin-specific and regional water-resource issues. The presentations included an overview of the region's water-resource situation. Five international rivers – the Kunene, Okavango, Orange, Zambezi, and Congo – were highlighted as being potentially vulnerable to conflict as a result of proposed water projects.

Institutional aspects of international river-basin management were outlined in the discussion. Drawing from lessons learned through more than four decades of riparian collaboration in the Lower Mekong River basin, the SADC was analysed in terms of its ability to promote effective basin-level management institutions. In general, the SADC, like the Mekong River Committee, was praised for fostering an environment of regional cooperation that has helped to overcome obstacles in establishing collaborative water organizations. The SADC's broad-based approach to transboundary water management offers riparian nations substantial flexibility to design management institutions that meet the unique needs and conditions of the individual basins and riparian states. A more cautious assessment was made of the SADC's specific efforts to promote effective water institutions through its regional water protocol. The protocol's use of general language concerning river-basin management places

substantial responsibility on (and assumes the political will of) riparian nations to negotiate appropriate instruments with sufficient detail to manage their shared waters effectively. The participants cautioned that, without the political will, the principles and provisions contained in this multilateral agreement cannot be enforced.

With the exception of the Congo, all of these basins with some potential for conflict were discussed in greater detail in the case studies presented by the workshop participants. The case studies covered a range of topics such as hydropolitics, political risk analysis, joint development and cooperation, and equitable allocation of water. Despite their topical diversity, a number of common themes and conclusions emerged from the case-study presentations. For example, in discussions concerning regional river-basin institutions and the various political and climatic factors responsible for their creation, the presenters frequently alluded to an overall atmosphere of cooperation in the region concerning water resources. In addition to several existing and planned basin institutions and collaborative projects, the recently signed Revised Protocol on Shared Watercourses in the SADC was cited as an illustration of a regional effort to promote integrated water-resources management. Receiving equal emphasis, however, were factors viewed as constraining regional cooperation. Concerns over national sovereignty, competing interests, technical limitations, and unprecedented climatic events as a result of global warming were all considered as potential hindrances to future collaboration.

Thematic discussions

Thematic discussion focused on the various themes of the workshop and led to the formulation of a cohesive set of recommendations. To facilitate this discussion, the workshop organizers had developed a set of questions that provided a general framework for discussion. These questions are reproduced here:

1. Which basins need transition into international management?
2. Is transboundary water transfer the only reason for “internationalization” in the region?
3. Is integrated management feasible and/or desirable in major water systems?
4. Do these systems need RBOs for better management?
5. What opportunities and/or obstacles exist to RBOs?
6. What is the role of non-state actors? How feasible and desirable is transparency of information and public participation?
7. What is the appropriate role of third parties?
8. How do water quality issues fit in?

9. What complications arise from interbasin water transfers? Is the basin the most relevant unit?
10. What constitutes fair and equitable water management?
11. How do political and social conditions impact water management?
12. What quantitative tools are available to support rational decision-making?

A broad range of issues was cited as the motivators for “internationalization.” These include economic development, coordinated management of droughts and floods, improvement in disease control and health quality, improvement in water quality, and energy generation. All of these issues need cooperative approaches to be successful, and international forums such as RBOs can play an important role. In the South African context, it was also apparent that a significant improvement in the region’s institutions is absolutely essential before such cooperation can materialize. This highlighted the need for, and importance of, capacity development at the institutional as well as human level. Structurally, these RBOs must have endorsement and support from all the riparian governments and should have a legal identity of their own. Some suggestions to strengthen the institutional resiliency of RBOs include enhanced information sharing, institutional capacity development, and human capacity development, including improved negotiation skills, broader participation, team building, and cross-discipline training.

The discussion also highlighted other issues related to transboundary water-resources management. Access to, and availability of, information is considered a cornerstone of a successful management paradigm. Therefore, improved and targeted dissemination of information, equal access to information by all, and transparency in the management approaches were all identified as key issues. It was suggested that information at the basin level can become more transparent through the involvement of local governments and communities. Similarly, non-state actors (e.g. NGOs), interest groups, and regional and international organizations can all play an important role in promoting effective basin-wide management.

