

# Hydropolitical Vulnerability and Resilience along International Waters

## AFRICA





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## ACRONYMS

ADF	African Development Fund	NBI	Niger Basin Initiative
AIDS	Acquired Immune Deficiency Syndrome	NBA	Nile Basin Authority
AMCOW	African Ministers' Council on Water	NSC	North-South Carrier
CIDA	Canadian International Development Agency	OKACOM	Permanent Okavango River Basin Water Commission
CGIAR	Consultative Group on International Agricultural Research	OMVS	Organisation pour la Mise en Valeur du Bassin du Fleuve Senegal
DGIS	Directoraat Generaal Internationale Samenwerking/the Netherlands Ministry for International Affairs	ORASECOM	Orange-Senqu River Commission
DNA	Mozambican National Department of Water Affairs	PCà CP	From Potential Conflict to Co-Operation Potential
ENWC	Eastern National Water Carrier	RAMSAR	The Ramsar Convention on Wetlands (1971)
EU	European Union	RBO	River Basin Organization
EU WI	European Union Water Initiative	RBC	River Basin Commission
FAO	Food and Agriculture Organization of the United Nations	SADC	Southern African Development Community
GCC	Global Climate Change	SARCCUS	Southern African Regional Commission for the Conservation and Utilisation of the Soil
GDP	Gross Domestic Product	SIDA	Swedish International Development Cooperation Agency
GEF	Global Environmental Fund	STI	Sexually Transmitted Infection
GEF IW	Global Environmental Fund - International Waters	TPTC	Tripartite Permanent Technical Committee
HADCM3	Hadley Centre's Third Generation Coupled Ocean-Atmosphere Global Climate Model	UN	United Nations
HIV	Human Immunodeficiency Virus	UNDP	United Nations Development Programme
IBT	Inter-Basin Transfers	UNEP	United Nations Environment Programme
IPCC	Intergovernmental Panel on Climate Change	UN – Water/Africa	Interagency Group for Water in Africa (formerly IGWA)
IUCN	The World Conservation Union	USAID	United States Agency for International Development
IWRM	Integrated Water Resources Management	WARAP – IWRM	West African Regional Action Plan for Integrated Water Resources Management
JPCC	Joint Permanent Commission for Cooperation	WB	World Bank
JPTC	Joint Permanent Technical Committee	WSSD	World Summit on Sustainable Development
JULBS	Joint Upper Limpopo Basin Study	WWF	World Wildlife Fund /World Wide Fund for Nature
KOBWA	Komati Basin Water Authority	ZACPLAN	Action Plan for the Zambezi River Basin
LBPTC	Limpopo Basin Permanent Technical Committee	ZACPRO	Zambezi River Action Project
LWC	Limpopo Watercourse Commission		
MAR	Mean Annual Runoff		



# PREFACE

Wherever a major river, lake, or aquifer system is shared by two or more sovereign nations, the shared (international) waters become vulnerable to indiscriminate exploitation and degradation. In a situation of rising populations and increasing urbanization, industrialization, and environmental degradation, nations sharing the water resources also become vulnerable to conflict. These vulnerabilities are made more acute by climate variations and variations in precipitation. Yet, historical evidence from around the world has also shown that faced with rising water scarcity for multiple societal and environmental needs, and recognising the vulnerability of their shared water resources, nations are compelled, often reluctantly, to seek cooperative and resilient ways to develop, manage, and use their shared water resources. This hydro-political vulnerability and resilience along international waters is a subject area that has increasingly become a critical arena of systematic enquiry requiring the development of comparable databases and analyses among the different regions of the world.

Africa is unique among the developing world-regions in that all major rivers and freshwater lakes and aquifers on the continent are shared by two or more countries, and each country in the continent shares one or more freshwater bodies with its neighbours, sometimes hostile neighbours. The diversity of political, social, and economic structures and organizations among the African countries, and the highly varied spatial and temporal precipitation and distribution of water in the continent, make the hydro-political climate in Africa very complex and vulnerable. Colonial legacies of arbitrarily demarcated national borders, leading to ethnically divided and contested living spaces and natural resources, add further to the hydro-political vulnerability in Africa. Often, a lack of scientific assessments of vulnerabilities, weaknesses in the governance structures, and absence of the required technical, human, and financial resources exacerbate the vulnerabilities along international waters. Currently, with only 64% of Africa's population having access to improved water supply, with the coverage being as low as 50% in the rural areas, the region has the lowest proportional coverage of any region of the world.

At the same time, Africa has the privilege of being the leading developing-world continent where multiple region-wide and sub-regional entities now exist that work in coordination to guide and support the efforts of nations to seek and develop cooperative ways of developing, managing, and sharing the multiple-use potential of their shared water resources. Multiple efforts by such entities as the African Union (AU), New Partnership for Africa's Development (NEPAD) and the African Minister's Council on Water (AMCOW), as well as many other regional, sub-regional and local bodies, often supported by the international community, have been and are continuing to ensure that bilateral and multilateral water-related agreements are developed, ratified, and implemented in all the shared water basins in Africa. This hydro-political resilience along the international waters in Africa needs to be highlighted and systematically presented to support informed policy-making and promote emulations of similar efforts in other regions globally.

Guided by the targets for safe water supply and improved sanitation (MDG 7 and Target 10) set by the Millennium Summit and the World Summit on Sustainable Development, UNEP's present and future commitments and activities relating to freshwater are embodied in the UNEP Water Policy and Strategy, including the work on transboundary water resources, and it comprises three main components: assessment, management, and coordination. This report, the first in a series of assessment reports on hydro-political vulnerability and resilience along international waters in different geographic regions of the world, presents a comprehensive assessment of the hydro-political vulnerability of Africa's international waters. It also presents concrete and comprehensive data on the cooperative agreements, in-place and being developed, in the major water basins in the continent to deal with the hydro-political vulnerabilities and to develop sustainable resilience and informed policies at the regional, sub-regional, and national levels.



A handwritten signature in black ink, appearing to read 'Klaus Toepfer', with a long horizontal stroke extending to the right.

KLAUS TOEPFER

United Nations Under-Secretary General  
and Executive Director, United Nations Environment Programme

# FOREWORD

At a meeting in Abuja, Nigeria in April 2002, the African Ministers' responsible for water adopted the "Abuja Ministerial Declaration on Water — a key to sustainable development in Africa." The declaration marked the launching of the African Ministers' Council on Water (AMCOW), a major step forward in forging region-wide collective action for sustainable development in the continent. AMCOW's mission is to provide political leadership, policy direction and advocacy for the protection, management, and wise utilization of all of Africa's water resources for sustainable social, economic, and environmental development, and for the maintenance of the integrity of Africa's ecosystems in furtherance of the vision and goals of the African Union (AU) and the New Partnership for Africa's Development (NEPAD).

Under the auspices of AMCOW, the Pan-African Implementation and Partnership Conference (Addis Ababa, 8-12 December 2003) aimed to address the implications of the outcomes of the World Summit on Sustainable Development on regional water initiatives, as well as the region's role in the implementation of the Summit's outcomes. Most importantly, the conference provided a platform for all African countries, the international community, UN agencies and development cooperation partners to reaffirm their commitment to solve Africa's water crises. Since the conference, renewed and concerted region-wide efforts have been directed at meeting the water policy challenges identified by the African countries themselves. These include:

- A higher level of political commitment expressed through appropriate policies and instruments;
- Greater attention being paid to improving and expanding the knowledge base on water resources, protecting ecosystems, providing equitable sharing of water among competing sectors; and
- Taking stock of the hydropolitical vulnerabilities and resilience along the region's international waters.

It is in this context that I, as President of AMCOW, welcome this new publication, *Hydropolitical Vulnerability and Resilience along International Waters: Africa*, being released by the United Nations Environment Programme (UNEP) as part of its contribution to the observance of the International Decade for Action: Water for Life. The close collaboration between AMCOW, UN agencies, particularly UN Water: Africa, of which UNEP is an active member, and the international community has already generated increased awareness of the vulnerabilities affecting our continent's shared water resources, as well as the resilience clearly demonstrated by collective action at all levels — national, sub-regional, and regional — to confront the challenges. This publication, the first in a series on the water-related vulnerabilities and resilience in the developing and developed world regions, should inspire the needed intergovernmental dialogues and collective actions to halt and reverse the water crises facing our world.

MRS. MARIA MUTAGAMBA

President, African Ministers' Council on Water (AMCOW)  
and Minister of State for Water Resources, Uganda



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WATER IS LIFE

JULY 01:2003

*Gathering in celebration of new village water sources, Eritrea. Photo credit: USAID.*

# CHAPTER 1. HYDROPOLITICAL VULNERABILITY AND RESILIENCE: *SERIES INTRODUCTION*

Aaron T. Wolf

**W**ater management is, by definition, conflict management. Postel (1999) describes the roots of the problem: Water, unlike other scarce, consumable resources, is used to fuel all facets of society, from biologies to economies to aesthetics and spiritual practice. Moreover, it fluctuates wildly in space and time, its management is usually fragmented, and it is often subject to vague, arcane, and/or contradictory legal principles. There is no such thing as managing water for a single purpose — all water management is multi-objective and based on navigating competing interests. Within a nation these interests include domestic users, agriculturalists, hydropower generators, recreators, and environmentalists — any two of which are regularly at odds — and the chances of finding mutually acceptable solutions drop exponentially as more stakeholders are involved. Add international boundaries, and the chances decrease exponentially yet again (Elhance 1999).

Surface and groundwater that cross international boundaries present increased challenges to regional stability because hydrologic needs can often be overwhelmed by political considerations. While the potential for paralyzing disputes is especially high in these basins, history shows that water can catalyze dialogue and cooperation, even between especially contentious riparians. There are 263 rivers around the world that cross the boundaries of two or more nations, and untold number of international groundwater aquifers. The catchment areas that contribute to these rivers comprise approximately 47% of the land surface of the earth, include 40% of the world's population, and contribute almost 80% of freshwater flow (Wolf et al. 1999).

Sixty-three of these international river basins are in Africa, and their basins comprise 64% of the continent's surface. Most of these rivers are shared by two to four countries, although some are shared by many more: Congo and Niger (11 countries), Nile (10), and Lake Chad (8).

Within each international basin, allocations from environmental, domestic, and economic users increase annually, while the amount of freshwater in the world remains roughly the same as it has been throughout history. Given the scope of the problems and the resources available to address them, avoiding water conflict is vital. Conflict is expensive, disruptive, and interferes with efforts to relieve human suffering, reduce environmental degradation, and achieve economic growth. Developing the capacity to monitor, predict, and preempt transboundary water conflicts, particularly in developing countries, is key to promoting human and environmental security in international river basins, regardless of the scale at which they occur.

## 1.1 HYDROPOLITICAL VULNERABILITY AND RESILIENCE

In general, concepts of “resilience” and “vulnerability” as related to water resources are often assessed within the framework of “sustainability” (Blaikie et al. 1994), and relate to the ability of bio-physical systems to adapt to change (e.g., Gunderson and Pritchard 2002). As the sustainability

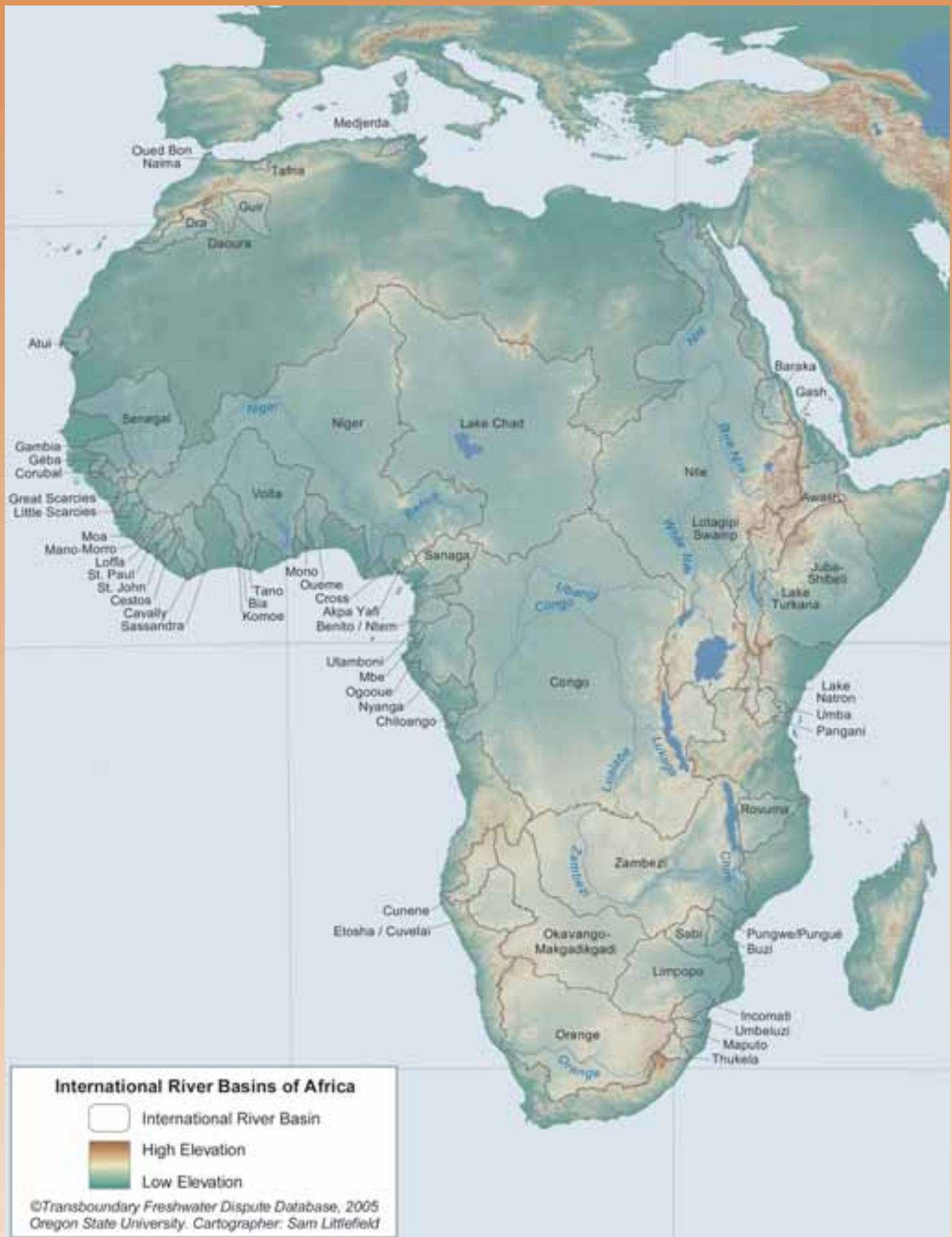


Figure 1.1 International river basins in Africa.





Figure 1.2 International river basins and countries, territories, and areas of Africa.



*Angels' Flight over Victoria Falls, Zambezi River. Photo credit: Kenneth M. Gale, [www.forestryimages.org](http://www.forestryimages.org).*

discourse has broadened to include human systems in recent years, so too has work been increasingly geared towards identifying indicators of resilience and vulnerability within this broader context (e.g., Bolte et al. 2004; Lonergan et al. 2000; Turner 2003). In parallel, dialogue on “security” has migrated from traditional issues of war and peace toward also beginning to incorporate the human-environment relationship in the relatively new field of “environmental security” (see UNEP 2004; Vogel and O’Brien 2004).

The term “hydropolitics” (coined by Waterbury 1979) came about as the potential for conflict and violence to erupt over international waters began to receive substantial new attention. Hydropolitics relates to the ability of geopolitical institutions to manage shared water resources in a politically sustainable manner, i.e., without tensions or conflict between political entities. “Hydropolitical resilience,” then, is defined as the complex human-environmental system’s ability to adapt to permutations and change within these systems; “hydropolitical vulnerability” is defined by the risk of political dispute over shared water systems. Wolf et al. (2003) suggested the following relationship between change, institutions, and hydropolitical vulnerability: “The likelihood of

conflict rises as the rate of change within the basin exceeds the institutional capacity to absorb that change.”

This suggests that there are two sides to the dispute setting: the rate of change in the system and the institutional capacity. In general, most of the parameters regularly identified as indicators of water conflict are actually only weakly linked to dispute. Institutional capacity within a basin, however, whether defined as water management bodies or treaties, or generally positive international relations, is as important, if not more so, than the physical aspects of a system. It turns out, then, that very rapid changes, either on the institutional side or in the physical system, that outpace the institutional capacity to absorb those changes, are at the root of most water conflict. For example, the rapid institutional change in “internationalized” basins, i.e., basins that include the management structures of newly independent States, has resulted in disputes in areas formerly under British administration (e.g., the Nile, Jordan, Tigris-Euphrates, Indus, and Ganges-Brahmaputra), as well as in the former Soviet Union (e.g., the Aral tributaries and the Kura-Araks). On the physical side, rapid change most outpaces institutional capacity in basins that

include unilateral development projects and the absence of cooperative regimes, such as treaties, River Basin Organizations (RBOs), or technical working groups, or when relations are especially tenuous over other issues (Wolf et al. 2003).

The general assumption of this series, then, which will be explored in each regional study, is that rapid change tends to indicate vulnerability while institutional capacity tends to indicate resilience, and that the two sides must be assessed in conjunction with each other for a more accurate gauge of hydropolitical sustainability. Building on these relationships, the characteristics of a basin that would tend to enhance resilience to change include:

- international agreements and institutions, such as RBOs
- a history of collaborative projects
- generally positive political relations
- higher levels of economic development.

In contrast, facets that would tend towards vulnerability would include:

- rapid environmental change
- rapid population growth or asymmetric economic growth
- major unilateral development projects
- the absence of institutional capacity
- generally hostile relations
- natural climatic variability — naturally variable rainfall patterns with frequent periods of floods and drought.

## 1.2 WATER AND SECURITY

Water disputes revolve around one or more of three issues: quantity, quality, and timing. The dynamics of those three issues play out very differently within various scales related to water and security, whether internationally, intranationally, or regionally and indirectly. Each setting might be characterized as follows (for examples, see Table 1.1):

1. *International waters*: very little violence, but long processes from tension to cooperation, resulting in exacerbated political relations, inefficient water management, and ecosystem neglect; long, rich record of conflict resolution and development of resilient institutions; institutional capacity is at the heart of whether environmental stresses lead to conflict or cooperation.
2. *Intranational waters* (between sub-national political units, including states/provinces, ethnic/religious groups, and/or economic sectors): violence potential higher than in international setting; rationale for international involvement more difficult, given greater issues of national sovereignty.
3. *Regional instability (indirect)/political dynamics of loss of irrigation water*: potential for politically destabilizing processes of mass migrations to cities and/or neighboring countries when water supplies for broadly irrigated regions are threatened due to drop in quantity (including lowering of groundwater levels) or quality; issues of poverty alleviation and distribution of wealth are tied directly to amelioration of security concerns.

### 1.2.1 International Waters

Water is a unique and vital resource for which there is no substitute. It ignores political boundaries, fluctuates in both space and time, and has multiple and conflicting demands on its use — problems compounded in the international realm by the fact that the international law that governs it is poorly developed, contradictory, and unenforceable. It is no wonder, then, that water is perpetually suspect — not only as a cause of historic armed conflict, but as the resource that will bring combatants to the battlefield in the 21<sup>st</sup> Century. What is the likelihood that “the wars of the next century will be about water,” as some have predicted?<sup>1</sup>

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1. World Bank Vice President Ismail Serageldin, quoted in the *New York Times*, 10 August 1995. His statement is probably most often quoted. For fear of water wars, see Joyce R. Starr, “Water Wars,” *Foreign Policy* (Spring 1991): 17–36; and John Bulloch and Adel Darwish, *Water Wars: Coming Conflicts in the Middle East* (London: Victor Gollancz, 1993).

## TABLE 1.1 SELECTED EXAMPLES OF WATER-RELATED DISPUTES

### QUANTITY

#### *Cauvery River, South Asia*

The dispute on India's Cauvery River sprang from the allocation of water between the downstream state of Tamil Nadu, which had been using the river's water for irrigation, and upstream Karnataka, which wanted to increase irrigated agriculture. The parties did not accept a tribunal's adjudication of the water dispute, leading to violence and death along the river.

#### *Mekong Basin, Southeast Asia*

Following construction of Thailand's Pak Mun Dam, more than 25,000 people were affected by drastic reductions in upstream fisheries and other livelihood problems. Affected communities have struggled for reparations since the dam was completed in 1994.

#### *Okavango-Makgadikgadi Basin, Southern Africa*

In the Okavango-Makgadikgadi Basin, Botswana's claims for water to sustain the delta and its lucrative ecotourism industry contribute to a dispute with upstream Namibia, which wants to pipe water from the Okavango River to supply its capital city with industrial and drinking water.

### QUALITY

#### *Rhine River, Western Europe*

Rotterdam's harbor had to be dredged frequently to remove contaminated sludge deposited by the Rhine River. The cost was enormous and consequently led to controversy over compensation and responsibility among Rhine users. While in this case negotiations led to a peaceful solution, in areas that lack the Rhine's dispute resolution framework, siltation problems could lead to upstream/downstream disputes.

### QUANTITY AND QUALITY

#### *Incomati River, Southern Africa*

Dams and water transfers in the South African area of the Incomati River basin reduced freshwater flows and increased salt levels in Mozambique's Incomati estuary. This altered the estuary's ecosystem and led to the disappearance of salt-intolerant plants and animals that are important for people's livelihoods.

### TIMING

#### *Syr Dar'ya, Central Asia*

Relations between Kazakhstan, Kyrgyzstan, and Uzbekistan—all riparians of the Syr Dar'ya, a major tributary of the disappearing Aral Sea—exemplify the problems caused by water flow timing. Under the Soviet Union's central management, spring and summer irrigation in downstream Uzbekistan and Kazakhstan balanced upstream Kyrgyzstan's use of hydropower to generate heat in the winter. But the parties are barely adhering to recent agreements that exchange upstream flows of alternate heating sources (natural gas, coal, and fuel oil) for downstream irrigation, sporadically breaching the agreements.

Sources: Wolf et al. 2005; Jägerskog 2003; Allan 2001; Elhance 1999; Bulloch and Darwish 1993; Starr 1991; Israeli-Jordanian peace treaty ([www.israel-mfa.gov.il/mfa/go.asp?MFAH00pa0](http://www.israel-mfa.gov.il/mfa/go.asp?MFAH00pa0)); Israeli-Palestinian interim agreement ([www.mfa.gov.il/mfa/go.asp?MFAH00qd0#app-40](http://www.mfa.gov.il/mfa/go.asp?MFAH00qd0#app-40), and [www.nad-plo.org/fact/annex3.pdf](http://www.nad-plo.org/fact/annex3.pdf)).





Distributing jerry cans for water storage, Sudan. Photo credit: C. Reintsma, USAID.

### 1.2.1.1 Examining the Record

In order to cut through the prevailing anecdotal approach to the history of water conflicts, researchers at Oregon State University (OSU) undertook a three-year research project, which attempted to compile a dataset of every reported interaction between two or more nations, whether conflictive or cooperative, that involved water as a scarce and/or consumable resource or as a quantity to be managed — i.e., where water was the *driver* of the events,<sup>2</sup> over the past 50 years (Wolf et al. 2003). The study documented a total of 1,831 interactions, both conflictive and cooperative, between two or more nations over water during the past 50 years, and found the following:

First, despite the potential for dispute in international basins, the record of acute conflict over international water resources is historically overwhelmed by the record of cooperation. The last 50 years have seen only 37 acute disputes (those involving violence); of those, 30 were between Israel and one or another of its neighbors, and the violence ended in 1970. Non-Mideast cases accounted for only five acute events, while, during the same period, 157 treaties were negotiated and signed. In fact, the

only “water war” between nations on record occurred over 4,500 years ago between the city-states of Lagash and Umma in the Tigris-Euphrates basin (Wolf 1998). The total number of water-related events between nations of any magnitude are likewise weighted towards cooperation: 507 conflict-related events, versus 1,228 cooperative events, implying that violence over water is neither strategically rational, hydrographically effective, nor economically viable.

Second, despite the occasional fiery rhetoric of politicians — perhaps aimed more often at their own constituencies than at an enemy — most actions taken over water are mild. Of all the events, some 43% fell between mild verbal support and mild verbal hostility. If the next level on either side — official verbal support and official verbal hostility — is added in, the share of verbal events reaches 62% of the total. Thus almost two-thirds of all events were only verbal and more than two-thirds of those had no official sanction (Wolf 1998).

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2. Excluded are events where water is incidental to the 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.



Fishing day, Niger. Photo credit: Marcia Macomber, OSU.

Third, there were more issues of cooperation than of conflict. The distribution of cooperative events covered a broad spectrum, including water quantity, quality, economic development, hydro-power, and joint management. In contrast, almost 90% of the conflict-laden events related to quantity and infrastructure. Furthermore, almost all extensive military acts (the most extreme cases of conflict) fell within these two categories (Wolf 1998).

Fourth, despite the lack of violence, water acted as both an irritant and a unifier. As an irritant, water can make good relations bad and bad relations worse. Despite the complexity, however, international waters can act as a unifier in basins with relatively strong institutions.

This historical record suggests that international water disputes do get resolved, even among enemies, and even as conflicts erupt over other issues. Some of the world's most vociferous enemies have negotiated water agreements or are in the process of doing so, and the institutions they have created often prove to be resilient, even when relations are strained.

The Mekong Committee, for example, established by the governments of Cambodia,

Laos, Thailand, and Viet Nam as an intergovernmental agency in 1957, exchanged data and information on water resources development throughout the Viet Nam War. Israel and Jordan have held secret "picnic table" talks on managing the Jordan River since the unsuccessful Johnston negotiations of 1953–1955, even though they were technically at war from Israel's independence in 1948 until the 1994 treaty. The Indus River Commission survived two major wars between India and Pakistan. And all 10 Nile Basin riparian countries are currently involved in senior government-level negotiations to develop the basin cooperatively, despite "water wars" rhetoric between upstream and downstream states.<sup>3</sup>

In Southern Africa, a number of river basin agreements were signed in the 1970s and 1980s, when the region was embroiled in a series of local wars. Although complex to negotiate, the agreements, once established, were one of the rare arenas of peaceful cooperation between

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3. Mekong Committee from Ti Le-Huu and Lien Nguyen-Duc, *Mekong Case Study*, PCCP Series No. 10 (Paris, France: UNESCO-IHP 2003); Indus River Commission from Aaron T. Wolf, "Water and Human Security," *AVISO Bulletin*, Global Environmental Change and Human Security Project, Canada (June 1999); and Nile Basin talks from Alan Nicol, *The Nile: Moving beyond Cooperation*, PCCP Series No. 16, (Paris, France: UNESCO-IHP 2003).



*Dam construction for agriculture in a rural area, Sierra Leone. Photo credit: L. Lartigue, USAID.*

countries. Now that the wars in the area have ended, water cooperation is one of the foundations for regional cooperation (Turton 2004). Some have identified cooperation over water resources as a particularly fruitful entry point for building peace; however, it is unclear what conditions are required for environmental cooperation to play a major role (Conca and Dabelko 2002).

### **1.2.1.2 Tensions and Time Lags: Causes for Concern**

So if there is little violence between nations over their shared waters, what's the problem? Is water actually a security concern at all? In fact, there are a number of issues where water causes or exacerbates tensions, and it is worth understanding these processes to know both how complications arise and how they are eventually resolved.

The first complicating factor is the time lag between when nations first start to impinge on each other's water planning and when agreements are finally, arduously, reached. A general pattern has emerged for international basins over time. Riparians of an international basin implement water development projects unilaterally — first on water within their own territory — in

attempts to avoid the political intricacies of the shared resource. At some point, one of the riparians, generally the regional power, will implement a project that impacts at least one of its neighbors. In the absence of relations or institutions conducive to conflict resolution, the project can become a flashpoint, heightening tensions and regional instability, and requiring years or, more commonly, decades, to resolve — the Indus treaty took 10 years of negotiations, the Ganges 30, and the Jordan 40 — and, all the while, water quality and quantity degrades to where the health of dependent populations and ecosystems is damaged or destroyed. This problem gets worse as the dispute gains in intensity; one rarely hears talk about the ecosystems of the lower Nile, the lower Jordan, or the tributaries of the Aral Sea—they have effectively been written off to the vagaries of human intractability. During such periods of low-level tensions, threats and disputes rage across boundaries with relations as diverse as those between Indians and Pakistanis and between Americans and Canadians. Water was the last and most contentious issue resolved in negotiations over a 1994 peace treaty between Israel and Jordan, and was relegated to “final status” negotiations — along with other of the





*Hippos feeding, Botswana. Photo credit: Paul Bolstad, University of Minnesota, [www.forestryimages.org](http://www.forestryimages.org).*

most difficult issues such as Jerusalem and refugees — between Israel and the Palestinians.

The timing of water flow is also important; thus, the operation of dams is also contested. For example, upstream users might release water from reservoirs in the winter for hydropower production, while downstream users might need it for irrigation in the summer. In addition, water quantity and water flow patterns are crucial to maintaining freshwater ecosystems that depend on seasonal flooding. Freshwater ecosystems perform a variety of ecological and economical functions and often play an important role in sustaining livelihoods, especially in developing countries. As awareness of environmental issues and the economic value of ecosystems increases, claims for the environment's water requirements are growing. For example, in the Okavango Basin, Botswana's claims for water to sustain the Okavango Delta and its lucrative ecotourism industry have contributed to a dispute with upstream Namibia, which wants to use some of the water passing through the Caprivi Strip on its way to the delta for irrigation.

Water quality problems include excessive levels of salt, nutrients, or suspended solids. Salt intrusion can be caused by groundwater overuse

or insufficient freshwater flows into estuaries. For example, dams in the South African part of the Incomati River basin reduced freshwater flows into the Incomati estuary in Mozambique and led to increased salt levels. This altered the estuary's ecosystem and led to the disappearance of salt-intolerant flora and fauna important for people's livelihoods (the links between loss of livelihoods and the threat of conflict are described below). The same exact situation exists on the border between the United States and Mexico, where high salinity problems have not only reduced agricultural productivity, but have severely altered ecosystems in the Colorado and Rio Grande rivers and impacted marine flora and fauna in the Gulfs of California and Mexico, where the respective rivers terminate.

Excessive amounts of nutrients or suspended solids can result from unsustainable agricultural practices, eventually leading to erosion. Nutrients and suspended solids pose a threat to freshwater ecosystems and their use by downstream riparians, as they can cause eutrophication and siltation, respectively, which, in turn, can lead to loss of fishing grounds or arable land. Suspended solids can also cause the siltation of reservoirs and harbors: for example, Rotterdam's harbor had



Dam catchment in Ethiopia, where rapid siltation threatens municipal drinking water supplies. Photo credit: Badege Bishaw, OSU.

to be dredged frequently to remove contaminated sludge deposited by the Rhine River. The cost was enormous, and consequently led to conflict over compensation and responsibility among the river's users. Although negotiations led to a peaceful solution in this case, without such a framework for dispute resolution, siltation problems can lead to upstream/downstream disputes such as those in the Lempa River basin in Central America (Lopez 2004).

### 1.2.1.3 Institutional Capacity: The Heart of Conflict Management

Most authors who write about hydropolitics, and especially those who explicitly address the issue of water conflicts, hold to the common assumption that it is the scarcity of such a critical resource that drives people to conflict. It feels intuitive—the less there is of something, especially something as important as water, the more dearly it is held and the more likely people are to fight over it.

The three-year OSU study worked to tease out just what the indicators of conflict are. A 100-layer Geographic Information System (GIS) was compiled—a spatial database of all the

parameters that might prove part of the conflict/cooperation story, including physical (e.g., runoff, droughts), socioeconomic (e.g., GDP, rural/urban populations), and geopolitical (e.g., government type, votes on water-related UN resolutions) parameters. With this GIS in place, a statistical snapshot was developed of each setting for each of the events over the last 50 years of conflict or cooperation.

The results were surprising, and often counterintuitive. *None* of the physical parameters was statistically significant — arid climates were no more conflictive than humid climates, and international cooperation actually *increased* during droughts. In fact, when the numbers were run, almost no single variable proved causal — democracies were as conflictive as autocracies, rich countries as poor countries, densely populated countries as sparsely populated ones, and large countries the same as small countries.

It was close reflection of aridity that finally put researchers on the right track: institutional capacity was the key. Naturally arid countries were cooperative: if one lives in a water-scarce environment, one develops institutional strategies for adapting to that environment. Once institutions —



As countries on the continent industrialize so do the risks associated with pollution increase. Paper and pulp mill in Mpumalanga province, South Africa, Incomati River basin. Photo credit: Anton Earle.

whether defined by formal treaties, informal working groups, or generally warm relations — and their relationship to the physical environment became the focus, researchers began to get a clear picture of the settings most conducive to political tensions in international waterways. We found that the likelihood of conflict increases significantly whenever two factors come into play. The first is that some large or rapid change occurs in the basin's physical setting — typically the construction of a dam, river diversion, or irrigation scheme — or in its political setting, especially the breakup of a nation that results in new international rivers. The second factor is that existing institutions are unable to absorb and effectively manage that change. This is typically the case when there is no treaty spelling out each nation's rights and responsibilities with regard to the shared river, nor any implicit agreements or cooperative arrangements. Even the existence of technical working groups can provide some capability to manage contentious issues, as they have in the Middle East.

The overarching lesson of the study is that unilateral actions to construct a dam or river diversion *in the absence* of a treaty or institutional mechanism that safeguards the interests of other

countries in the basin is highly destabilizing to a region, often spurring decades of hostility before cooperation is pursued. In other words, the red flag for water-related tension between countries is not water stress *per se*, as it is within countries, but rather the unilateral exercise of domination of an international river, usually by a regional power.

In the Jordan River Basin, for example, violence broke out in the mid-1960s over an “all-Arab” plan to divert the river's headwaters (itself a pre-emptive move to thwart Israel's intention to siphon water from the Sea of Galilee). Israel and Syria sporadically exchanged fire between March 1965 and July 1966. Water-related tensions in the basin persisted for decades and only recently have begun to dissipate.

A similar sequence of events transpired in the Nile basin, which is shared by 10 countries — of which Egypt is last in line. In the late 1950s, hostilities broke out between Egypt and Sudan over Egypt's planned construction of the High Dam at Aswan. The signing of a treaty between the two countries in 1959 defused tensions before the dam was built. But no water-sharing agreement exists between Egypt and Ethiopia, where some 55% of the Nile's flow originates, and a war of words has raged between these two





Niger River in Niger; dugout canoes filled with squashes. Photo credit: William M. Ciesla, Forest Health Management International, [www.forestryimages.org](http://www.forestryimages.org)

nations for decades. As in the case of the Jordan, in recent years the Nile nations have begun to work cooperatively toward a solution thanks in part to unofficial dialogues among scientists and technical specialists that have been held since the early 1990s, and more recently a ministerial-level “Nile Basin Initiative” facilitated by the United Nations and the World Bank.

### 1.2.2 Intranational Waters

The second set of security issues occur at the sub-national level. Much literature on transboundary waters treats political entities as homogeneous monoliths: “Canada feels . . .” or “Jordan wants.” Analysts are only recently highlighting the pitfalls of this approach, often by showing how different subsets of actors relate very different “meanings” to water. Rather than being simply another environmental input, water is regularly treated as a security issue, a gift of nature, or a focal point for local society. Disputes, therefore, need to be understood as more than “simply” over a quantity of a resource, but also over conflicting attitudes, meanings, and contexts. Throughout the world, local water issues revolve around core values that often date back generations. Irrigators, indigenous populations, and environmentalists, for

example, can see water as tied to their very ways of life, and increasingly threatened by newer uses for cities and hydropower. Moreover, the local setting strongly influences international dynamics and vice versa.

If there is a history of water-related violence, and there is, it is a history of incidents at the sub-national level, generally between tribes, water-use sectors, or states/provinces. In fact, the recent research at OSU suggests that, as the scale drops, the likelihood and intensity of violence rises.<sup>4</sup> There are many examples of internal water conflicts ranging from interstate violence and death along the Cauvery River in India, to the USA, where California farmers blew up a pipeline meant for Los Angeles, to inter-tribal bloodshed between Maasai herdsman and Kikuyu farmers in Kenya. The inland, desert state of Arizona in the USA even commissioned a navy (made up of one ferryboat) and sent its state militia to stop a dam and diversion on the Colorado River in 1934.

Another contentious issue is water quality, which is also closely linked to water quantity. Decreasing water quality can render it inappropriate for some uses, thereby aggravating its

4. Giordano et al. 2002.



*Washing day in the town of Menongue on the Cuebe River, southern Angola. Photo credit: Anthony Turton.*

scarcity. In turn, decreasing water quantity concentrates pollution, while excessive water quantity, such as flooding, can lead to contamination by sewage. Low water quality can pose serious threats to human and environmental health. Water quality degradation is often a source of dispute between those who cause degradation and the groups affected by it. As pollution increasingly impacts upon livelihoods

and the environment, water quality issues can lead to public protests.

One of the main causes of declining water quality is pollution, e.g., through industrial and domestic wastewater or agricultural pesticides. In Tajikistan, for example, where environmental stress has been linked to civil war (1992–1997), high levels of water pollution have been identified as one of the key environmental issues threatening human development and security. Water pollution from the tanning industry in the Palar Basin of the Indian state of Tamil Nadu makes the water within the basin unfit for irrigation and consumption. The pollution contributed to an acute drinking water crisis, which led to protests by the local community and activist organizations, as well as to disputes and court cases between tanners and farmers (Carius et al. 2003).

### **1.3 REGIONAL INSTABILITY: POLITICAL DYNAMICS OF LOSS OF IRRIGATION WATER**

As water quality degrades—or quantity diminishes—over time, the effect on the stability of a region can be unsettling. For example, for 30 years the Gaza Strip was under Israeli occupation. Water quality deteriorated steadily, saltwater intrusion degraded local wells, and water-related diseases took a rising toll on the people living there. In 1987, the intifada, or Palestinian



*Modern pipeline system for irrigation in an oasis in the Draa Valley, Morocco. Photo credit: Daniel Malzbender.*



uprising, broke out in the Gaza Strip, and quickly spread throughout the West Bank. Was water quality the cause? It would be simplistic to claim direct causality. Was it an irritant exacerbating an already tenuous situation? Undoubtedly.

An examination of relations between India and Bangladesh demonstrates that these internal instabilities can be both caused and exacerbated by international water disputes. In the 1960s, India built a barrage at Farakka, diverting a portion of the Ganges flow away from its course into Bangladesh, in an effort to flush silt away from Calcutta's seaport, some 100 miles to the south. In Bangladesh, the reduced upstream flow resulted in a number of adverse effects: degraded surface and groundwater, impeded navigation, increased salinity, degraded fisheries, and endangered water supplies and public health. Migration from affected areas further compounded the problem. Ironically, many of those displaced in Bangladesh have found refuge in India.

Two-thirds of the world's water use is for agriculture so, when access to irrigation water is threatened, one result can be movement of huge populations of out-of-work, disgruntled men from the country-side to the cities—an invariable recipe for political instability. In pioneering work, Sandra Postel identified those countries that rely heavily on irrigation, and whose agricultural water supplies are threatened either by a decline in quality or quantity. The list coincides precisely with regions of the world community's current security concerns, where instability can have profound effects: India, China, Iran, Pakistan, Uzbekistan, Iraq, Bangladesh, and Egypt (Postel and Wolf 2001).

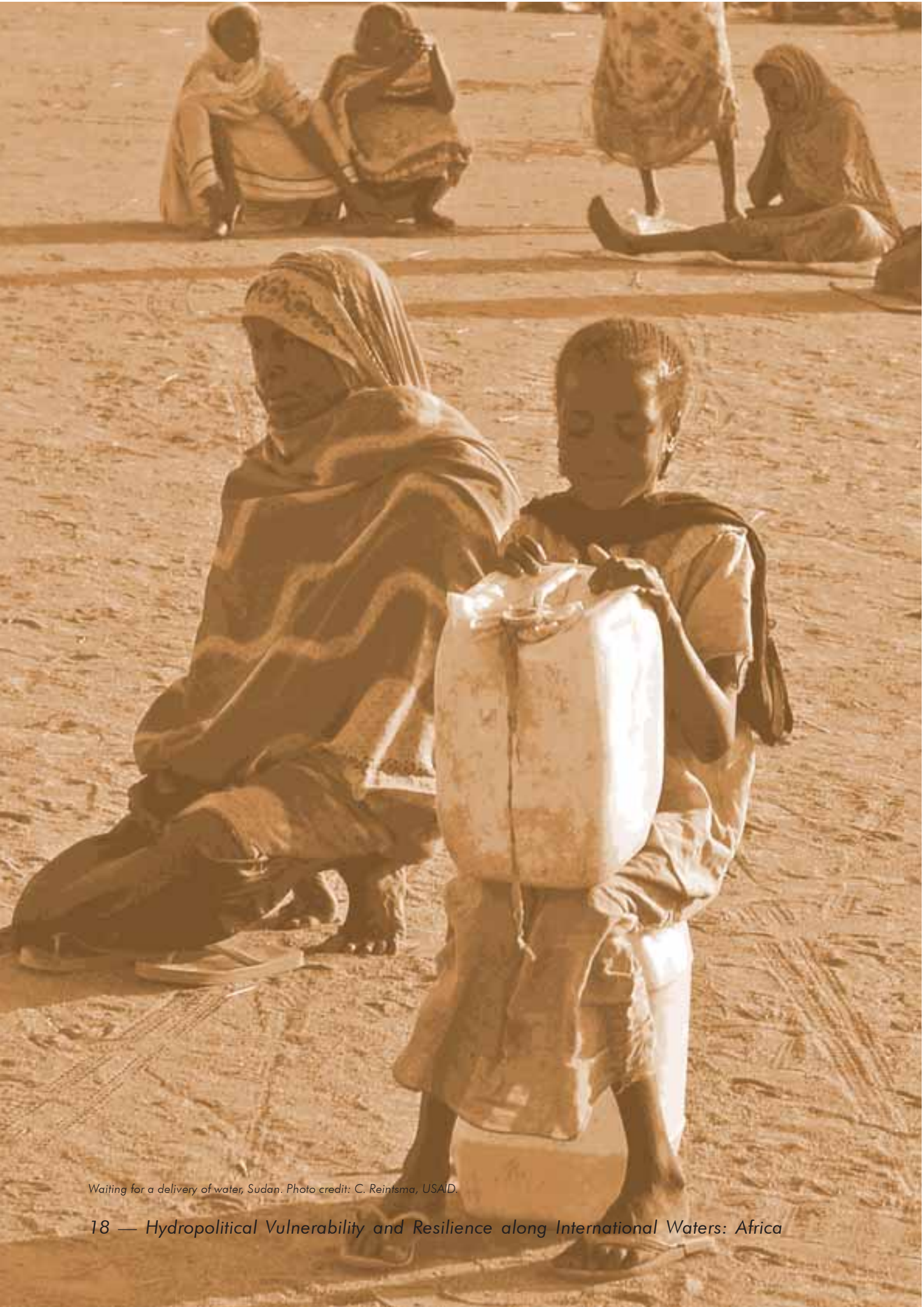
Water management in many countries is also characterized by overlapping and competing responsibilities among government bodies.

