HELSINKI UNIVERSITY OF TECHNOLOGY
Water Resources Laboratory

WATER RESOURCES DEVELOPMENT AND MANAGEMENT

O. Varis · C. Tortajada · A. K. Biswas (Eds.)

Management of Transboundary Rivers and Lakes

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With 27 Figures and 18 Tables

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This book is dedicated to
Pertti Vakkilainen
Professor of Water Resources at
Helsinki University of Technology
as a token of esteem for an eminent
engineer and humanist
and
as a mark of true regard for a friend.

Foreword

Water's role in the nature is very fundamental. As it circulates in the atmosphere, in the rivers, lakes, soil, rock, and in the oceans, it is the major conveyer of various chemical substances and of energy, and it can also be called as the blood of the ecosystems of this planet. But at the same time water is interwoven in the various functions of the nature and the human society in countless ways which makes water one of the most complicated challenges of the mankind today. These challenges call for seeing water in a broad development framework, pressed by a mix of demographic, social, environmental, technological and economic drivers.

Human beings are exploiting and enjoying, but at the same time polluting and deteriorating, the waters in various ways and water is equally important to the human socio-economic system as it is to the nature. It may sound a bit anecdotal to say that water obeys no borders, but that is true; the hydrologic cycle with its rivers, river basins, lakes, aquifers, rainfalls, oceans, etc., cross administrational borders without any passport control. River and lake basins are in most cases very different from the administrational borders that the human beings have set up.

The management of large river and lake basins which fall in the territory of more than one state constitutes one of the many major complications and challenges in water management. It has been estimated that around 40 percent of the world's population lives in such basins, and those basins account for 60 percent of the world's freshwater supply. Therefore, in the era of rapidly growing global connections through the mobility of people, goods and ideas across national borders, it is fundamental to understand the challenges of managing, often politically highly sensitive, transboundary waters, and to develop sustainable management principles to such systems.

Water has been at the curriculum of Helsinki University of Technology since the very beginning. It is one of the old topics of the university, a university which has expanded and diversified to cover a spectrum of disciplines ranging from architecture to telecommunications, from civil engineering to industrial engineering, and from chemical technology to computer science. Now as the institute celebrates its centenary as a university, it is my utmost honour to congratulate and thank the water experts of our university in that they have constantly been striving to develop the field through intensive research and expanding the nation's expertise in various water related matters in a very honourable way.

This book on the management of transboundary river and lake basins is a stunning example of this strive which has brought the water research group of our university as a highly recognized and respected core of expertise at international level. The book contains thorough analyses of transboundary water management form a number of highly demanding cases. Those cases include the following rivers or river systems: Mekong, Ganges, Jordan, Indus, La Plata, Okavango, the Southern African Hydrological Complex, the Large Lakes basin of North America, China's transboundary waters, as well as Finland's transboundary watersheds with Norway, Sweden and Russian Federation.

None of these complex ecological-political entities is similar to any other. They all are unique in their characteristics and problems as well as contemporary management approaches and potential solutions of future challenges. With full respect to and appreciation of this complexity, the international community has seen crucial to develop some guiding principles and approaches to manage international waters. Some of these approaches include the Helsinki Rules of 1966, the International Convention of Non-Navigational Use of International Waters, and the statements of United Nations Summits such as those of Mar del Plata in 1976, Rio de Janeiro in 1992 and Johannesburg in 2002.

The various, profound analyses of the several international water systems scrutinize the role of those documents, principles and approaches, revealing important experience on how to develop the management principles for transboundary waters so that they would be more just and functional than the past and the contemporary ones.

I am sure that this book will be a valuable source of information for those who work in administrative, consulting or research tasks related to transboundary waters. This way the book demonstrates the power of university research in making a difference for mankind.

Matti Pursula
Rector
Helsinki University of Technology

Preface

Conceptually and technically, a river or a lake basin is a natural unit for the management of water and associated natural resources. However, the borders of the river and lake basins are seldom identical to the political and administrative boundaries between nations, or within nations. Currently, there are over 260 river and lake basins in the world, which are shared by two or more countries.

An issue that has received only limited attention thus far is how best to coordinate the management activities based on hydrological boundaries with those that are based on administrative boundaries. It is a complex issue, especially for the management of transboundary water bodies.

Rivers and lakes often cross several administrative and jurisdictional boundaries, which mostly have different priorities, objectives and interests, even when they are within one single country. The problem becomes more complex when two or more nations are involved. Inspite of the political and institutional complexities, water resources of a single basin cannot be managed rationally on a long-term basis, until and unless some form of coordinating agreement can be reached between the various administrative jurisdictions sharing the same basin. In addition to an overall agreement, a functional coordinating mechanism is necessary between the institutions of the different jurisdictions so that water resources of the same basin can be efficiently used and managed to maximise human welfare and to protect the environment.