A number of practical constraints to effective river-basin management were also identified and some suggestions for overcoming them were made. In general, the composition of governmental structures and diffusion of responsibility within them was cited as a key factor limiting effectiveness. This could be further compounded by the lack of appropriately skilled human resources – particularly in RBOs, where the officials sitting at the table may not possess the necessary negotiation skills. It was suggested that targeted capacity development in negotiation and conflict prevention could address these problems directly and in the short term.

It was recognized that a number of the river basins in the region can

significantly benefit from international management: these include the Zambezi, Limpopo, Incomati, Orange, Okavango, Save, and Kunene. However, a number of practical constraints were also apparent to such internationalization. Lack of political will and ongoing conflicts – such as the civil war in Angola – were cited as primary hindrances in effective cooperation on international management for some river basins. On the basis of practical considerations and recommendations by the workshop participants, the Limpopo and Orange river basins were identified as those with the highest potential for successful internationalization.

Key findings

A thorough discussion was carried out on significant issues and challenges faced in the region at the moment. Despite the time constraints for the meeting, a very substantial contribution was made towards meeting the objectives of the workshop. Most importantly, a number of forward-looking recommendations were formalized by the group of experts attending the meeting. The papers that were presented at the workshop, and which constitute the basis of the chapters included in this volume, form a useful information base on the river-management issues in the region and provide a detailed description of the individual river basins.

The key findings from the workshop are summarized here. It is important to underline the fact that due consideration was given to the activities where tangible output can be observed within a “limited” period. In addition, the focus was on critical issues that have a maximum impact on the river basins in question. In that sense, the recommendations presented here are not exhaustive but indicate those that were deemed to be of higher priority by the panel of experts present at the workshop.

Collaborative efforts

- In terms of cooperative water management, the participants identified various forms of current and planned collaborative efforts in the region including formal, informal, bilateral, and multilateral relationships.
- Basins of specific concern were also named – Limpopo and Orange – and described in the case studies, and general management and technical needs were highlighted for the region as a whole.
- Raising the awareness of the general public and getting them involved in the development and implementation of water-resources management was found to be a critical element.
- On the basis of experience in other river basins, it was recommended

that the development of networks of professionals working on the various water issues should be encouraged. Such professional networks typically operate above political influences and can significantly contribute towards building trust amongst riparian countries.

Issues for further research

- The workshop participants indicated a general scarcity of information on the region. Utilization of remote sensing to enhance the scarce information resources on the region was, therefore, identified as a fundamental future need. It was suggested that developing a regional remote-sensing centre would be a step in the right direction.
- Given the limitations on the volume of available water resources, the participants endorsed research into alternative and novel sources for water; these would include desalination of saline waters.
- The issues of gender and water need to be addressed further. More specifically, the role of women in management of water resources cannot be overemphasized; this aspect has not been well studied in the Southern African region.

Capacity development

- It was recommended that a virtual research institution could be developed to further the regional cooperation and networking on water-management issues. International organizations such as the UNU can play a key role in this effort.
- Training of government officials and negotiators in scientific issues relevant to water management and in general negotiation skills was identified as an important task.

Note

1. UNU International Workshop “Sustainable Development of International Water Systems in the Southern African Region,” held on 25–26 September 2000 at Sandton, South Africa.

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Acronyms

ADB	Asian Development Bank
amsl	above mean sea level
ANC	African National Congress
ARIMA	autoregressive integrated moving average
BCM	billion cubic metres
BECC	Border Environment Cooperation Commission
CIA	Central Intelligence Agency
CODESA	Convention for a Democratic South Africa
CONSAS	Constellation of Southern African States
COPDAB	Conflict and Peace Data Bank
CPU	central processing unit
DM	demand management
DRC	Democratic Republic of Congo
DSS	Decision-support system
DWAF	Department of Water Affairs and Forestry
ECOVIC	East African Communities Organization for Management of Lake Victoria Resources
EFR	estuary flow requirement
EIA	environmental-impact assessment
EMINWA	Environmentally Sound Management of Inland Waters
ENSO	El Nino southern oscillation [system]
ENWC	Eastern National Water Carrier
ESCOM	Electricity Supply Commission
FAA	<i>Forças Armadas Angolanas</i>
FAO	Food and Agriculture Organization