Disaggregated decision-making often produces divergent management approaches that serve contradictory objectives and lead to competing claims from different sectors. And such claims are even more likely to contribute to disputes in countries where there is no formal system of water-use permits, or where enforcement and monitoring are inadequate. Controversy also often arises when management decisions are formulated without sufficient participation by local communities and water users, thus failing to take into account local rights and practices. Protests are especially likely when the public suspects that water allocations are diverting public resources for private gain or when water use rights are assigned in a secretive and possibly corrupt manner, as demonstrated by the violent confrontations in 2000 following the privatization of Cochabamba, Bolivia's water utility (Postel and Wolf 2001).

Finally, there is the human security issue of water-related disease. It is estimated that between 5 and 10 million people die each year from water-related diseases or inadequate sanitation. More than half the people in the world lack adequate sanitation. Eighty percent of disease in the developing world is related to water (Gleick 1998). This is a crisis of epidemic proportions, and the threats to human security are self-evident.



*Washing dishes, Central African Republic. Photo credit: Jane McCauley Thomas, College of the Sequoias.*



*Waiting for a delivery of water, Sudan. Photo credit: C. Reintsma, USAID.*



# CHAPTER 2. HYDROPOLITICAL VULNERABILITY AND RESILIENCE ALONG AFRICA'S INTERNATIONAL WATERS

Anthony Turton, Anton Earle, Daniel Malzbender, and Peter J. Ashton

The growing literature on the politics of water resource management, or hydro politics, has generated many new ideas and management approaches. Unfortunately, much of this literature has tended to emphasize the notion of water-related conflicts (Turton 2002). This has diverted attention away from some of the more important political issues associated with water in areas where disputes and conflicts are rare. Examples of these issues include our understanding of power structures and institutions — how they develop, how they adapt to meet new challenges, and how they impact decision making at different levels of society. Importantly, these political-level interactions also take place within a legal framework — either internationally in a multilateral or a bilateral context, or at a national or sub-national level.

The African continent has sixty-three international river basins that, collectively, cover 64% of Africa's surface area and contain over 90% of its surface water resources (Map 1a). Most of these rivers are shared by two to four countries, although some are shared by many more: Congo and Niger (11 countries), Nile (10), Lake Chad and Zambezi (8). Apart from these large basins with their relatively high annual flow volumes, there are also many smaller shared basins that contain highly variable quantities of water. An unusual feature of African transboundary river systems is that several are endoreic — they do not terminate in the ocean — but rather flow into a low lying inland area. These endoreic systems typically occur in drier environments and provide critically important focus points for human economic, cultural and social activities in the region. Good examples of such systems are provided by the saline or alkaline basins of Lake Chad, Lake Natron, and Lake Turkana, and the freshwater Okavango-Makgadikgadi and Cuvelai basins. While the volumes of water in these endoreic river basins are seldom large, local residents rely so heavily on these resources that they become disproportionately significant (see Marsh and Seely 1992 for more details of the Cuvelai basin case in Namibia).

## 2.1 DRIVERS OF HYDROPOLITICAL VULNERABILITY IN AFRICA

The core assumption of this report is that two components determine the hydro political vulnerability in a river basin or country, namely: the rate of change in the hydrological system, and the institutional capacity to absorb and respond to that change. In this overview, we hypothesize that the risk of dispute or conflict is minimized if the (institutional) capacity to absorb change can respond appropriately to whatever change occurs. Therefore, an analysis of hydro political vulnerability in Africa must examine both sides of the scale, i.e., the underlying hydrological factors that create or drive change and the legal and institutional (social) responses to such change. On the African continent, three factors control both human and hydro political vulnerability: climate, population dynamics, and socioeconomic conditions. The relative influence of each of these highly variable factors depends on the geographic location of the international basin in question.



Elephants, East Africa. Photo credit: G. Keith Douce, the University of Georgia, [www.forestryimages.org](http://www.forestryimages.org).

### 2.1.1 Climate

The African continent straddles the equator, covering approximately equal latitudes to the north and south. This, combined with its physical geography results in a wide range of climates, annual rainfall patterns and hydrologic relationships among African riparian states (see Maps 1b, 2a). In the equatorial regions, rainfall is both abundant and predictable. However, rainfall volumes decline, and their timing and duration become less predictable, the further one moves north or south from the equator. Simultaneously, rates of evapotranspiration increase as one moves further away from the equator. As a result, the continent is marked by enormous disparities in water resource availability, both temporally and spatially. The drier northern and southern parts of the continent have few perennial rivers, and the many ephemeral or episodic rivers, which flow seasonally or for short periods after rainfall act as linear oases. In contrast, the equatorial region of Africa has many large perennial rivers that show relatively little seasonal variation in flow.

Rainfall patterns across the African continent are characterized by clear seasonal cycles each year, superimposed on longer-term cycles of 'wetter' and 'drier' periods (Map 1b). The interactions of these cycles give rise to periods of flood and drought. Drought years and flood years

frequently follow directly upon one another, and "average" rainfall is seldom recorded. The extensive arid regions of the continent lose a large proportion of the rainfall they receive, reducing the proportion of rainfall that is converted to runoff (Map 2a). In the driest regions of northern and southern Africa, rainfall-to-runoff conversion ratios are often less than 5%. The combined effects of variations in rainfall and evapotranspiration rates explain much of the variability in the annual discharges of major river systems.

Many of the larger African international river basins encompass both wetter and drier regions. Here, the bulk of the water is generated in the well watered portions of these basins, while the drier portions contribute proportionately less water. The hydropolitical consequences of this situation are that countries positioned within the lower reaches of such a basin are dependent on water generated and released from upstream riparian countries.

Over time, water resource managers have built large storage dams and associated intra- and Inter-Basin Transfer schemes (IBTs) to mitigate the impact of natural climatic variability and improve the security of water supplies. However, while the construction of reservoirs and canals may reduce the uncertainty of supply in one part of the basin, they alter the hydrologic functions



Water hole for human and livestock use in dry riverbed, Kenya. Photo credit: David J. Moorhead, University of Georgia, [www.forestryimages.org](http://www.forestryimages.org)

and the volume, quality, timing, and duration of natural flow regimes in downstream reaches of the donor and recipient systems. This is clearly visible in southern Africa, where South Africa and Zimbabwe have been ranked among the world's top 20 countries in numbers of large dams built (Map 2b). Southern Africa also has several large IBT schemes that take water from areas of relative water abundance and deliver it to areas of relative water scarcity (see Map 3a); more such schemes are being evaluated for possible future construction. Where these schemes occur within international river basins, they place increased pressure on the national water management institutions in the region, necessitating cooperation, data-sharing, and joint management strategies. Additionally, these schemes have important environmental, social, economic, and cultural side effects on a wide range of stakeholders. In many cases, the costs and benefits of IBTs are spread unevenly among stakeholders. The large-scale export of water from one country may benefit its national GDP, but local communities in the "donor" basin seldom receive any financial benefits from the scheme and, at a local scale, may be worse off than before. One of the largest (in terms of water volume) potential donor basins in Africa is the Congo, which borders on three important water-stressed basins: Lake Chad, Zambezi, and Nile. Possible future IBTs from the

Congo to these basins have been proposed by various state and non-state groups (see Heyns 2002 for some examples) and two of these options are being evaluated at this time.

### **2.1.2 The Effect of Global Climate Change on Africa**

Any changes in temperature caused by Global Climate Change (GCC) will influence the vulnerabilities associated with Africa's variable climatic patterns and could also affect the availability of groundwater resources. While the likely effects of GCC can not yet be predicted with accuracy, an increase in temperature could lengthen and accentuate periods of drought in some regions, while possibly increasing annual rainfalls in others. According to the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report (IPCC 2001), human activity is modifying the global climate. Temperature rises in the range of 2° to 6°C are projected to occur during the next 100 years, and these are expected to be accompanied by changes in precipitation patterns, rises in sea-level, and an increase in the frequency of droughts and floods. While the exact nature of the change is not known, there is wide agreement about the likely general trends that have been simulated by global climate models



Retreating glaciers of Mount Kilimanjaro. Photo credit: David J. Moorhead, [www.forestryimages.org](http://www.forestryimages.org).

using a consistent set of emission scenarios based on the latest IPCC social-economic scenarios:

- The historical climate record for Africa shows warming of approximately  $0.7^{\circ}\text{C}$  over most of the continent during the 20th Century, a decrease in rainfall over large portions of the Sahel, and an increase in rainfall in east central Africa and parts of southern Africa (Hulme et al. 2001).
- Climate change scenarios for Africa (Biggs et al. 2004; Hulme et al. 2001) suggest that future warming across Africa could range from  $0.2^{\circ}\text{C}$  per decade (low scenario) to more than  $0.5^{\circ}\text{C}$  per decade (high scenario). This warming is anticipated to be greatest over the interior of semi-arid margins of the Sahara and central Southern Africa.
- Although model results vary, there is a wide consensus that East Africa will receive increased rainfall while lower rainfalls will occur in southwestern Africa. Future changes in mean seasonal rainfalls in Africa are less well defined. Under the lowest warming scenario, few areas experience changes in rainy season totals (December – February or June – August) that exceed natural variability by 2050. The exceptions are parts of equatorial East Africa, where rainfall is likely to increase by 5%–20%

in December – February, and decrease by between 5%–0% in June – August. Under the most rapid global warming scenario, increasing areas of Africa will likely experience changes in summer or winter rainfall that exceed the level of natural variability. Large areas of equatorial and East Africa could experience increases in December – February rainfall of 50%–100%, with decreases in June – August over parts of the Horn of Africa. There are some June – August rainfall increases for the Sahel region (Scholes and Biggs 2004).

Overall, climate change models, such as the HADCM3, predict that large areas of southern Africa will become drier by 2050 (see Map 3b).

At this time, the possible impacts of GCC on groundwater resources are still speculative. However, aquifers are recharged in a non-linear fashion (Cave et al. 2003), with the rate of recharge declining significantly when mean annual rainfall drops below 200 mm. The recharge process is complex, depending on a number of factors, including soil type and depth, nature of the underlying geological formations, type and integrity of land cover, and the duration and intensity of the rainfall events. Nevertheless, despite these uncertainties, increased air temperatures would likely result in increased losses of soil-water through evaporation; simultaneously,





Victoria Falls, Zambezi River, during season low flow (August 1998). Photo credit: Peter J. Ashton.

increased evaporation rates would likely lead to an increase in precipitation, having an opposite effect. The results of GCC are thus not predictable with any degree of certainty (Bailey and Scholes 1999). This is significant for groundwater dependent ecosystems, and to communities that rely on groundwater for their livelihoods. Interestingly, this

is less likely to have adverse effects on the already dry Sahara, because it is underlain by a series of deep confined aquifers that contain fossil water dating back thousands of years. Instead, the impacts will more likely be felt in the semi-arid south and west of the continent (see Map 4a for the approximate contours of Africa's international aquifers).



Aerial view, drought in southern Africa (Zambia), February 2003. Photo credit: F. Sands, USAID.





### 2.1.3 Population Dynamics

High population growth rates, the prevalence of disease, and an increasing trend of urbanization, are key demographic factors that will play increasingly important roles in future management of the water resources in Africa's international river basins. African countries have the highest fertility rates in the world, and although population growth rates have slowed in the past decades, population densities within several international river basins are expected to double in the next 25 years (Map 5a). Conversely, continued high rates of HIV/AIDS transmission in southern Africa, are

predicted to stabilize populations, or even cause a slight decline in population numbers, during the next ten to fifteen years, if an effective cure for AIDS is not found. This could lead to a reduction in water demand (see sidebar, p. 26). In Cairo and other large cities, expanded city limits and rapidly growing populations have created extensive squatter settlements or slums that overwhelm the abilities of water management institutions to provide adequate water and sanitation infrastructure. In the future, such rapidly expanding cities will continue to challenge the ability of national and local governments; first, to provide access



Photo credits: Shops and homes (top), and lumberyard, Karen, Kenya. David J. Moorhead, the University of Georgia, [www.forestryimages.org](http://www.forestryimages.org).





and safe water to growing numbers of people, and secondly, to treat water containing high concentrations of pollutants that is ultimately released into international waterways.

Pressures from population growth impact the natural environment in several ways. Deforestation, pollution, and overgrazing of rangelands all reduce both the quality and quantity of freshwater resources (Map 5b). The high rates of population growth in Central, East and West Africa (Table 2.1) lead to increased demands for water, which in turn, intensifies the need for more water supply infrastructure. However demographic changes

due to the HIV/AIDS epidemic pose a particular challenge to institutional capacity. With the exception of some countries in West and North Africa, African HIV/AIDS prevalence rates are higher than those experienced anywhere else in the world. As a consequence, more than 70% of all adults infected with HIV/AIDS live in Africa (UNDP 2002). Despite increasing HIV/AIDS prevalence rates in East and West Africa, the southern African region has been hit hardest by the pandemic, with seven countries of the region now having adult HIV/AIDS prevalence rates of over 10% (see Map 6a).



Photo credits: (top) roadside market, Tanzania. Kenneth M. Gale, [www.forestryimages.org](http://www.forestryimages.org); Maasai herding goats near Amboseli National Park, Kenya. Gerard D. Hertel, West Chester University, [www.forestryimages.org](http://www.forestryimages.org).

## IMPACTS OF THE HIV/AIDS PANDEMIC ON SOUTHERN AFRICAN WATER RESOURCES

While population growth rates in West and East Africa remain high despite the prevalence of HIV/AIDS, the pandemic is predicted to slow, or even stop, population growth in southern Africa. Although this might ease per-capita water stress levels for a while, it represents a major challenge for water management because of the accompanying economic slow-down and loss of government revenue that could support water resource management. It is difficult to predict the effect of possible behavior changes as a response to awareness campaigns, or the increased availability of life-extending drugs that can reduce mortality rates. However, given the limited availability of accurate, widespread surveillance data from southern Africa, it is difficult to forecast population development and, subsequently, their water needs. The pandemic is already affecting agricultural and industrial productivity in the region, thereby adding to the difficulties in estimating future water demand. With the many uncertainties and complicating factors, there is a high risk that the construction of water supply schemes will not be well matched to water needs. If mortality rates are overestimated, or slow down relatively suddenly due to the improved availability of drugs, water supply schemes planned under the assumption of high mortality rates might not provide sufficient water. In contrast, if mortality rates are underestimated, over-sized water supply schemes will result in unnecessary expenditure (Ashton and Ramasar 2002). An example of this is Rand Water, which supplies the greater Johannesburg metropolis in South Africa, where the impact of HIV/AIDS has already reduced future demands for water (Turton et al. 2004; see Figure 2.1).

The effect of HIV/AIDS is most prevalent in the 15–49 year age group, which is also the most economically active segment of the population. As a result, annual economic growth in the worst affected countries is predicted to decline by 1%–2% points (UNDP 2002), while household income, particularly in poor households, will be reduced. This, in turn, reduces public revenue streams. In Botswana, for example, it is estimated that the government will lose 20% of its public revenue by 2010 because of HIV/AIDS (UNDP 2002). With a substantial reduction in the ability of consumers to pay for services received, water supply agencies will find it increasingly difficult to recover the expenses associated with providing water supplies (Ashton and Ramasar 2002).

The most significant effect of HIV/AIDS, from an institutional viewpoint, is the rapid loss of human resource capacity. Institutional capacity in the region is generally weak, due to shortages of skilled and technically trained personnel. While HIV/AIDS affects people at all educational levels, the loss of skilled and experienced personnel presents particular problems to many organizations. Such institutions now need to expand and accelerate their training programs so that more staff can be quickly trained as replacements. Given the high mortality rates, it has become increasingly difficult to maintain the current levels of institutional capacity, let alone improve them.

This poses particular difficulties for transboundary institutions in the short-, medium-, and longer term.

Effective cooperation in the southern African region depends on good interpersonal relationships among the institution members drawn from different countries. Where there is a high turnover of staff due to the impact of HIV/AIDS, in addition to the loss of skills, it becomes more difficult to develop long-term personal trust, thereby weakening an important basis for effective cooperation. For example, many of the river basin commissions in southern Africa have common membership, thereby cascading experiences from one commission into another. The same persons, in their capacity as commissioners from Namibia, sit on two commissions (OKACOM for the Okavango River and ORASECOM for the Orange River); while in Botswana the same commissioners serve on the commissions for the Okavango River, the Orange River, and the future Limpopo River Basin Commission.

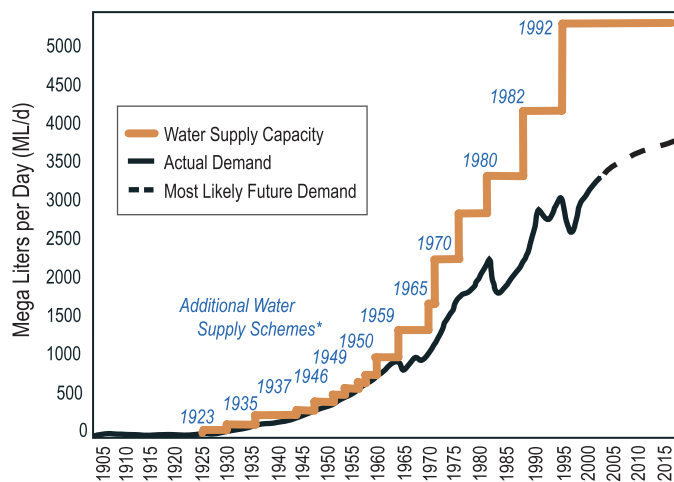


Figure 2.1 Changes in water demand projections in South Africa as a result of HIV/AIDS-related population mortality. The solid line represents actual demand in real terms. The dotted line represents the most likely scenario for future demand, taking HIV into consideration. The stepped, orange-coloured line refers to supply capacity. It is stepped because each new scheme—dam or pipeline upgrade—creates additional capacity and thus jumps in steps. That capacity must be paid for, so, in an ideal world, the steps should coincide with the demand curve, meaning that supply is being augmented in synchronization with demand and there is no surplus capacity that represents capital expenditure in excess of need. \*The years in each step refer to the date of commissioning of each new component of the supply scheme. Source: Turton et al. 2004.





School children, Kenya. Photo credit: G. Keith Douce, the University of Georgia, [www.forestryimages.org](http://www.forestryimages.org).

**TABLE 2.1 POPULATION GROWTH STATISTICS FOR THE DIFFERENT REGIONS MAKING UP THE AFRICAN CONTINENT.**

Region	Population (millions)			Growth Rate <sup>1</sup>	
	1950	2000	2050	(%/Yr)	(%/Yr)
Southern Africa <sup>2</sup>	34.279	118.630	205.148	2.514	1.102
Central Africa <sup>3</sup>	19.467	73.844	228.055	2.702	2.281
Eastern Africa <sup>4</sup>	54.589	216.983	591.833	2.798	2.027
Western Africa <sup>5</sup>	66.331	241.386	617.478	2.617	1.896
North Africa <sup>6</sup>	44.163	142.148	245.189	2.351	1.096
SADC Countries <sup>7</sup>	54.113	203.445	449.264	2.684	1.597
Sub-Saharan Africa <sup>8</sup>	174.666	650.843	1,642.514	2.666	1.869
<b>Africa Total<sup>9</sup></b>	<b>218.829</b>	<b>792.991</b>	<b>1,887.703</b>	<b>2.608</b>	<b>1.750</b>

<sup>1</sup> "Growth rate" refers to the average annual percentage growth in the numbers of people between the years in question (i.e., 1950 to 2000, and 2000 to 2050).

<sup>2</sup> Southern Africa: Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe.

<sup>3</sup> Central Africa: Cameroon, Central African Republic, Congo Republic (Brazzaville), Democratic Republic of Congo (Kinshasa), Equatorial Guinea, Gabon.

<sup>4</sup> East Africa: Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, Uganda.

<sup>5</sup> West Africa: Benin, Burkina Faso, Chad, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.

<sup>6</sup> North Africa: Algeria, Egypt, Libya, Morocco, Tunisia, Western Sahara.

<sup>7</sup> SADC Countries: Angola, Botswana, Democratic Republic of Congo (Kinshasa), Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.

<sup>8</sup> Sub-Saharan Africa: Southern Africa, Central Africa, East Africa, West Africa.

<sup>9</sup> Africa Total = Southern Africa + Central Africa + East Africa + North Africa + West Africa.

Note: No island states included in any of the Africa totals. In other words, the following countries have been omitted: Cape Verde Islands, Comores, Madagascar, Mauritius, Reunion, Sao Tome & Principe, Seychelles.

Source: United Nations 2005.



As a consequence of the HIV/AIDS pandemic, mortality rates have increased dramatically and life expectancy has decreased substantially: in Botswana, for example, life expectancy at birth is expected to drop to 41 years (UNDP 2004). However, while the pandemic affects every segment of society, poor communities are particularly vulnerable and are least able to cope. Apart from its obvious socioeconomic

consequences, the HIV/AIDS pandemic also has a range of more subtle but equally far-reaching implications for water resource management (Ashton and Ramasar 2002).

#### **2.1.4 Socioeconomics**

Social resources encompass factors such as institutional development, economic wealth, systems of government, laws, and legislation, and the education level of the population, and can be thought of as “second-order resources” or the social adaptive capacity of society (Ohlsson 1995). These social resources hold the key to adapting to current and anticipated shortages of water, the first-order resource. In essence, a politically powerful, stable and diversified economy will have a range of policy and technology options available to solve problems caused by water shortages. In contrast, weaker economies with low levels of institutional, social and economic development, find it far more difficult to adapt to water insecurity. Across Africa, large numbers of people experience pervasive poverty, ill-health and malnutrition, compounded by a lack of access to clean domestic water supplies. Their plight is worsened by frequent food shortages that are driven by their dependence on erratic water supplies for both subsistence and irrigated agriculture. These high levels of social vulnerability represent huge challenges for national governments, compelling them to prioritize water development projects as a means to resolve these problems. Some of the specific



Donkey returning with water at farmstead (top); mother and child, Kenya. Photo credits: David J. Moorhead, University of Georgia, [www.forestryimages.org](http://www.forestryimages.org)





Surface and groundwater pollution is a growing problem in African cities such as Cape Town. (Photo taken next to Joe Slovo informal settlement on the outskirts of Cape Town.) Photo credit: Anton Earle.

motivations of states within a hydropolitical context will be discussed in later sections of this regional report, highlighting examples of vulnerabilities and the building of international water management institutions. The important aspect to note here is the need for domestic capacity to provide reliable water services in the light of continued population growth, disease, and the potential threats linked to climate change effects.

With these drivers in mind, we review the hydrological and socioeconomic realities faced by African nations that share transboundary water resources, and we examine the ways in which institutional structures have been used to respond to these realities. We highlight these dynamics by focusing on a set of case studies in specific basins in Southern, Eastern, and Western Africa.

## **2.2 THE CAPACITY TO ABSORB CHANGE: THE STATE OF HYDROPOLITICAL COOPERATION IN AFRICA**

In many situations where the political will may not yet be in place, there are opportunities to promote

technical-level cooperation among country representatives of a shared river basin. These include opportunities to form combined institutions and use the existing (national and international) legal frameworks jointly to manage shared water resources. Such technical cooperation can be expanded and enhanced once cooperation at the political level is established. The existence of legal agreements, as well as the legal and institutional capacity to effectively implement them, has a direct bearing on the ability of countries in a region to adapt to changing climatic, economic, demographic, and social conditions. A basin runs the risk of water scarcity leading to some type of dispute if the joint institutional capacity and legal framework are not in place. The following section provides a brief overview of such river basin institutions and the prevailing legal framework across the continent. Due to the large size of the region and the scarcity of comparative research in Africa, this study is not a comprehensive overview of the whole area; rather, it seeks to chart the evolution of the agreement-forming process and the general levels of institutional development across the continent.



A river flowing through the Okapi Fauna Reserve (Congo River Basin), in the vicinity of Epulu, DRC. Photo credit: J. Doremus, USAID.

### **2.2.1 Law and Institutions: The Two Pillars of Cooperation**

Four key reasons make it difficult to present an all-inclusive assessment of hydropolitical vulnerability across the African continent. First, African countries have had a rich, complex and varied history, ranging from early (pre-colonial) times when traditional systems of governance prevailed — many of which have not been fully recorded — to the modern era of sovereign statehood. Each country has had a unique colonial experience and we are confronted today by a patchwork of legal and political systems, based loosely on the systems of the former French, British, Spanish, Portuguese, German, Italian, and Belgian colonial powers. Second, the developmental trajectory of each country differed as they passed through these various experiences. Some countries had a traumatic history of colonial subjugation, followed by bloody wars of liberation in which statehood was earned on the battlefield. Other countries have had a far smoother transition. Third, the continent of

Africa is vast, spanning many climatic zones and presenting a mosaic of different ecological spaces and cultural systems. Finally, infrastructure is poorly developed in many parts of the continent and, where regionalism occurs, this is often very loosely defined. As a result, the regional dynamics at work in Southern Africa are completely different to those in East, West, Central, and North Africa.

### **2.2.2 The Evolution of Transboundary Water Law**

Transboundary water law aims to aid decision-making on the rational and equitable utilization of water resources, within the letter and the spirit of the law, based on the findings of scientific research such as hydrological, economic, and social assessments of the basin environment. Importantly, national and international water law cannot be implemented effectively in the absence of effective institutional structures (see Map 6b).

In essence, international water law provides a foundation and framework for the management



of transboundary water resources. International agreements between basin states are the most important legal tools for transboundary water management (see Appendix 1), and effective decision-making on water utilization requires a thorough understanding of the status and extent of applicable transboundary water law. In the past, this has often been hampered by a shortage of available information on existing international agreements that deal with transboundary water issues. While the picture is still far from complete, significant progress has been made in recent years in locating and analyzing these agreements. Following the categorization proposed by Lautze and Giordano (2005), developments in African transboundary water law can be divided into three distinct periods: the colonial period, the early independence period, and the late independence period.

### 2.2.2.1 Colonial Period

The colonial period between 1885 and 1956 created the concept of transboundary waters in Africa (Lautze and Giordano 2005) where the concept of the nation state was virtually unknown prior to colonization. This period saw rivers being used to demarcate national boundaries, thereby creating transboundary waters as a “by-product.” However, while colonialism created international transboundary waters, the number of these transboundary waters was limited because each colonial power governed sub-regions that now consist of numerous independent states. Colonial powers entered into international treaties with each other to define their spheres of influence; when colonialism ended, the number of international transboundary water bodies increased markedly.

In addition to the creation of transboundary waters, colonialism also left an indirect legacy that still influences the management of transboundary waters today. Each of the now-independent African states inherited its legal system from the previous colonial power; the resulting diversity of legal systems are not always fully compatible with each other in their respective African settings. In contrast, the inherent incompatibilities in the original European legal systems have been overcome by a variety of institutional structures and by joint harmonisation

efforts guided by strong EU regulations and directives. With regional integration generally being less advanced in Africa (compared to the EU) and reform efforts being impeded by capacity constraints, there is less encouragement for regional policy and legal harmonization processes that could help to create strong joint governance structures. This places many African countries at a disadvantage as far as regional cooperation efforts are concerned, even when the political will is present.

Significantly, all transboundary agreements signed in the colonial era were bilateral (mostly between the different colonial powers (Figure 2.2), reaching agreement without consulting their colonies, even though some rivers had several riparian states (e.g., the Nile, which had six riparian states during the colonial period). Some agreements dealt only with what were called “native access issues”—guaranteeing the local population continued access to the river—and very few contained more substantive provisions. Of the thirteen agreements that were concluded during this period, and which addressed substantive issues, nine were on the Nile basin, reflecting the economic significance of this basin at that time. With the core elements of those “colonial era” agreements still applicable, Lautze and Giordano (2005) argue that current tensions on the Nile should come as no surprise. This is because all colonial Nile basin agreements were bilateral, with Britain as a signatory. Effectively, this means that no more than one of the current riparian states is party to each treaty. Lautze and Giordano (2005) further suggest that the agreements between colonial powers were concluded largely on a basis of power equality, compared to those signed with independent African States (Egypt and Ethiopia in case of the Nile). This could also be part of the reason for current tensions in the Nile basin.

Eight of the thirteen agreements mentioned above contain explicit provisions on water sharing, most of them based on historic use. In line with the levels of awareness and the general treaty-making trends which prevailed at that time, none of the treaties contain provisions that deal with issues of water quality, technical cooperation, or the creation of joint management institutions.

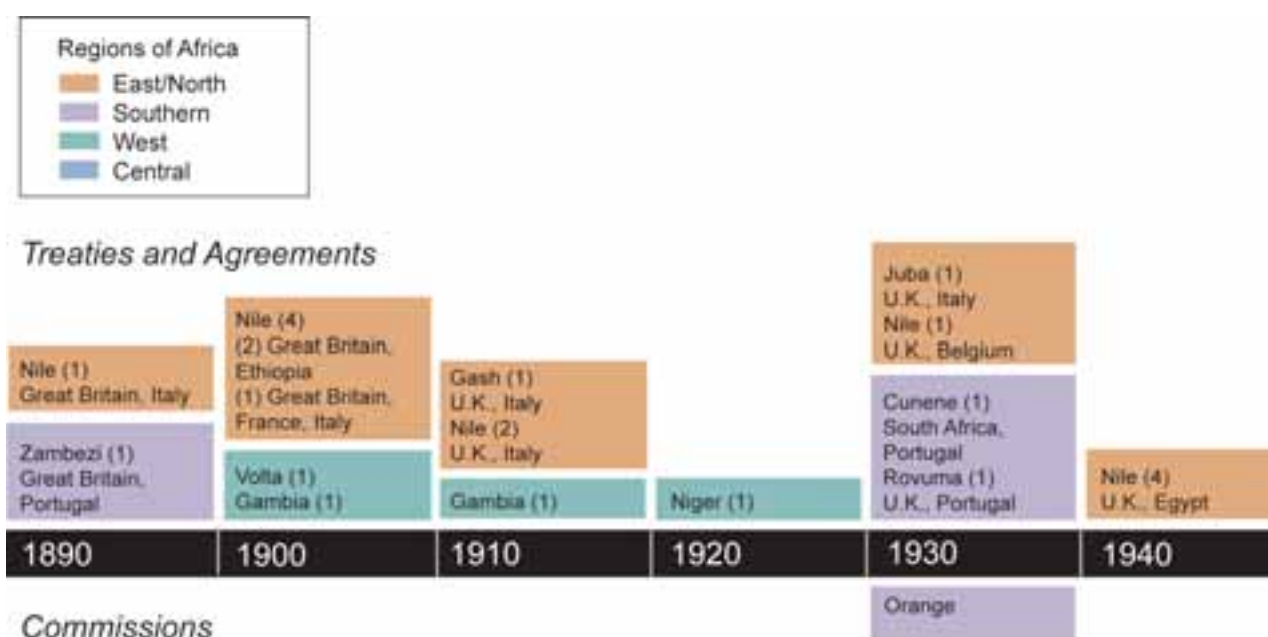


Figure 2.2 Timeline of transboundary agreements and river basin organizations in Africa, 1890–2000 (with number finalized for each decade). See Appendix 1 for details.

### 2.2.2.2 Early Independence Period

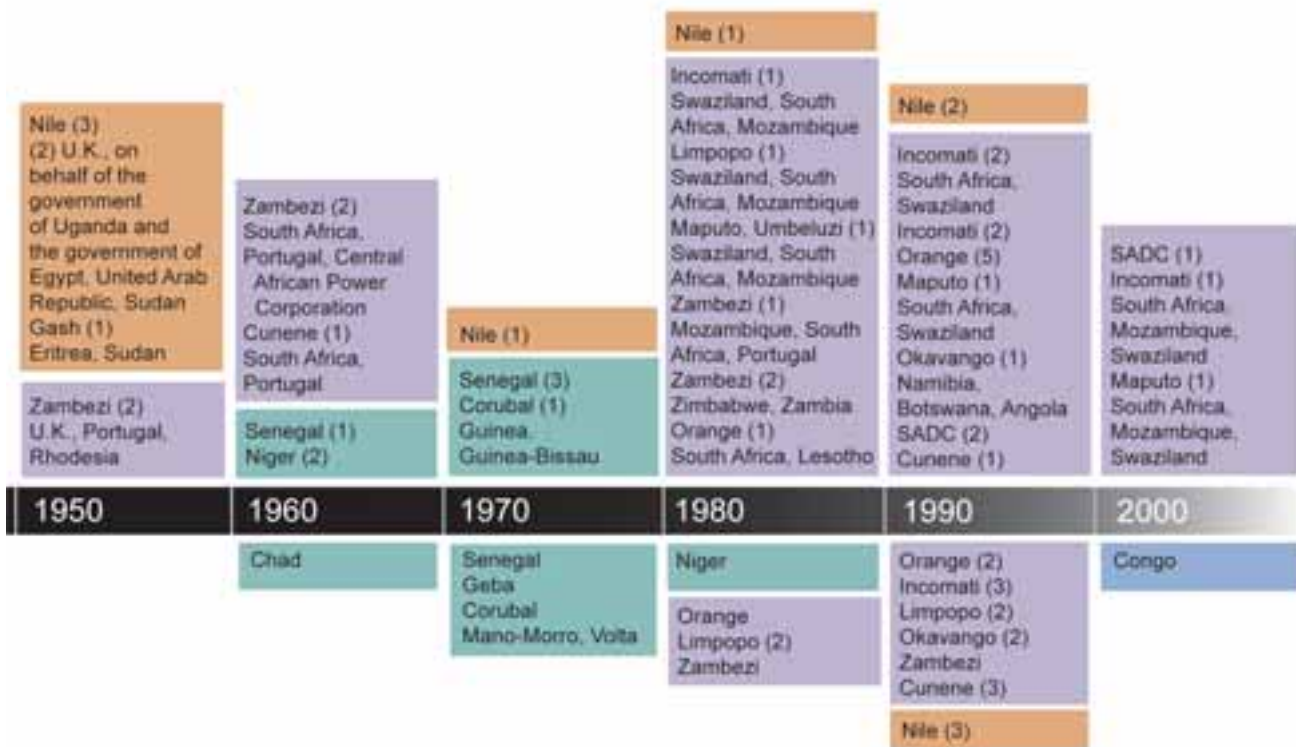
The number of transboundary water agreements increased dramatically in the period between 1959 and 1989, the early independence period (Lautze and Giordano 2005). This was probably due to the increased number of independent states, compared with colonial times, and their desire to express their newly found sovereignty. According to Swatuk (2000), “the increased activity of the traditionally weaker states in international discussions around the environment, and specifically water, was one way in which they were building statehood.” The increase in the number of agreements signed was accompanied by a shift away from bilateral agreements to predominantly multilateral agreements that included more than half of all riparian states, coupled to a substantial shift in the substance matter of the agreements. While most agreements of the colonial period contained provisions on water allocation, the treaties signed during the early independence period focused more on cooperation and joint management to enhance economic development, and on conflict prevention and resolution. This period also marked the establishment of the first African river basin

organizations for the Niger (1964), Senegal (1972), Chad (1973), and Gambia (1978) basins (FAO 1997). However, this fundamental shift towards joint management did not reflect a newly developed African spirit of cooperation, but is attributed instead to a general shift in thinking encouraged by international organizations and lending institutions.

### 2.2.2.3 Late Independence Period

The late independence period between 1989 and 2004, ushered in a new era of cooperative development between African states and the nature and content of the agreements show some distinct features. While most agreements still focus on cooperation, joint management, and conflict prevention and resolution, the underlying rationale for these efforts has shifted in line with global trends, from economic development to sustainable development. In a move that seems to reflect some patterns of the colonial period, there has been a shift from multilateral to bilateral treaties, with fewer agreements including all riparian states (see Turton et al. 2004: 387-389). Here, Pike’s Law suggests that the effort required to reach any agreement increases by the cube of the number of parties involved (Turton 2004: 251).





This law helps to explain the propensity towards bilateral agreements in river basins that are shared by more than two riparian states. Another feature that was previously more common during the colonial period is the increased number of explicit water allocation provisions in these treaties. A possible reason for this may be that the states needed a period of consolidation, trust building, and institutional capacity building after independence, before cooperation efforts and joint management institutions reached the point where concrete water allocation decisions could be made.

The geographical focus of many of agreements has also shifted. For example, while the agreements signed in the early independence period were primarily between West African countries, the late independence period saw a rapid increase in the number of treaties between southern African countries. Part of the reason for this has been linked to the timing of the Cold War, where the respective Cold War superpowers supported different sides in the various wars of liberation. One of the consequences of this in the southern African region is that many aspects of regional infrastructural development became linked to the national security concerns of South

Africa (Turton 2003a; 2004; Turton and Earle 2005). Southern African states that co-operated with South Africa gained considerable economic leverage, while states that refused to cooperate were actively excluded from many regional development opportunities until after South Africa became independent.

An understanding of the strategic political drivers in southern Africa helps to contextualize the current status of river basin commissions in the region. Significantly, in all cases of transboundary river basin development, states that previously co-operated with South Africa now have relatively strong institutions, while weak institutions characterize the states that refused to cooperate with South Africa (Turton 2004; Turton and Earle 2005). Nevertheless, whatever the reasons for their present status, each of these institutions provides a powerful vehicle to enable cooperative water resource management to become a driver of regional integration and economic development. Where some institutions are perceived to be weaker than others, there is a clear need for them to be strengthened to the point where each institution is equally effective in promoting sustainable and equitable management of water in the southern African region.



Stream, Uluguru Mountains, Tanzania. Photo credit: Gerard D. Hertel, West Chester University, [www.forestryimages.org](http://www.forestryimages.org).

#### 2.2.2.4 The Role of Domestic Law and Capacity

Despite its obvious importance, the commitment of states to transboundary water law only partially reflects the legal ability of these states to absorb and respond to changes that occur within a basin. Despite an impressive record of treaty practice with respect to international river basin management, many African states still have ineffective institutional mechanisms and insufficient technical and economic capacity to manage their shared water resources (Wouters 1999).

In this context, a legal aspect that is often underestimated in Africa is the link between international agreements and domestic law. International agreements bind states on the international level (or “international plane”; Aust 2000), in relation to each of the other parties to the agreement. On the international plane the state is responsible for any conduct in breach of its international obligations, the “state responsibility.” However, while states have a general duty to bring their internal (domestic) law into conformity with obligations under international law (Brownlie 1998), it is clear that, as Aust (2000) puts it, “it should not be assumed that once a treaty has entered into force for a state it is then in force in a state.”

To ensure that domestic law conforms to a state’s treaty obligations, and domestic authorities have at their disposal the legal means to carry out these obligations, the treaty must be given effect in domestic law. In other words, the provisions of international law need to be incorporated into domestic law, since this is the law that is applied by domestic authorities. Where, for example, an international agreement contains detailed provisions on water allocation, the upstream country must ensure that the agreed flows are maintained to the downstream country. It is therefore essential for the upstream country that its domestic law can prevent potential over-exploitation by users within its territory. Where the domestic law does not provide these means and where the international agreement does not automatically become part of domestic law, the necessary legislative steps need to be undertaken. The procedure to achieve this will depend on the legal system of the respective state. In Namibia, for example, international law automatically becomes part of Namibian domestic law provided that it is in conformity with the Namibian Constitution. In a country such as South Africa, the provisions of an international treaty first have to be enacted into national law by national legislation, e.g., an Act of Parliament (Keightley 1996).

## SOUTHERN AFRICAN RIVER BASIN INSTITUTIONS

The Southern African Development Community (SADC) has been in existence since 1980, when it was formed as a loose alliance of nine majority-ruled States in southern Africa known as the Southern African Development Coordination Conference (SADCC), with the main aim of coordinating development projects in order to lessen economic dependence on the then-apartheid South Africa. The founding Member States were: Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, United Republic of Tanzania, Zambia, and Zimbabwe.

SADCC was formed in Lusaka, Zambia on April 1, 1980, following the adoption of the Lusaka Declaration—Southern Africa: Towards Economic Liberation. The transformation of the organisation from a Coordinating Conference into a Development Community (SADC) took place on August 17, 1992, in Windhoek, Namibia, when the Declaration and Treaty was signed at the Summit of Heads of State and Government, thereby giving the organisation a legal character.

The Member States are Angola, Botswana, the Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia, and Zimbabwe.

The ability of a country to comply with international agreements can be undermined in situations where its domestic law is inadequate or where it is incapable of enforcing its law. Here, non-compliance with an international agreement could arguably bear a higher potential risk of dispute or conflict than a situation where no international agreement was in place, since non-compliance could be perceived as a deliberate disregard for international obligations. Here, the substantial shortages of domestic and institutional capacity in many African states (Map 7a) could lead to inadvertent, or non-deliberate, violations of international agreements. Good technical and political collaboration, co-operation and communication between states are essential to prevent conflict arising from this type of situation.

On the other hand, a lack of domestic capacity can also prevent countries from concluding agreements with each other. Where a country is aware that it has insufficient capacity to implement and enforce an agreement, it would hesitate before elevating cooperation to a higher level (i.e., a joint management level) to avoid the risk of subsequent non-compliance. Hence, it is not merely the state of transboundary water law, but rather the interrelated aspects of international and domestic law, that determine the ability of a country to absorb changes on the legal level. At

this time, the shortage of domestic legal and institutional capacity in many African countries gives far more reason for concern than the status of transboundary water law.

### **2.2.3 The State of Institutional Development: The Establishment and Functioning of Water Commissions in Southern Africa**

Many African governments share similar visions and face comparable development problems, whilst also sharing several geographic, historical, cultural, and linguistic ties that supersede political boundaries (Ashton 2002). This has prompted the formation of regional- and continental-scale coalitions or associations such as SADC (see sidebar, p. 35) and the New Partnership for Africa's Development (NEPAD) that seek jointly to address mutual aspirations and problems (Ashton and Chonguiza 2003). These regional linkages and agreements are particularly important in the context of joint resources such as transboundary river and aquifer systems (FAO 2000), and highlight the rapidly expanding political agenda for regional integration that presses African countries to open their borders to transboundary economic development. Simultaneously, these initiatives have reinforced the need for countries to evaluate the





Communal water standpipe in Joe Slovo informal settlement outside Cape Town. Such standpipes represent the basic level of water service the government of South Africa wishes to guarantee to all citizens. Photo credit: Anton Earle.

extent to which their existing systems of governance can accommodate and comply with decision-making processes and management structures that must now extend beyond national boundaries (Ashton 2002; MacKay and Ashton 2004).

The significant role played by water in southern Africa is illustrated by the fact that the first co-operation protocol that was signed within the SADC region was the Protocol on Shared Watercourse Systems (Ramoeli 2002). Heyns (2002) notes that one of the major development challenges facing the SADC region in the near future is the need to implement large, regional water sharing and transfer schemes that can alleviate the economic limitations imposed by looming water scarcity in some countries. This represents a strong call to launch a substantial regional hydraulic mission that will develop the infrastructure needed to provide a high assurance of supply on which future economic growth can be planned with confidence.

Key elements of the body of international water law codified in the Helsinki Rules on the Uses of the Waters of International Rivers and the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses

have been incorporated into the SADC Protocol on Shared Watercourse Systems and its 2000 amendment. This instrument forms the legal and institutional foundation for the management of transboundary rivers in all SADC Member States (Ramoeli 2002). This is significant, because even if an individual SADC state has not ratified the two international conventions described above, it is still bound by the core principles enshrined in them by virtue of their ratification of the SADC Water Protocol and the Revised Protocol. Further evidence for increasing cooperation is the emergence of a trend that shows African governments to be spearheading the notion of an ecosystem approach to the development of international environmental law (McIntyre 2004).

At the international level, states have to balance two sets of opposing issues that influence their hydropolitical vulnerability. First, concerns about national sovereignty and perceptions about the relative power of riparian states can diminish the effectiveness of joint management efforts and institutions, thereby increasing hydropolitical vulnerability. This contrasts with the influence exerted on countries by national development needs and regional water shortages; these



*Aerial view of a portion of the Okavango Delta, Botswana. Photo credit: Peter Ashton.*

provide a strong incentive for closer cooperation, thereby helping to reduce the hydropolitical vulnerability of the states concerned. Most African countries face a variety of challenges in meeting their needs for water. Where these needs must be met from transboundary river systems, there is a clear need for strong governance structures to ensure equity and avoid conflict. However, if the available institutional capacity is too weak to avoid or resolve potential conflicts between states, or between different uses within a state, a stalemate may occur. Indeed, all forms of development slow or stall where riparian states are unwilling to negotiate or unable to compromise on their use of shared water resources. In such a situation, there is very real risk that rising demands for water within a country may result in unilateral action.

Misunderstandings about the specific roles and functions of particular transboundary river basin institutions have also led to groundless accusations that the institutions concerned are unable to manage the water resources in a particular river basin. A southern African example of such a situation is provided by the Okavango River basin, which is shared by Angola, Botswana

and Namibia. The Okavango River and its main tributaries rise in central Angola, flow through northern Namibia and terminate in Botswana's Okavango Delta; this is the largest Ramsar site in the world and an increasingly important source of tourism revenue for Botswana. Growing awareness of rising needs for water and potential conflicts of interest about possible uses of the water in the basin, led the governments of Angola, Botswana, and Namibia to form the Okavango River Basin Water Commission (OKACOM) in 1994, with the interests of each state represented by senior government officials (OKACOM 1994). OKACOM is strictly an advisory body, designed to promote liaison between the countries, share information and inform the respective governments on all issues related to the management of the water resources of the Okavango basin. Management of these water resources remains the responsibility of the respective governments. However, this important feature is often overlooked by individuals who expect OKACOM to actively manage the basin's water resources. This has led to mistaken perceptions that OKACOM is either weak or ineffective (because it does not manage the basin's water





*Pumping station pumping water from the lower Orange River to the Namibian mining town of Rosh Pinah. Photo credit: Daniel Malzbender.*

resources) when in fact it was never intended to fulfill this role (Ashton and Neal 2005).

In its present form, OKACOM represents a transitional stage on the trajectory of institutional development between informal technical cooperation and a fully fledged River Basin Organization (RBO) that actively undertakes management actions on behalf of the respective governments. OKACOM provides the governments of Angola, Botswana and Namibia with an important vehicle for liaison, communication, collaboration and trust-building, despite the inaccurate perceptions that it is a 'weak' institution (e.g., Ramberg 1997; Turton 1999). Suggestions, for example, that Namibia "bypassed OKACOM" in its plans to evaluate the development of a pipeline to convey water from the Okavango River to the Eastern National Water Carrier (e.g., Ramberg 1997) are unfounded. In both the pipeline case, and the later process to evaluate the feasibility of a hydropower plant at Popa Falls on the Okavango River, Namibian authorities were meticulous in adhering to all of the requirements stipulated by the OKACOM agreement. However, this was ignored by some sectors of the general public, based on inaccurate media reports about the role and responsibility of OKACOM.

Clearly, each of the three states (Angola, Botswana, and Namibia) still need to agree on what might constitute fair and equitable "shares" of the water in the Okavango basin. Given that over 95% of the runoff is generated in Angola, while most of the water is "used" by ecosystems in Botswana, this will not be a simple matter. Meanwhile, growing needs for development in each country continue to place pressure on the respective governments to supply adequate quantities of water. The recent cessation of civil war in Angola has also highlighted that country's urgent need for economic reconstruction and the rehabilitation of its infrastructure; this will place additional pressure on the basin's water resources. However, international public opinion is opposed to large-scale water developments anywhere in the Okavango River basin because these could adversely affect the ecological integrity of the unique Okavango Delta. None of the three basin states can afford to act unilaterally as this could result in them being ostracized by the international community. Instead, the countries must jointly decide how to achieve an equitable sharing of the basin's water resources, and what types of development options can be followed. The role and responsibilities of OKACOM need



*Okavango Delta, a pristine natural environment supporting ecotourism jobs in Botswana. Photo credit: Anton Earle.*

to be expanded formally to facilitate this (Ashton and Neal 2005).

Earlier studies of 19 southern African river basin commissions (Heyns 1995a; 1995b; Ohlsson 1995; Turton 1999) noted that each of these institutions had achieved some, though limited, measures of inter-state cooperation. However, these organizations had not yet developed to the extent that there was tangible cooperation in the form of collaborative programs for implementing joint management goals for entire river basins. Nevertheless, the activities of these organizations have demonstrated a growing government commitment to inter-state collaboration and cooperation aimed at improving social development in the region. A more recent study (Halcro-Johnston et al. 2004) has confirmed that the governments of southern African states were making considerable efforts to improve joint basin management at the regional level.

Within these southern African commissions, several issues impede states in their efforts to demonstrate the tangible outcomes of joint management strategies. First and foremost, a shortage of both human resources as well as financial and technical resources makes active participation in these commissions difficult for

some states. Second, a country's perceptions about its sovereignty also influence the way that it participates in river basin commissions. The act of assigning decision-making power to a river basin commission could imply a loss of sovereignty, as the state would have to commit itself to managing shared water resources located within its own territory in consensus with other members of the commission (Turton 2004; Turton and Earle 2005).

The relatively fragmented nature of institutional development in international river basins across Africa can be attributed to the different colonial experiences and the relative "youth" of most national governments. As a result of their differing backgrounds and different levels of infrastructural development, the various institutions have followed separate developmental trajectories. The best way forward would be to encourage further regional debate about the relative advantages and disadvantages of cooperative water resource management. Given the wide economic disparities among southern African countries, it will be especially important to ensure that economically weaker states can also accrue equitable benefits. There is no easy or generic solution to balancing the needs of two riparian states in an unequal political power





*Aquaculture project on the outskirts of the city of Maputo, Mozambique. Such projects contribute to food security, but may pose environmental risks, such as the destruction of wetlands and mangrove swamps. Photo credit: Anton Earle.*

arrangement. New research is needed on specific examples, first to gain a greater understanding of how river basin commissions function, and second to understand the reasons why politically powerful states should move from power-based to interests-based approaches to management. The research would need to determine the reasons for the degree of success or failure from the perspective of each participant. This would enhance our collective understanding of how



*Red lechwe, Moremi Wildlife Refuge, Botswana. Photo credit: Paul Bolstad, University of Minnesota, [www.forestryimages.org](http://www.forestryimages.org)*

states interact and cooperate in arid regions (Turton 2004; Turton and Earle 2005).

In southern Africa, for example, four of the most highly developed states are reaching a point where transboundary water availability is affecting the evolution of international relations between those states. The four states, Botswana, Namibia, South Africa and Zimbabwe, share three common characteristics: all rely heavily on the water resources of international rivers; all have reached a point where water scarcity can limit their future economic growth; and all regard water as a strategic natural resource.

Significantly, these four states all share either one, or both, of two key international river basins: the Orange and Limpopo. These two river basins are of strategic significance to the riparian states concerned, since both basins are reaching a point of closure (Turton 2003a), where all of the available water has been allocated to some productive activity and there is no more water left to be allocated to new uses (Svendsen et al. 2001). Closure can be considered a threshold-crossing; it can trigger either competitive or cooperative behavior among the respective riparian states. Thus, the degree to which a river



*The Hartebeespoort Dam north of Johannesburg in the Limpopo basin is one of the most polluted on the continent, receiving treated sewerage outflow from over 30 urban sewerage-works. Communities downstream of the dam experience water quality problems. Photo credit: Anton Earle.*

basin is approaching closure can also be used as an indicator of potential future conflict that must be prevented.

In the Limpopo River basin, South Africa, and Botswana are upstream riparian countries relative to their neighbours Zimbabwe and Mozambique. Virtually all of the available water in the Limpopo basin has been fully committed to current water users in Botswana and South Africa, leaving relatively little water available for users in Zimbabwe and Mozambique. In terms of South Africa's National Water Act of 1998, the water needs of downstream riparian states must now be considered before domestic water allocations are made, and international agreements to provide water to downstream riparian states must be honored (Turton 2003b). The imbalance of water allocation in the Limpopo basin creates tension between the four riparian states, with specific emphasis being placed on current patterns of water allocation and the legal requirements of the future type of cooperation required between riparian states.

In the southern portion of the Southern African Development Community (SADC) region,<sup>1</sup> water has a relatively long history of politicization, having played an important but often subtle role

in border demarcation and land ownership issues during the colonial and Apartheid years (Turton 2003b). In the post-Apartheid era, the overt nature of water politics in the region may have altered, but the underlying drivers remain largely unchanged. The four economically most developed states in the region share international river basins with other states, and their relatively arid climates combined with looming water shortages pose significant limitations to their future economic growth prospects. In the present conditions of regional peace and political integration, these drivers are pressing states to cooperate with each other and find joint solutions to their water management problems. Evidence for increased cooperation can already be seen in the number of bilateral and multilateral river basin commissions that have been formed during the past decade. In this way, water acts as a vehicle of regional integration (Halcro-Johnston et al. 2004). However, if inter-state relations should deteriorate for any reason, it is not clear if the present levels of cooperation over water issues would continue—even if only at a technical level.

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1. Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe.



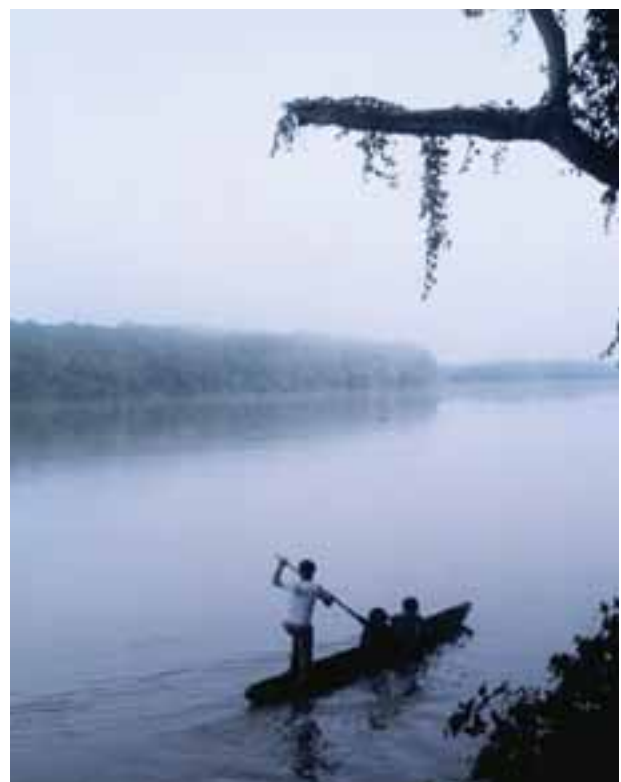
## 2.3 REGIONAL OVERVIEW OF KEY HYDROLOGICAL, SOCIOLOGICAL, AND HYDROPOLITICAL CHARACTERISTICS

### 2.3.1 Central Africa

Central African states<sup>2</sup> share six international river basins that receive high rainfalls and which discharge their flows into the Atlantic Ocean. The largest of these systems is the Congo River (Map 2a), while the remaining river basins are all much smaller. Per person availability of water in these international basins is high — over 100,000 cubic meters per person annually in the case of Gabon — reflecting their relatively low population densities and high rainfalls (Map 5b). In addition, the north-eastern portion of the DRC contributes a relatively modest amount of water to the Nile River system.

International water governance systems in the Central African region are not unified, though some individual states are members of regional affiliations such as the Southern African Development

Community Water Protocol (DRC) and the Nile Basin Initiative (DRC, Rwanda and Burundi). The first Central African river basin organization was formed in 1999, when the Commission Internationale du Bassins Congo-Oubangui-Sangha (CICOS) was formed between Cameroon, Central African Republic, Republic of Congo and DRC. There is relatively low potential for inter-state conflict over water supplies since all



2. Cameroon, Central African Republic, Democratic Republic of Congo (DRC), Equatorial Guinea, Gabon, Republic of Congo.

Photo credits: (top) UN "Peace Boat" departs Kinshasa (DRC) on the Congo River, USAID. (right) Canoe on the Sangha River, Central African Republic, Jane McCauley Thomas, College of the Sequoias.





the states have relatively low population densities and ample water to supply their foreseeable domestic needs. Indeed, the continuous availability of ample water in these countries ensures that their conflict potential is likely to occur at a much smaller and more localized scale — between communities and water users.

However, while ample water may be available, very few people in the region enjoy assured access to clean and safe water supplies, with many communities being affected by high levels of water-borne diseases. In essence, the issue is not one of water scarcity, but rather one of access to safe water (Gleick 1998; Ashton 2002). Countries such as the DRC and Republic of Congo are even looking at opportunities to export some of their “surplus” water to more arid countries. For example: diverting water from the northward-flowing Kasai River tributary of the Congo River via the Zambezi River or Okavango River to Botswana, Namibia and South Africa in the south (Heyns 2002: 166–67); or taking water from the northern Ubangui River tributary of the Congo River, via the Logone-Chari system to

Lake Chad in the north (Kuwairi 2004). While options such as these are technically feasible, their environmental implications need to be examined carefully. For instance, several Congo River tributaries support the parasite that causes Onchocerciasis, or river blindness, in humans. This parasite is absent from the more arid river basins to the north and south of the Congo system and there is a risk that the parasite could be introduced inadvertently to these systems. If such an event occurred, it would have enormous social and ecological consequences for the receptor systems and their human populations.



Photo credits: (top) washing dishes; children play in the rain, northern Korup, Cameroon. Jane McCauley Thomas, College of the Sequoias.



### 2.3.2 North Africa

The North African states<sup>3</sup> share nine international river basins and several important groundwater aquifers. Algeria shares the Medjera River basin with Tunisia and the Tafna, Oued Bon Naima, Guir, Daoura and Dra basins with Morocco. The southern portions of Libya and Algeria contain a few ephemeral rivers that flow only after rare

rainfall events. These ephemeral rivers are located in the southern Sahara Desert and drain southwards, occasionally contributing small proportions of flow to the Niger and Lake Chad drainage systems in West Africa. Egypt is an important downstream riparian state in the Nile basin, which it shares with Sudan, as well as Ethiopia and Eritrea in Northeast Africa, and six other East African countries.

North Africa incorporates most of the Sahara Desert and as a result has a very dry and hot climate. With the exception of parts of the Atlas Mountains shared by Morocco, Algeria, and Tunisia, extremely low rainfalls are recorded over most of the region. Several large transboundary aquifers are located across the North African region; the most important of these are the Errachedia, Tindouf, Taoudéni, Northern Sahara, Mourzouk-Djado, Irhazeer-lullemedin and Nubian Sandstone aquifers. These aquifers contain very large quantities of fossil water which has been dated at several thousand years, suggesting that these aquifers are not being effectively recharged in recent times. Nevertheless, these groundwater resources are critically important for the societies and economies of each North African country (Map 4b). For example, the Northern Sahara,



3. Algeria, Egypt, Libya, Morocco, and Tunisia.

Photos, from top: Children on dunes; Orobanche flowers emerge after rare rainfall, Algeria; outside a coffee house, Tunisia street. Photo credits: Jane McCauley Thomas, College of the Sequoias.





Mourzouk Djado and Nubian Sandstone aquifers in the Libyan Desert supply water to the northern coastal regions of Algeria, Tunisia, and Libya. Here, the Great Manmade River Project in Libya has enabled Libya to withdraw large volumes of water from several aquifers in the central and southern portions of the country to supply coastal developments (Kuwairi 2004). Egypt also uses some water from the Nubian Sandstone Aquifer mainly for irrigated agriculture, while further to the south, communities living in the northern portions of Chad and Sudan also rely on groundwater drawn from this aquifer system.

The annual per-capita availability of water is low throughout North Africa (typically less than 1000 cubic meters per year) (Map 5b). Due to the very low rainfalls received in this region, most agricultural activities rely heavily on groundwater resources to meet irrigation needs. In contrast, Egypt relies almost entirely on the water resources of the lower Nile River for its agricultural production, though recent agricultural developments have seen increased areas of irrigated agriculture being supplied by groundwater drawn from the Nubian Sandstone Aquifer.

The Nile River has two main tributaries: the Blue Nile, which rises in the central highlands of Ethiopia and supplies some 55% of the flow, and the White Nile, which rises in Lake Victoria (fed by rivers draining from Kenya, Tanzania, Uganda, DRC, Rwanda, and Burundi) and contributes

some 45% of the Nile's flow. The Gash and Baraka rivers drain from Ethiopia and Eritrea through north-eastern Sudan into the middle reaches of the Nile. Apart from Egypt's participation in the Nile Basin Initiative (together with the other nine riparian states), none of the other North African basins is covered by international water agreements or commissions.



*Sailboat on Nile, near Asyut, Egypt (top), photo credit: Gene Molander. Overland water transport, Morocco, photo credit: Daniel Malzbender.*



### 2.3.3 East Africa

Shared basins of East Africa<sup>4</sup> include the Nile, Baraka, Gash, Lotagipi Swamp, Awash, Juba-Shibeli, Lake Turkana, Lake Natron, Uмба, and Pangani, collectively shared

among the states of Burundi, Rwanda, Sudan, Uganda, Eritrea, Ethiopia, Djibouti, Somalia, Kenya, and Tanzania. Tanzania also shares portions of the Congo, Rovuma, and Zambezi basins to the east and south with DRC, Zambia, and Mozambique, respectively. In

Eastern Africa, rainfall patterns are largely determined by the presence of mountainous areas and the region's equatorial location. For example, the Ethiopian Highlands generate a large proportion of the water resources of this region, providing the main source of water for the Nile,



(Top) Livestock herd along stream, East Africa, photo credit: Kenneth M. Gale, [www.forestryimages.org](http://www.forestryimages.org).  
(bottom) Dugout canoes on lakeshore, Tanzania, photo credit: William M. Ciesla, Forest Health Management International, [www.forestryimages.org](http://www.forestryimages.org).

4. Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Sudan, Tanzania, and Uganda.





Gash, Awash, Juba-Shibeli, Lake Turkana, and the Lotagipi Swamp systems (Map 7b).

The institutional structures for transboundary water management in Eastern Africa are some of the oldest agreements on the continent. Most of these agreements were developed bilaterally between former colonial powers (Great Britain, Italy, Belgium), and with Ethiopia, with the majority of these agreements being focused on the Nile River. Later (1950s) treaties included bilateral agreements between Egypt, Uganda and Sudan (on the Nile) and between Eritrea and Sudan (on the Gash) (TFDD, treaties database). Despite these early treaties, East African countries

did not form river basin commissions or similar structures until the 1990s, when formal multi-lateral programs engaged the 10 Nile basin governments in joint management activities through the Nile Basin Initiative (see the Nile basin case study, pp. 50–54).



(Top) Ceremony to mark the opening of new water sources in two villages, Eritrea, photo credit: USAID. (bottom) A soil and peat cleansing bed in Uganda's flower industry, photo credit: Chemonics/M. Herrick, USAID.



### 2.3.4 West Africa

In West Africa,<sup>5</sup> rainfall is high over the equatorial regions and declines sharply to the north with increasing latitude. High rates of population

growth, combined with a large number of shared water courses in the region, create the potential for conflict. Many of the basins have functioning river basin commissions that have been in existence for a long time. For example, the Lake Chad Basin

Commission has been in operation since 1964, while in the Senegal basin, the Organisation pour la Mise en Valeur du Bassin du Fleuve Senegal (OMVS), has been in existence since 1972. Another river basin commission was also recently established for the largest river basin in the region — the Niger. The Niger River faces a variety of threats from climate change,

5. Benin, Burkina Faso, Chad, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo.



A canoe on the Niger River at sunset, Guinea (top); and a participant in a women's agricultural cooperative, Guinea. Photo credits: L. Lartigue, USAID.





desertification, and pollution, as well as the consequences of the wide variety of competing uses, including agriculture, fisheries, hydropower generation, and industrial development. River basin organizations in West Africa tend to have greater decision-making powers than in other parts of Africa, with the OVMS already having presided over the construction of two large dams and a hydropower scheme on the Senegal River. There is strong cooperation between the states with countries reaching general agreement on national and regional development goals and principles. However, some basins in the region, such as the Volta, still lack a fully operational commission and have little cooperation among

basin states. The variety of climatic and human drivers that contribute to environmental degradation on the Volta basin, make it necessary to strengthen the policy and institutional capacity in each basin state to enable effective management of the basin as a whole.



(Top) removal of invasive water hyacinth plants, Niger River, Niger, photo credit: Marcia Macomber, OSU. (Left) Replanting rice seedlings along Niger River floodplains, Mali; and (right) little girl carrying jerry can of water, Liberia, photo credits: USAID.

## 2.4 THE HYDROPOLITICAL SITUATION IN SELECTED AFRICAN BASINS

The varying state of hydropolitical dynamics in different African basins reflects the diversity of the political, social, economic, and ecological situations in Africa as a whole and the degree of cooperative basin management among riparian states varies significantly. For example, some countries (e.g., South Africa, Botswana, Namibia, Cameroon, Nigeria, Mauritania, and Mali) may simultaneously be a riparian state in a basin that has an established cooperative governance structure such as a river basin commission, and also a riparian state in a different basin that lacks

any form of formal management or decision-making institution. The complexity of hydropolitics in Africa prevents the use of broad generalizations as a way to characterize the situation in different river basins. Therefore, selected case studies are used to illustrate the current reality of river basin management in Africa. These case study basins have been selected to provide a cross-section of the types of issues that influence our understanding of hydropolitical vulnerability in Africa.

### 2.4.1 The Nile Basin

The Nile, with a length of close to 6700 km and a total basin area slightly over 3 million km<sup>2</sup>, is one of the largest river basins in the world (Figure 2.3). It also has the unusually high number of ten

riparian states: Burundi, the Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, United Republic of Tanzania and Uganda (Map 7b). Of these states, Egypt occupies the lowest position along the river course and its economy is almost entirely dependent on the waters of the Nile. The fact that some 55% of the Nile waters flow from Ethiopia, while the remainder comes from Lake Victoria in East Africa, poses an unusual situation. Despite being the most economically powerful of the ten riparian states, Egypt is extremely vulnerable in terms of the security of its water supplies. As a result, Egypt views the use of water from the Nile River as a matter of utmost strategic impor-



Figure 2.3 The Nile River basin





*Transportation on Blue Nile, Ethiopia. Photo credit: Badege Bishaw, OSU.*

tance. In the past, Egyptian politicians have expressed deep concerns about this situation; certain statements, most notably that made by Egyptian President Anwar Sadat in 1979, that “the only matter that could take Egypt to war again is water,” is regarded as the origin of the “water wars discourse.” This term is used to describe a hypothetical situation where the wars of the future would be fought over scarce resources such as water. In more recent times, the political discourse has shifted away from a conflict bias, to a greater focus on the use of water as a vehicle for cooperation and collaboration between riparian states.

The challenges facing the Nile basin countries are similar to those faced by most if not all of the other African countries that share river basins. Countries in the Nile basin have high population growth rates and many (e.g., Ethiopia, Eritrea, and Sudan) experience chronic shortages of the most basic physical needs, water and food (National Water Research Center 2001). In terms of water scarcity, the Nile basin is among the most problematic regions of the world. Together with urbanization, societies and the environment are under excessive pressure. Sudan, Ethiopia,

and Eritrea are among the Nile basin states that are most vulnerable to climatic variations; the current difficulty in accurately predicting the likely consequences of climate change poses additional problems for long-term planning processes. The difficulties faced by the Nile basin countries in their efforts to manage the basin’s resources in a sustainable way are further complicated by wide social and economic disparities in the riparian countries. Several riparian states see the resolution of these socioeconomic disparities as a more urgent priority than efforts to manage the basin’s water resources in an integrated and sustainable way (National Water Research Center 2001).

Perhaps the biggest obstacle to institution building and cooperative management in the past has been the history of political tension between various riparian states, most notably Egypt, Sudan, and Ethiopia. The underlying reason for these tensions is rooted in Egypt’s almost total reliance on the Nile River for its domestic consumption and industrial production, as well as for hydropower generation. In recent years, the upstream riparian states (Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda) have experienced very rapid rates of population

# HISTORIC OVERVIEW OF KEY HYDROPOLITICAL EVENTS IN THE NILE BASIN

- 1891**—The first recorded agreement on the Nile: a Protocol signed between Great Britain and Italy in which the two countries demarcated their respective spheres of influence. Egypt, as the main user of the Nile, laid the foundation for securing unhindered access (Haftendorn 2000:58).
- 1898**—Military conflict arose between Britain and France when a French expedition attempted to gain control of the headwaters of the White Nile. While the parties ultimately negotiated a settlement to the dispute, the incident has been characterized as having “dramatized Egypt’s vulnerable dependence on the Nile and fixed the attitude of Egyptian policy-makers ever since” (Gleick 1998:128).
- 1922**—Egypt gains independence from Britain
- 1929**—Nile Waters Agreement signed between Egypt, Sudan, and the British colonies/ protectorates in East Africa. Belgian colonies (Zaire, Rwanda, and Burundi) are not signatories. This agreement creates historic legal rights, with Egypt assuming full rights to the entire natural dry season flow of the Nile, relegating Sudan’s use to the water that it can store from the end of the seasonal flood (Turton 2000).
- 1935**—Bilateral agreement reached between Egypt and Sudan on the construction of a barrage at Lake Tana. The Italian invasion of Ethiopia precluded an accord with Ethiopia, the party most involved (Waterbury 1979:93).
- 1946**—Equatorial Nile Project launched, involving the dredging of the Jonglei Canal in Sudan. Because approximately 34 bcm or 40% of the total Nile flow (50% of the water that flows through the Sudd wetland) is lost to evaporation, the Jonglei Canal sought to “conserve” this water by reducing the surface area. The Jonglei project was later stopped (in 1983) due to the civil war in Sudan (Hultin 1995) and never resumed.
- 1952**—Nasser came to power in Egypt. The Egyptian Revolutionary Command Council (RCC) consisting of Nasser and 11 of his political allies were no strong ideologues or doctrinaire revolutionaries, they were bound by one thing—an overriding concern for Egypt’s independence in all spheres (political, military, and economic). The RCC thus sought a spectacular project to turn this ideal into reality. Adrien Daninos, having had his past plans rejected by the former Egyptian regime, presented the idea of the Aswan High Dam to the RCC (Waterbury 1979:100). Two months later, the visionary “High Dam Covenant” is endorsed by the Egyptian government. The endorsed plans for the Aswan Dam clash with Sudanese plans for the Roseires Dam.
- 1954**—After mounting tensions between Egypt and Sudan, the latter declares the 1929 Agreement void (Hultin 1995).
- 1956**—Ethiopia asserts right to use the waters of the Blue Nile for the development of its own people. Sudanese independence escalates hostilities with Egypt, and Sudan announces its intention to assert sovereign rights over the Blue Nile (Hultin 1995). In his response speech, Nasser states that Egypt’s very survival depended on the Aswan High Dam Project, thereby linking water scarcity to national security in a paradigm that has endured to this day.
- 1958**—Egypt dismisses the British Report on the Nile Valley Plan that sees the whole basin being managed as an integral unit. Pending negotiations over the Nile, Egypt sent a military expedition into the disputed territory between Egypt and Sudan. This is the first time that tensions came close to military conflict. The tensions finally eased with the collapse of the Sudanese government by means of military coup (Postel 1999:136; Hultin 1995) and the subsequent election of a pro-Egyptian government in Sudan
- 1959**—Nile Water Treaty signed. This Bilateral Agreement on the Full Utilization of the Nile Waters distributes the total flow of the Nile into the Aswan High dam, consisting of 84 bcm, as follows: Egypt, 55.5 bcm; Sudan, 18.5 bcm, with the remaining 10 bcm lost to evaporation and seepage (Postel 1999). The wording of agreement is based on the legal concept of “historic rights”. The agreement, does however, contain provisions on the inclusion of upstream riparians over time and allocations for upstream uses.
- 1961**—Tanzania independence from Britain. Tanzania develops the Nyerere Doctrine, which states that “former colonial countries had no role in the formulation and conclusion of treaties made during the colonial era, and therefore they must not be assumed to automatically succeed to those treaties” (Collins 1990; Hultin 1995; Ohlsson 1995).
- 1962**—Based on the Nyerere Doctrine, Tanzania informs Great Britain, Egypt, and Sudan that it has rejected the 1929 Agreement. Egypt announces that it still regards the 1929 Agreement as valid (Hultin 1995).
- 1963**—Kenya gains independence and immediately invokes the Nyerere Doctrine, also rejecting the 1929 Agreement. Uganda rejects the 1929 Agreement but does not cite the Nyerere Doctrine. Zaire, Rwanda, and Burundi were never bound to this, as they were under Belgian rule at the time the treaty was signed (Turton 2000).
- 1971**—Aswan High Dam fully completed, with a storage capacity of 164 bcm and a surface area of 4,000 square kilometres (Waterbury 1979).
- 1978**—Ethiopia, now under the rule of Mengistu Haile Mariam, proposed construction of dams on the headwaters of the Blue Nile, leading Egypt to repeatedly declare the vital importance of water (Turton 2000).
- 1979**—Anwar Sadat makes the speech that marks the official birth of the “water wars” debate (Gleick 1998).
- 1984**—After the major famine in Ethiopia, the military government announces plans to forcibly relocate 1.5 million people, which eventually fails. This underlying political concept is called “garrison socialism” (Hultin 1995).



**1989**—Ethiopian government abandons the resettlement policy with only 4% of the planned irrigation land being developed. Egypt fears a renewal of plans to develop Ethiopian irrigation lands and this aspect became part of the Egyptian security paradigm (Hultin 1995).

**1990**—Boutros Boutros-Ghali, in his capacity as the Egyptian Foreign Minister, states that “the national security of Egypt which is based on the waters of the Nile, is in the hands of other countries. ... The next war in the region will be over the waters of the Nile” (Hultin 1995). This gave the “water wars” debate a stronger impetus.

**1991**—Sudan and Ethiopia sign an agreement over the joint use of the Nile waters. The Ethiopian Government also announces that it has plans to construct a number of dams in the Ethiopian highlands, triggering Egyptian fears over its access to the Nile (Haftendorn 2000).

**1992**—The 10 riparian states meet to launch the Nile River Basic Action Plan (NRBAP). One of the elements of this is to establish a cooperative scheme for the management of the Nile (Green Cross International 2000).

**1993**—The Riparian States of the Upper Nile meet to foster cooperation within the basin, which becomes an annual event (Hultin 1995).

**1995**—New tensions flare between Sudan and Egypt. Sudan threatens to cut off the flow of Nile water to Egypt. Tensions were linked with the assassination attempt on President Mubarak while he was attending a meeting in Addis Ababa, Ethiopia (Hultin 1995), thereby elevating the sense of urgency. The World Bank, in conjunction with the UNDP and the Canadian CIDA begins working with an International Advisory Group, senior officials from the riparian states, and other donor agencies to give impetus to the newly developed NRBAP (Green Cross International 2000).

**1998**—Ethiopia demands a re-examination of the 1959 Agreement (which widely excludes Ethiopia from the utilization of

Nile waters) at a meeting of the Nile Basin States in Tanzania. The Ethiopian Foreign Minister announces the intent to construct various dams and reservoirs within Ethiopia, citing better climatic and engineering-related criteria (lower evaporation and deeper valleys with good dam sites). Toshka/New Valley Project in Egypt is launched. It will use 5 bcm from upstream of the Aswan High Dam, and send it via aqueduct to the Western Desert where it will irrigate 200,000 hectares at an estimated cost of 87-145 billion US\$ (Hultin 1995). This should be interpreted as exercising the “historic right” that was established in the 1959 agreement. It is primarily political in orientation; therefore, issues of economic efficiency are secondary. This negates the Ethiopian plans and reinforces the legal principle of “historic rights.”

**1999**—The Council of Ministers of Water Affairs of the Nile Basin States (Nile-COM) agree to transitional institutional arrangements to strengthen cooperation in the Nile Basin (Green Cross International 2000). The Nile Basin Initiative (NBI) is officially launched in Dar es Salaam, with all basin states (except Eritrea) being members. The NBI succeeds the former Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE) until an acceptable permanent legal framework is established (Green Cross International 2000).

Source: adapted from Turton 2000.

Nile River, at Memphis, Egypt.  
Photo credit: Gene Molander.



*Invasive water hyacinth plants, Nile River irrigation canal, Egypt. Photo credit: Gene Molander.*

growth combined with increased demands for water for agriculture, industry and domestic uses. In view of these two factors, it is not surprising that the upstream riparian states have expressed a desire to exploit the water resources of the Nile's upper tributaries for the benefit of their societies. Taken together, this has contributed to the increased anxiety felt by the downstream riparian states (Sudan and Egypt), and has also contributed to a greater awareness of the need for regional collaboration.

Despite publicized periods of tension between the Nile basin states, there have also been examples of regional cooperation (see the historic overview sidebar, pp. 52–53). For example, the Nile River was managed as a hydrological unit

during colonial times, but as each basin state gained independence, it claimed riparian sovereignty—ultimately eroding any notion of basin-wide management. This had the result that much of the cooperation during post-colonial times occurred at a bilateral level. Currently, all of the Nile basin riparian states are working together to achieve wider cooperation through the recently formed Nile Basin Initiative. Because these current efforts take place against the backdrop of the region's somewhat turbulent hydropolitical history, a brief summary of key hydropolitical events over the past century is included in the historic overview (pp. 52–53).

This historic overview illustrates the complicated hydropolitical situation in the Nile basin and shows that events leading to inter-state anxiety were regularly followed by bilateral cooperation that resolved these tensions. However, in several cases, tensions tended to re-emerge because the underlying problems had not been resolved. The example of the exclusion of Ethiopia from the 1959 agreement illustrates how bilateral cooperation between two riparians (in that case, Egypt and Sudan) can increase the potential for dispute with other riparian states. This makes the call for a multilateral solution involving all riparian states even more desirable and the recent establishment of the Nile Basin Initiative (NBI)



*Blue Nile hydropower plant, Ethiopia. Photo credit: Badege Bishaw, OSU.*



is a very encouraging development. The fact that the Nile Basin Initiative was initiated by third-party actors (UNDP, CIDA) reveals that third parties can play a pivotal role as external drivers for cooperation.

### 2.4.2 The Volta Basin

Located in West Africa, the Volta River basin covers an area of 412,800 km<sup>2</sup> and comprises six riparian countries: Benin, Burkina Faso, Côte d'Ivoire, Mali, Togo, and Ghana (Figure 2.4). Groundwater resources are important in the northern parts of the Volta basin, especially the Liptako-Gourma basin that is shared by Burkina Faso and Mali. Along the West African coastline, a short distance outside the Volta basin, the Côte d'Ivoire-Ghana Coastal Aquifer to the west and the Benin-Togo-Nigeria Coastal Aquifer to the east, help to reduce demands for water from the Volta River. Burkina Faso and Ghana are the two largest riparian states in the Volta basin, comprising 42% and 40%, respectively, of the total basin area. Smaller proportions of the basin area are contributed by Benin (3.6%), Côte d'Ivoire (3.3%), Mali (4.6%) and Togo (6.3%) (Andah and Gichuki 2003).

The countries comprising the Volta basin are amongst the poorest nations in the world. The comparatively richest country, Côte d'Ivoire has a per capita GDP of \$715, compared to \$250 in Burkina Faso, the poorest basin country (Andah and Gichuki 2003). All the basin countries have very high population densities

and high population growth rates, with the result that there is a rapid increase in the demand for water to meet domestic, agricultural, and industrial development needs. Increased industrial activity and incomplete treatment of effluent and wastes have resulted in pollution, particularly around cities and towns. This pollution, combined with desertification in the northern areas, poses threats to the basin's water resources. To date, the Volta basin does not have a fully operational river basin commission and the institutional capacity of each basin state needs to be strengthened.

The water resource uses in the Volta basin reflect a pattern that is typical of most African countries: much of the water is needed for agriculture and livestock production, as well as domestic



Figure 2.4 The Volta River basin.

consumption, complemented by some demand for industrial use and hydropower generation (mainly in Ghana). Between 62.3% (Ghana) and 92.4% (Burkina Faso) of the total Volta basin population rely on agricultural activities for their livelihoods and agricultural water use represents the key water demand factor in the basin. However, the available water resources do not fully meet the current water needs of the population and some previously perennial tributaries of the Volta are now seasonal. The degree of water scarcity is expected to increase in the future, primarily due to the anticipated increase in population in each riparian country. Over the next 40 years, the total population within the Volta basin is expected to increase by more than 80%, with the population increase in individual basin states ranging from 71% for Côte d'Ivoire to 119% for Burkina Faso. These projections suggest that the current basin population of 20 million will nearly double over the next four decades.

This increase in population will cause a dramatic rise in the demand for water. In response to their projected high population numbers, the basin countries are seeking ways to expand industrial production for job creation, as well as irrigated agriculture to meet the growing demand for food. These developments will likely have far-reaching impacts on the Volta basin's water resources. The projected increase in consumptive water demand over a 20-year period (from 2000-2020) is expected to range between 62% for Togo and a staggering 1,221% for Côte d'Ivoire. Similar projections for the other basin states also show very variable increases in water use, with 93% for Mali, 128% for Burkina Faso, 424% for Ghana, and 583% for Benin. The expansion of irrigation and domestic water consumption are



*The White Volta in Ghana is used for transport, hydropower, irrigation, and domestic uses. Photo credit: Anthony Turton.*

expected to be the main factors responsible for this increase in each basin state (Andah and Gichuki 2003).

Several additional factors make this difficult situation worse. The first of these is the observed change in climatic conditions as reflected in a southward shift of the dry Sahel region from the north. Although reliable hydrological data are scarce in the region, rainfalls and river flows have declined steadily during the last twenty years, combined with the recorded rise in temperatures over the last 30 years and accompanied by higher evaporation rates. While the exact long-term impact of these climate effects remains difficult to predict, it is clear that the current climatic changes have already had an adverse effect on the amount of available water in the Volta basin and further changes would likely worsen this situation.

A second crucial factor relates to the widespread inefficient use of available water resources. A recent review (Andah and Gichuki 2003) has estimated that water supply systems for domestic and industrial use have transmission losses of up to 50% due to leakages. In the agricultural sector, flood irrigation is the most commonly used farming practice in the Volta basin, with high volumes of water being lost through evaporation and seepage. Additional volumes of water are lost by evaporation from the rapidly increasing number of small water storage reservoirs throughout the basin. Most of the Volta basin countries lack the financial resources to upgrade the existing infrastructure or introduce more efficient irrigation systems such as sprinklers or drip irrigation.

The Volta basin countries attempt to address the problems caused by diminishing surface water resources by making increased use of groundwater resources. However, high rates of groundwater abstraction often exceed the rates at which aquifers are recharged, leading to falling water tables. Throughout the southern portion of the Volta basin, rapid rates of deforestation, combined with the transformation of previously vegetated landscapes to agricultural cropping areas, results in reduced rates of infiltration and aquifer recharge, further aggravating the situation.