FBIS	Foreign Broadcast Information Service
FDD	Freshwater Dispute Database
FLS	Front Line States
FRIEND	Flow Regimes from International and Experimental Network Data
GEDS	Global Event Data System
GEF	Global Environment Facility
GGP	gross geographic product
GNP	gross national product
GWP	Global Water Partnership
HSC	hydropolitical security complex
HYCOS	hydrological cycle observing system
IBRD	International Bank for Reconstruction and Development (= World Bank)
IBTs	inter-basin transfers
IBWTS	inter-basin water-transfer scheme
ICJ	International Court of Justice
IDA	International Development Association
IFPS	Interactive Financial Planning System
IFR	instream flow requirements
IIASA	International Institute for Applied Systems Analysis
IJC	International Joint Commission
ILC	International Law Commission
ILEC	International Lake Environment Committee
ILP	international legal personality
INBA	International Nile Basin Association
INFOTERRA	International Referral System
IRIS	interactive river-system simulation
ITCZ	intertropical convergence zone
IUCN	World Conservation Union
IWRA	International Water Resources Association
IWRM	integrated water-resources management
JIA	Joint Irrigation Authority
JPTC	Joint Permanent Technical Commission
JTC	Joint Technical Committee
JULBS	Joint Upper Limpopo Basin Study
JWC	Joint Water Commission
LBPTC	Limpopo Basin Permanent Technical Committee
LCBC	Lake Chad Basin Commission
LHDA	Lesotho Highlands Development Authority
LHWC	Lesotho Highlands Water Commission
LHWP	Lesotho Highlands Water Project
LRC	Limpopo River Commission
MAP	mean annual precipitation
MAR	mean annual run-off
MCM	million cubic metres

MEC	Member of the Executive Council
MK	Mkonto we Sizwe (armed wing of ANC)
MOU	Memorandum of Understanding
MPLA	<i>Movement Popular de Libertação de Angola</i> (Portuguese: Popular Movement for the Liberation of Angola)
MRC	Mekong River Commission
NBI	Nile Basin Initiative
NGOs	non-governmental organizations
OAU	Organization of African Unity
OKACOM	Okavango River Basin Commission
ORACOM	Orange–Senqu River [Basin] Commission
ORP	Orange River Project
ORRS	Orange River Replanning Study
ORSA	Orange River System Analysis
OVTS	Orange–Vaal Transfer Scheme
PJTC	Permanent Joint Technical Commission
PWC	Permanent Water Commission
RBC	river-basin commission
RBO	river-basin organization
RECONCILE	Resources Conflict Institute
RENAMO	Mozambique National Resistance Movement
SADC	Southern African Development Coordination Conference
SADC-WSCU	SADC Water Sector Coordination Unit
SADF	South African Defence Force
SATAC	Southern African Technical Advisory Committee
STHPZ	subtropical high-pressure zone
SWAKEK	South-West Africa Water and Electric Corporation
SWAPO	South-West Africa People’s Organization
TCTA	Trans-Caledon Tunnel Authority
TFDD	Transboundary Freshwater Dispute Database
TPTC	Tripartite Permanent Technical Committee
UN/ECE	UN Economic Commission for Europe
UN/ESCAP	United Nations/Economic and Social Commission for Asia and the Pacific
UNCED	UN Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNITA	<i>União Nacional para a Indêpendência Total de Angola</i> (Portuguese: National Union for the Total Independence of Angola)
UNU	United Nations University
USAID	United States Agency for International Development
VNJIS	Violsdriift and Noordoewer Joint Irrigation Scheme
WHYCOS	World Hydrological Cycle Observing System
WSCU	Water Sector Coordinating Unit
WTO	World Trade Organization
WWF	Worldwide Fund for Nature (formerly World Wildlife Fund)

ZACPLAN	Zambezi [River] Action Plan
ZAMCOM	Zambesi River Commission
ZINWA	Zimbabwe National Water Authority
ZRA	Zambesi River Authority

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