In addition to these problems, the Volta basin also experiences other water-related problems. In particular, the Volta River and its





*Celebration for the opening of a new well, Ghana. Photo credit: USAID.*

tributaries experience massive infestations of aquatic weeds that were originally introduced as ornamental plants (Andah and Gichuki 2003). These infestations interfere with boat traffic, reduce the efficiency of hydropower generation, and result in declining fish catches. These adverse economic effects are compounded by the health-related effects caused by the high prevalence rates of water-borne diseases. Malaria and river blindness represent the key human health concerns of the Volta basin states.

Against this background, it is obvious that the variety and seriousness of these problems make it difficult for the riparian states to alleviate poverty in their countries through increased industrialization and agricultural production. Instead, increasing competition for the available water resources has the potential to generate disputes and perhaps even conflicts among the different water users. Current water use patterns in the Volta basin have already stretched the available resources almost to their limits, and it will be increasingly difficult to satisfy additional demands for water (Andah and Gichuki 2003). With the sustainability of the Volta basin under threat, there is

an urgent need for the basin states to cooperate more closely to jointly manage the basin's water resources. However, since all of the basin states have relatively weakly developed institutional capacity for such joint management efforts, there is a pressing need to strengthen and improve these structures and processes in each country.

Management of the water resources in the Volta basin takes place at a national level in each country and is considered to be 'weak' in all of the riparian states. Water resource management responsibilities are spread across many institutions, resulting in overlapping responsibilities, difficulties in coordination, and weakened inter-sectoral cooperation (Andah and Gichuki 2003).

A similar situation exists at the international level. There is no co-operative, basin-wide agreement to regulate and manage the Volta basin, or to promote technical co-operation between the states. Existing co-operation is limited to a few bilateral agreements between some of the basin states. However, while the states have not combined to form a formal river basin organization to manage the basin at a regional level, the two largest riparian states, Burkina Faso and

Ghana (jointly comprising some 82% of the total basin area), have signed a bilateral agreement to create a joint commission to manage the water resources of the Volta basin. There is also a cooperative agreement between Burkina Faso and Côte d'Ivoire to develop joint programs for integrated water resource management. However, the bilateral focus of these agreements prevents the riparian states from addressing some of the most pressing issues in a comprehensive manner. For example, the construction of small, shallow water storage reservoirs for irrigation is virtually uncontrolled; Burkina Faso now has more than 400 of these reservoirs and their combined effect is to reduce flows in downstream portions of river tributaries that enter other countries.

The escalating pressure on the Volta basin's water resources, combined with relatively weak water management capacity at both national and transboundary levels, places the Volta basin at risk of dispute or conflict over water resources in the future. This risk of conflict will increase dramatically as populations increase, because the economy of each basin state is highly dependent on the water resources of the Volta basin, and most of the countries have no access to alternative sources of freshwater.

The urgent need for transboundary water management at a basin level has been recognized by the riparian countries, as well as external role players, and is starting to be addressed. The West African Regional Action Plan for Integrated

Water Resources Management (WARAP-IWRM) is addressing the Volta basin as part of its activities in West Africa. Other initiatives, funded by foreign donors, are addressing national and regional capacity constraints in water-related research and institutional capacity building. Progress to date has been slow because of the magnitude of the problems and the constraints to development faced by the riparian states. These initiatives will need to keep pace with the escalating pressures on the basin's water resources and ensure that the new institutional structures can sustain inter-state cooperation.



Figure 2.5 The Limpopo River basin.

### 2.4.3 The Limpopo Basin

The Limpopo basin (Figure 2.5) covers an area of 414,800 km<sup>2</sup> and comprises portions



of four southern African countries, namely: Botswana (19.7%), Mozambique (21.0%), South Africa (44.2%) and Zimbabwe (15.1%) (UNEP 2004). The total length of the main stem of the Limpopo River is 1,700 km and forms part of the border between South Africa and Botswana, and the border between South Africa and Zimbabwe. The basin occupies a strategically important position in the region because the river and its tributaries are vital for the economies of the four basin states (Ashton and Turton, in press).

The different portions of the Limpopo basin receive highly variable rainfalls, ranging from 1000 mm per annum in the mountainous south-eastern sector, to less than 400 mm in the central and western regions. Most of the basin receives

less than 500 mm of rainfall each year and evaporation rates are high throughout the basin. There is an additional complication that rainfall is highly seasonal as well as very variable between years. Some 90% of the rainfall occurs between October and April, usually as isolated thunderstorms, and rain is usually recorded on fewer than 50 days per year. While the basin often experiences flooding after intense rainfalls, severe droughts also occur, causing great hardship for rural communities that rely on rain-fed subsistence agriculture.

The total urban plus rural population in the basin is 14 million, with 10.7 million in the South African part of the basin, 1 million each in Botswana and Zimbabwe, and 1.3 million in Mozambique (Louw and Gichuki 2003). Some

large urban and industrial centers in Botswana (Gaborone, Francistown) and South Africa (Pretoria, Mokopane, Polokwane) are located within the basin, though most of the population is rural. As several former homeland states are located here, the South African part of the basin forms the least developed part of that country, with a relatively high population density and very high poverty levels.

However, in contrast to other African river basins such as the Volta, the main pressure on the water resource in the future is not expected to result from increased population numbers. Although population density has increased in the basin countries over the last decade, this trend is

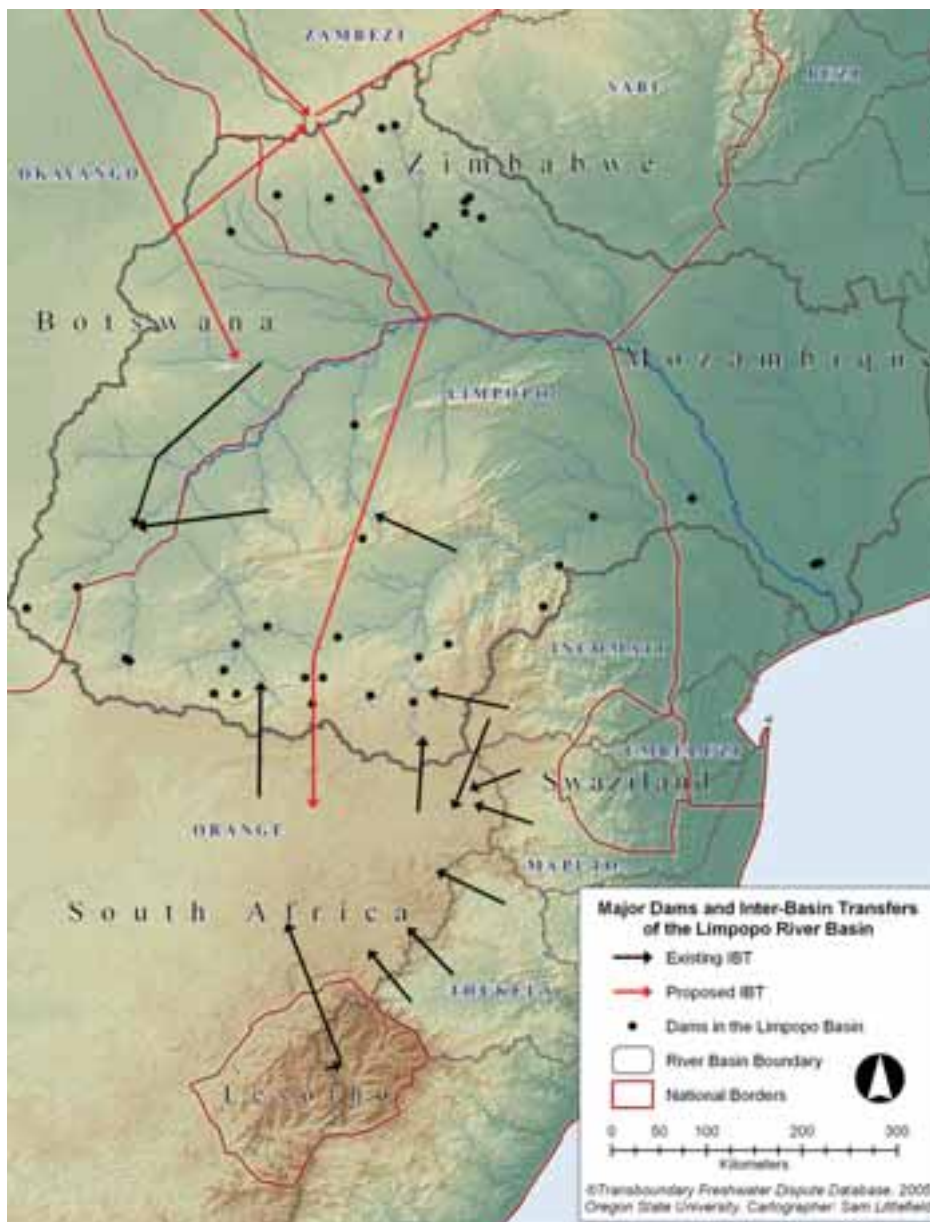


Figure 2.6 Dams and interbasin transfers (IBT) in the Limpopo basin (redrawn from Heyns 1995b).



now beginning to slow, apparently due to the ravaging effects of the HIV/AIDS pandemic. If an effective cure for HIV/AIDS is not found soon, current high HIV prevalence rates indicate that the total population of the Limpopo basin could decrease over the next 50 years.

The Limpopo River basin is a critically important source of water for three of the four most economically developed states in the southern African region — Botswana, South Africa and Zimbabwe — all of which face potential limitations to their future economic growth potential as the result of localized water deficits (Ashton and Turton, in press; Turton 2003b; 2004; Turton and Earle 2005). The water resources of the Limpopo basin are already over-allocated (Basson et al. 1997) and return flows of treated effluent now comprise a substantial proportion of the water in the upper parts of the basin near the cities of Pretoria and Johannesburg (Turton et al. 2004).

The water resources of the Limpopo River basin have been highly developed and the basin



Many rural people rely on unprotected natural sources for their domestic water (Mpumalanga province in South Africa, in the Incomati River basin). Photo credit: Anton Earle.

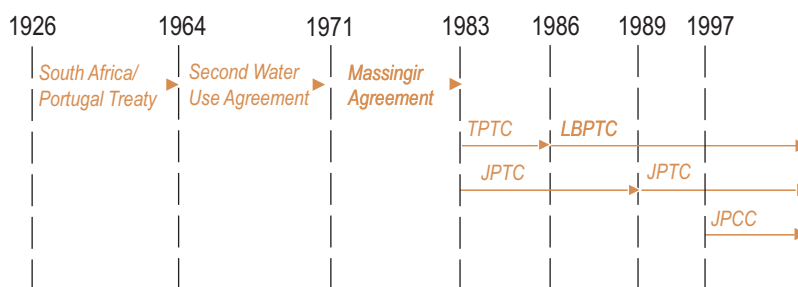


Figure 2.7 Historic overview of regime creation in the Limpopo River basin (Turton 2003b).

contains some 43 large storage reservoirs, each with a capacity in excess of 2 million m<sup>3</sup> (3 in Botswana, 2 in Mozambique, 26 in South Africa, and 12 in Zimbabwe, Map 8b). The Limpopo River basin is the second largest of the five international river basins shared by South Africa in terms of both its surface area and mean annual runoff. The overall importance of this basin is also reflected in the numbers of inter-basin transfers (IBTs) of water (Figure 2.6). The Limpopo basin receives water from four IBTs, namely: the Vaal–Olifants IBT; Vaal–Crocodile IBT; Komati–Olifants IBT; and Usuthu–Olifants IBT. In addition, the Limpopo basin contains two intra-basin transfers from the Olifants sub-basin to the drier Sand and Mogalakwena sub-basins (Basson et al. 1997).

Much of the water for Gaborone, the industrial and economic hub of Botswana, is supplied from South Africa through the Molatedi Dam and associated pipeline (Conley 1995). A second, internal source of supply has subsequently been developed through the North-South Carrier (NSC), which transfers water from the Letsibogo Dam on the Moutloutse River, a tributary of the Limpopo River, to Gaborone and other urban centers. The NSC can also be extended northwards to receive water from the Zambezi River basin in future, and technical investigations are currently underway. The Limpopo basin is considered to be “closed”, with water use in the South African portion alone exceeding the basin’s potential yield by 800 million m<sup>3</sup> per year. The shortfall is made up by importing water from the Vaal River, while return flows of treated effluent from Pretoria and Johannesburg augment water supplies for downstream users (Basson et al. 1997; Conley 1995; Heyns 2002). Heyns (1995b) notes that South Africa has the capacity to transfer

700 million m<sup>3</sup> per year from various international river basins into the Limpopo if required, giving an indication of the likely response to, and importance of, basin closure.

Given the economic importance of the basin and its degree of closure, it is not surprising that there has been a long history of regime creation in attempts to find solutions for the increasing water scarcity in the Limpopo basin (Turton 2003b; 2004; Turton et al. 2004; Turton and Earle 2005). Regime creation dates back to a 1926 general agreement between South Africa and Portugal, which laid the groundwork for the subsequent development of various river basins in southern Africa, mostly to the benefit of the colonial powers at that time (Treaty 1926) (see Figure 2.7).

A Second Water Use Agreement was signed in 1964 by South Africa and Portugal, building on the earlier (1926) South Africa / Portugal Treaty. This Second Water Use Agreement was a colonial agreement that spoke of rivers of “mutual interest” including the Cuvelai, Okavango, Limpopo, Maputo and Incomati, but which focused in detail on the Cunene River (Heyns 1995b, 1996; Treaty 1964; Turton 2003b; 2004; Turton and Earle 2005). A third formal agreement was signed by South Africa and Portugal in 1971 for the purposes of constructing the Massingir Dam 30 km downstream of the South African border, on the Olifants River tributary of the Limpopo River (Treaty 1971). Known as the “Massingir Agreement,” it placed no restrictions on South Africa, recognizing that the inflow would decrease as South Africa developed more dams in the future (Conley 1995).

In February 1983, Mozambique, South Africa and Swaziland signed the Agreement on the establishment of the Tripartite Permanent Technical Committee (TPTC), to make joint recommendations for managing the water shortages experienced in the Limpopo, Incomati, and Maputo Rivers (Treaty 1983; Ohlsson 1995; Chenje and Johnson 1996; Pallett 1997). The TPTC was the first attempt to establish something like a basin-wide regime in southern Africa, though it was flawed because it excluded Botswana and Zimbabwe. Consequently the TPTC was unable to function from its inception because it was not fully inclusive (Heyns 1995a; Ohlsson 1995; Vas and Pereira 1998; Vas 1999). Vas and Pereira (1998) attribute this failure, at least in part, to “the passive attitude of [the] DNA”



*Dam on the Kouga River in South Africa. Photo credit: Anton Earle.*

(the Mozambican National Department of Water Affairs). Vas (1999) also notes that the lack of diplomatic representation between Mozambique, South Africa and Zimbabwe hindered the process.

Negotiations around the establishment of a functioning basin-wide regime for the Limpopo basin were resurrected in 1986, and resulted in the Agreement on the Establishment of the Limpopo Basin Permanent Technical Committee (LBPTC) between Botswana, Mozambique, South Africa and Zimbabwe (Treaty 1986). The LBPTC became the first basin-wide regime to be established in Southern Africa, though it has not functioned well, despite including all of the riparian states (Ohlsson 1995). Given the history of failures in the Limpopo River basin, bilateral negotiations have become the preferred route, resulting in the uneven development of regimes in different parts of the basin.

The initial failure of the TPTC after its launch in February 1983, combined with the critical need to establish a working arrangement, triggered bilateral negotiations between South Africa and Botswana regarding the shared upper Limpopo basin. An Agreement on the Establishment of the Joint Permanent Technical Committee (JPTC) was reached in November 1983 between the two countries to deal with matters of mutual interest



*Okavango Delta, Botswana. Photo credit: Anton Earle.*

(Treaty 1983; Chenje and Johnson 1996; Pallett 1997). This functioned well and was consequently upgraded to a commission through the Agreement on the Establishment of the Joint Permanent Technical Commission on the Limpopo River Basin in June 1989 (Treaty 1989; Chenje and Johnson 1996; Pallett 1997). The JPTC is functioning well and launched the Joint Upper Limpopo Basin Study (JULBS), to investigate a range of issues, including three possible new dams on the Limpopo River at the Cumberland, Martins Drift, and Pont Drift sites (Heyns 1995b).

Bilateral relations between South Africa and Botswana were further strengthened in 1997 with the Agreement on the Establishment of the Joint Permanent Commission for Cooperation (JPCC) (Treaty 1997). This is a broad intergovernmental agreement aimed specifically at fostering closer cooperation in various fields, including water-related issues.

However, there are no bilateral water agreements between South Africa and Zimbabwe which share the middle reaches of the Limpopo basin. The main reasons for this were the frosty relationships between the two countries due to Zimbabwe's support for the South African liberation movement (Turton 2003a, b; 2004; Turton and Earle 2005). In post-Apartheid South Africa, the political climate favored the normalization of inter-state relations, but Zimbabwe had entered a

phase of political, economic and institutional decay. In addition, neither South Africa nor Zimbabwe has expressed a wish to exploit the tributaries of the shared middle Limpopo River, negating any need for a bilateral agreement between the countries. Any activity that reduced flows in the central segment of the Limpopo River would only affect Mozambique, and not South Africa or Zimbabwe.

There are also no bilateral agreements between South Africa and Mozambique that deal with the main stem of the Limpopo River, though the two countries did sign agreements on the Olifants River, a tributary of the Limpopo River (Treaty 1971). Historically, the main reason for the lack of co-operation between the two countries at the political level was Mozambique's hostile stance towards the previous South African government and its support for the South African liberation movement (Turton 2003a, b; 2004; Turton and Earle 2005). Another factor relates to Mozambique's geographical position as the most downstream of the four riparian states, making it more vulnerable to any upstream activities. The Limpopo River basin is regarded as one of the two most important water resources in southern Mozambique (the other being the Incomati) (Vas and Pereira 1998).

However, a new development could bring fresh momentum to the regime-creation process



in the Limpopo basin. Mozambique has expressed concern over the possibility that runoff in the Limpopo River could be reduced if the proposed new dams are built in the South African portion of the upper Limpopo basin (Vas and Pereira 1998). Renewed attempts are being made to revive the almost defunct LBPTC, and meetings have been held between Mozambique and Zimbabwe on the issue (Heyns 1995a; Vas and Pereira 1998). This could herald a new phase of cooperation and regime creation in the Limpopo basin, having been encouraged by the Resolution of the Tripartite Permanent Technical Committee on Exchange of Information and Water Quality in the Incomati and Maputo River Basins, and the subsequent signing of the Incomaputo Agreement during the WSSD (Treaty 2002a; b).

In addition to the political factors that have been identified as important drivers for regime creation, such as national interest and general political relations, another important factor also influences the process of regime creation and cooperation. This factor relates to the existence of disputed hydrological data, which can be linked to an absence of collaborative efforts, and which usually reflects the influence of political differences between the various riparian states. Significantly, where regime creation is at its most advanced (e.g., the JPTC), the states have carried out joint

country studies or joint fact-finding studies (e.g., the JULBS) that have yielded uncontested data, which then build confidence in the participants. This feature highlights the important role of second-order resources in stimulating the development and maintenance of a regime. This also suggests that a shortage of second-order resources within a given riparian state or states can prevent the creation of an effective and sustainable regime, because the state(s) concerned are unable to adapt their positions and rather continue to perpetuate existing political arrangements.

## 2.5 CONCLUSIONS

This overview of hydropolitical vulnerability in Africa has illustrated some of the major complexities that have arisen, partly as a result of the painful historical changes that the continent has experienced, and partly due to the virtual absence of systematic scientific research on hydropolitical issues. Nevertheless, the geographical realities of water in Africa remain unchanged: the continent's international river basins cover some 64% of the continent's area, support around 77% of the total African population, and contain a staggering 93% of the continent's total surface water resources. Underlying this is the largely unexplored significance of the continent's 38 transboundary aquifer systems, most of which have not been investigated in any great detail.

This raises the question of the standing of transboundary river basin management at the continental level. Here, it is useful to note the mosaic of issues presented in Table 2.2. This table shows that many of the countries comprising Africa's major river basins have political histories that include one or more of: a recent experience of sub-national political unrest, endemic violence, armed conflict or war. It must be emphasized, however, that the disputes and conflicts that have occurred were not related directly to water. However, in many cases, the issues that drove the conflict, and the subsequent impacts of that conflict, have been magnified through the management of water. A map of known disputes and conflicts over water or water-related issues shows a strong correlation with the areas of transition from perennial rivers to ephemeral river systems in Africa (Figure 2.8). It is in these regions where water supplies are uncertain or highly variable, that there



*Fishing, Niger River, Niger. Photo credit: Marcia Macomber, OSU.*

**TABLE 2.2 INTERNATIONAL FRESHWATER AGREEMENTS STATISTICS SUMMARY**

BASIN	WATER RESOURCES				BASIN-WIDE		COLLABORATIVE	
	RECENT HISTORY	APPROACHING	FUNCTIONING	ALL BASIN	AGREEMENT	WATER PROJECTS	WATER PROJECTS	WATER PROJECTS
	OF CONFLICT <sup>1</sup>	POINT OF CLOSURE	BI- OR MULTI-LATERAL RBI <sup>2</sup>	STATES MEMBERS OF RBI	REGULATING WATER USE <sup>9</sup>	BETWEEN BASIN STATES <sup>3</sup>	BETWEEN BASIN STATES <sup>3</sup>	AS A DRIVER OF DISPUTE/CONFLICT <sup>4</sup>
Okavango	✓ <sup>5</sup>	—	✓	✓	—	✓	✓	✓
Senegal	✓ <sup>6</sup>	—	✓	✓	—	✓	✓	✓
Niger	✓ <sup>7</sup>	—	✓	✓	—	✓	✓	✓
Lake Chad	✓ <sup>8</sup>	✓	✓	—	—	✓	✓	✓
Volta	—	—	✓	—	—	✓	✓	✓
Limpopo	✓	✓	✓	✓	—	✓	✓	✓
Incomati	✓	✓	✓	✓	✓	✓	✓	✓
Zambezi	✓	—	✓	✓	—	✓	✓	✓
Nile	✓	—	✓	✓	✓	✓	✓	✓
Orange	✓	✓	✓	✓	—	✓	✓	✓

Note: positive response: (✓); negative response: (—).

<sup>1</sup> “Conflict” = Loss of one or more lives; “dispute” = vehement exchange of opinion, without use of force. Conflicts are rare, usually localized within a country. Most disagreements in Africa are localized disputes—sometimes between communities from different countries, but most often internal—involving a relatively small geographic area.

<sup>2</sup> RBI = River basin institution. The term “effective” depends on the mandate given to the respective institution; therefore, replaced with “functioning”. Some RBIs are merely advisory, whereas others have a directed management role; “effectiveness” is therefore a relative term.

<sup>3</sup> Between all or some basin states.

<sup>4</sup> These “rapid changes,” such as in climate or population, take place in the entire river basin or in some parts of the river basin. Thus, the Nile, for example, would experience rapid changes in several portions of the upper reaches of its catchment.

<sup>5</sup> Angolan Civil War in upper reaches of catchment; Namibian struggle for independence.

<sup>6</sup> Localized conflict in Mali, over the building of the Manantali Dam; few deaths; suppressed locally.

<sup>7</sup> War between Nigeria and Biafra in the Niger Delta area; Nigeria conquered Biafra and stopped secession.

<sup>8</sup> Conflict (war) between Chad and Libya over disputed territory, many deaths; “resolved” with the help of the French Foreign Legion.

<sup>9</sup> Contains specific references to defined volumes of water use at a basin scale. Individual countries may have specific bilateral treaties that specify water use volumes at a sub-basin scale.



Golden crowned cranes, Uganda. Photo credit: William M. Ciesla, Forest Health Management International, [www.forestryimages.org](http://www.forestryimages.org).

is a critical need for the societies and communities to be able to adapt and respond to this situation (Ashton 2002). In virtually every case illustrated in Figure 2.8, the disputes and conflicts have taken place at highly localized, sub-national levels.

This assessment has also highlighted another important issue — that of a threshold event or rapid change in a key factor, that can trigger or initiate political tension at local or national level. In the context of hydropolitical vulnerability, such a trigger event could be related to a range of issues such as ecosystem collapse, basin closure, regional drought and climate change (Table 2.2). The events are extremely complex to predict and

even more difficult to manage, especially at a local level. However, of these issues, basin closure is likely to become a key indicator of hydropolitical vulnerability because it can be measured and managed. Here, it is important to note that four of the rivers listed in Table 2.2, are either closed or are approaching closure. Since this could prevent or interfere with efforts to ensure fair and equitable sharing of water resources, all four of these river basins can be regarded as highly vulnerable to potential future disputes or conflict over water.

Interestingly, all of the river basins listed in Table 2.2 have some form of bilateral or multi-lateral river basin institution, or both, though perceptions differ as to their effectiveness. However, given the vulnerability of the Limpopo basin described above, the absence of an effective river basin institution and the lack of a basin-wide agreement to regulate water use, accentuates the level of risk faced by the Limpopo basin. In each of the other three “vulnerable” basins, the presence of a functioning river basin institution helps to reduce the levels of vulnerability in these basins. Nevertheless, these three basins still need to give attention to the development of basin-wide agreements that would regulate water use within the respective basins.

Conversely, those countries whose river basins have functioning river basin institutions, and where water sharing agreements are in place, have demonstrated a higher degree of resilience or adaptability. The countries sharing these river basins are more likely to conclude and maintain



Figure 2.8. Most disputes over water occur in areas of transition from perennial to ephemeral systems or where water supplies are uncertain (updated and redrawn from Ashton 2000).





*Network of irrigation canals near Todra, southern Morocco. Photo credit: Daniel Malzbender.*

peaceful relations with their neighbours. Where one of these basins may be approaching closure (e.g., the Incomati basin), the countries concerned (Mozambique, South Africa and Swaziland) can use their existing institutional structures and processes to deal effectively with this issue.

In an African context, groundwater is also seen as a critically important feature that links water-scarce countries through their dependency on a sparse resource; in the case of the arid Sahara, this is of major strategic significance. Because of Africa's political history, much of the continent's water is transboundary in nature and, for a variety of technical and institutional reasons, surface and groundwater resources are usually managed separately and by different institutions. In an ideal world, a single institution should be responsible for managing all components of the hydrological cycle since they are indivisibly interlinked. This immediately poses an important question for both national governments and transboundary water management institutions: to what extent is it useful or practical to regard surface water and groundwater as an indivisible

resource, as enshrined in the internationally accepted concept of integrated water resource management (IWRM)?

This question raises a range of technical and institutional issues, some of which emphasize the many differences between surface and groundwater resources. Specific groundwater issues include: the nature and source of the groundwater resource, ease of access, including aspects of hydraulic connectivity, yield and recharge, as well as geological and chemical parameters, such as transmissivity and chemical quality. In several cases, aquifer systems appear not to be connected hydraulically to a surface water resource. Therefore, despite its possible strategic significance (e.g., the Nubian Sandstone Aquifer) it might make little sense to combine the management of such a resource with other surface water resources into a single institutional structure. Inevitably, this issue will need to be dealt with on a case-by-case basis.

Table 2.2 also shows another significant trend that is relevant to hydropolitical vulnerability. There seems to be little common agreement

between countries on the best way to regulate water use within the concept of IWRM. Often, this is driven by differing perceptions of the quantity and quality of water available, based on independent assessments carried out by different countries and authorities. Where data are institutionalized within a given river basin organization, they provide a focal point for engagement between the various riparian states. In the absence of such institutionalized (or 'accepted') data, each actor could follow an independent approach and attempt to maximize their own advantage. This type of approach would act to limit the extent of inter-state collaboration on water resource development projects, and could act as a fundamental driver of dispute and conflict. Clearly, this issue must be plainly understood by each basin state. It is the formal institutionalization of data, so called "joint fact-finding," which enables states and institutions to reach agreement. Emerging from this is the core concept of benefit sharing, as opposed to water sharing — an issue of growing strategic significance when water use is rationalized. Acceptance of this concept also acts as a threshold event that provides a clear indicator of the maturity of the participating institutions or states and presents these states with a buffer against the effects of rapid changes in a given basin. It is very encouraging to note that there is already a deeply entrenched culture of collaborative projects within the basins shown in Table 2.2 (Map 9b), demonstrating that the spirit of cooperation does exist in Africa, despite the disparity in river basin institutions in these basins.

Africa is also at an important threshold in its own right. The ending of the Cold War removed a major driver of violent conflict and also reduced the supply of weapons and military support to the continent. Theoretically, at least, the various African conflicts are more likely to remain sub-national or localized and therefore easier to contain, manage, and resolve. This has opened the door for more effective

transboundary water resource management — of both surface and groundwater — to act as a driver or vehicle of regional peace and as a foundation for much-needed economic growth and shared prosperity. This is vitally important as Africa sheds its image of a strife-torn continent, and moves along a trajectory towards greater democracy, economic development, and political stability.

The concept of hydropolitical vulnerability provides an important theoretical tool for use at both strategic and operational levels. A clear understanding of hydropolitical vulnerability enables states and institutions to isolate linkages, identify dependencies, and highlight cooperative solutions to common problems. Clearly identified thresholds are also critically important elements of this whole understanding. The Limpopo basin is a case in point: imminent basin closure, the absence of an effective river basin institution, and a lack of agreement on water sharing, suggest that this river basin faces the greatest risk of disputes over water.

Where states and institutions have identified, prioritized, and agreed on specific thresholds, they are better able to respond to impending changes or water scarcity, allowing them time to implement solutions that offer a greater range of sustained benefits to all participants. Such a broad view provides far more opportunities for states and institutions to select beneficial options that can avoid conflict. Clearly, the adoption of a narrower viewpoint, focused purely on water-sharing, will provide some effective solutions, some of which may even be sustainable in the long-term. However, by restricting their options in this way, states and institutions will also tend to forfeit many of the collective advantages that could have accrued.



Hippos, East Africa. Photo credit: Kenneth M. Gale, [www.forestryimages.org](http://www.forestryimages.org).





*Testing water in a treatment facility, South Africa. Photo credit: R. Zurba, USAID.*



# CHAPTER 3. REGIONAL AND SUBREGIONAL EFFORTS TO BUILD HYDROPOLITICAL RESILIENCE IN AFRICA

Arun Elhance, Halifa Drammeh, Salif Diop, Patrick M'mayi, Erika Henson, Martin Schaefer, and Hanna Lindblom

In Agenda 21, the Programme for the Further Development of Agenda 21 and the Johannesburg Plan of Implementation (JPOI) of the World Summit on Sustainable Development (WSSD), the international community, including all the African nations, set itself the following major goals and targets relating to water (Report of the Secretary-General 2004):

1. To halve, by 2015, the proportion of people without access to safe drinking water;
2. To develop Integrated Water Resources management (IWRM) and water efficiency plans by 2005, with support for developing countries;
3. To stop the unsustainable exploitation of water resources by developing water resources management strategies at the regional, national and local levels, which promote both equitable access and adequate supplies;
4. To promote effective coordination among the various international and intergovernmental bodies and processes working on water-related issues, both within the United Nations system and between the United Nations and international financial institutions.

These goals and targets have guided and will continue to guide several collective initiatives to deal with hydrological vulnerabilities in Africa and build hydrological resilience. Of necessity, due to the international status of the major water resources in the continent, a majority of these initiatives are regional and/or sub-regional in scope. Some initiatives focus their efforts at the level of particular river basin(s), lake basin(s) and aquifer(s). The scale of the challenges these initiatives face in their pursuit of just the 2015 target on access to water can be grasped from the following:

*To meet the water target in Africa, an additional 405 million people must get access to some form of improved water supply by the year 2015 with an average of over 36 million every year, 690,000 every week and 138,000 every weekday starting in January 2004 (UNEP 2003).*

## 3.1 REGIONAL INITIATIVES

### 3.1.1 The African Union (AU)

Created in 1999, the African Union (AU) serves as the over-arching regional governing body for the continent. It was established to accelerate the process of political integration within the continent and, thereby, facilitate Africa's ability to compete in the global economy. The union carries out this function by promoting and supporting cooperation between and among African countries. Among its many other functions to promote and support prosperity, peace and security, and development in Africa, the Union provides an enabling forum for African countries to work together to establish initiatives that promote proper development and use of water resources. Recently the African Union has asked the



*Carrying water, rainy season. Photo credit: Marcia Macomber.*

African governments to commit at least five percent of their national budgets to fund water projects (African Unification Front 2003).

### **3.1.2 The New Economic Partnership for African Development (NEPAD)**

The New Partnership for Africa's Development, or NEPAD, is a multilateral agreement among African countries that aims to eradicate poverty; to place African countries, both individually and collectively, on a path of sustainable growth and development; to halt the marginalisation of Africa in the globalisation process and enhance its full and beneficial integration into the global economy and finally to accelerate the empowerment of women in Africa.

It is the inter-connectedness of water to meeting the above goals that makes water resource management and development a central issue that must be addressed by NEPAD. NEPAD recognizes that water resources and access to fresh water are vital component for life and economic development. Chapter Eight of NEPAD, entitled the "Environmental Initiative," identifies conservation and sustainable use of

Coastal, Marine and Freshwater Resources, as one of its eight focal points. NEPAD proposes to attack this challenge not only through assessment and regulation, but also through the application of science and technology aimed at alleviating Africa's shortage of water and, thereby, improving the quality of water and enhancing its distribution for domestic, industrial and agricultural uses. Under the NEPAD strategic Action Plan all regions have been charged with the task of strengthening the financial mechanisms for the development of their water sectors (NEPAD 2002).

### **3.1.3 African Minister's Council on Water (AMCOW)**

Launched in 2002, AMCOW is the forum of all 53 African ministers responsible for water affairs in the continent, acting in the spirit of the New Economic Partnership for African Development (NEPAD). The primary objective of AMCOW is to keep under constant review integrated water resource management policies, strategies and actions to address challenges facing the continent in the areas of water and sanitation, and to contribute to the attainment of NEPAD's goals of stronger regional cooperation, peace and



*A woman proudly demonstrates her working kitchen sink, South Africa. Photo credit: R. Zurba, USAID.*

security, poverty eradication, and sustainable economic development of Africans and Africa.

Since its launch, AMCOW has received support and pledges of support from several international donors and cooperating partners. On the home front, AMCOW has also been working with the African Development Bank on

the establishment of an African Water Facility to be housed by the Bank and to provide the much-needed window for the expeditious financing of water projects in Africa. Securing firm African financial commitments to the implementation of the Millennium Development Goals on water will show that the continent is ready for action. These commitments and the other key initiatives will also prepare a firm

foundation on which to build strong partnerships between all stakeholders — regional and international — that is required to address Africa's water and sanitation crisis. AMCOW has developed a triennium work programme for 2005-2007 that includes a large range of activities and initiatives at the regional and sub-regional levels.



*Old latrines, Senegal. Poor hygiene is often cited as a reason parents keep their daughters from going to school. Photo credit: R. Nyberg, USAID.*





Scientists discuss plans for integrated watershed management at dam catchment in Ethiopia, where rapid siltation, caused by soil erosion resulting from deforestation and agricultural practices, threatens municipal drinking water supplies. Photo credit: Badege Bishaw, OSU.

### 3.1.4 The UN Economic Commission for Africa (UN ECA)

Established in 1958, ECA is one of five regional commissions under the administrative direction of United Nations (UN) headquarters. As the regional arm of the UN in Africa, it is mandated to support the economic and social development of its 53 member States, foster regional integration, and promote international cooperation for Africa's development. Concerning water, ECA has been instrumental in mobilizing political will through the formation of the African Ministers' Council on Water and in setting out the African Water Vision for 2025. ECA's strategies to promote the implementation of the African Water Vision 2025 comprise three elements:

- building human and institutional capacities for implementing Integrated Water Resources Management (IWRM)
- assisting Member States, river basin organizations (RBOs) and regional economic communities (RECs) in the development and implementation of integrated river basin and watershed

management strategies and plans for the major river/aquifer basins as well as plans that concentrate on domestic water supply and sanitation and on innovative financing mechanism

- promoting enhanced irrigation development to improve agricultural production and food security through policy dialogue, formulation of basin-wide irrigation development strategies for selected major river and aquifer basins, and disseminating best practices for small-scale irrigation.

ECA also advises countries on developing treaties and protocols on shared waters that address issues such as water quality and utilization, hydropower generation, flood management, and conflict resolution, and on water transfer within basins so that water-scarce areas can be given rights to the resources they need. With its partners, ECA as the Secretariat of UN Water/Africa publishes the biennial African Water Development Report (AWDR) aimed at providing Africa's decision makers with a basis for managing Africa's water resources.



Water tankers being filled for deliveries to camps for internally displaced persons, Liberia. Photo credit: USAID/OFDA.



Drilling borehole in the Koro region, Mali. Muddy water spews up from 50 meters beneath the earth's surface. Wells in this region range from 95 to 140 meters deep. Photo credit: USAID.

## 3.2 SUB-REGIONAL INITIATIVES

### 3.2.1 Economic Community of West African States (ECOWAS)

ECOWAS, a regional organization of 15 African states<sup>1</sup> was formed in 1975, in order to support economic integration and collaboration within the western region of Africa (ECOWAS, 2005). More recently, it has expanded its governance into other collaborative socio-political development areas, working within the framework of the Millennium Development Goals. ECOWAS endeavours to halve the proportion of people in ECOWAS countries who do not have adequate access to safe drinking water by 2015 (Shrimpton 2002). The action plan proposes that in order to reach this goals ECOWAS must intensify its monitoring activities and update evaluation and assessment of water resources, with help from national and regional monitoring and research institutions. It also proposes to support research

1. Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.



Pump station in the Namib desert near Walvis Bay, Namibia. Photo credit: Anton Earle.

on land and water resources and facilitate the distribution of this information (West African Water Vision, 2000). Moreover, ECOWAS aims to create synergy and partnership among countries and institutions that are involved in transboundary water resources and, finally, to orchestrate a harmonious exchange of information (West African Water Vision 2000).

### **3.2.2 Southern African Development Community (SADC)**

SADC is the regional governing body for southern Africa composed of 13 member states (SADC 1992).<sup>2</sup> From the beginning, the formation of SADC was premised on more than just the goal of improving the economic integration of the region; rather, the treaty that created the governing body included social, environmental, developmental, and political aims as well as economic integration. Thus, the expansion of the regional governing body into the management and governance of water and sanitation works synergistically in helping the region to meet its other aims of economic and political stability. SADC is the most advanced of all the sub-regions in

Africa with the creation of its protocol on the Shared Water Course Systems in the Southern African Development Community. The protocol establishes basin-wide management institutions and their financial frameworks, goals and objectives, and acts as a forum for settlement of disputes concerning water between member states. It is also at the forefront of information gathering and research with its SADC Water Resource Database and the Southern African Research and Documentation Centre, which allow for wide distribution of information on watercourses and water resource development.

### **3.2.3 Intergovernmental Authority on Development (IGAD)**

IGAD is a six-member<sup>3</sup> regional organization of countries in the Horn of Africa. It was created in 1996 and subsumed the initiative set forth by its

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2. Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.

3. Djibouti, Ethiopia, Kenya, Somalia, Sudan, and Uganda.





*The Blue Nile in the Ethiopian Highlands. Photo credit: Anton Earle.*

predecessor, the Intergovernmental Authority on Drought Development (IGADD) (IGAD, 2004). Initially, it was created to address the problems of drought and famine caused by the extreme and dynamic weather variations, which had negative impacts on food security, political security, humanitarian affairs, and economic growth of the region.

In compliance with a request from Global Environment Facility (GEF) and its implementing agencies, IGAD was, in May 2000, involved with the initiative to address land and water management through programming (IGAD Sudan, 2002a). Its central objectives in terms of water resources management are to:

- provide education and build the capacity of national hydrological services of the member states
- improve, at the base level, the skills needed for using water resources efficiently.

Finally, IGAD aims to promote awareness about shared transboundary water resources (IGAD Sudan, 2002b). The IGAD projects have received the support of the USA and several European countries.



*Repairing a water storage facility, Uganda. Photo credit: K. Burns, USAID.*



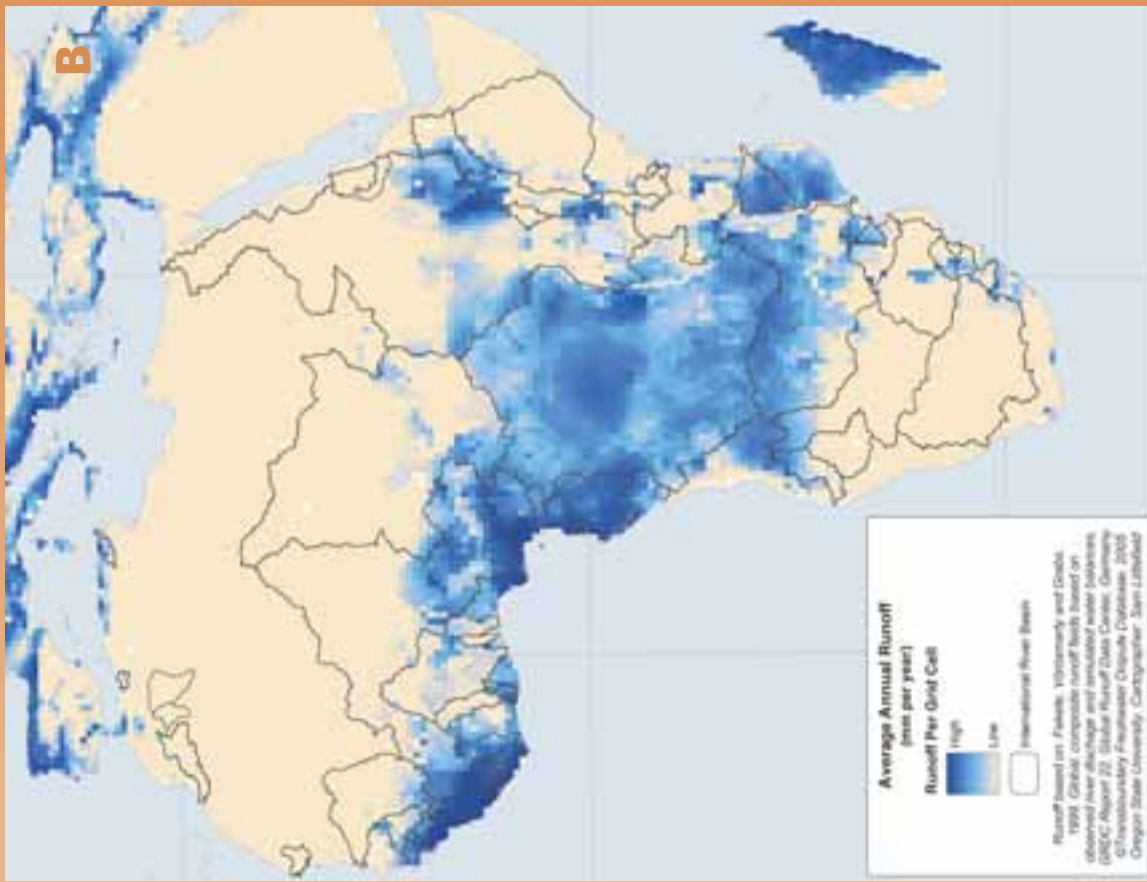
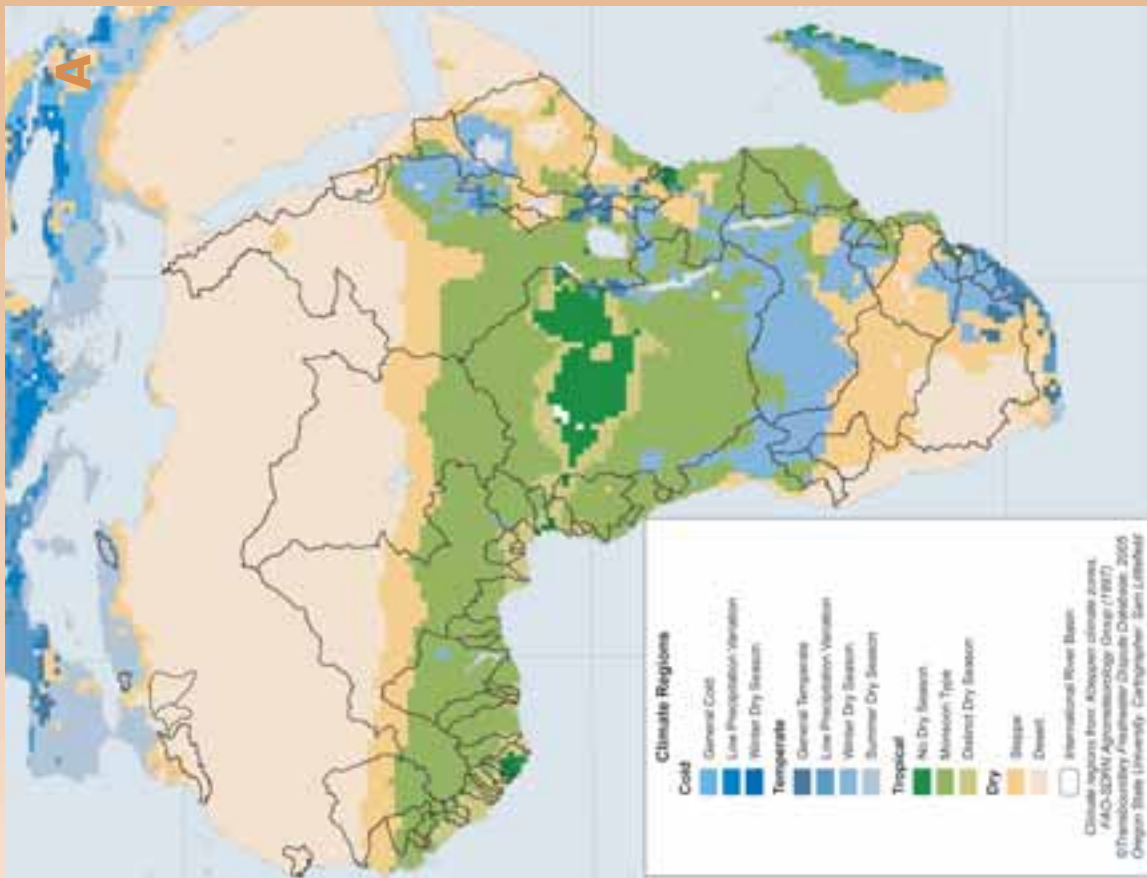


# ATLAS OF HYDROPOLITICAL VULNERABILITY AND RESILIENCE: AFRICA



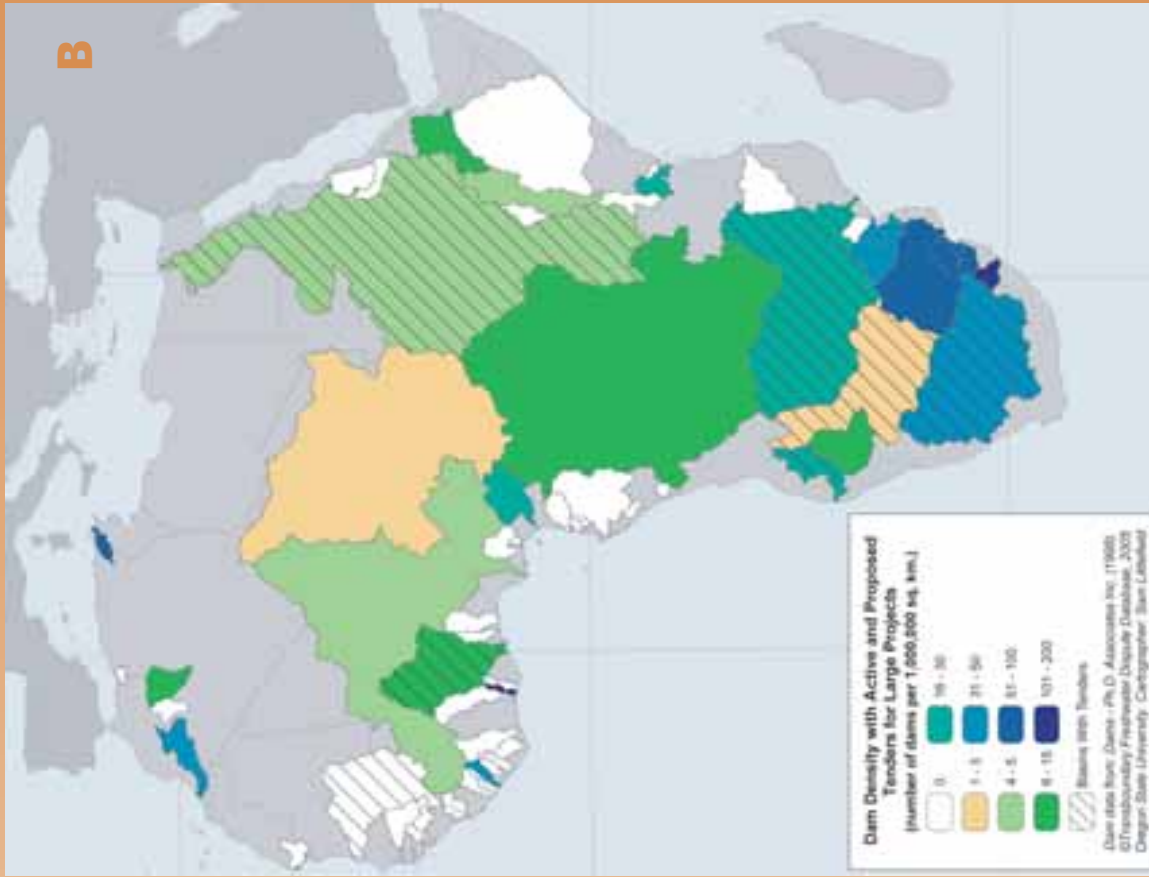
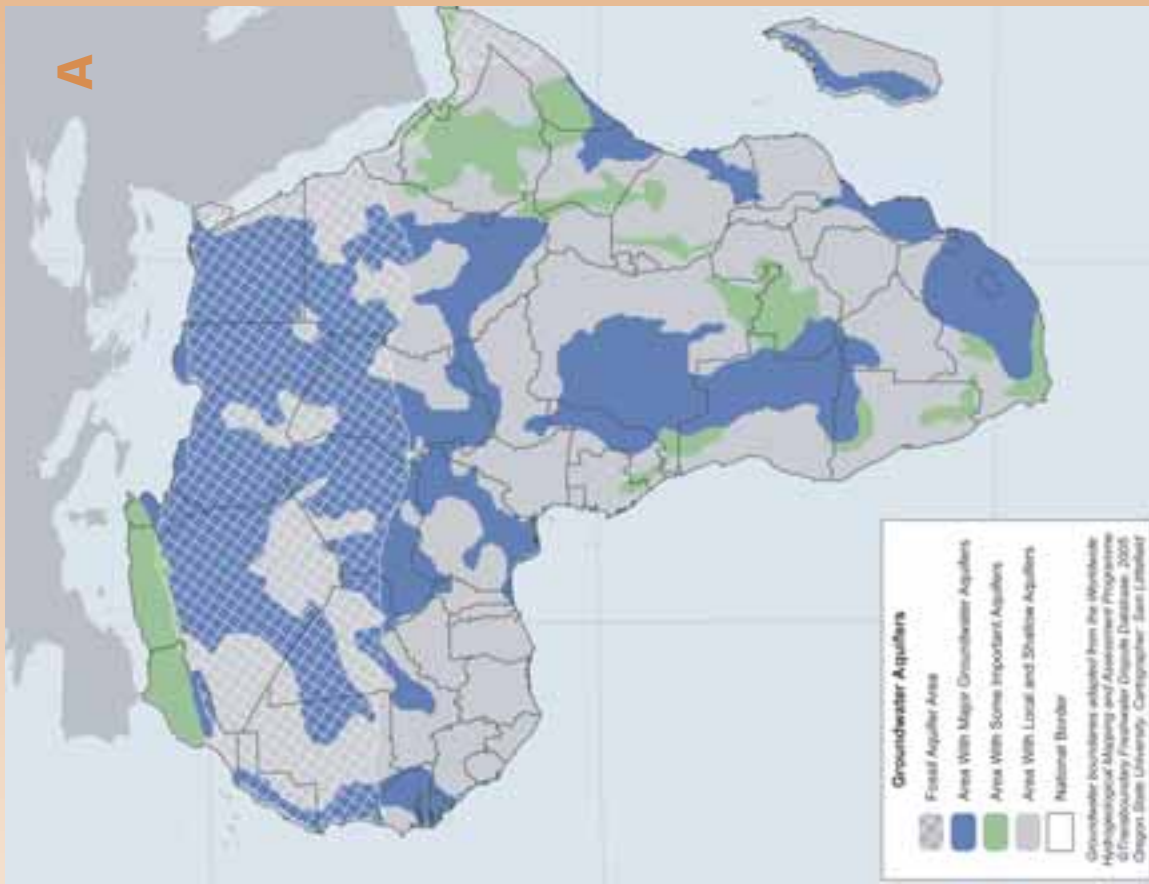
Watering nursery seedlings, Kenya. [www.forestryimages.org](http://www.forestryimages.org)





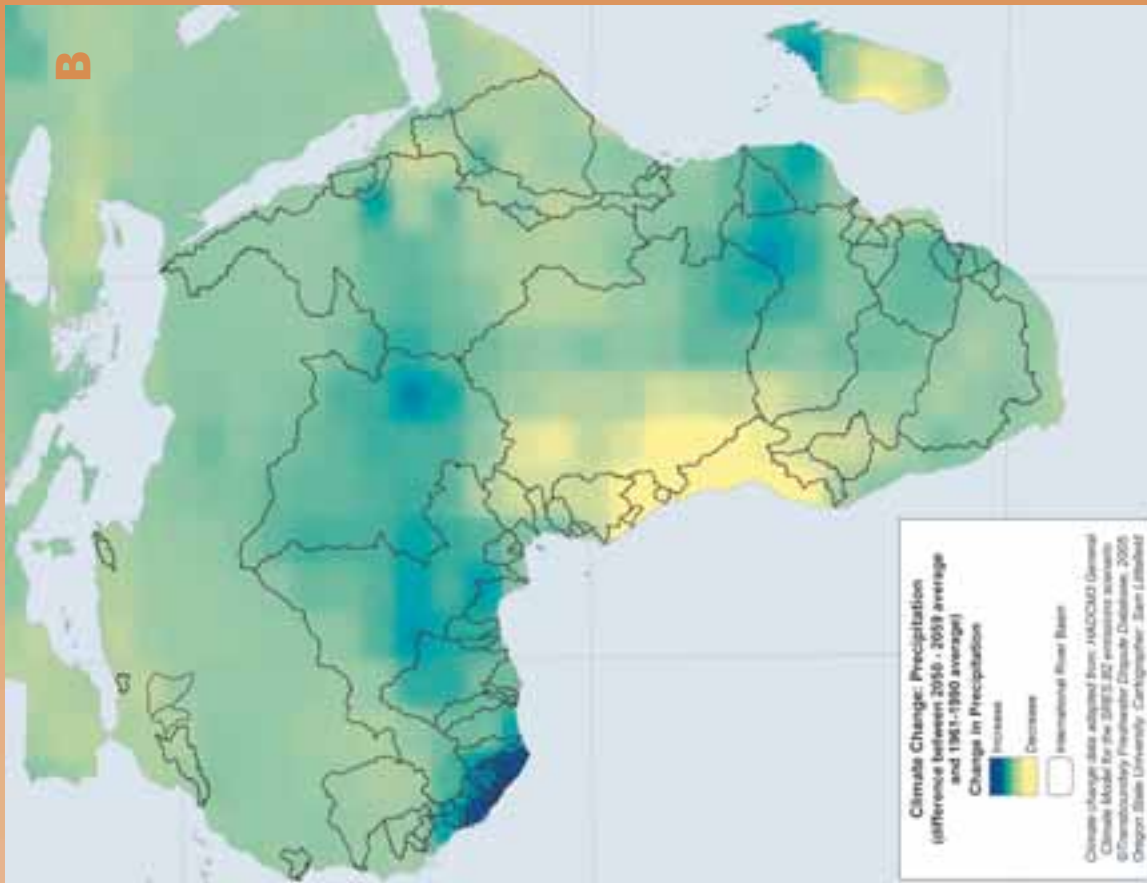
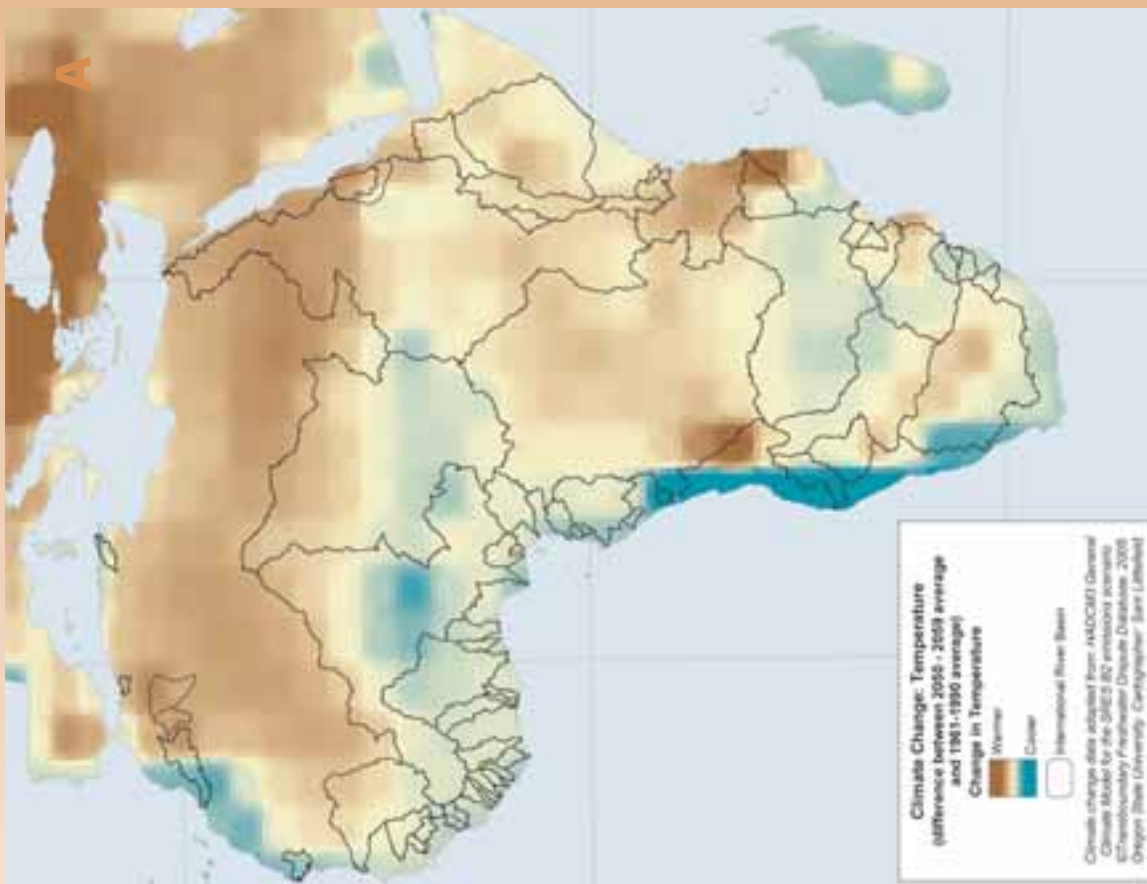
Map 1 (A) Climate Regions. Köppen climate zones based on a 0.5 decimal degree grid by Leemans and Cramer (1991) published by the International Institute for Applied Systems Analysis (IIASA). The Köppen system integrates IIASA average monthly rainfall total and average monthly temperature, in most cases averaged from 1961 – 1990, to yield five base climate types: tropical, dry, temperate, cold and polar. Each primary type is divided into sub-classes based mainly on the distribution of rainfall and temperature throughout the year. Not all classes may be represented at the continental level. (B) Average Annual Runoff. Fekete et al. (1999) produced composite runoff fields by accessing GRDC discharge data, selecting significant global gauging stations, and geo-registering the discharge information to locations on a simulated topological network. This dataset was deemed accurate for presentation with a 0.5 decimal degree grid. Summary statistics based on the runoff dataset, such as those used for projected water stress (human indicators), may not be considered accurate for basins with an area less than approximately 25,000 km<sup>2</sup>.

## BIOPHYSICAL PARAMETERS



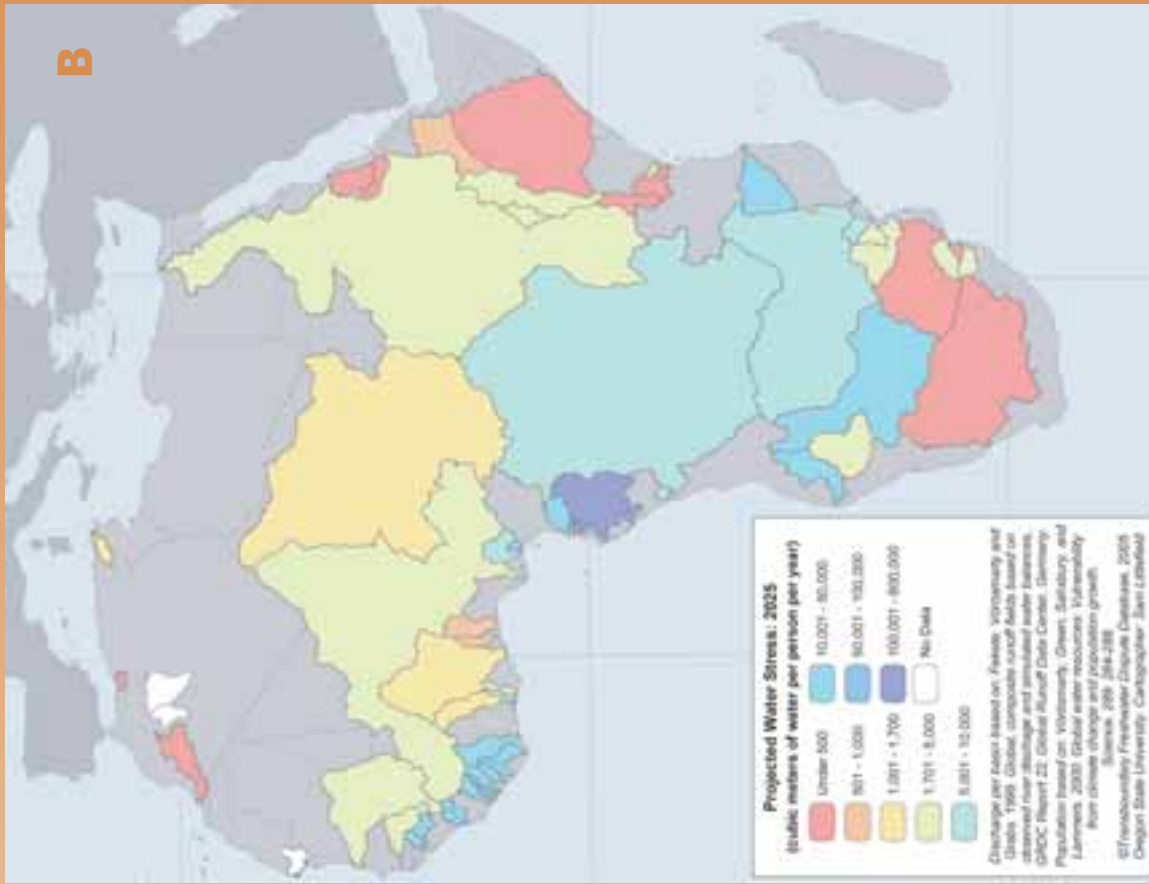
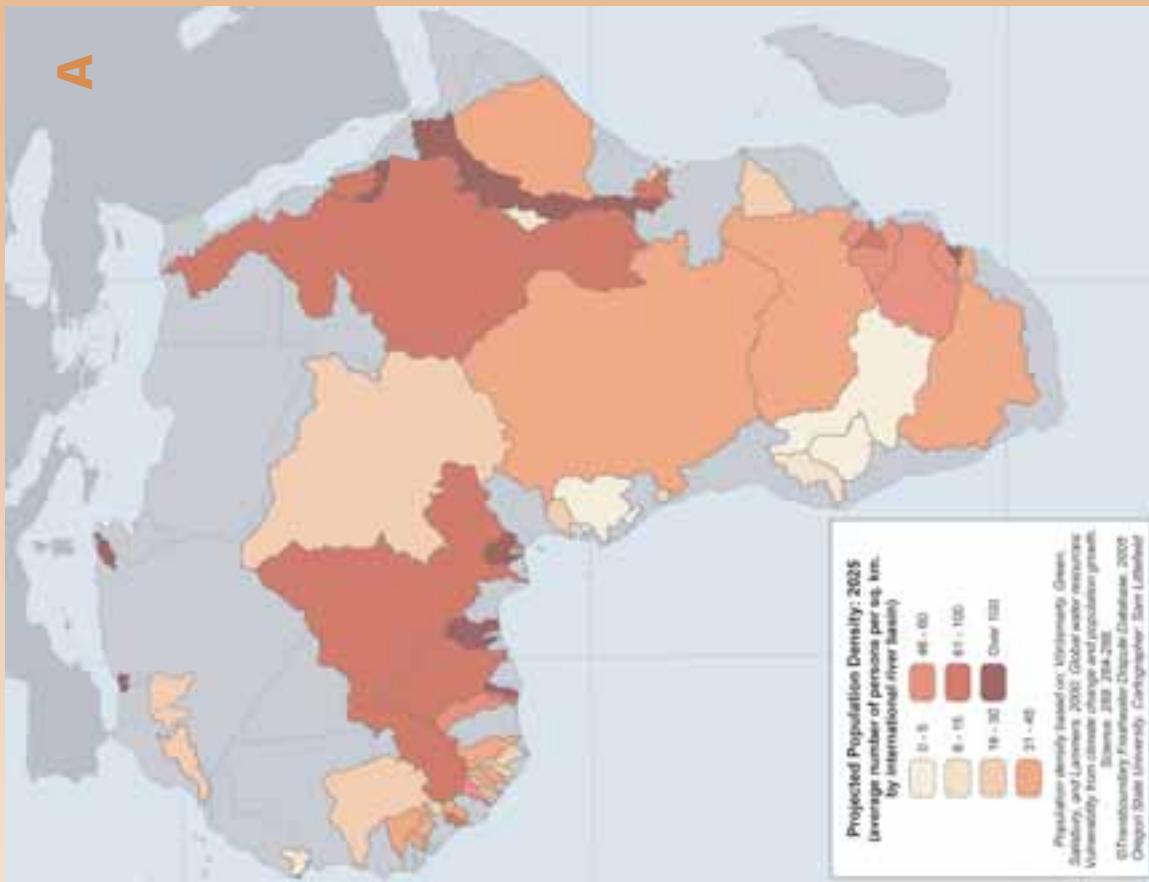
Map 2 (A) Groundwater Aquifers. Adapted from a map developed by the World-wide Hydrogeological Mapping and Assessment Programme (WHYMAP), August 2004. The most important groundwater basins are shown in blue. The green color symbolizes hydrogeological environments of complex structure. Unmarked regions are occupied by local and shallow aquifers in which relatively dense bedrock is exposed to the surface. Hatching has been applied in areas where “fossil” or non-renewable groundwater is stored. The boundaries of the various colored hydrogeologic regions are first order approximations using the best available information. (B) Dam Density with Active and Proposed Tenders for Large Infrastructure: Global Dams Data from: Ph.D. Associates Inc. 1998. DCW in ASCII version 3.0. 1998; Density Calculations from Fiske and Yoffee, 2001. Data on tenders is taken from the International Rivers Network “Dams In The Pipeline of Financial Institutions” database, which includes new projects in the lending pipeline from the World Bank, the Asian Development Bank, the African Development Bank and the Inter-American Development Bank, as well as links to ongoing and completed projects on the individual websites.





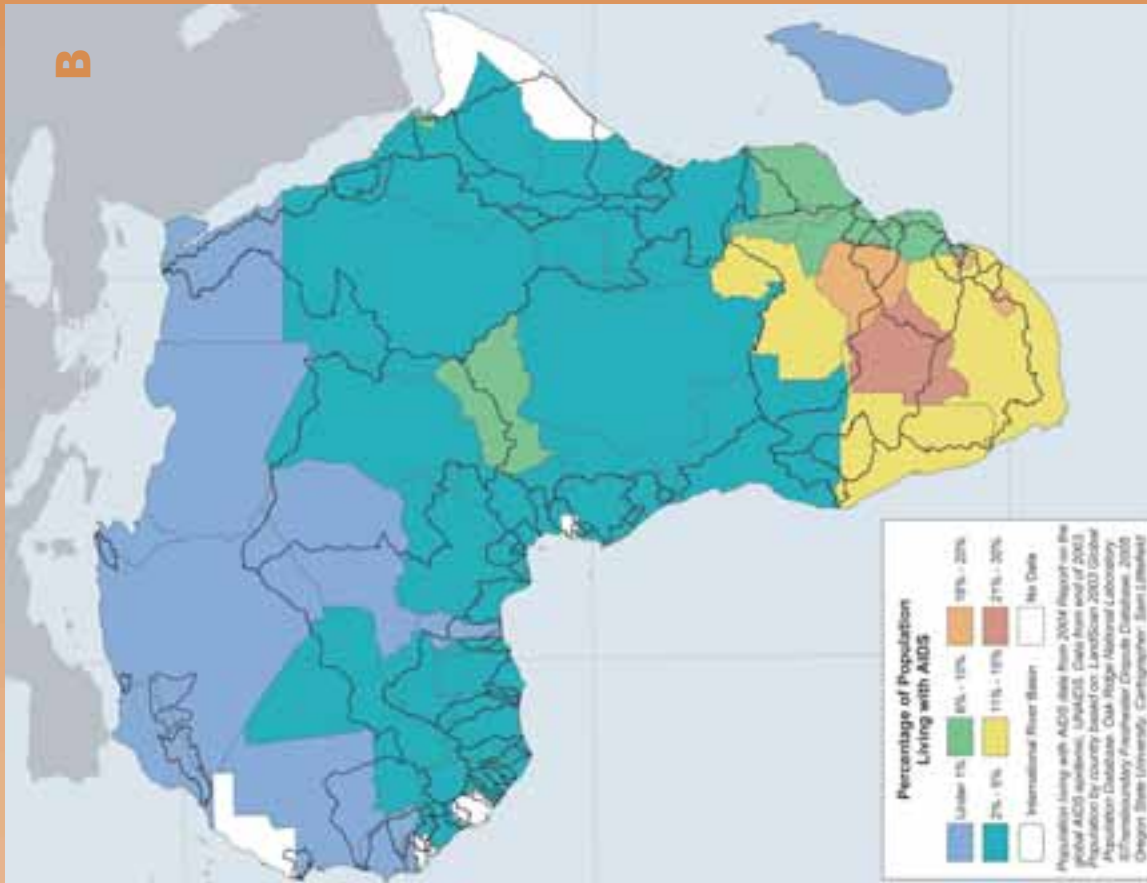
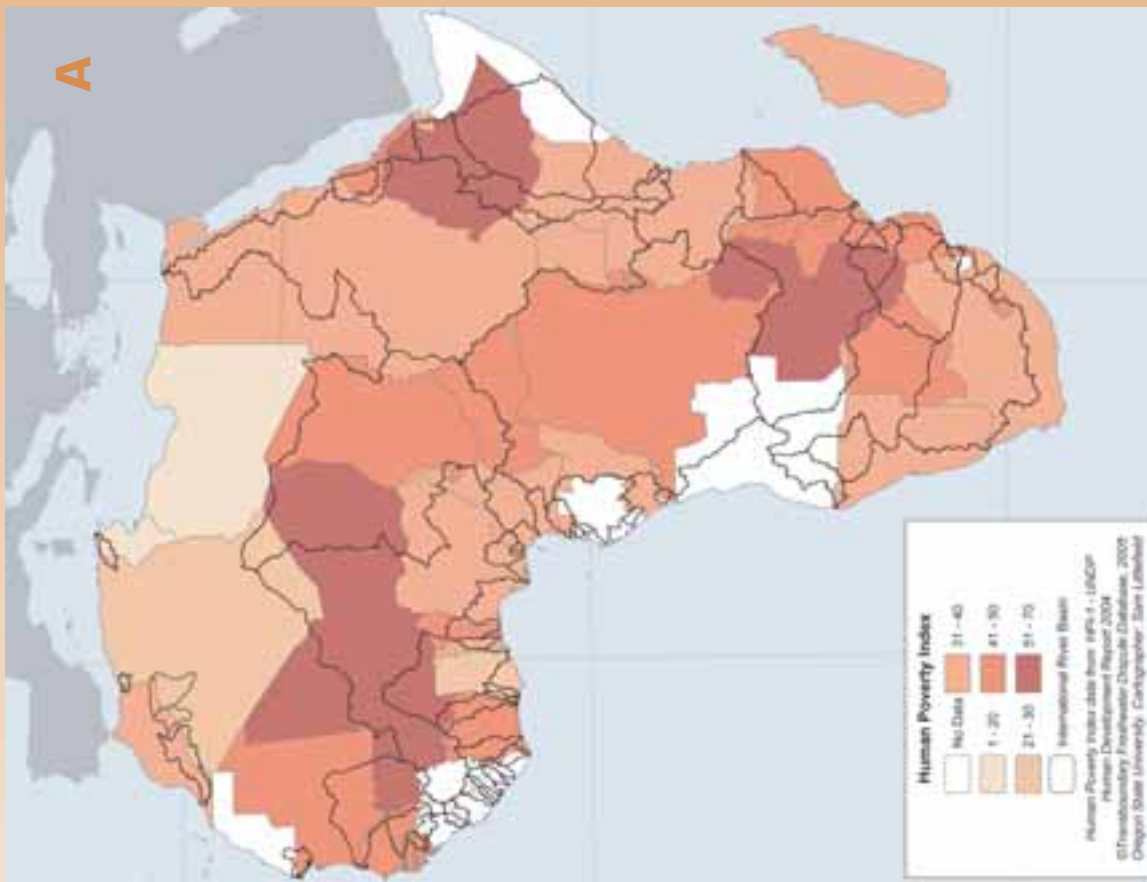
Map 3 (A) Climate Change in Africa: Temperature. (B) Climate Change in Africa: Precipitation: Based on HADCM3 general climate model using the SRES B2 (moderate emissions, climate change, and technological advancement) emissions scenario. HADCM3 is distributed as 2.5 x 3.5 decimal degree data, which could not be properly projected in a GIS without square grid cells. Cell values were distributed to points at 2.5 x 3.5 decimal degree cell centroids, which were interpolated, using the inverse distance weighted method, at a resolution of 0.5 decimal degrees. The interpolated data used here should not be taken to exactly represent HADCM3 projections, but do provide a reasonable cartographic representation of current HADCM3 climate change predictions.





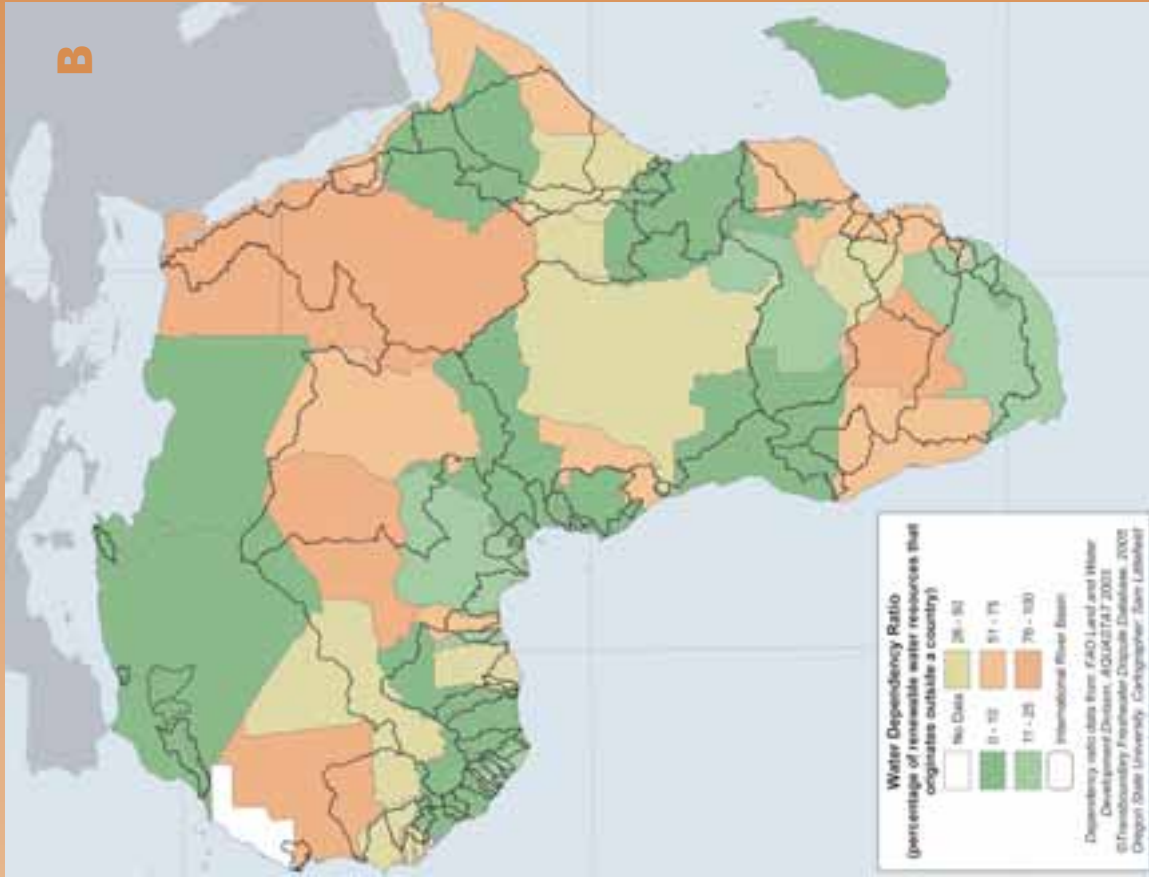
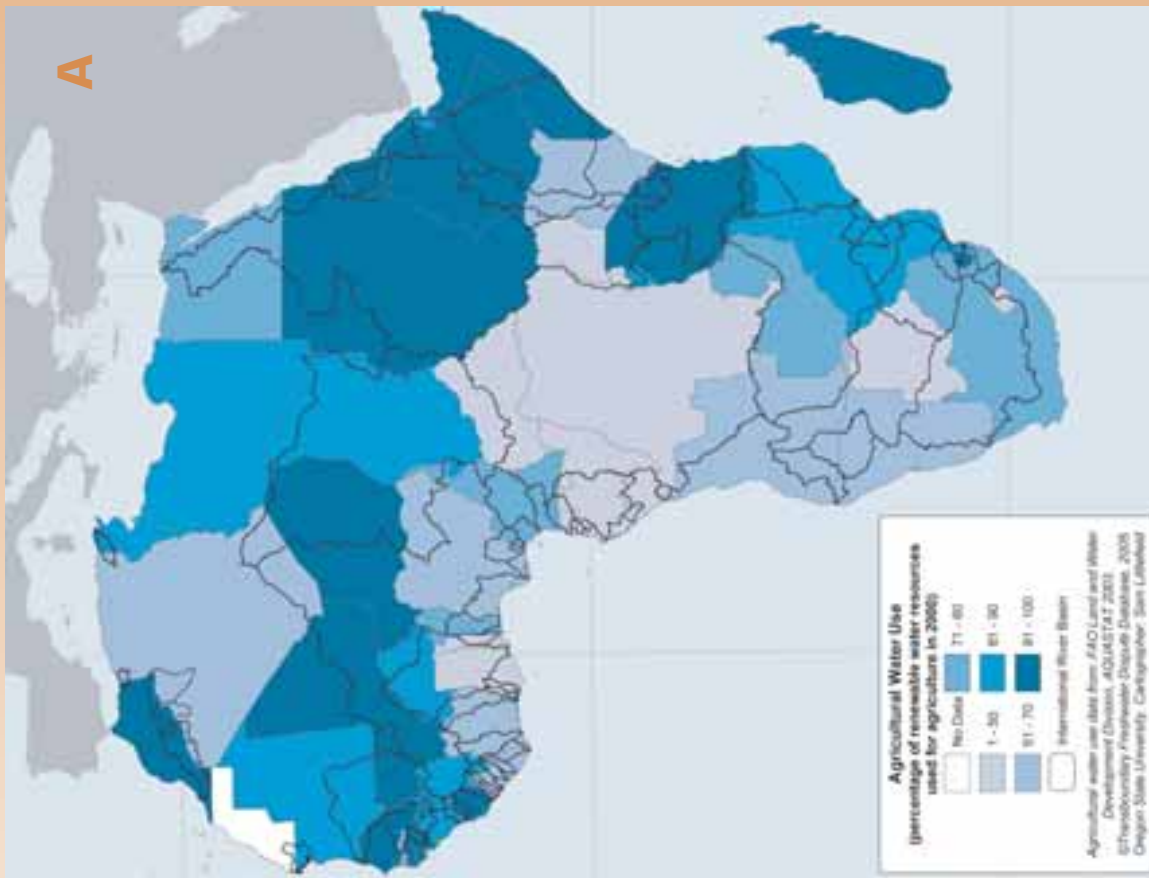
**Map 4 (A) Projected Population Density: 2025** The 2025 population dataset is published at a cell size of 0.5 decimal degrees (DD), which places a size constraint for small basin analysis. The raster was resampled at 0.01 DD to overcome the deficiency. This disregards some of the assumptions of the original 0.5 DD cell size, but affords a tentative estimate of predicted population in small basins. Because small basins maintain less area, there is less area to smooth out data errors. Therefore, some basins, especially those with a relatively small area (less than 25,000 km<sup>2</sup>), may have projected populations significantly lower or higher than they should be. **(B) Projected Water Stress: 2025.** Water stress is the amount of water available per capita. Water stress estimates do not account for spatial variability of water resources, nor for technological or other adaptations effecting how a given population manages water scarcity. The map's calculation of water stress is based on renewable water supply defined by discharge, and does not consider groundwater extraction. Falkenmark's (1989) definition of water stress, calculates water supply based on renewable surface and groundwater flows. According to Falkenmark, a threshold value of 1000 cubic meters per person per year indicates a general point at which water shortages begin to chronically hamper economic development and human health and well-being in moderately developed nations.

## SOCIOECONOMIC AND GEOPOLITICAL PARAMETERS



Map 5 (A) Human Poverty Index. The Human Poverty Index (HPI-1) is taken from the United Nations Development Programme: Human Development Report 2004. The HPI-1 value measures deprivations in three basic dimensions of human development: probability at birth of not surviving to the age of 40, adult illiteracy rate, and a decent standard of living (the unweighted average of the population without sustainable access to an improved water source and children under weight for age). The formula to calculate the HPI-1, as well as specific data on the indicators, can be found at <http://hdr.undp.org/reports/global/2004/>. (B) Percentage of Population Living with AIDS: Based on 2004 UNAIDS data for the end of 2003. Values represent the percent of the total population living with AIDS as calculated with UNAIDS estimates of number of infected and LandScan 2003 population data aggregated by country.

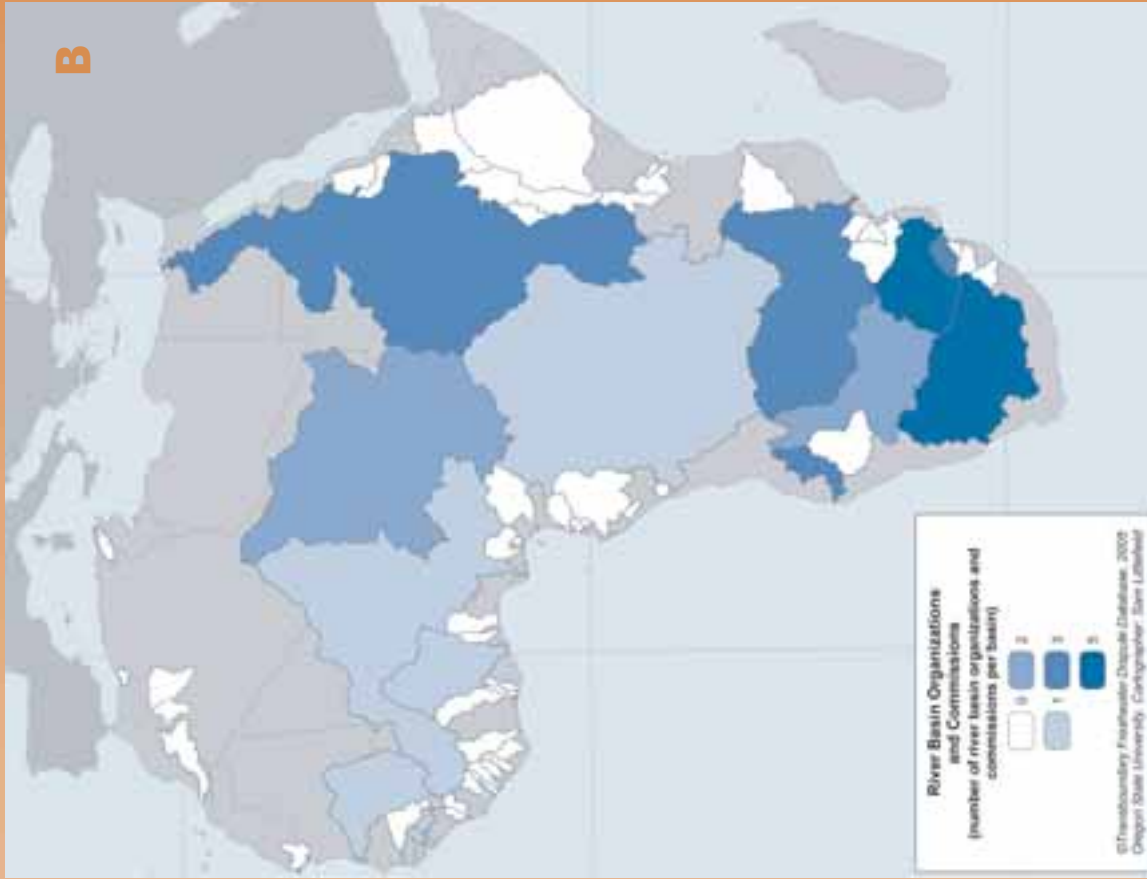
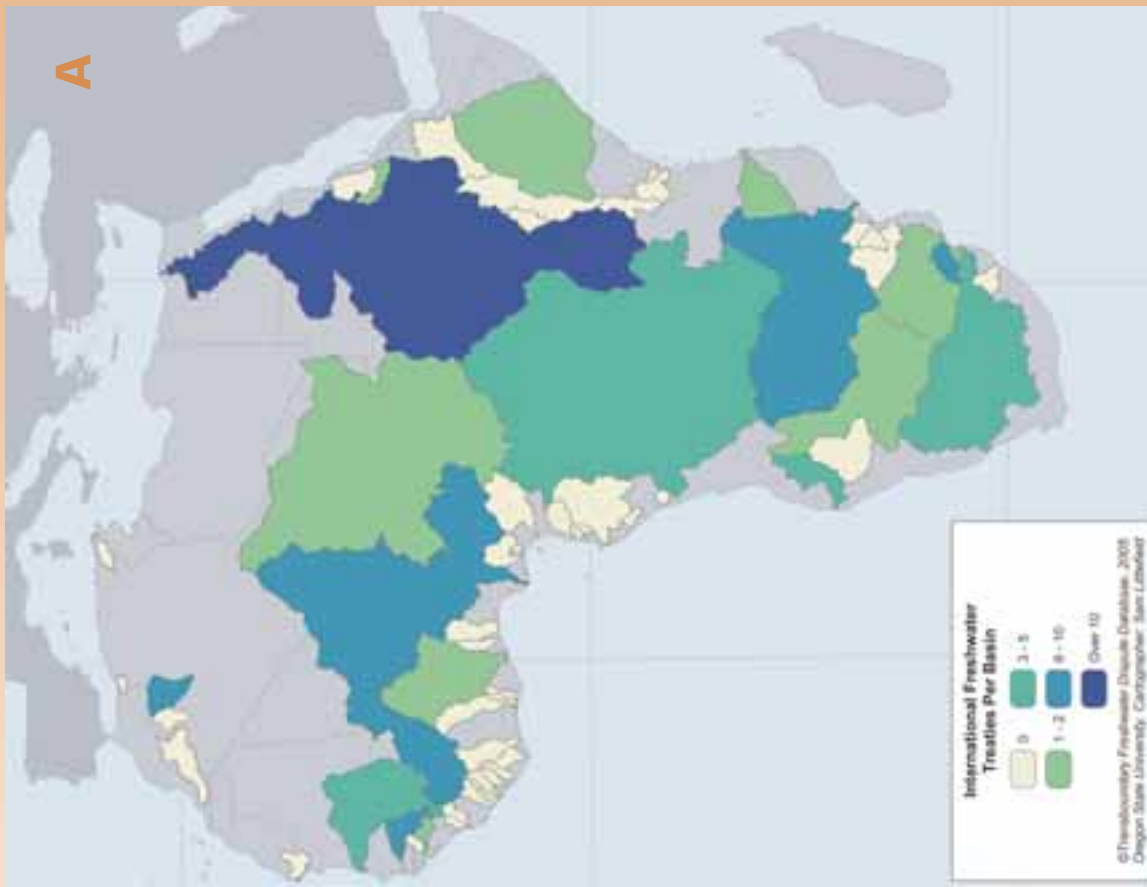




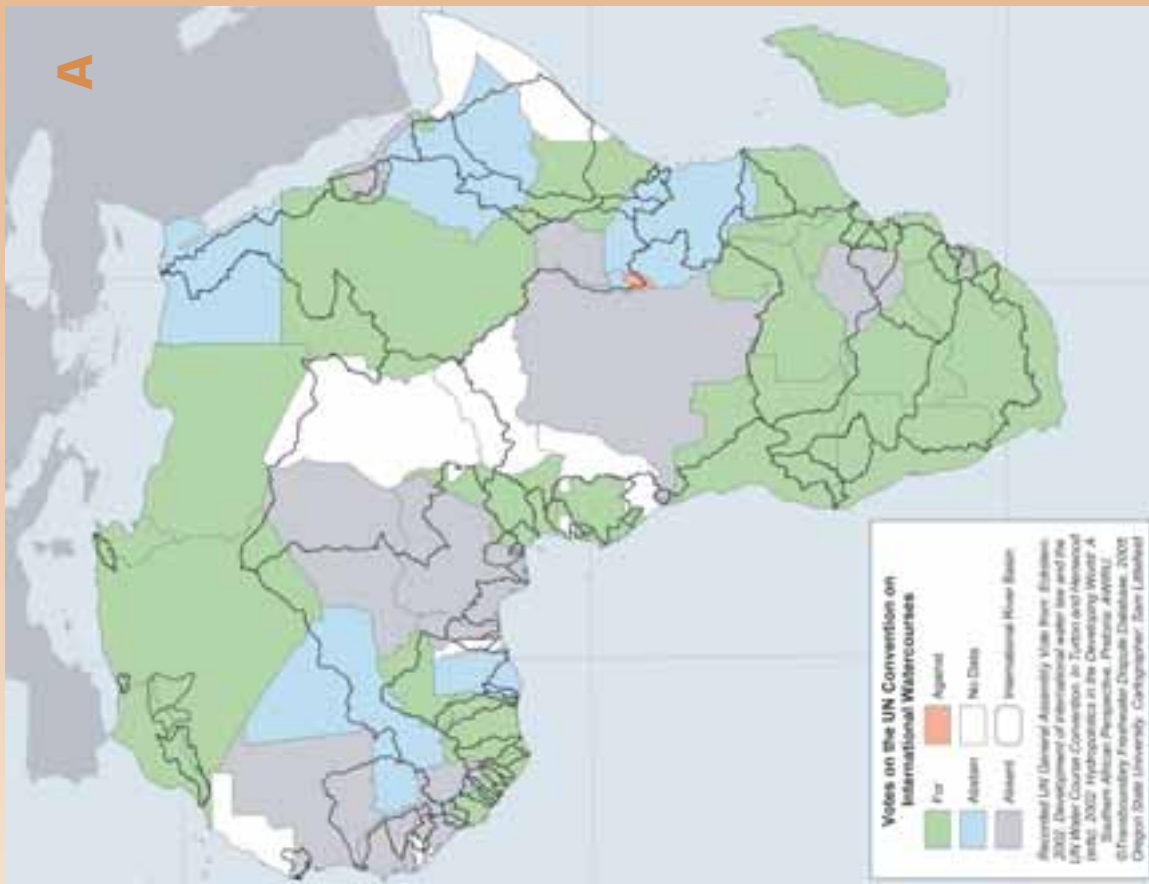
Map 6 (A) **Agricultural Water Use:** Agricultural water use is based on a model of irrigation water requirements developed for AQUASTAT by the FAO Land and Water Development and incorporates crop, reference, and actual evapotranspiration, crop coefficient, area under irrigation as percentage of the total area under analysis, and cropping intensity. Renewable water resources available for agricultural use are defined as the sum of internal renewable water resources and incoming flow originating outside the country, taking into consideration the quantity of flows reserved to upstream and downstream countries through formal or informal agreements or treaties. (B) **Water Dependency Ratio:** Water dependency ratio is calculated for AQUASTAT by the FAO Land and Water Development Division. It incorporates total country inflow and outflow of surface water and groundwater after accounting for flow submitted to and reserved by bilateral and multilateral treaties.

## INSTITUTIONAL CAPACITY

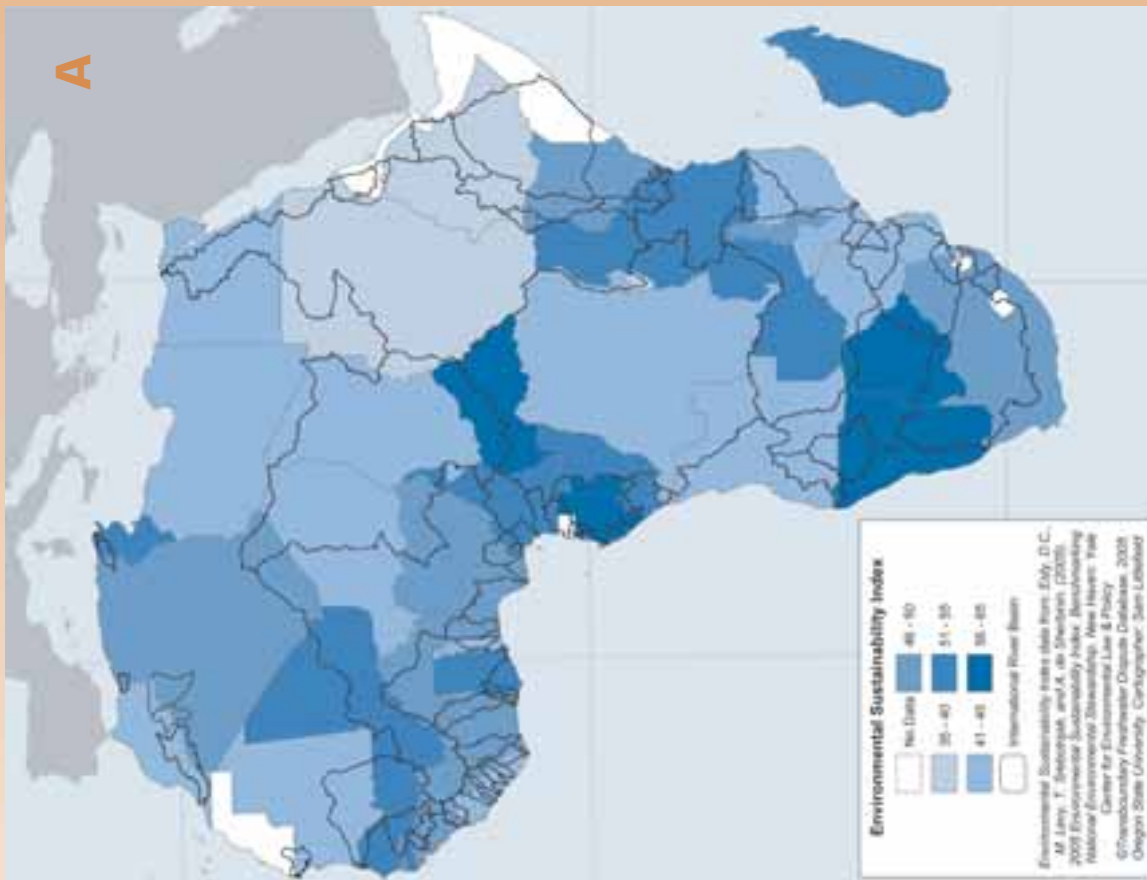




**Map 7 (A) International Freshwater Treaties Per Basin.** Number of treaties per basin is the sum of all agreements (historical, present, general) which have been signed by States governing water resources in the basin, either with one another or as part of a regional agreement, where the concern is water as a scarce or consumable resource, a quantity to be managed, or an ecosystem to be improved or maintained. Documents concerning navigation rights and tariffs, division of fishing rights, and delineation of rivers as borders or other territorial concerns are not included, unless freshwater as a resource is also mentioned in the document, or physical changes are being made that may impact the hydrology of the river system (e.g., dredging of river bed to improve navigation, straightening of a river's course). **(B) River Basin Organizations and Commissions (RBO/RBC).** Data for map was collected over a 6-month period from July to December 2004, drawing from: a compilation by Johannes Akiwumi at UNEP's Division of Environmental Information and Assessment (Nairobi); and internet searches and email interviews with international waters practitioners and scholars. (See appendices for sources). Presence of an RBO/RBC in an international river basin does not imply that all riparian countries are parties to the institution. Zero values do not necessarily reflect an absence of an RBO/RBC.



Map 8 (A) Votes on the UN Convention on International Watercourses. Vote records presented are based on data from the original convention voting period, which was open from May 1997 until May 2000. However, though the convention closed in 2000, member states may choose to become party to the convention at any time. (B) Institutional Capacity and Proposed Infrastructure: Treaties and River Basin Organizations and Commissions may serve to increase the hydropolitical resilience of a basin. This may be particularly important in basins with tenders for large projects, which can alter river functions and displace local inhabitants.



**Map 9 (A) Environmental Sustainability Index.** The 2005 Environmental Sustainability Index (ESI) measures the ability of a country to protect the environment over the next several decades. The ESI is an equally weighted average of 21 indicators, grouped into categories such as environmental systems, reducers of environmental stresses, reducers of human vulnerability, societal and institutional capacity and global stewardship. These data are combined from 76 separate data sets of natural resource endowments, pollution levels, environmental management efforts, etc. The ESI is useful for comparative analysis in identifying leading countries in environmental sustainability. The full ESI report is available at <http://www.yale.edu/esi>. **(B) Riparian Country Collaborations.** Data for the map was collected from internet searches, and compiled over a 5-month period from July to December 2004. Due to the short time period in which the study took place, the number of projects represented on the map may not accurately reflect the number of collaborations actually occurring. Detailed information about each riparian country collaboration (including participating countries; principal issue area; level of collaboration; dates of collaboration; and source from which the information was gathered) is compiled in the appendices.



# APPENDICES

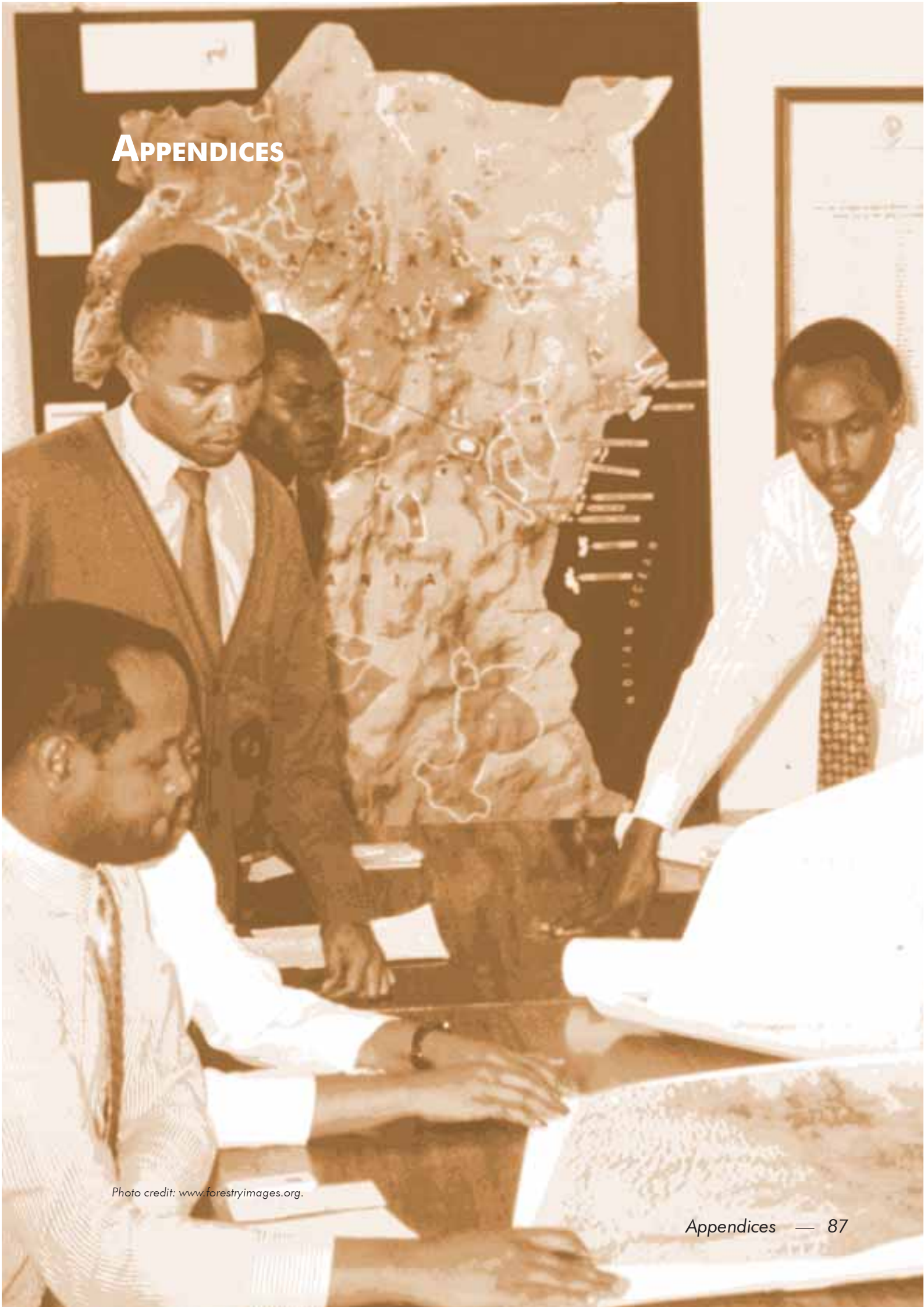


Photo credit: [www.forestryimages.org](http://www.forestryimages.org).



# APPENDIX 1. INTERNATIONAL FRESHWATER AGREEMENTS, RIVER BASIN ORGANIZATIONS, AND RIVER BASIN COMMISSIONS OF AFRICA

The treaties contained in this document were compiled as part of the Transboundary Freshwater Dispute Database (TFDD) project at Oregon State University in collaboration with the Food and Agriculture Organization of the United Nations. The documents included are treaties or other international agreements relating to international freshwater resources, where the concern is water as a scarce or consumable resource, a quantity to be managed, or an ecosystem to be improved or maintained. Treaties concerning navigation rights and tariffs, division of fishing rights, and delineation of rivers as borders or other territorial concerns are not included, unless freshwater as a resource is also mentioned in the document, or physical changes are being made to the river system that might impact the hydrology of the river system (e.g., dredging of river bed to improve navigation, straightening of river course).

For ease of reference, the treaties are first categorized by continent, and then by international basin, as delineated in the TFDD Geographical Information System. The treaties listed under each international basin either refer directly to that international basin, or a sub-basin thereof. In cases of multiple spellings or names for the same river system of an international basin, a "/" separates the names (e.g., Congo/Zaire). Where the basin represents the confluence of a set of major rivers, a "-" is used to separate the names of the different river systems (e.g., Juba-Shibeli).

It is important to note that the following database of treaties is, by its very nature, a work in constant progress, and makes no claims to completeness. Those interested in updates should follow progress on the relevant sites, such as:

African Water Issues Research Unit  
<http://www.up.ac.za/academic/libarts/polsci/awiru/>

The African Transboundary Water Law Page  
<http://www.africanwaterlaw.org/>

The Transboundary Freshwater Dispute Database Project  
<http://www.transboundarywaters.orst.edu/>

The area of each basin and its riparian countries' territorial share was calculated using a GIS at 1 km spatial resolution (Wolf et al. 1999). We recognize the limitations of the data sources and process by reporting the size of basins, not as raw data as is common with digital data, but by rounding the last significant figure in basins 1-99 km<sup>2</sup> and the last two significant figures in basins 100 km<sup>2</sup> or larger. As a result of rounding the area values, the numbers for areas within each basin do not necessarily add up to the total area for that basin. The percentage areas were calculated based on raw data, and therefore do not reflect the rounding of the areas. An asterisk (\*) following a TFDD basin's name indicates notes in Appendix 2 regarding caveats associated with the derivation of the area values. The following is a description of the terms used in the appendices.



## DESCRIPTION OF TERMS

**Commission**—A bilateral or multilateral body, composed of officials appointed by national governments to participate in dialogue, discourse, and negotiations regarding the international water body for which it was created.

**Date**—The date usually indicates the date on which a treaty document was signed or a river basin commission was instituted. If such information was unavailable, the next choice was the date of entry into force, followed by the date of ratification. For agreements consisting of a series of letters or notes written on different dates, the latest date was used. Dates are represented in a month/day/year format.

**Economic program**—A bilateral or multilateral economic development project or program which aims to improve investment/trade/economic activities among countries sharing an international water body.

**Environmental program**—A bilateral or multilateral project or program which aims to improve/protect/conservate the quality and habitat of aquatic systems associated with an international water body.

**International initiative**—A bilateral or multilateral body, composed of non-official actors who serve a Track 2 function, bringing stakeholders together to dialogue and strategize about transboundary water issues. International initiatives involve stakeholders from multiple countries who are mainly functioning to enhance dialogue and improve stakeholder participation, but do not necessarily implement their own projects, as they do not have funding to do so.

**Level of collaboration**—Indication of level of international water collaboration form: official or non-official. Official collaboration is acknowledged by the national government while non-official collaboration has no governmental involvement.

**Organization**—A bilateral or multilateral body, composed of officials acting on behalf of their government (ministerial, technical or other) to conduct coordinated and/or informed management of the international water body. An organization differs from a commission in that it involves the implementation of bilateral or multilateral programs (information sharing, joint management, etc.)

**Participating countries**—The countries that are party to the international water collaboration form

**Principal issue**—Issue area that international water collaboration form focuses on more than on other issues

**Riparian country collaborations**—Projects, programs, or partnerships *with a river basin as a geographic focus*, involving organizations or representatives (acting in an official or non-official capacity) from two or more countries that share the international water body.

**Signatories**—Signatories to the agreement. The formal country names as delineated in the actual treaty are used if that information is readily apparent; otherwise, common country names are listed instead.

**Social / health program**—A bilateral or multilateral social and/or health project or program which aims to improve the social and/or health conditions of the people living in an international water body

**Treaty basin**—Identifies the basin or sub-basins specifically mentioned in the document. If a document applies to all basins shared between the signatories, but no river or basin is mentioned specifically, the treaty basin is listed as “frontier or shared waters.” For frontier or shared waters, a treaty is listed under all the TFDD basins shared between those signatories. A document may therefore appear listed under multiple basins.

**Treaty or agreement**—The full formal name of the document or best approximation thereof. The place of signature is often included as part of the agreement name. Agreement titles, regardless of the language of the source document, are listed in English. Not all titles are official

**Type of international water collaboration**—Form of international water collaborations

# CONGO/ZAIRE\*

Total area: 3,699,100 km<sup>2</sup>

Countries	Area of Basin in Country km <sup>2</sup>	%
<b>Congo, Democratic Republic of (Kinshasa)</b>	<b>2,307,800</b>	<b>62.39</b>
<b>Central African Republic</b>	<b>402,000</b>	<b>10.87</b>
<b>Angola</b>	<b>291,500</b>	<b>7.88</b>
<b>Congo, Republic of the (Brazzaville)</b>	<b>248,400</b>	<b>6.72</b>
<b>Zambia</b>	<b>176,600</b>	<b>4.77</b>
<b>Tanzania, United Republic of</b>	<b>166,800</b>	<b>4.51</b>
<b>Cameroon</b>	<b>85,300</b>	<b>2.31</b>
<b>Burundi</b>	<b>14,300</b>	<b>0.39</b>
<b>Rwanda</b>	<b>4,500</b>	<b>0.12</b>
<b>Gabon</b>	<b>460</b>	<b>0.01</b>
<b>Malawi</b>	<b>90</b>	<b>0.00</b>



## TREATIES AND AGREEMENTS

*Convention ... regarding various questions of economic interest...*

Treaty basin: Congo/Zaire

Date: July 20, 1927

Signatories: Belgium; Portugal

*1926 Exchange of notes accepting the protocol relative to the Tanganyika-Ruanda-Urundi Frontier*

Treaty basin: Congo/Zaire

Date: May 17, 1926

Signatories: U.K.; Belgium

*General act of the conference of Berlin ... respecting: (1) freedom of trade in the basin of the Congo; (2) the slave trade; (3) neutrality of the territories in the basin of the Congo; (4) navigation of the Congo; (5) navigation of the Niger; and (6) rules for future occupation of the coast of the African continent*

Treaty basin: Congo, Niger

Date: February 26, 1885

Signatories: Austria-Hungary; Belgium; Denmark; France; Germany; Great Britain; Italy; Netherlands; Norway; Portugal; Russia; Spain; Sweden; Turkey; United States of America

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

*Commission Internationale du Bassins Congo-Oubangui-Sangha (CICOS)*

Treaty basins: Congo, Oubangui, Sangha

Date: November 6, 1999, effective since November 23, 2003

Signatories: Cameroon, Central African Republic, Congo, Republic of the (Brazzaville), Congo, Democratic Republic of (Kinshasa)

Photo: fisherman at sunset, Blue Nile. Photo credit: William M. Ciesla, Forest Health Management International, [www.forestryimages.org](http://www.forestryimages.org).

# CORUBAL

Total area: 24,000 km<sup>2</sup>

Countries	Area of Basin in Country km <sup>2</sup>	%
Guinea	17,500	72.71
Guinea-Bissau	6,500	27.02



## TREATIES AND AGREEMENTS

*Protocol of the agreement between the Republic of Guinea and the Republic of Guinea-Bissau on the management of the Koliba-Korubal river, signed at Conakry*

Treaty basin: Koliba-Korubal

Date: October 21, 1978

Signatories: Guinea, People's Revolutionary Republic of; Guinea-Bissau, Republic of

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

*Organisation pour la Mise en Valeur du Fleuve Gambie/Gambia River Basin Development Organization (OMVG)*

The three principal thrusts of OMVG concern energy, food security, and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, Fello Sounga and Saltinho on the River Koliba/Corubal and Gaoual on the River Géba. The main objective of OMVG, is to promote socioeconomic integration of its members States. OMVG executes regional projects in the three river basins: River Gambia, River Géba (or Kayanga), and River Corubal (or Koliba).

Treaty basin: Gambia, Géba, Corubal

Date: 1978

Signatories: Guinea, Guinea-Bissau



# CUNENE

Total area: 110,000 km<sup>2</sup>

Countries	Area of Basin in Country km <sup>2</sup>	%
Angola	95,300	86.68
Namibia	14,700	13.32



## TREATIES AND AGREEMENTS

### *Joint Water Commission terms of reference*

Treaty basin: Frontier or shared waters

Date: January 1, 1996

Signatories: Mozambique; South Africa

### *Agreement between the government of the Republic of South Africa and the government of Portugal in regard to the first phase of development of the water resource of the Cunene River Basin*

Treaty basin: Cunene

Date: January 21, 1969

Signatories: Portugal; South Africa, Republic of

### *Exchange of notes... respecting the boundary between the mandated territory of South Africa and Angola*

Treaty basin: Cunene

Date: April 29, 1931

Signatories: Portugal; South Africa

### *Agreement between South Africa and Portugal regulating the use of the water of the Cunene River*

Treaty basin: Cunene, Kunene

Date: July 1, 1926

Signatories: Portugal; South Africa

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

### *Angola Namibian Joint Commission of Cooperation (ANJCC)*

Treaty basin: Cunene, Kunene

Date: 1996

Signatories: Angola, Namibia

### *Joint Operating Authority*

Treaty basin: Cunene, Kunene

Date: Not available

Signatories: Angola, Namibia

### *Permanent Joint Technical Commission*

Treaty basin: Cunene, Kunene

Date: Not available

Signatories: Angola, Namibia

# GAMBIA

Total area: 69,900 km<sup>2</sup>

Countries	Area of Basin in Country km <sup>2</sup>	%
Senegal	50,700	72.48
Guinea	13,200	18.92
Gambia, The	5,900	8.51



## TREATIES AND AGREEMENTS

*Convention relating to the status of the River Gambia, signed at Kaolack*

Treaty basin: Gambia

Date: June 30, 1978

Signatories: Gambia; Guinea; Senegal

*Convention relating to the creation of the Gambia River Basin Development Organization*

Treaty basin: Gambia

Date: June 30, 1978

Signatories: Gambia; Guinea, People's Revolutionary Republic of; Senegal

*Agreement between Great Britain and France respecting the boundary between Sierra Leone and French Guinea*

Treaty basin: Gambia

Date: September 4, 1913

Signatories: France; Great Britain

*Agreement between France and Great Britain relative to the frontier between French and British possessions from the Gulf of Guinea to the Niger*

Treaty basin: Gambia

Date: October 19, 1906

Signatories: France; Great Britain

*Agreement between Great Britain and France*

Treaty basin: Gambia

Date: August 10, 1889

Signatories: France; Great Britain

*Exchange of notes between France and Great Britain respecting navigation and use of the Great Scarcies River*

Treaty basin: Gambia

Date: February 4, 1895

Signatories: France; Great Britain

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

### *Organisation pour la Mise en Valeur du Fleuve Gambie/Gambia River Basin Development Organization (OMVG)*

OMVG executes regional projects in three river basins: Gambia, Geba, Corubal (River Koliba/) Fello Sounga and Saltinho on the River Koliba/Corubal, and Gaoual on the River Géba. The three principal thrusts of OMVG concern energy, food security and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, Fello Sounga and Saltinho on the River Koliba/Corubal, and Gaoual on the River Géba. The main objective of OMVG, is to promote socioeconomic integration of its members States. OMVG executes regional projects in the three river basins: River Gambia, River Géba (or Kayanga), and River Corubal (or Koliba).

*Treaty basin:* Gambia, Géba, Corubal

*Date:* 1978

*Signatories:* Guinea, Guinea-Bissau, Senegal



# GASH

Total area: 40,000 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Eritrea	21,400	53.39
Sudan	9,600	24.09
Ethiopia	9,000	22.52



## TREATIES AND AGREEMENTS

*Letters between the irrigation adviser and director of irrigation, Sudan government, and the controller of agriculture, Eritrea*

Treaty basin: Gash

Date: April 18, 1951

Signatories: Eritrea; Sudan

*Exchange of notes between the United Kingdom and Italy respecting the regulation of the utilisation of the waters of the River Gash*

Treaty basin: Gash

Date: June 15, 1925

Signatories: Great Britain; Italy

# GÉBA

Total area: 12,800 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Guinea-Bissau	8,700	67.69
Senegal	4,100	31.88
Guinea	50	0.42



## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

*Organisation pour la Mise en Valeur du Fleuve Gambie/Gambia River Basin Development Organization (OMVG)*

The three principal thrusts of OMVG concern energy, food security, and communications. OMVG has carried out studies which have resulted in the recommendation of four sites of potential development as hydro-electric power projects. These are at Sambangalou on the River Gambia, Fello Sounga and Saltinho on the River Koliba/Corubal, and Gaoual on the River Géba. The main objective of OMVG is to promote socioeconomic integration of its members States. OMVG executes regional projects in the three river basins: River Gambia, River Géba (or Kayanga), and River Corubal (or Koliba).

*Treaty basin:* Gambia, Géba, Corubal

*Date:* 1978

*Signatories:* Guinea, Guinea-Bissau, Senegal

# INCOMATI\*

Total area: 46,700 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
South Africa	29,200	62.47
Mozambique	14,600	31.20
Swaziland	3,000	6.33



## TREATIES AND AGREEMENTS

*Agreement on the development and utilisation of the resources of the Komati River Basin between the government of the Republic of South Africa and the government of KaNgwane*

Treaty basin: Komati

Date: October 7, 1992

Signatories: KaNgwane; South Africa, Republic of

*Treaty on the development and utilisation 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*

Treaty basin: Komati

Date: March 13, 1992

Signatories: South Africa, Republic of; Swaziland, Kingdom of

*Treaty on the establishment and functioning of the joint water commission between the government of the Republic of South Africa and the government of the Kingdom of Swaziland*

Treaty basin: Komati, Maputo

Date: March 13, 1992

Signatories: South Africa, Republic of; Swaziland, Kingdom of

*Tripartite permanent technical committee ministerial meeting of ministers responsible for water affairs*

Treaty basin: Inkomati, Komati, Sabie

Date: February 15, 1991

Signatories: Mozambique; South Africa; Swaziland

*Agreement between the government of the Republic of South Africa, the government of the Kingdom of Swaziland and the government of the People's Republic of Mozambique relative to the establishment of a tripartite permanent technical committee*

Treaty basin: Frontier or shared waters

Date: February 17, 1983

Signatories: Mozambique, People's Republic of; South Africa, Republic of; Swaziland, Kingdom of



## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

### *Komati Basin Water Authority (KOBWA)*

A bi-national company formed in 1993 through the treaty on the Development and Utilization of the Water Resources of the Komati River Basin signed in 1992 between the Kingdom of Swaziland and the Republic of South Africa. The purpose of KOBWA is to implement Phase 1 of the Komati River Basin Development Project. Phase 1 comprises the design, construction, operation, and maintenance of Driekoppies Dam in South Africa (Phase 1a) and the Maguga Dam in Swaziland (Phase 1b). Additional party involved: Mozambique, which shares the same river system and is participating through TPTC.

*Treaty basin:* Incomati

*Date:* 1993

*Signatories:* Mozambique, South Africa, Swaziland

### *Joint Water Commission (JWC)*

The Joint Water Commission was established as a technical advisory commission to advise the Governments of the Kingdom of Swaziland and the Republic of South Africa on water resources of common interest. The JWC was formed through the JWC treaty signed in 1992. There are three commissioners appointed by each Government for a period determined by each Government. The JWC monitors the activities of KOBWA on behalf of the governments of Swaziland and South Africa.

*Treaty basin:* Incomati

*Date:* March 13, 1992

*Signatories:* South Africa, Swaziland

### *Tripartite Permanent Technical Commission (TPTC)*

*Treaty basin:* Incomati

*Date:* February 15, 1991

*Signatories:* Mozambique, South Africa, Swaziland

# JUBA-SHIBELI

Total area: 803,500 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Ethiopia	367,400	45.72
Somalia	220,900	27.49
Kenya	215,300	26.79



## TREATIES AND AGREEMENTS

*Exchange of notes setting out an agreement between His Majesty's government in the United Kingdom and the Italian government regarding the boundary between Kenya and Italian Somaliland, together with the agreement adopted by the boundary commission and appendices, London*

*Treaty basin: Dif (pools of)*

*Date: November 22, 1933*

*Signatories: Great Britain, United Kingdom of; Italy*

# LAKE CHAD\*

Total area: 2,388,700 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Chad	1,079,200	45.18
Niger	674,200	28.23
Central African Republic	218,600	9.15
Nigeria	180,200	7.54
Algeria	90,000	3.77
Sudan	82,800	3.47
Cameroon	46,800	1.96
Chad, claimed by Libya	12,300	0.51
Libya	4,600	0.19



## TREATIES AND AGREEMENTS

*Agreement pertaining to the creation of a fund for the development of the Chad basin commission*

Treaty basin: Chad

Date: October 10, 1973

Signatories: Cameroon; Chad; Niger; Nigeria

*Convention and statutes relating to the development of the Chad Basin*

Treaty basin: Lake Chad

Date: May 22, 1964

Signatories: Cameroon; Chad; Niger; Nigeria

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

*Lake Chad Basin Commission (LCBC)*

The Commission is a Regional Government Organization, designed to manage the basin and to resolve disputes that might arise over the lake and its resources. The aims of the Commission are to regulate and control the utilization of water and other natural resources in the basin; to initiate, promote and coordinate natural resources development projects and research within the basin area; to examine complaints; and to promote the settlement of disputes, thereby promoting regional cooperation. Note: the Central African Republic joined in 1994 and Sudan was admitted as an observer by the 10th Summit held in N'Djamena in July, 2000. It will become the sixth member state after ratifying the convention and statute which created the Commission.

Treaty basin: Lake Chad

Date: May 22, 1964

Signatories: Cameroon, Central African Republic, Chad, Niger, Nigeria

*Basin Committee for Strategic Planning (BCSP)*

Created through LCBC, for local initiatives.

Treaty basin: Lake Chad

Date: Not available

Signatories: Cameroon, Central African Republic, Chad, Niger, Nigeria



# LIMPOPO

Total area: 414,800 km<sup>2</sup>

Countries	Area of Basin in Country km <sup>2</sup>	%
South Africa	183,500	44.25
Mozambique	87,200	21.02
Botswana	81,500	19.65
Zimbabwe	62,600	15.08



## TREATIES AND AGREEMENTS

*Agreement between the government of the Republic of South Africa, the government of the Kingdom Swaziland and the government of the People's Republic of Mozambique relative to the establishment of a tripartite permanent technical committee.*

*Treaty basin:* Frontier or shared waters

*Date:* February 17, 1983

*Signatories:* Mozambique, People's Republic of; South Africa, Republic of; Swaziland, Kingdom of

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

### *Limpopo Watercourse Commission (LWC)*

This commission was negotiated by the Limpopo Basin Permanent Technical Committee. The Commission between South Africa, Botswana, Mozambique and Zimbabwe is to manage the Limpopo River and must facilitate the building of capacity within the four countries to manage the water resource.

*Treaty basin:* Limpopo

*Date:* November 1, 2003

*Signatories:* Botswana, Mozambique, South Africa, Zimbabwe

### *Joint Water Commission (JWC)*

In 1996, after South Africa's political change, the two countries signed in Mozambique, an agreement establishing a Joint Water Commission (JWC), with advisory functions on technical matters relating their common rivers, including the Limpopo.

*Treaty basin:* Limpopo

*Date:* 1996

*Signatories:* Mozambique, South Africa

### *Limpopo River Basin Commission (LRC)*

Institutional arrangement to manage water. Operating on a river-catchment basis, rather than by national boundaries, this body provides an appropriate institutional vehicle to guide the development in the basin.

*Treaty basin:* Limpopo

*Date:* 1995

*Signatories:* Botswana, Mozambique, South Africa, Zimbabwe

### *Limpopo Basin Permanent Technical Committee (LBPTC)*

In 1986, Limpopo Basin States signed in Harare, Zimbabwe, a multilateral agreement establishing a Limpopo Basin Permanent Technical Committee (LBPTC), which was set up to advise the parties on issues regarding the river. The LBPTC did not however function during its first ten years. LBPTC's second meeting was held in South Africa in 1995. At the meeting, it was agreed to activate the LBPTC, and discussions concentrated on mutual interest regarding the common river.

*Treaty basin:* Limpopo

*Date:* 1986

*Signatories:* Botswana, Mozambique, South Africa, Zimbabwe

### *Joint Permanent Technical Committee (JPTC)*

The JPTC was established in 1983 to make recommendation on matters concerning common interest in the Limpopo.

*Treaty basin:* Limpopo

*Date:* 1983

*Signatories:* Botswana, Mozambique, South Africa, Zimbabwe

# MANO-MORRO

Total area: 6,900 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Liberia	5,700	82.84
Sierra Leone	1,200	17.16



## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

### *Mano River Union (MRU)*

The MRU was established in 1973 to constitute a customs and economic union between the member states in order to improve living standards. Decisions are taken at meetings of a joint ministerial committee. The governments of all three 'Mano River Union' countries recognise that their individual future prosperity depends on increasing dialogue and co-operation between them, and moves to revitalise the Mano River Union are likely to resume as soon as peace has returned to Sierra Leone and to the respective border regions of the three countries.

*Treaty basin:* Mano-Morro

*Date:* October 3, 1973

*Signatories:* Guinea, Liberia, Sierra Leone,



# MAPUTO

Total area: 30,700 km<sup>2</sup>

Countries	Area of Basin in Country km <sup>2</sup>	%
South Africa	18,500	60.31
Swaziland	10,600	34.71
Mozambique	1,500	4.98



## TREATIES AND AGREEMENTS

*Tripartite Interim Agreement between the Republic of Mozambique and the Republic of South Africa and the Kingdom of Swaziland for co-operation on the protection and sustainable utilisation of the water resources of the Incomati and Maputo watercourses*

Treaty basin: Maputo

Date: August 29, 2002

Signatories: Mozambique, People's Republic of; South Africa, Republic of; Swaziland, Kingdom of

*Treaty on the establishment and functioning of the joint water commission between the government of the Republic of South Africa and the government of the Kingdom of Swaziland*

Treaty basin: Komati, Maputo

Date: March 13, 1992

Signatories: South Africa, Republic of; Swaziland, Kingdom of

*Agreement between the government of the Republic of South Africa, the government of the Kingdom of Swaziland and the government of the People's Republic of Mozambique relative to the establishment of a tripartite permanent technical committee*

Treaty basin: Frontier or shared waters

Date: February 17, 1983

Signatories: Mozambique, People's Republic of; South Africa, Republic of; Swaziland, Kingdom of

# NIGER

Total area: 2,113,200 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Nigeria	561,900	26.59
Mali	540,700	25.58
Niger	497,900	23.56
Algeria	161,300	7.63
Guinea	95,900	4.54
Cameroon	88,100	4.17
Burkina Faso	82,900	3.93
Benin	45,300	2.14
Côte D'Ivoire	22,900	1.08
Chad	16,400	0.78
Sierra Leone	50	0.00



## TREATIES AND AGREEMENTS

*Decree No. 99-120/PCRN/MAE/IA pertaining to the publication of the agreement between the Republic of Niger and the Republic of Benin relative to the realization of the hydroelectric management of the Dyondyonga site on the Mékrou river, signed at Contonou*

Treaty basin: Mékrou

Date: January 14, 1999

Signatories: Benin, Republic of; Niger, Republic of

*Agreement between the Federal Republic of Nigeria and the Republic of Niger concerning the equitable sharing in the development, conservation and use of their common water resources*

Treaty basins: Gada/Goulbi, Komadougou-Yobe, Maggia/Lamido, Tagwai/El Fadama

Signatories: Niger, Republic of; Nigeria, Federal Republic of

Date: July 18, 1990

*Protocol of the agreement between the Republic of Niger and the Republic of Mali relative to cooperation in the utilization of resources in water of the Niger River*

Treaty basin: Niger

Date: July 12, 1988

Signatories: Mali, Republic of; Niger, Republic of

*Revised convention pertaining to the creation of the Niger Basin Authority, signed at N'Djamena*

Treaty basin: Niger

Date: October 29, 1987

Signatories: Benin, People's Republic of; Burkina Faso; Cameroon; Chad; Côte D'Ivoire; Guinea; Mali; Niger; Nigeria

*Revised financial procedures of the Niger Basin Authority, done at Ndjamen*

Treaty basin: Niger

Date: October 27, 1987

Signatories: Algeria; Benin; Cameroon; Chad; Guinea; Cote D'Ivoire; Mali; Niger; Nigeria; Burkina Faso

*Convention creating the Niger Basin Authority and protocol*

Treaty basin: Niger

Date: November 21, 1980

Signatories: Benin, People's Republic of; Cameroon; Chad; Côte D'Ivoire; Guinea, Revolutionary People's Republic of; Mali; Niger; Nigeria; Upper Volta

*Agreement concerning the River Niger Commission and the navigation and transport on the River Niger*

*Treaty basin:* Niger

*Date:* November 25, 1964

*Signatories:* Benin; Burkina Faso; Cameroon; Chad; Cote D'Ivoire; Guinea; Mali; Niger; Nigeria

*Act regarding navigation and economic cooperation between the states of the Niger Basin*

*Treaty basin:* Niger

*Date:* October 26, 1963

*Signatories:* Cameroon; Chad; Côte D'Ivoire; Dahomey; Guinea; Mali; Niger; Nigeria; Upper Volta

*Convention of Barcelona*

*Treaty basin:* Niger

*Date:* April 20, 1921

*Signatories:* France; Great Britain; "among others"

*General act of the conference of Berlin ... respecting: 1) freedom of trade in the basin of the Congo; 2) the slave trade; 3) neutrality of the territories in the basin of the Congo; 4) navigation of the Congo; 5) navigation of the Niger; and 6) rules for future occupation of the coast of the African continent*

*Treaty basins:* Congo, Niger

*Date:* February 26, 1885

*Signatories:* Austria-Hungary; Belgium; Denmark; France; Germany; Great Britain; Italy; Netherlands; Norway; Portugal; Russia; Spain; Sweden; Turkey; United States of America

## **RIVER BASIN ORGANIZATIONS AND COMMISSIONS**

*Niger Basin Authority (NBA), formerly the Niger River Commission (RNC)*

The NBA is one of the oldest African Intergovernmental Organization as its creation dates back to 1964 when it was called River Niger Commission. The River Niger Commission functioned for seventeen years and the results achieved were deemed insufficient. Consequently, the member states decided to replace it with a new organization, the Niger Basin Authority which became heir to all the assets, liabilities and programs initiated by the River Niger Commission. The aim of the Niger Basin Authority is to promote cooperation among the member countries and to ensure integrated development in all fields through development of its resources.

*Treaty basin:* Niger

*Date:* 1980

*Signatories:* Algeria, Benin, Burkina Faso, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria, Sierra Leone



# NILE\*

Total area: 3,038,100 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
<b>Sudan</b>	<b>1,931,300</b>	<b>63.57</b>
<b>Ethiopia</b>	<b>356,900</b>	<b>11.75</b>
<b>Egypt</b>	<b>273,100</b>	<b>8.99</b>
<b>Uganda</b>	<b>238,900</b>	<b>7.86</b>
<b>Tanzania, United Republic of</b>	<b>120,300</b>	<b>3.96</b>
<b>Kenya</b>	<b>50,900</b>	<b>1.68</b>
<b>Congo, Democratic Republic of (Kinshasa)</b>	<b>21,700</b>	<b>0.71</b>
<b>Rwanda</b>	<b>20,800</b>	<b>0.69</b>
<b>Burundi</b>	<b>13,000</b>	<b>0.43</b>
<b>Egypt, admin. by Sudan</b>	<b>4,400</b>	<b>0.14</b>
<b>Eritrea</b>	<b>3,500</b>	<b>0.12</b>
<b>Sudan, admin. by Egypt</b>	<b>2,000</b>	<b>0.07</b>



## TREATIES AND AGREEMENTS

*Agreement to initiate program to strengthen regional coordination in management of resources of Lake Victoria*

Treaty basin: Lake Victoria

Date: August 5, 1994

Signatories: Kenya; Tanzania, United Republic of; Uganda

*Framework for general co-operation between the Arab Republic of Egypt and Ethiopia*

Treaty basin: Nile

Date: July 1, 1993

Signatories: Egypt, Arab Republic of; Ethiopia

*Accession of Uganda to the agreement pertaining to the creation of the organization for the management and development of the Kagera river basin*

Treaty basin: Kagera

Date: May 18, 1981

Signatories: Burundi; Rwanda; Tanzania, United Republic of; Uganda

*Agreement for the establishment of the organization for the management and development of the Kagera river basin (with attached map), concluded at Rusumo, Rwanda*

Treaty basin: Kagera

Date: August 24, 1977

Signatories: Burundi; Rwanda; Tanzania, United Republic of; Uganda

*Agreement between the government of the United Arab Republic and the government of Sudan*

Treaty basin: Nile

Date: November 8, 1959

Signatories: Sudan; United Arab Republic

*Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam in Uganda*

Treaty basin: Nile

Date: July 16, 1952

Signatories: Egypt; Great Britain and Northern Ireland, United Kingdom of

- Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland on behalf of the government of Uganda and the government of Egypt regarding cooperation in meteorological and hydrological surveys in certain areas of the Nile basin*  
Treaty basin: Nile Date: January 19, 1950  
Signatories: Egypt; Great Britain on behalf of Uganda
- Exchange of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam, Uganda*  
Treaty basin: Nile Date: December 5, 1949  
Signatories: Egypt; Great Britain on behalf of Uganda
- Exchanges of notes constituting an agreement between the government of the United Kingdom of Great Britain and Northern Ireland and the government of Egypt regarding the construction of the Owen Falls Dam, Uganda*  
Treaty basin: Nile Date: May 31, 1949  
Signatories: Egypt; Great Britain
- Exchange of notes constituting an agreement between the United Kingdom of Great Britain and Northern Ireland and Egypt regarding the utilisation of profits from the 1940 British government cotton buying commission and the 1941 joint Anglo-Egyptian cotton buying commission to finance schemes for village water supplies*  
Treaty basin: Nile Date: December 7, 1946  
Signatories: Egypt; Great Britain
- Agreement between the United Kingdom and Belgium regarding water rights on the boundary between Tanganyika and Ruanda-Urundi*  
Treaty basin: Nile Date: November 22, 1934  
Signatories: Belgium; Great Britain
- Exchange of notes between His Majesty's government in the United Kingdom and the Egyptian government in regard to the use of the waters of the river Nile for irrigation purposes*  
Treaty basin: Nile Date: May 7, 1929  
Signatories: Egypt; Great Britain
- Exchange of notes between the United Kingdom and Italy respecting concessions for a barrage at Lake Tsana and a railway across Abyssinia from Eritrea to Italian Somaliland*  
Treaty basin: Lake Tsana Date: December 20, 1925  
Signatories: Great Britain; Italy
- Agreement between Great Britain, France, and Italy respecting Abyssinia*  
Treaty basin: Nile Date: December 13, 1906  
Signatories: France; Great Britain; Italy
- Agreement between Great Britain and the Independent State of the Congo, modifying the agreement signed at Brussels 12 May 1894, relating to the spheres of influence of Great Britain and the Independent State of the Congo in East and Central Africa*  
Treaty basin: Nile Date: May 9, 1906  
Signatories: Congo, Independent State of; Great Britain
- Treaties between Great Britain and Ethiopia, relative to the frontiers between Anglo-Egyptian Soudan, Ethiopia, and Erythraea (railway to connect Soudan with Uganda)*  
Treaty basin: Nile, Sobat Date: May 15, 1902  
Signatories: Ethiopia; Great Britain
- Exchange of notes between Great Britain and Ethiopia*  
Treaty basin: Nile Date: March 18, 1902  
Signatories: Ethiopia; Great Britain

*Protocol between Great Britain and Italy for the demarcation of their respective spheres of influence in Eastern Africa*

Treaty basin: Nile

Date: April 15, 1891

Signatories: Great Britain; Italy

## **RIVER BASIN ORGANIZATIONS AND COMMISSIONS**

### *Nile Basin Initiative (NBI)*

Nile Basin Initiative (NBI). The NBI is a transitional mechanism that includes nine Nile riparian countries as equal members in a regional partnership to promote economic development and fight poverty throughout the Basin. The vision of the NBI is to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources. Within the framework of the Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE), a Nile River Basin action plan was prepared in 1995 with support from CIDA. In 1997, the World Bank agreed to a request by the Council of Ministers of Water Affairs of the Nile Basin States (Nile-COM) to lead and coordinate donor support for their activities. In 1998, recognizing that cooperative development holds the greatest prospects of bringing mutual benefits to the region, all riparians, except Eritrea, joined in a dialogue to create a regional partnership to facilitate the common pursuit of sustainable development and management of Nile waters.

Treaty basin: Nile

Date: 1999

Signatories: Burundi, Central African Republic, Egypt, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda, Kenya, Rwanda, Sudan (administered by Egypt)

### *Lake Victoria Fisheries Organization*

Objectives: to foster co-operation amongst the Contracting Parties in matters regarding Lake Victoria; To harmonize national measures for the sustainable utilization of the living resources of the Lake; To develop and adopt conservation and management measures to assure the health of the Lake's ecosystem and the sustainability of its living resources. The Lake Victoria Fisheries Organization was established by a Convention (mandate) signed on 30th June 1994, in Kisumu, Kenya by the "Contracting Parties" who consist of the Governments of the Republic of Kenya, the Republic of Uganda and the United Republic of Tanzania.

Treaty basin: Lake Victoria

Date: June 30, 1994

Signatories: Kenya, Tanzania, Uganda

### *Technical Cooperation Committee for the Promotion of the Development and Environmental Protection of the Nile Basin (TECCONILE)*

Formed in an effort to focus on a development agenda.

Treaty basin: Nile

Date: 1993

Signatories: Burundi, Central African Republic, Egypt, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda, Kenya, Rwanda, Sudan (administered by Egypt)



# OKAVANGO- MAKGADIKGADI\*

Total area: 706,900 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Botswana	358,000	50.65
Namibia	176,200	24.93
Angola	150,100	21.23
Zimbabwe	22,600	3.19



## TREATIES AND AGREEMENTS

*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)*

Treaty basin: Okavango

Date: September 16, 1994

Signatories: Angola, Republic of; Botswana, Republic of; Namibia, Republic of

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

*The Permanent Okavango River Basin Commission (OKACOM)*

OKACOM is a regional, high-level committee that was formed to ensure the water resources of the Okavango River system are managed in appropriate and sustainable ways and to foster co-operation and co-ordination between the three Basin states; Angola, Namibia, and Botswana.

Treaty basin: Okavango

Date: September 15, 1994

Signatories: Angola, Botswana, Namibia

*Joint Permanent Water Commission (JPWC)*

JPWC focus is on the bilateral management of the Okavango River and the Kwando-Chobe-Linyati reach of the Zambezi River.

Treaty basin: Okavango, Zambesi

Date: November 13, 1990

Signatories: Botswana, Namibia

# ORANGE\*

Total area: 945,500 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
South Africa	563,900	59.65
Namibia	240,200	25.40
Botswana	121,400	12.85
Lesotho	19,900	2.10



## TREATIES AND AGREEMENTS

*Protocol VI to the treaty on the Lesotho Highlands Water Project: supplementary arrangements regarding the system of governance for the project*

Treaty basin: Orange

Date: January 1, 1999

Signatories: Lesotho; South Africa

*Agreement between the government of the Republic of South Africa and the government of the Republic of Namibia on water related matters pertaining to the incorporation of Walvis Bay in the territory of the Republic of Namibia*

Treaty basin: Orange

Date: March 01, 1994

Signatories: Namibia, Republic of; South Africa, Republic of

*Agreement between the government of the Republic of Namibia and the government of the Republic of South Africa on the establishment of a permanent water commission*

Treaty basin: Frontier or shared waters

Date: September 14, 1992

Signatories: Namibia, Republic of; South Africa, Republic of

*Ancillary agreement to the deed of undertaking and relevant agreements entered into between the Lesotho Highlands Development Authority and the government of the Republic of South Africa*

Treaty basin: Orange

Date: August 31, 1992

Signatories: Lesotho Highlands Development Authority; South Africa, Republic of

*Protocol IV to the treaty on the Lesotho Highlands Water Project: supplementary arrangements regarding phase IA*

Treaty basin: Orange

Date: November 19, 1991

Signatories: Lesotho; South Africa

*Treaty on the Lesotho Highlands Water Project between the government of the Republic of South Africa and the government of the Kingdom of Lesotho*

Treaty basins: Senqu/Orange

Date: October 24, 1986

Signatories: Lesotho, Kingdom of; South Africa, Republic of

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

### *Orange/Senqu River Commission (ORASECOM)*

ORASECOM is the first RBO to be established in terms of the SADC Protocol on Shared Watercourse Systems. The secretariat was established in 2003.

*Treaty basin:* Orange

*Date:* November 3, 2000

*Signatories:* Botswana, Lesotho (Kingdom of), Namibia, South Africa, Republic of

### *Permanent Water Commission (PWC)*

In a bilateral agreement in 1992, Namibia and South Africa established a Permanent Water Commission (PWC). The PWC was to act as a technical adviser to the Parties on matters relating to the development and utilization of the Orange water resources.

*Treaty basin:* Orange

*Date:* 1992

*Signatories:* Namibia, South Africa, Republic of

### *Joint Irrigation Authority (JIA)*

The countries signed in 1992 another agreement establishing a JIA, administering an existing irrigation scheme along the riverbanks under the auspices of the PWC.

*Treaty basin:* Orange

*Date:* 1992

*Signatories:* Namibia, South Africa, Republic of

### *Lesotho Highlands Water Commission (LHWC)*

The signing of the Lesotho Highlands Water Project Treaty by the Government of Lesotho and of the Republic of South Africa on the 24th October 1986 established the Joint Permanent Technical Commission (JPTC) to represent the two countries in the implementation and operation of the LHWP. The Joint Permanent Technical Commission (JPTC), was later renamed the Lesotho Highlands Water Commission (LHWC) with a secretariat in Lesotho to monitor and oversee the Treaty.

*Treaty basin:* Orange

*Date:* October 24, 1986

*Signatories:* Lesotho, Kingdom of; South Africa, Republic of

### *Lesotho Highlands Development Authority (LHDA)*

The LHDA was set up to implement and operate that part of the Lesotho Highlands Water Project (LHWP) that falls within the borders of Lesotho.

*Treaty basin:* Orange

*Date:* 1930

*Signatories:* Lesotho, Kingdom of; South Africa, Republic of



# ROVUMA

Total area: 151,700 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Mozambique	99,000	65.27
Tanzania, United Republic of	52,200	34.43
Malawi	400	0.30



## TREATIES AND AGREEMENTS

*Exchange of notes constituting an agreement between the United Kingdom and Portugal regarding the boundary between Tanganyika Territory and Mozambique. Lisbon, May 11, 1936 - December 28, 1937*

Treaty basins: Domoni, Rovuma

Date: December 28, 1937

Signatories: Great Britain; Portugal

# SENEGAL

Total area: 436,000 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Mauritania	219,100	50.25
Mali	150,800	34.59
Senegal	35,200	8.08
Guinea	30,800	7.07



## TREATIES AND AGREEMENTS

*Convention concluded between Mali, Mauritania, and Senegal relative to the legal status of common works, Bamako*

Treaty basin: Senegal

Date: December 21, 1978

Signatories: Mali; Mauritania; Senegal

*Convention pertaining to the creation of the organization for the management of the Senegal river*

Treaty basin: Senegal

Date: March 11, 1972

Signatories: Mali; Mauritania; Senegal

*Convention relating to the statute of the Senegal river, signed at Nouakchott*

Treaty basin: Senegal

Date: March 11, 1972

Signatories: Mali; Mauritania; Senegal

*Convention of Dakar*

Treaty basin: Senegal

Date: January 30, 1970

Signatories: Guinea; Mali; Mauritania; Senegal

*Convention of Bamako*

Treaty basin: Senegal

Date: July 26, 1963

Signatories: Guinea; Mali; Mauritania; Senegal

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

*Organisation pour la Mise en Valeur du bassin du fleuve Sénégal (OMVS)*

In 1963, shortly after independence, Guinea, Mali, Mauritania, and Senegal signed the Bamako Convention for the Development of the Senegal River Basin that declared the Senegal River to be an "International River" and created an "Interstate Committee" to oversee its development. In 1968, the Labe Convention created the Organisation of Boundary states of the Senegal River (OERS - Organisation des Etats Riverains du Sénégal). In 1972 the OMVS, a river management organisation, was created, replacing the OERS, which broke up after the withdrawal of its fourth member, Guinea.

Treaty basin: Senegal

Date: March 11, 1972

Signatories: Mali, Mauritania, Senegal

# UMBELUZI

Total area: 10,900 km<sup>2</sup>

Countries	Area of Basin in Country	
	km <sup>2</sup>	%
Mozambique	7,200	65.87
Swaziland	3,500	32.44
South Africa	30	0.27



## TREATIES AND AGREEMENTS

*Agreement between the government of the Republic of South Africa, the government of the Kingdom of Swaziland and the government of the People's Republic of Mozambique relative to the establishment of a tripartite permanent technical committee*

Treaty basin: Frontier or shared waters

Date: February 17, 1983

Signatories: Mozambique, People's Republic of; South Africa, Republic of; Swaziland, Kingdom of



# VOLTA

Total area: 412,800 km<sup>2</sup>

## Area of Basin in Country

Countries	km <sup>2</sup>	%
Burkina Faso	173,500	42.04
Ghana	166,000	40.21
Togo	25,800	6.26
Mali	18,800	4.56
Benin	15,000	3.63
Côte D'Ivoire	13,500	3.27



## TREATIES AND AGREEMENTS

*Exchange of notes between France and Great Britain relative to the boundary between the Gold Coast and French Sudan*

*Treaty basin:* Frontier or shared waters

*Date:* July 19, 1906

*Signatories:* France; Great Britain

## RIVER BASIN ORGANIZATIONS AND COMMISSIONS

*Liptako-Gourma Integrated Authority or Autorite de developpement integre de la region du Liptako-Gourma (ALG)*

The ALG, a sub-regional institution has the primary mission to promote the integrated development of the Liptako-Gourma region with a view to improving the living conditions of the population.

*Treaty basin:* Volta

*Date:* December 3, 1970

*Signatories:* Burkina Faso, Mali, Niger

# ZAMBEZI\*

Total area: 1,385,300 km<sup>2</sup>

Countries	Area of Basin in Country km <sup>2</sup>	%
Zambia	576,900	41.64
Angola	254,600	18.38
Zimbabwe	215,500	15.55
Mozambique	163,500	11.81
Malawi	110,400	7.97
Tanzania, United Republic of	27,200	1.97
Botswana	18,900	1.37
Namibia	17,200	1.24
Congo, Democratic Republic of (Kinshasa)	1,100	0.08



## TREATIES AND AGREEMENTS

*Agreement between the Republic of Zimbabwe and the Republic of Zambia concerning the utilization of the Zambezi River*

Treaty basin: Zambezi

Date: July 28, 1987

Signatories: Zambia, Republic of; Zimbabwe, Republic of

*Agreement on the action plan for the environmentally sound management of the common Zambezi River System*

Treaty basin: Zambezi

Date: May 28, 1987

Signatories: Botswana; Mozambique, People's Republic of; Tanzania, United Republic of; Zambia; Zimbabwe

*Agreement between the governments of the Republic of Portugal, the People's Republic of Mozambique and the Republic of South Africa relative to the Cahora Bassa Project*

Treaty basin: Zambezi

Date: May 2, 1984

Signatories: Mozambique, People's Republic of; Portugal, Republic of; South Africa, Republic of

*Agreement between South Africa and Portugal relating to hydropower development on the Zambezi River [untitled]*

Treaty basin: Zambezi

Date: April 1, 1967

Signatories: Portugal; South Africa

*Agreement relating to the Central African Power Corporation*

Treaty basins: Kariba, Zambezi

Date: November 25, 1963

Signatories: Northern Rhodesia; Southern Rhodesia

*Agreement between the government of the United Kingdom of Great Britain and Northern Ireland on their own behalf and on 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*

Treaty basin: Kwando

Date: November 18, 1954

Signatories: Great Britain; Great Britain on behalf of the Federation of Rhodesia and Nyasaland; Portugal

*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 Shiré Valley Project*

*Treaty basin:* Zambezi

*Date:* January 21, 1953

*Signatories:* Great Britain; Portugal

*Treaty between Great Britain and Portugal defining their respective spheres of influence in Africa*

*Treaty basins:* Buzi, Limpopo, Pungwe, Sabi, Shiré, Zambezi

*Date:* June 11, 1891

*Signatories:* Great Britain; Portugal

## **RIVER BASIN ORGANIZATIONS AND COMMISSIONS**

### *Zambezi Watercourse Commission (ZAMCOM)*

Commission to manage and develop the Zambezi river's water resources. Besides managing the Zambezi's resources, the Commission, consisting of three organs - a council of ministers, a technical committee and a secretariat drawn from all eight countries - will advise member countries on planning, utilisation, protection and conservation issues around the river. Country representatives will also protect national interests in actual or potential disputes. Signing the agreement is expected to bring benefits across all sectors, including trade, industry, energy production, food security, transport and communication, tourism, regional security and peace. Additional parties involved: SADC and the ZRA. The formation of ZAMCOM as by the Watercourse protocol is part of the ongoing Project 6 of the ZACPLAN. The sixth project is considered as a key part of the ZACPLAN to formulate a development strategy and simulate various development scenarios for the Basin.

*Treaty basin:* Zambezi

*Date:* July 13, 2004

*Signatories:* Angola, Congo, Democratic Republic of (Kinshasa), Malawi, Mozambique, Tanzania, United Republic of, Botswana, Namibia, Zambia, Zimbabwe

### *Joint Permanent Water Commission (JPWC)*

JPWC focus is on the bilateral management of the Okavango River and the Kwando-Chobe-Linyati reach of the Zambezi River.

*Treaty basin:* Okavango, Zambezi

*Date:* November 13, 1990

*Signatories:* Botswana, Namibia

### *Zambezi River Authority (ZRA)*

The Zambezi River Authority is governed by a Council of Ministers consisting of four members, two of whom are Ministers in the Government of the Republic of Zambia and two of whom are Ministers in the Government of Zimbabwe. Mission: to co-operatively manage and develop in an integrated and sustainable manner the water resources of the Zambezi River in order to supply quality water, hydrological and environmental services for the maximum socio-economic benefits to Zambia, Zimbabwe and the other Zambezi River basin countries. Promoting regional co-operation in integrated water resources management; Providing hydrological and environmental services to the entire Zambezi River countries; Efficiently, equitably and sustainably managing and operating the Kariba Complex and other future dams on the common Zambezi River.

*Treaty basin:* Zambezi

*Date:* 1987

*Signatories:* Zambia, Zimbabwe



# GENERAL/REGIONAL: AFRICA

## TREATIES AND AGREEMENTS

### *Protocol on shared watercourses in the Southern African Development Community*

*Treaty basins:* SADC region

*Date:* August 07, 2000

*Signatories:* Angola; Botswana; Congo, Democratic Republic of; Lesotho; Malawi; Mauritius; Mozambique; Namibia; Seychelles; South Africa; Swaziland; Tanzania, United Republic of; Zambia; Zimbabwe

### *Protocol on shared watercourse systems in the Southern African Development Community (SADC) region*

*Treaty basins:* SADC region

*Date:* August 28, 1995

*Signatories:* Angola, Botswana, Lesotho; Malawi; Mozambique; Namibia; South Africa, Republic of; Swaziland; Tanzania, United Republic of; Zambia, Zimbabwe

### *African convention on the conservation of nature and natural resources*

*Treaty basin:* General

*Date:* September 15, 1968

*Signatories:* Algeria; Cameroon; Central African Republic; Congo; Cote d'Ivoire, Djibouti; Egypt; Ghana; Kenya; Liberia; Madagascar; Malawi; Mali; Morocco; Mozambique; Niger; Nigeria; Rwanda; Senegal; Seychelles; Sudan; Swaziland; Togo; Tunisia; Uganda; Tanzania; Zaire

## APPENDIX 2. NOTES ON BASINS

### AKPA

The dispute between Nigeria and Cameroon, over land and maritime boundaries in the vicinity of the oil-rich Bakasi Peninsula, was referred to the International Court of Justice (ICJ) for resolution. The ICJ ruled in 2002 on the entire Cameroon-Nigeria land and maritime boundary, including a decision in favour of Cameroon over the Bakasi Peninsula. However, Nigeria initially rejected cession of the Bakasi Peninsula, then agreed, but has yet to withdraw its forces, while much of the indigenous population in the area opposes cession of this territory to Cameroon. In the interim, Nigeria and Cameroon have formed a Joint Border Commission, which continues to meet regularly to resolve differences bilaterally. The two countries have commenced joint demarcation exercises in less-contested sections of the boundary, starting in Lake Chad in the north. The Bakasi Peninsula, in the southwest province of Cameroon, is divided by the Akpa Yafi River and lies to the west of Cameroon's Rio Del Rey (Cohen 1998; CIA World Factbook 2005).

### ATUI

Morocco claims and administers Western Sahara, whose sovereignty remains unresolved – the UN-administered cease-fire has remained in effect since September 1991, administered by the UN Mission for the Referendum in Western Sahara (MINURSO). However, attempts to hold a referendum have failed and parties thus far have rejected all brokered proposals (CIA World Factbook 2005).

### CONGO/ZAIRE

Informal reports indicate that the indefinite segment of the Democratic Republic of Congo (Kinshasa) – Zambia boundary has been settled, including the previously indeterminate tri-point between Democratic Republic of Congo (Kinshasa) – Tanzania – Zambia in Lake Tanganyika (CIA World Factbook 2005).

A long segment of the border between Democratic Republic of Congo (Kinshasa) and Republic of Congo (Brazzaville) remains indefinite, as there has been no formal division of the river and its islands between the two countries. The only portion of this shared boundary that has been defined is that in the Pool Malebo/Stanley Pool area (CIA World Factbook 2005).

### INCOMATI

The spelling of this basin name differs in different official languages. Thus, the Incomati is also known as the Inkomati, Nkomati, Komati, and Komatie.

### LAKE CHAD

Lake Chad has varied in extent between 20,000 to 50,000 km<sup>2</sup>, though in recent years it has shrunk to less than 2,500 km<sup>2</sup>. Demarcation of international boundaries in the vicinity of Lake Chad is incomplete and only Nigeria and Cameroon have heeded the admonitions of the Lake Chad Commission to ratify the boundary delimitation treaty; Chad and Niger have yet to comply with the requirements of this treaty.

Determining the boundaries of sectors involving rivers that drain into Lake Chad is complicated by flooding patterns and the uncovering or covering of islands. The lack of demarcated boundaries has led to localized border disputes in the past (Biger 1995; CIA World Factbook 2005).

## LAKE MALAWI

The precise position of the international border between the Republic of Malawi and the United Republic of Tanzania in the northern reaches of Lake Malawi and along the meandering River Songwe has not been resolved and remains dormant (Day 1987). Two islands (Chisumu Island and Likoma Island) located within the portion of Lake Malawi claimed by the United Republic of Tanzania, are claimed by Malawi (CIA World Factbook 2005).

## LAKE TURKANA

The administrative boundary between Kenya and Sudan does not coincide with the international boundary (CIA World Factbook 2005).

## LOTAGIPI SWAMP

The administrative boundary between Kenya and Sudan does not coincide with the international boundary (CIA World Factbook 2005).

## NILE

Egypt's administrative boundary with Sudan does not coincide with the international boundary. Egypt and Sudan retain claims to administer triangular areas that extend north and south of the 1899 Treaty boundary between these countries along the 22<sup>nd</sup> Parallel, but have withdrawn their respective military presence from these areas. Egypt is economically developing the "Hala'ib Triangle", a barren area of 20,580 km<sup>2</sup> located north of the 22<sup>nd</sup> Treaty Line.

## NTEM

There is an unresolved sovereignty dispute between Equatorial Guinea and Cameroon over an island at the mouth of the Ntem River, marking the border between these two countries.

## OKAVANGO-MAKGADIKGADI

The Makgadikgadi sub-basin is hydraulically connected to the Okavango River sub-basin during periods of high flows, but these sub-basins are not shown separately on these maps. The Makgadikgadi sub-basin consists of four, normally dry, sub-basins (Deception Pan, Boteti River, Ntvetwe Pan, and Sowa Pan) that drain into the Makgadikgadi Pan system (Sowa plus Ntvetwe pans) during periods of exceptionally high rainfalls. These sub-components, together with the Okavango sub-basin, make up the combined Okavango-Makgadikgadi Basin. Zimbabwe shares a small portion of the Makgadikgadi sub-basin with Botswana; this drained by the Nata River that flows into Sowa Pan. The "full" Okavango-Makgadikgadi basin has four riparian states: Angola, Botswana, Namibia, and Zimbabwe. The two sub-basins are only "joined" during years of exceptionally high rainfalls and inflows to these pans (Ashton and Neal 2003).

## ORANGE

Although, topographically, Botswana is riparian to the Orange River Basin, there is no evidence to indicate that Botswana territory has contributed water to the Orange River in living memory. Nevertheless, Botswana's political status as riparian to the Orange River Basin has been accepted by the other basin states. Namibia and South Africa are undergoing negotiations to confirm the exact positions of their boundary along the Orange River (Conley and van Niekerk 1998).

## ZAMBEZI

The quadripoint position between Botswana, Namibia, Zambia, and Zimbabwe has been resolved by the countries concerned. The dispute between Botswana and Namibia over ownership of the uninhabited Kasikili (Sedudu) Island in the Linyanti (Chobe) River has been resolved in Botswana's favour by the International Court of Justice. Botswana and Namibia have agreed that they will resolve the ownership issue of one other island in the Linyanti River through mutual discussions.



## APPENDIX 3. RIPARIAN COUNTRY COLLABORATIONS

This is a preliminary, but incomplete, list of collaborative projects that have been entered into by riparian states. The precise details of each project change frequently, so this list should not be considered to be definitive. Up-to-date details of each project can be obtained from the relevant websites that are listed for each collaborative project.

### CONGO/ZAIRE

*UN AIDS project: The Initiative of Countries in the Congo River Basin - Oubangui Chari including Congo, the Democratic Republic of Congo (DRC), the Central African Republic (CAR) and Chad*

Global objective: to reduce the vulnerability and risk of STI/ HIV/AIDS infection in the context of mobility within countries of the Lake Chad Basin. Specific objectives: a) To harmonize strategies for preventing STI/ HIV/AIDS transmission among mobile populations along the communication routes of the Congo River Basin.

*Participating countries:* Central African Republic, Chad, Congo, Republic of the (Brazzaville), Congo, Democratic Republic of (Kinshasa)

*Date:* 2001-2005

*Level/Type of Collaboration:* Official/Social – health program

*Principal Issue:* AIDS prevention

*Source:* <http://www.onusida-aoc.org/Fr/Initiative%20Fleuve%20Congo.htm>

*UNDP project: Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika involving Zaire, Zambia, and Tanzania*

Project that aims to produce an effective and sustainable system for managing and conserving the biodiversity of Lake Tanganyika into the foreseeable future.

*Participating countries:* Tanzania, Zaire, Zambia

*Date:* Data not available

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, joint management

*Source:* [http://www.thewaterpage.com/donor\\_involvementSADC.htm](http://www.thewaterpage.com/donor_involvementSADC.htm)

### GAMBIA

*ADF loan (project): \$ 14.66 million loan to finance the natural resource development and management project of areas located on the borders of the four member states (Gambia, Guinea, Guinea Bissau and Senegal) of the OMVG.*

The objective of the project is to reduce poverty and sustainably improve the living conditions of the populations in the project area. It specifically seeks to increase agro-forestry and pastoral output, rationalize tapping of the natural resources and improve social infrastructure in the project area.

*Participating countries:* Gambia, Guinea, Guinea-Bissau, Senegal

*Date:* January 2002-January 2008

*Level/Type of Collaboration:* Official/Economic program

*Principal Issue:* Economic development, joint management, other: poverty eradication

*Source:* [http://www.afdb.org/knowledge/pressreleases2001/adf\\_41\\_2001e.htm](http://www.afdb.org/knowledge/pressreleases2001/adf_41_2001e.htm)

## GASH

### *UNESCO / WMO Project: evolving HELP basin.*

HELP is a joint initiative of the United Nations Educational Scientific Organization (UNESCO) and the World Meteorological Organization (WMO). HELP is creating an approach to integrated catchment management through the creation of a framework for water law and policy experts, water resource managers and water scientists to work together on water-related problems. Additional information is needed to re-classify this basin. The classification "evolving" indicates that the basin is not yet fully operational, but has successfully completed its proposal document.

*Participating countries:* Sudan, Ethiopia

*Date:* February 1999

*Level/Type of Collaboration:* Non-Official/International initiative

*Principal Issue:* Water quality, joint management, technical cooperation/assistance, other: research and training

*Source:* [http://portal.unesco.org/sc\\_nat/ev.php?URL\\_ID=3740&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201](http://portal.unesco.org/sc_nat/ev.php?URL_ID=3740&URL_DO=DO_TOPIC&URL_SECTION=201)

## INCOMATI

### *Shared Rivers Initiative.*

Research joint venture Universidad de Eduardo Mondlane, University of Natal and University of Swaziland. Vision: collaborative trans-disciplinary research and training in the region supports integrated management for sustainability of shared river systems.

*Participating countries:* Mozambique, South Africa, Swaziland

*Date:* Data not available

*Level/Type of Collaboration:* Non-official/International initiative

*Principal Issue:* Joint management, other: research and training

*Source:* TFDD

### *Komati River Basin Development Project (KRBDP)*

Project for the design, construction, operation and maintenance of the Driekoppies Dam in South Africa and the Maguga Dam in Swaziland

*Participating countries:* South Africa, Swaziland

*Date:* 1990

*Level/Type of Collaboration:* Official/Economic program

*Principal Issue:* Joint management, infrastructure/development, technical cooperation/assistance

*Source:* [http://www.thewaterpage.com/donor\\_involvementSADC.htm](http://www.thewaterpage.com/donor_involvementSADC.htm)

### *UNDP project*

UNDP has funded activities associated with the Komati River Basin.

*Participating countries:* South Africa, Swaziland

*Date:* Data not available

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Data not available

*Source:* <http://www.netcoast.nl/projects1/mozambique.htm>

### *Netcoast project*

Management of the Incomati River Basin and adjacent Coastal Zone. Essence of the project is to demonstrate sustainable management of river basin and coastal zone on the basis of already existing data; new data will be gathered in this context. The Incomati programme serves as an example of a regional approach to the management of international river basins and coastal areas. Project elements are: exchange of knowledge; capacity building; training; systems approach for integrated management; coupling of river basin and coastal zone; shared water resource management; data exchange; and vision development.

NetCoast is a place on the worldwide web where professionals in Integrated Coastal Zone Management come for the latest relevant information, knowledge, documents, publications, software systems, fresh links to other sites and for professional collaboration. NetCoast is a virtual meeting-place for everyone involved in coastal zone issues.

*Participating countries:* Mozambique, South Africa, Swaziland

*Date:* 2000-2005

*Level/Type of Collaboration:* Non-Official/International initiative

*Principal Issue:* Joint management, other: research & training

*Source:*

## LAKE CHAD

### *GEF IW project: Reversal of Land and Water Degradation Trends in the Lake Chad Basin Ecosystem*

The stated long term objective of this project is to achieve global environmental benefits through improved management of the basin. Existing barriers will be overcome by enhancing collaboration and capacity building, by improving the knowledge of the natural systems, by testing solutions and new participatory approaches through on the ground demonstrations, and by identifying, and agreeing on, the main transboundary problems and related remediation/preventive actions.

*Participating countries:* Algeria, Cameroon, Chad, claimed by Libya, Central African Republic, Chad, Libya, Niger, Nigeria, Sudan

*Date:* Not yet implemented

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, economic development, joint management, infrastructure/development, border issues

*Source:* <http://www.gefonline.org/projectDetails.cfm?projID=767>

### *USAID, GEF and LakeNet project: Toward a Lake Basin Management Initiative: Sharing Experiences and Early Lessons in GEF and Non-GEF Lake Basin Management Projects*

The project has focused on practical lessons learned from lake basin management efforts around the world, created new knowledge, filled an important gap in lake management experiences on tropical lakes, saline lakes, and lakes in developing countries, and derives lake management lessons from internationally funded projects, principally GEF-financed lake basin projects, as well as lake projects financed by the WB and other agencies and governments.

*Participating countries:* Algeria, Cameroon, Chad, claimed by Libya, Central African Republic, Chad, Libya, Niger, Nigeria, Sudan

*Date:* January 2003 - December 2004

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, economic development, joint management, technical cooperation/assistance, other: research and education

*Source:* <http://www.worldlakes.org/programs.asp?programid=2>. For draft final report see [http://www.worldlakes.org/uploads/draftfinalreport1.16august2000\\_pdf.pdf](http://www.worldlakes.org/uploads/draftfinalreport1.16august2000_pdf.pdf)

### *Exploring an EU Water Initiative - African Component Component II: Integrated Water Resources Management (IWRM) with a focus on transboundary river basins*

The European Framework Directive on water takes on the application of IWRM at the river basin level. Main goal: to contribute to the dissemination of internationally agreed principles as covered in the various international conventions.

*Participating countries:* Algeria, Cameroon, Chad, claimed by Libya, Central African Republic, Chad, Libya, Niger, Nigeria, Sudan

*Date:* September 2002 - March 2003

*Level/Type of Collaboration:* Official/Economic, social and environmental program

*Principal Issue:* Economic development, joint management, technical cooperation/assistance, border issues

*Source:* See <http://www.freshwateraction.net/library/eu7.pdf>

#### *EUWI project: Lake Chad, the Africa Water Initiative pilot basin*

At the 2002 World Summit on Sustainable Development in Johannesburg (WSSD), the EUWI was launched to contribute to the achievement of the Millennium Development Goals (MDG) and WSSD targets for drinking water and sanitation, within the context of an integrated approach to water resources management. The main focus of the Water Initiative will be to reinforce political will and commitment to action, promote improved water governance, capacity-building and awareness, improve the efficiency and effectiveness of water management through multi-stakeholder dialogue and coordination, strengthen coordination through promoting river basin approaches, and identify additional financial resources and mechanisms to ensure sustainable financing. Lake Chad is one of the five selected basins for which an action plan is developed.

*Participating countries:* Cameroon, Central African Republic, Chad, Niger, Nigeria

*Date:* 2002-2005

*Level/Type of Collaboration:* Official/Economic, social and environmental program

*Principal Issue:* Water quality, water quantity, joint management, technical cooperation/assistance

*Source:* <http://www.euwi.net/> and [http://www.euwi.net/file\\_upload/Niki\\_tmpphpNku4xk.pdf](http://www.euwi.net/file_upload/Niki_tmpphpNku4xk.pdf)

#### *UN AIDS project: The Initiative of the Lake Chad Basin Countries on STI/HIV/AIDS.*

Similarities exist between the objectives of the LCBC and those of the Initiative of the Lake Chad Basin Countries on STI/HIV/AIDS in particular the strengthening of collaboration and co-operation between the countries concerned and all partners for concerted action, exchange of information and experience, enhancing of regional co-ordination for a more efficient use of resources and mobilization of additional financial resources.

*Participating countries:* Cameroon, Central African Republic, Chad, Niger, Nigeria

*Date:* 2001-2005

*Level/Type of Collaboration:* Official/Social – health program

*Principal Issue:* Joint management, other: AIDS prevention

*Source:* <http://www.onusida-aoc.org/Eng/Lake%20Chad%20Basin.htm>

## **LIMPOPO**

#### *CGIAR project: Integrated Basin Water Management Systems (research theme 4): Benchmark Basin*

To improve the productivity of water (in crop, livestock and fisheries production systems and ecosystem services) within the basin, by generating and applying knowledge on how to manage trade-offs and promote synergies to enhance water productivity, while maintaining or improving food security and environmental sustainability. This will be achieved through research, capacity building and outreach activities in three key areas at a basin level. Expected outputs will include improved understanding of issues of scale, upstream-downstream interactions and basin governance requirements, documented in publications.

*Participating countries:* Botswana, Mozambique, South Africa, Zimbabwe

*Date:* November 2002 - 2012

*Level/Type of Collaboration:* Non-official/International initiative

*Principal Issue:* Other: research and education

*Source:* [http://www.waterforfood.org/BB\\_Limpopo\\_River\\_Basin.htm](http://www.waterforfood.org/BB_Limpopo_River_Basin.htm)

## **MANO-MORRO**

#### *Mano River Relief and Development Network (MRRDN)*

The Mano River Basin forms an international sub-basin within the Mano-Morro River Basin. MRRDN has representative groups throughout the United States and outreach/affiliate groups in the Mano River Basin region of West Africa. Their vision is a region where every person is capable of exercising his or her right to life, liberty and happiness without violence, ethnic or civil strife. MRRDN is a collaborative effort by exiles, refugees, students and displaced citizens of the countries of the Mano River region basin. MRRDN mission is to obtain and provide funds, goods and services exclusively for the benefit and support of vulnerable populations (IDPS, refugees, forced migrants and uprooted people) of the Mano River Basin due to disasters (man-made and natural).

*Participating countries:* Guinea, Liberia, Sierra Leone

*Date:* Data not available



*Level/Type of Collaboration:* Non-official/International initiative and social – health program

*Principal Issue:* Other: poverty eradication

*Source:* <http://www.manoriverrelief.org/Home.htm>

#### *MRU Initiative on HIV/AIDS*

Technical consultations held in 1998 and 1999 with the three MRU countries resulted in a draft proposal for sub-regional collaboration to reduce vulnerability to HIV/AIDS among displaced populations and their host communities.

*Participating countries:* Guinea, Liberia, Sierra Leone

*Date:* 1998

*Level/Type of Collaboration:* Official/Social /health program

*Principal Issue:* Other: AIDS prevention

*Source:* <http://www.onusida-aoc.org/Eng/Mano%20River%20Union%20Initiative.htm>

## **NIGER**

#### *GEF IW project: Reversing Land and Water Degradation Trends in the Niger River Basin*

The project addresses the transboundary environmental management and capacity building for the shared water and land resources. The project focuses on the increment needed to integrate management of the Basin's resources, representing the major environmental element of the concurrent Strategic Shared Vision and Sustainable Development Action Plan (SDAP) for the Niger River Basin.

*Participating countries:* Algeria, Benin, Burkina Faso, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria, Sierra Leone

*Date:* Approved May 16, 2003

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, water quantity, economic development, joint management

*Source:* <http://www.gefonline.org/projectDetails.cfm?projID=1093>

#### *Liptako-Gourma Integrated Authority or Autorite de developpement integre de la region du Liptako-Gourma (ALG)*

The ALG, a sub-regional institution created by Burkina Faso, Mali, and Niger, has the primary mission to promote the integrated development of the Liptako-Gourma region with a view to improving the living conditions of the population. ALG works together with the Nile Basin Initiative.

*Participating countries:* Burkina Faso, Mali, Niger

*Date:* December 3, 1970

*Level/Type of Collaboration:* Official/Economic, social and environmental program

*Principal Issue:* Hydro-power/hydro-electricity, navigation, fishing, economic development, irrigation, infrastructure/development

*Source:* [http://www.afdb.org/knowledge/pressreleases2003/adf\\_57\\_2003e.htm](http://www.afdb.org/knowledge/pressreleases2003/adf_57_2003e.htm)

#### *EUWI project: Niger, the Africa Water Initiative pilot basin*

At the 2002 World Summit for Sustainable Development in Johannesburg (WSSD), the EU launched the EUWI to contribute to the achievement of the Millennium Development Goals (MDGs) and WSSD targets for drinking water and sanitation, within the context of an integrated approach to water resources management. The main focus of the Water Initiative will be to: reinforce political will and commitment to action, promote improved water governance, capacity-building and awareness, improve the efficiency and effectiveness of water management through multi-stakeholder dialogue and coordination, strengthen coordination through promoting river basin approaches, and identify additional financial resources and mechanisms to ensure sustainable financing. The Niger river is one of the five selected basins for which an action plan will be developed.

*Participating countries:* Algeria, Benin, Burkina Faso, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria, Sierra Leone

*Date:* 2002-2005 *Level/Type of Collaboration:* Official/Economic, social and environmental program

*Principal Issue:* Water quality, water quantity, joint management, technical cooperation/assistance

*Source:* <http://www.euwi.net/> and [http://www.euwi.net/file\\_upload/Niki\\_tmpphpNku4xk.pdf](http://www.euwi.net/file_upload/Niki_tmpphpNku4xk.pdf)

WWF/DGIS project: *Niger Basin Initiative (NBI)*. Additional parties involved: Wetlands International, Nigerian Conservation Foundation, NBA and RAMSAR.

The NBI will conserve and sustainably manage wetlands' resources throughout the basin. The NBI will also make it possible to establish a map of the biodiversity and natural resources of the Niger floodplain.

Participating countries: Algeria, Benin, Burkina Faso, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria, Sierra Leone

Date: May 1, 2001

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management, other: wetland preservation

Source: [http://www.wwf.org.hk/eng/pdf/references/pressreleases\\_international/print160202\\_message.html](http://www.wwf.org.hk/eng/pdf/references/pressreleases_international/print160202_message.html)

WB project: *Gestion Integree des Ressources en Eau de Niger Superieure (GIRENS)*

This project is for the implementation of the priority activities of the integrated management of the water resources of higher Niger, initiated since 1995 by the governments of Guinée and Mali.

Participating countries: Guinea, Mali

Date: September 1, 2004 - December 31, 2009

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management, technical cooperation/assistance

Source: TFDD

## NILE

GEF IW project: *Nile Transboundary Environmental Action Project, Phase I*

The Project will support the development of a basin-wide framework for actions to address high-priority transboundary environmental issues within the context of the Nile Basin Initiative's Strategic Action Program.

Participating countries: Burundi, Central African Republic, Egypt, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda, Kenya, Rwanda, Sudan (administered by Egypt)

Date: Approved December 7, 2001

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, economic development, joint management, infrastructure/development, technical cooperation/assistance

Source: <http://www.gefonline.org/projectDetails.cfm?projID=1094>

CGIAR project: *Integrated Basin Management Water Systems (research theme 4): Benchmark Basin*

To improve the productivity of water (in crop, livestock and fisheries production systems and ecosystem services) within the basin, by generating and applying knowledge on how to manage trade-offs and promote synergies to enhance water productivity, while maintaining or improving food security and environmental sustainability. This will be achieved through research, capacity building and outreach activities in three key areas at a basin level. Expected outputs will include: Improved understanding of issues of scale, upstream-downstream interactions and basin governance requirements, documented in publications.

Participating countries: Burundi, Central African Republic, Egypt, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda, Kenya, Rwanda, Sudan (administered by Egypt)

Date: November 2002 - 2012

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Research and education

Source: [http://www.waterforfood.org/BB\\_Nile\\_River\\_Basin.asp](http://www.waterforfood.org/BB_Nile_River_Basin.asp) and [http://www.mrcmekong.org/news\\_events/announcement/ann\\_1.htm](http://www.mrcmekong.org/news_events/announcement/ann_1.htm)

NBI project: *Nile Transboundary Environmental Action Program*

This Project is the first of the 8 basin-wide projects to be implemented on the ground under the Shared Vision Program of the Nile Basin Initiative (NBI).

Participating countries: Burundi, Central African Republic, Egypt, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda, Kenya, Rwanda, Sudan (administered by Egypt)

Date: May 29, 2004  
Level/Type of Collaboration: Official/Environmental program  
Principal Issue: Water quality, joint management  
Source: See <http://www.nilebasin.org/pressreleases.htm>

#### *Nile Basin Capacity Building Network for River Engineering*

The main target of establishing this network is to create an environment in which professionals from the water sector sharing the Nile River Basin would have the possibility to exchange their ideas, their best practices and lessons learned. Through this network, education, training, research and exchange of information for and by professionals can take place.

*Participating countries:* Burundi, Central African Republic, Egypt, Egypt (administered by Sudan), Eritrea, Ethiopia, Congo, Democratic Republic of (Kinshasa), Sudan, Tanzania, United Republic of, Uganda, Kenya, Rwanda, Sudan (administered by Egypt)

Date: 2001

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Research and education

Source: <http://www.nbcbn.com/> and <http://www.cap-net.org/ShowNetworkDetail.php?NetworkID=41>

#### *UNESCO / WMO Project: Atbara as proposed HELP basin*

The Atbara River Basin forms an international sub-basin within the Nile River Basin. HELP is a joint initiative of the United Nations Educational Scientific Organization (UNESCO) and the World Meteorological Organization (WMO). HELP is creating an approach to integrated catchment management through the creation of a framework for water law and policy experts, water resource managers and water scientists to work together on water-related problems. Additional information is needed to re-classify this basin. The classification "Proposed HELP basin" indicates that the Basin may need to provide more detail for various aspects described in the Proposal Document.; may not have yet achieved any initial operational activity; may not have yet begun full stakeholder involvement; may have identified too few or too narrow a range of the HELP key issues; may also need to provide further information about official endorsement, support and funding commitments.

*Participating countries:* Ethiopia-Eritrea-Sudan

Date: February 1999

Level/Type of Collaboration: Non-Official/International initiative

Principal Issue: Water quality, joint management, technical cooperation/assistance, other: research and training

Source: [http://portal.unesco.org/sc\\_nat/ev.php?URL\\_ID=3727&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201](http://portal.unesco.org/sc_nat/ev.php?URL_ID=3727&URL_DO=DO_TOPIC&URL_SECTION=201)

#### *UNESCO / WMO Project: Blue Nile as proposed HELP basin*

The Blue Nile River Basin forms an international sub-basin within the Nile River Basin. HELP is a joint initiative of the United Nations Educational Scientific Organization (UNESCO) and the World Meteorological Organization (WMO). HELP is creating an approach to integrated catchment management through the creation of a framework for water law and policy experts, water resource managers and water scientists to work together on water-related problems. Additional information is needed to re-classify this basin. The classification "Proposed HELP basin" indicates that the Basin may need to provide more detail for various aspects described in the Proposal Document.; may not have yet achieved any initial operational activity; may not have yet begun full stakeholder involvement; may have identified too few or too narrow a range of the HELP key issues; may also need to provide further information about official endorsement, support and funding commitments.

*Participating countries:* Sudan, Ethiopia

Date: February 1999

Level/Type of Collaboration: Non-Official/International initiative

Principal Issue: Water quality, joint management, technical cooperation/assistance, other: research and training

Source: [http://portal.unesco.org/sc\\_nat/ev.php?URL\\_ID=3728&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201](http://portal.unesco.org/sc_nat/ev.php?URL_ID=3728&URL_DO=DO_TOPIC&URL_SECTION=201)

*USAID, GEF and LakeNet project: Toward a Lake Basin Management Initiative: Sharing Experiences and Early Lessons in GEF and Non-GEF Lake Basin Management Projects*

Lake Victoria forms an international sub-basin within the Nile River Basin.

*Participating countries:* Burundi, Kenya, Rwanda, Tanzania, Uganda

*Date:* October 1, 2002

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, technical cooperation/assistance, other: research and education

*Source:* See <http://www.worldlakes.org/programs.asp?programid=2>

*EUWI project: Lake Victoria, the Africa Water Initiative pilot basin*

At the 2002 World Summit for Sustainable Development in Johannesburg (WSSD), the EU launched the EUWI to contribute to the achievement of the Millennium Development Goals (MDGs) and WSSD targets for drinking water and sanitation, within the context of an integrated approach to water resources management. The main focus of the Water Initiative will be to: reinforce political will and commitment to action, promote improved water governance, capacity-building and awareness, improve the efficiency and effectiveness of water management through multi-stakeholder dialogue and coordination, strengthen coordination through promoting river basin approaches, and identify additional financial resources and mechanisms to ensure sustainable financing. Lake Victoria is one of the five selected basins for which an action plan will be developed.

*Participating countries:* Burundi, Kenya, Rwanda, Tanzania, Uganda

*Date:* 2002-2005

*Level/Type of Collaboration:* Official/Economic, social and environmental program

*Principal Issue:* Water quality, water quantity, joint management, technical cooperation/assistance

*Source:* <http://www.euwi.net/> and [http://www.euwi.net/file\\_upload/Niki\\_tmpphpNku4xk.pdf](http://www.euwi.net/file_upload/Niki_tmpphpNku4xk.pdf)

*Lake Victoria Development Programme.*

The East African Community (EAC) established the Lake Victoria Development Programme in 2001, as a mechanism for coordinating the various interventions on the Lake and its Basin; and serving as a centre for promotion of investments and information sharing among the various stakeholders. The programme is the driving force for turning the Lake Victoria Basin into an economic growth zone. The Programme envisages a broad partnership of the local communities around the Lake, the East African Community and its partner states as well as the development partners.

*Participating countries:* Kenya, Tanzania, Uganda

*Date:* 2001

*Level/Type of Collaboration:* Official/Economic program

*Principal Issue:* Water quality, fishing, economic development, joint management, technical cooperation/assistance, other: poverty eradication

*Source:* <http://www.eac.int/LVDP/about.htm>

*Lake Victoria Environmental Management Project (LVEMP)*

LVEMP is a comprehensive environmental program for the conservation of Lake Victoria and its basin. It is a regional project formed under a Tripartite Agreement signed on 5th August 1994 by the three riparian countries – the Republic of Kenya, United Republic of Tanzania, and the Republic of Uganda; which provided for its preparation and implementation. The major objective of the LVEMP is to restore a healthy, varied lake ecosystem that is inherently stable and able to support, in a sustainable way, the increasing activities in the lake and its catchment for the benefit of the people of the riparian countries as well as the international community. Objectives: to maximize the sustainable benefits to riparian communities from using resources within the basin to generate food, employment and income, supply safe water, and sustain a disease free environment; to conserve biodiversity and genetic resources for the benefit of the riparian and the global community; and to promote regional cooperation

*Participating countries:* Kenya, Tanzania, Uganda

*Date:* July 1997 - June 2002

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, water quantity, economic development, joint management

*Source:* <http://www.lvemp.org/>



## OKAVANGO-MAKGADIKGADI

### *GEF IW project: Environmental Protection and Sustainable Management of the Okavango River Basin*

The proposed project, while strengthening OKACOM and the countries capacity, would help to remove the barriers still preventing joint agreement on actions to protect the basin's globally valuable ecosystems by sustainably managing the shared water resources. The project would focus on reaching a science based diagnostic analysis of the transboundary environmental problems, as a basis for building consensus among riparians on selected priority actions needed to address these transboundary problems, including policy, legal and legislative reforms.

*Participating countries:* Angola, Botswana, Namibia

*Date:* Approved July 1, 2000

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, joint management, other: research and education

*Source:* <http://www.gefonline.org/projectDetails.cfm?projID=842>

### *EU project: WERRD (Water and Environmental Resources in Regional Development)*

The general objective of this project is to increase understanding of livelihoods, the environment and policies relating to international river basins. The project refers to the Okavango River and is being designed by a variety of participants from Botswana, England, Namibia, South Africa and Sweden. Main objective: to increase the understanding of the pre-conditions for improved livelihoods for people living in different parts of the Okavango river basin.

*Participating countries:* Angola, Botswana, Namibia

*Date:* December 2001 - December 2004

*Level/Type of Collaboration:* Official/Economic, social, and environmental program

*Principal Issue:* Other: research and education

*Source:* <http://www.drfn.org.na/water7.htm> and <http://www.okavangochallenge.com/okaweb/>

### *Green Cross International / PC → CP project: Water for Peace in the Okavango River Basin*

Main objective: to support OKACOM, as the legitimate intergovernmental agency responsible for the management of the Okavango River Basin, in the generation of knowledge that will be useful to the development of alternative policy options. The case study provide an important summary of data related to the hydrology of the river basin, in addition to substantial information on the historical management of the water resources. The legal, political and economical aspects, which make every case unique, were also analyzed and assessed.

*Participating countries:* Angola, Botswana, Namibia

*Date:* 2001-2003

*Level/Type of Collaboration:* Non-official/International initiative, social – health program

*Principal Issue:* Joint management, other: research and education

*Source:* [http://www.greencrossinternational.net/GreenCrossPrograms/WATERRES/wwf\\_03/gci\\_okavango1.pdf](http://www.greencrossinternational.net/GreenCrossPrograms/WATERRES/wwf_03/gci_okavango1.pdf)

### *IUCN demonstration site: Okavango, how to keep beauty beautiful*

The Okavango management project will bring together economic, social and environmental information to analyze resource use and abstraction. It will then use extensive participation to define strategic development options in a master plan and assess the economic, social and environmental impacts of these options. Ultimately, it will propose the best options to the government and people of Botswana.

*Participating countries:* Angola, Botswana, Namibia, Zimbabwe

*Date:* 2000-2006

*Level/Type of Collaboration:* Official/Economic, social, and environmental program

*Principal Issue:* Water quality, economic development, joint management, other: research and education

*Source:* <http://www.waterandnature.org/1j.html>

### *USAID project: Sharing Water Project*

This project is centered on the Okavango River Basin and focuses on the technical elements needed to build capacity among the various stakeholder groups in the states that are riparian to the Okavango River. Sharing

Water offers a platform, called collaborative learning, for collective resource inquiry involving a range of stakeholders, for human capacity building associated with joint fact-finding; and for negotiation around food and environmental security in the basin.

*Participating countries:* Angola, Botswana, Namibia

*Date:* April 2003 - July 2004

*Level/Type of Collaboration:* Official/International initiative.

*Principal Issue:* Joint management, technical cooperation/assistance, other: research and education

*Source:* <http://www.sharingwater.net/> and [http://www.csir.co.za/plsql/ptl0002/PTL0002\\_PGE100\\_LOOSE\\_CONTENT?LOOSE\\_PAGE\\_NO=7153136](http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE100_LOOSE_CONTENT?LOOSE_PAGE_NO=7153136)

#### *UN program of technical cooperation: Integrated management of the Okavango River Basin*

The United Nations Department of Economic and Social Affairs (UNDESA) has assisted the riparian countries to maintain the benefits of the Okavango which required agreement over the sharing of both the benefits and associated liabilities (to include those of an environmental and ecological nature) through joint management of the basin's water resources.

*Participating countries:* Angola, Botswana, Namibia, Zimbabwe

*Date:* December 1996 - September 2000

*Level/Type of Collaboration:* Official/Economic program

*Principal Issue:* Joint management, technical cooperation/assistance

*Source:* <http://esa.un.org/techcoop/flagship.asp?Code=RAF96G42>

#### *SIDA project: Every River Has its People*

The project aims to gather information and encourage exchange between people, to facilitate understanding among all major stakeholders of the problems local communities face and develop joint solutions to the most urgent problems experienced in the Okavango River Basin. The intention is not only to gather information and encourage exchange between people, but also to facilitate the understanding among all major stakeholders of the problems local communities face and develop joint solutions to the most urgent problems.

*Participating countries:* Angola, Botswana, Namibia

*Date:* May 2000 - August 2001

*Level/Type of Collaboration:* Official/Economic, social and environmental program

*Principal Issue:* Joint management, other: research and education

*Source:* <http://www.drfn.org.na/water8.htm>

## ORANGE

#### *Lesotho Highlands Water Project (LHWP)*

An inter-basin cross-border project transferring water from the mountainous water-rich area in Lesotho to the industrial heart of South Africa for domestic and industrial uses, and hydropower generation for Lesotho on the basis of royalties paid by South Africa to Lesotho.

*Participating countries:* Lesotho (Kingdom of), South Africa

*Date:* 1986

*Level/Type of Collaboration:* Official/Economic program

*Principal Issue:* Water quantity, Hydro-power/hydro-electricity, joint management, technical cooperation/assistance

*Source:* <http://www.riob.org/ag2002/LimpopoOrange.pdf>

#### *Lower Orange River Management Study (LORS)*

Review of previous environmental flow assessments for the lower Orange River. The consultants are to undertake the pre-feasibility study. The study aims to recommend measures to improve the availability of water along the lower Orange River and to facilitate the equitable distribution of water between the two countries in support of strategic objectives.

*Participating countries:* Namibia, South Africa

*Date:* 2002-2003

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, other: research and education

*Source:* TFDD

### *EUWI project: Orange/Senqu, the Africa Water Initiative pilot basin*

At the 2002 World Summit for Sustainable Development in Johannesburg (WSSD), the EU launched the EUWI to contribute to the achievement of the Millennium Development Goals (MDGs) and WSSD targets for drinking water and sanitation, within the context of an integrated approach to water resources management. The main focus of the Water Initiative will be to: reinforce political will and commitment to action, promote improved water governance, capacity-building and awareness, improve the efficiency and effectiveness of water management through multi-stakeholder dialogue and coordination, strengthen coordination through promoting river basin approaches, and identify additional financial resources and mechanisms to ensure sustainable financing. The Orange/Senqu river is one of the five selected basins for which an action plan will be developed.

*Participating countries:* Namibia, South Africa

*Date:* 2002

*Level/Type of Collaboration:* Official/Economic, social and environmental program

*Principal Issue:* Water quality, water quantity, joint management, technical cooperation/assistance

*Source:* <http://www.euwi.net/> and [http://www.euwi.net/file\\_upload/Niki\\_tmpphpNku4xk.pdf](http://www.euwi.net/file_upload/Niki_tmpphpNku4xk.pdf)

### *UN Project: South African Millenium Ecosystem Assessment (SAfMA)*

The assessment was approached as an experiment with studies to be conducted at three spatial scales: the entire SADC region, two major river basins (the Gariep and Zambezi), and local community assessments (Kafue basin in Zambia, Gorongosa-Marromeu in Mozambique, Lesotho, Great Fish River basin, Richtersveld and Gauteng in South Africa). The assessed area includes industrial production systems, urban, agricultural, livestock and forestry production areas as well as natural vegetation and conservation systems. The MA is an international work program designed to meet the needs of decision makers and the public for scientific information concerning the consequences of ecosystem change for human well-being and options for responding to those changes.

*Participating countries:* Angola, Congo, Democratic Republic of (Kinshasa), Malawi, Mozambique, Tanzania, United Republic of, Botswana, Namibia, Zambia, Zimbabwe

*Date:* June 1, 2001

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, technical cooperation/assistance; other: research and education, poverty eradication

*Source:* <http://www.millenniumassessment.org/en/index.aspx>

## **PANGANI**

### *IUCN project: Integrated management of the Pangani River Basin (Tanzania, Kenya)*

*Participating countries:* Kenya, Tanzania, United Republic of

*Date:* 2000-2006

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, other: research and education

*Source:* <http://www.waterandnature.org/e1.html> and <http://www.waterandnature.org/pub/>

## **PUNGWE/PUNGUÉ**

### *IUCN project: Establishing ecosystem management in the Pungwe River Basin*

This project will allow the establishment of a wide awareness raising and capacity building effort throughout the basin. Based on a thorough basin-wide assessment with full public and institutional support, a master plan and management plan for the basin is to be developed.

*Participating countries:* Mozambique, Zimbabwe

*Date:* Data not available

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, joint management, other: research and education

*Source:* <http://www.waterandnature.org/g1.html>

## SENEGAL

### *GEF IW project: Senegal River Basin Water and Environmental Management program*

The project has the overall objective of ensuring the sustainable management of the basin's water resources, biodiversity and environment.

*Participating countries:* Guinea, Mali, Mauritania, Senegal

*Date:* Approved December 7, 2001

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, other: research and education

*Source:* <http://www.gefonline.org/projectDetails.cfm?projID=1109>

### *IUCN demonstration site: Senegal, participation in development*

To date, the entire management approach of OMVS has been strictly sectoral. Although locally and in some sectors tremendous gains have been achieved, several indicators point out that the majority of the stakeholders in the valley have not benefited from the interventions of OMVS. Goal: a sustainable management of the Senegal River Basin based on the full participation of all stakeholders.

*Participating countries:* Guinea, Mali, Mauritania, Senegal

*Date:* 2000-2006

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, other: research and education

*Source:* <http://www.waterandnature.org/1h.html>

### *WB project: Senegal River Basin Water and Environmental Management Project*

The objective is to provide a participatory framework for the environmentally sustainable development of the Basin and to launch a basin-wide cooperative program for transboundary land-water management.

*Participating countries:* Guinea, Mali, Mauritania, Senegal

*Date:* October 28, 2003

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, other: research and education

*Source:* <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/SENEGALEXTN/0,,contentMDK:20134744~menuPK:296308~pagePK:141137~piPK:141127~theSitePK:296303,00.html>

## VOLTA

### *GEF IW project: Addressing Transboundary Concerns in the Volta River Basin and its Downstream Coastal Area*

Purpose of the proposed project is to facilitate the establishment of a multi-country management framework, to produce a diagnostic of main transboundary issues, and to define agreed measures to reverse/prevent resources degradation. The project will also include priority short-term demonstration actions.

*Participating countries:* Benin, Burkina Faso, Ghana, Ivory Coast, Mali, Togo

*Date:* Approved May 16, 2003

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Economic development, joint management, technical cooperation/assistance, other: research and education

*Source:* <http://www.gefonline.org/projectDetails.cfm?projID=1111>

### *Green Cross / PC—>CP International project: Water for Peace in the Volta River Basin*

The main objective of the Water for Peace in the Volta Project is the prevention of conflicts and the promotion of dialogue and cooperation on the water and land resources of the Volta Basin. The project focuses on ensuring the more involvement of civil society in the development of transboundary basin management agreements, institutions and strategies. The case study provide an important summary of data related to the hydrology of the river basin, in addition to substantial information on the historical management of the water resources.

*Participating countries:* Benin, Burkina Faso, Ghana, Ivory Coast, Mali, Togo



Date: 2002-2003

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Joint management, other: research and education

Source: [http://www.gci.ch/GreenCrossPrograms/WATERRES/wwf\\_03/gci\\_volta.pdf](http://www.gci.ch/GreenCrossPrograms/WATERRES/wwf_03/gci_volta.pdf)

**CGIAR project: Integrated Basin Water Management Systems: Benchmark Basin (research theme 4)**

To improve the productivity of water (in crop, livestock and fisheries production systems and ecosystem services) within the basin, by generating and applying knowledge on how to manage trade-offs and promote synergies to enhance water productivity, while maintaining or improving food security and environmental sustainability. This will be achieved through research, capacity building and outreach activities in three key areas at a basin level.

Participating countries: Benin, Burkina Faso, Ghana, Ivory Coast, Mali, Togo

Date: Nov. 2002 - 2012

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Water quality, water quantity, fishing, economic development, joint management, technical cooperation/assistance

Source: [http://www.waterforfood.org/AB\\_Volta%20Basin.asp](http://www.waterforfood.org/AB_Volta%20Basin.asp) and [http://www.mrcmekong.org/news\\_events/announcement/ann\\_1.htm](http://www.mrcmekong.org/news_events/announcement/ann_1.htm)

**EUWI project: Volta, the Africa Water Initiative pilot basin**

At the 2002 World Summit for Sustainable Development in Johannesburg (WSSD), the EU launched the EUWI to contribute to the achievement of the Millennium Development Goals (MDGs) and WSSD targets for drinking water and sanitation, within the context of an integrated approach to water resources management. The main focus of the Water Initiative will be to reinforce political will and commitment to action, promote improved water governance, capacity-building and awareness, improve the efficiency and effectiveness of water management through multi-stakeholder dialogue and coordination, strengthen coordination through promoting river basin approaches, and identify additional financial resources and mechanisms to ensure sustainable financing.

Participating countries: Benin, Burkina Faso, Ghana, Ivory Coast, Mali, Togo

Date: 2002-2004

Level/Type of Collaboration: Official/Economic, social and environmental program

Principal Issue: Water quality, water quantity, joint management, technical cooperation/assistance

Source: <http://www.euwi.net/> and [http://www.euwi.net/file\\_upload/Niki\\_tmpphpNku4xk.pdf](http://www.euwi.net/file_upload/Niki_tmpphpNku4xk.pdf)

**Liptako-Gourma Integrated Authority or Autorite de developpement integre de la region du Liptako-Gourma (ALG)**

The ALG, a sub-regional institution has the primary mission to promote the integrated development of the Liptako-Gourma region with a view to improving the living conditions of the population.

Participating countries: Burkina Faso, Mali, Niger

Date: December 3, 1970

Level/Type of Collaboration: Official/Social – health and economic program

Principal Issue: Hydro-power/hydro-electricity, navigation, fishing, economic development, irrigation, infrastructure/development

Source: [http://www.afdb.org/knowledge/pressreleases2003/adf\\_57\\_2003e.htm](http://www.afdb.org/knowledge/pressreleases2003/adf_57_2003e.htm)

**IUCN / SIDA project: Improving Water Governance in the Volta Basin**

The goal of the project is to promote international cooperation between Burkina Faso and Ghana on water management of the Volta basin. It will help the two countries to define shared principles and put in place a framework for cooperation for sustainable water management.

Participating countries: Burkina Faso, Ghana

Date: September 30, 2004

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Joint management, other: research and education

Source: [http://www.waterandnature.org/news/PRVoltaOct12004\\_EN.pdf](http://www.waterandnature.org/news/PRVoltaOct12004_EN.pdf)

## ZAMBEZI

### *UN Project: South African Millenium Ecosystem Assessment (SAfMA)*

The assessment is being approached as an experiment with studies to be conducted at three spatial scales: the entire SADC region, two major river basins (the Gariep and Zambezi), and local community assessments (Kafue Basin in Zambia, Gorongosa-Marromeu in Mozambique, Lesotho, Great Fish River Basin, Richtersveld and Gauteng in South Africa). The assessed area includes industrial production systems, urban, agricultural, livestock and forestry production areas as well as natural vegetation and conservation systems.

*Participating countries:* Angola, Congo, Democratic Republic of (Kinshasa), Malawi, Mozambique, Tanzania, United Republic of, Botswana, Namibia, Zambia, Zimbabwe

*Date:* June 1, 2001

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, technical cooperation/assistance, other: research and education, poverty eradication

*Source:* See <http://www.millenniumassessment.org/en/index.aspx>

### *SIDA project: Environmental Management Programme.*

*Objectives:* To maintain the water resources of Kariba and the Zambezi River in an acceptable condition, suitable for sustainable utilisation by power utilities, domestic, industrial, agricultural and environmental users; and to provide timely and accurate information on the environmental status of the Zambezi River and Lake Kariba to stakeholders and interested parties. Since 1998, the ZRA has been implementing an Environmental Monitoring Programme.

*Participating countries:* Zambia, Zimbabwe

*Date:* 1998

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, water quantity, hydro-power/hydro-electricity, economic development, joint management

*Source:* ee <http://www.zaraho.org.zm/sida-project.html> and [http://www.eawag.ch/research\\_e/apec/seminars/Case%20studies/2003/Zambezi.pdf](http://www.eawag.ch/research_e/apec/seminars/Case%20studies/2003/Zambezi.pdf)

### *GEF project: Support to Pollution Monitoring and Management on the Zambezi River*

The objective of this project is to prevent pollution, and support monitoring and management on the Zambezi River.

*Participating countries:* Zambia, Zimbabwe

*Date:* February 2001– February 2004

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Joint management, technical cooperation/assistance

*Source:* <http://www.zaraho.org.zm/fgef-project.html> and [http://www.eawag.ch/research\\_e/apec/seminars/Case%20studies/2003/Zambezi.pdf](http://www.eawag.ch/research_e/apec/seminars/Case%20studies/2003/Zambezi.pdf)

### *ZACPRO, project 6 (Zambezi River Action Project): Development of an Integrated Water Resources Management Strategy for the Zambezi River Basin*

The core project of ZACPLAN is the ZACPRO, financially supported by the Sida, Norad and Danida. The project started in October 2001 and will run for a period of three years. The project aims at developing a strategy for an integrated water resource management for a basin-wide collaboration of the Zambezi River.

*Participating countries:* Zambia, Zimbabwe

*Date:* October 2001 - October 2004

*Level/Type of Collaboration:* Official/Economic program

*Principal Issue:* Water quality, joint management

*Source:* <http://www.zaraho.org.zm/zacpro.html> and [http://www.eawag.ch/research\\_e/apec/seminars/Case%20studies/2003/Zambezi.pdf](http://www.eawag.ch/research_e/apec/seminars/Case%20studies/2003/Zambezi.pdf)

## ZACPLAN

In 1987, SADC adopted an action plan for the Zambezi River Basin (ZACPLAN), for environmentally sound planning and management of the water and related resources. By 1987, SADC had already adopted an action plan for the Zambezi River Basin (ZACPLAN), for environmentally sound planning and management of the water and related resources. The original form of the plan contains 19 projects and currently has five projects being finished with a varying degree of success. The ZACPLAN has been developed and implemented by the SADC-WD (Southern African Development Community Water Division). One of the outputs of ZACPLAN is the Protocol on Shared Water Course Systems. In short form, the Protocol states that water management has to include all uses including the conservation and sustainable use of living resources.

*Participating countries:* Zambia, Zimbabwe

*Date:* 1987

*Level/Type of Collaboration:* Official/Economic, social, and environmental program

*Principal Issue:* Water quality, joint management

*Source:* [http://www.eawag.ch/research\\_e/apec/seminars/Case%20studies/2003/Zambezi.pdf](http://www.eawag.ch/research_e/apec/seminars/Case%20studies/2003/Zambezi.pdf)

## *IUCN/CIDA project: the Zambezi Basin Wetlands Conservation and Resource Utilization Program (ZBWCRUP)*

ZBWCRUP was mounted in reaction to recognition on the part of Southern African Development Community (SADC) member states that widespread deterioration of wetlands has occurred. Aim: strengthening IUCN's members' and partners' capacity to provide input to initiatives within the Zambezi drainage basin and the region. Launched in 1995, the ZBWCRUP covers five riparian states of the Zambezi River and its tributaries (Botswana, Namibia, Malawi, Mozambique, Zambia). Project activities will be carried out at the local, national, and regional level.

*Participating countries:* Botswana, Malawi, Namibia, Mozambique, Zambia

*Date:* 1995

*Level/Type of Collaboration:* Official/Environmental program

*Principal Issue:* Water quality, fishing, economic development, joint management, technical cooperation/assistance, other: wetland preservation

*Source:* <http://www.iucn.org/themes/wetlands/zambezi.html>

# APPENDIX 4. TENDERS FOR LARGE PROJECTS

This list of projects is incomplete and is provided for illustrative purposes only.

## CUNENE

### *The Epupa Project*

The government of Namibia is currently planning a hydroelectric scheme on the Cunene River bordering Angola. The project design currently considered the best alternative consists of a 150 metres high and 600 metres long dam nine kilometres below the Epupa waterfall. The reservoir will be between 70 and 80 kilometres long and will flood an area of 295 km<sup>2</sup>. The power station will have an installed capacity of 415 MW and a planned annual electricity production of 1650 GWh.

Country: Namibia

Sector: Power

Cost in millions (USD): 3300

Status: Proposed

Source: <http://www.im.org/programs/epupa/> — [http://www.fivas.org/pub/power\\_c/k12.htm](http://www.fivas.org/pub/power_c/k12.htm)

## NILE

### *Sondu-Miriu hydroelectric power project*

Sondu Miriu HEP Project is located about 400 kilometres from the capital city of Nairobi. It covers six sub locations with a population density of 500 people per km<sup>2</sup>. The Kenya Generating Company, (KENGEN) plans to divert water from the Sondu-Miriu river into a regulating pond with a capacity of 1.1 million m<sup>3</sup>. This water will then be led into the main power house via a 7.2 kilometre tunnel.

Country: Kenya

Sector: Power

Cost in millions (USD): 160

Status: Active

Source: <http://www.im.org/programs/safrica/sondu.991222.html>

### *Energy Project (02)*

The objectives of the Second Energy Project are a) to increase the efficiency and sustainability of Ethiopia's power sector, and to increase electricity use for economic growth and improved quality of life; and b) to improve utilization efficiency of rural renewable energy. The project includes the construction of the Gilgel Gibe hydroelectric plant to increase generation capacity.

Country: Ethiopia

Sector: Power

Cost in millions (USD): 295

Status: Active

Source: [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1997/11/13/000009265\\_3980203114907/Rendered/PDF/multi0page.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1997/11/13/000009265_3980203114907/Rendered/PDF/multi0page.pdf)

### *Bujagali Private Hydropower Development Project*

The main development objective of the Bujagali Hydropower Project for Uganda is to promote growth through developing least-cost power generation for domestic use in an environmentally sustainable and efficient manner. The project consists of a small reservoir, a powerhouse, a rockfill dam, spillway, a 100- km transmission line, substations, and other associated works.

Country: Uganda

Sector: Power

Cost in millions (USD): 115

Status: Proposed

Source: [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2001/12/17/000094946\\_01113004004822/Rendered/PDF/multi0page.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2001/12/17/000094946_01113004004822/Rendered/PDF/multi0page.pdf)



### *Kajbar Dam and Merowe Dam*

The Sudanese government, with the financial assistance of China and Saudi Arabia, hopes to construct two dams estimated at a billion dollars each along the Nile in order to supply electricity to the capital city, Khartoum. These dams are the Kajbar (221m high) and the Merowe (60 m high). Kajbar will generate about 300 MW of power and Merowe about 1,000 MW for industrial use to supplement Sudan's three existing hydroelectric dams.

Country: Sudan

Sector: Power

Cost in millions (USD): 2000

Status: Proposed

Source: <http://www.im.org/programs/safrica/index.asp?id=030902.washedaway.html> — [http://www.vitrade.com/sudan\\_risk/Egypt/980604\\_dam.html](http://www.vitrade.com/sudan_risk/Egypt/980604_dam.html)

## OKAVANGO-MAKGADIKGADI

### *Popa Falls Hydro Power Project*

The Namibian Ministry of Mines and Energy (NamPower) has come to the end of the first phase of a feasibility study to consider the viability of developing a 30 MW hydropower station on the Okavango River, situated in the vicinity of the Popa Falls. The dam will be six meters high and one kilometer across and upstream from the Okavango Delta in Botswana. The hydropower station will be situated inside Namibian territory in its entirety.

Country: Namibia

Sector: Power

Cost in millions (USD): 300

Status: Proposed

Source: <http://www.im.org/programs/okavango/> — <http://www.nampower.com.na/nampower2004/projects/popa/index.asp>

## ORANGE

### *Lesotho Highlands Water Project (LHWP)*

The Lesotho Highlands Water Project is designed to divert water from the Orange River to the urban and industrial Gauteng region in South Africa through a series of dams and tunnels blasted through the mountains.

Country: Lesotho

Sector: Power

Cost in millions (USD): 8000

Status: Active

Source: <http://www.im.org/programs/lesotho/> — <http://web.worldbank.org/external/projects/main?pagePK=104231&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P001409>

## SENEGAL

### *Manantali dam project*

The Manantali project consists of the Manantali dam on the Bafing river, a tributary of the Senegal river, a 200 MW power station and a network of 1300 km of transmission lines to the capitals of Mali (Bamako), Mauritania (Nouakchott) and Senegal (Dakar). The dam is 1460 meters long and 65 meters high. It created a reservoir with a storage capacity of 11.3 billion m<sup>3</sup> and a surface area of 477 km<sup>2</sup>.

Countries: Mali - Mauritania - Senegal

Sector: Power

Cost in millions (USD): 500

Status: Active

Source: <http://www.im.org/programs/safrica/index.asp?id=bosshard.study.html> — [http://www.afdb.org/knowledge/loans2000/adf\\_manantali\\_energy.htm](http://www.afdb.org/knowledge/loans2000/adf_manantali_energy.htm)

## VOLTA

### *Bui Hydroelectric Development Project*

The Bui Hydroelectric Development will be a 110-m dam creating a 12,350 million m<sup>3</sup> reservoir, with a total surface area of 440 km<sup>2</sup>. A powerhouse will be built at the foot of the dam and will be equipped with three 133 MW generating units. The gated spillway will accommodate the 10,000-year flood. Two saddle dams will close low points on the reservoir rim. The river catchment area covers 123,000 km<sup>2</sup> with an average annual inflow of 6,470 million m<sup>3</sup>. The Bui reservoir active storage will be 5,620 million m<sup>3</sup>.

Country: Ghana

Sector: Power

Cost in millions (USD): 600

Status: Proposed

Source: <http://www.im.org/programs/safrica/index.asp?id=011008.buidam.html>  
<http://www.dams.org/kbase/submissions/showsub.php?rec=env101>

## ZAMBEZI

### *Power Rehabilitation Project*

Power Rehabilitation to rehabilitate the Kariba, Kafue Gorge, and Victoria Falls hydropower stations. The overall objective of the Power Rehabilitation Project is to enhance the ability of Zambia's electricity supply industry to provide electricity at least cost and in an efficient, sustainable manner to stimulate more and inclusive growth in the Zambian economy. The project components include rehabilitating hydropower stations, as well as distribution and transmission systems to improve technical efficiency and the quality and reliability of supply.

Country: Zambia

Sector: Power

Cost in millions (USD): 198.4

Status: Active

Source: [http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1998/11/17/000178830\\_98101903282625/Rendered/PDF/multi0page.pdf](http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1998/11/17/000178830_98101903282625/Rendered/PDF/multi0page.pdf)

### *Mepanda Uncua Dam Project*

The Mozambican government is proposing to build a dam at Mepanda Uncua, just downstream from the Cahora Bassa Dam. The Mozambican government has approached the European Investment Bank and the World Bank Group for financing to support the construction of the 100-meter Mepanda Uncua dam at an estimated cost of \$2.5 billion.

Country: Mozambique

Sector: Power

Cost in millions (USD): 2500

Status: Proposed

Source: <http://www.im.org/programs/mphanda/> — [http://www.bicusa.org/bicusa/issues/mphanda\\_nkuwa\\_dam\\_project\\_mozambique/index.php](http://www.bicusa.org/bicusa/issues/mphanda_nkuwa_dam_project_mozambique/index.php)

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>Zambezi

>Power Rehabilitation Project

>Source:

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