In recent years, some water professionals and political analysts have raised the spectre of water wars. A main hypothesis of this book is that through proper inter-institutional coordinating mechanisms, the countries sharing the same basin will benefit more through cooperation rather than through conflicts. Even though management of transboundary rivers and lakes are considered important at present, a comparative and objective study of the efficacy of the institutions to manage such basins efficiently is still conspicuous by its absence. It is thus necessary to conduct systematic and comprehensive objective analyses of the existing transboundary river and lake basin organisations in order to determine their relative successes and failures, and the reasons thereof.

Many international summits and high-level events related to development policies have been organised in the water sector in recent years. The Earth Summit in Rio, in 1992, did not manage to put water higher up in the international political agenda. Fortunately, this situation started to change after the mid-1990s when several high profile events gave water an increasing consideration. The four World Water Forums, the Bonn Freshwater Conference in 2001, the Johannesburg Summit in 2002 and many other events have highlighted water's roles in sustainable development of societies, poverty alleviation and environmental conservation, though much more remains to be done.

The World Summit on Sustainable Development, held in Johannesburg, in 2002, had a strong focus on water. The Summit considered water to be one of its ten focal areas. It considered water at much greater depth than in Rio. The Johannesburg

Framework for Action included many water-related recommendations. The two of its most important goals were to:

- halve the number of people with no access to safe drinking water and improved sanitation by 2015; and
- develop integrated water resources management (IWRM) and efficiency plans by 2005.

These goals are in accord with the UN Millennium Goals. This book focuses on the latter one of the two goals because the sponsor of this book, Finland, has defined clear policies with respect to the former one but none for the latter. However, efficient water management in major transboundary basins is a very complex issue, and not enough serious and objective studies have been carried out to draw appropriate general lessons which could be used in the management of similar water bodies in different parts of the world.

It should, however, be noted that each transboundary basin has its own special characteristics and boundary conditions, and thus a process which may work well in one location may not be the most appropriate for another. While consideration of the general lessons are likely to be a useful first step to formulate a management strategy for any specific basin, each basin is likely to have enough special characteristics so that the final plan is likely to be unique for any large basin. In the area of transboundary water management, it is highly unlikely that one size will fit all.

The overall scope of the book is to provide a comprehensive and objective analysis of the roles and modalities of operation of transboundary river and lake basin organisations in a global perspective. By identifying and analysing what works and what does not work within the overall context of the institutions that manage such basins, the analyses in the book are likely to provide a useful road map in terms of institutional arrangements and their modalities of operation so that the related water, land and associated natural resources of a transboundary basin can be efficiently managed.

The various case studies selected for this book will provide a macro global view. Basins and regions were carefully selected to give an overall perspective on a broad variety of the world's regions. These case studies provide the maximized experience from situations that prevail in high, middle and low income countries.

After the intensive and extensive discussions of the commissioned case studies, and subsequent overall analysis, many important issues were raised, among which were the following:

- It is unrealistic to intercompare management of transboundary water bodies with a single criterion. Different river basins have different physical and environmental characteristics; political, institutional and legal frameworks; water demand and use patterns and water use efficiencies; and economic and management capacities. In addition, power relationships are asymmetrical. This means that transfer of knowledge and experience from one basin to another should always be handled with caution, and that management plans for specific basins should be formulated with proper consideration of their own specific requirements, rather than direct adoption of an imported model. Management experiences from different transboundary water bodies could be useful as background information. Some of these experiences, when considered appropriate and relevant, may have to be specially tailored to fit the local conditions in order to formulate an appropriate institutional model.

- While the consideration of integrated river basin management has some merit, it should be noted that many times it may neither be practical nor realistic to expect inter-country agreements on large international basins, like the Ganges-Brahmaputra-Meghna system to consider a basin-wide management plan. Sub-basin level plans and agreements may be more realistic and implementable. Sometimes, it may be advisable to consider agreements between the upper riparian countries and a separate one between lower riparian countries, particularly if a basinwide treaty is likely to be out of reach in the foreseeable future for an entire, large river basin.
- Institutions for managing transboundary water bodies generally have limited enforcement authority and have not been very effective as implementing agencies. However, they have often proved useful as channels for communications and discussions, and also for exchange of data and information. Some of these institutions are often overloaded by various diplomatic and administrative tasks and their achievements in water management mostly have not been extensive. Thus, their major contributions may sometimes go outside the water sector.
- The existing literature on management of transboundary water bodies often focuses on conflicts and risks. These analyses are mostly academic and often full of misconceptions and misunderstandings, since the authors generally have limited knowledge and understanding of the background situations and the politics behind the issues. Lack of appreciation of the social-cultural-political-institutional contexts of the overall inter-country relationships, limited availability of data and analyses which are generally considered to be sensitive by many of the co-basin countries concerned and thus are kept confidential, and limited access to the real decision-makers, have ensured that the real situations are seldom analysed. These misconceptions and misunderstandings are often repeated by various authors, which gives the general impression that these are correct interpretations of actual facts, which of course is not the case.
- Treaties and institutional arrangements cannot remain static. Factors like water requirements, use patterns and efficiency of management change with time, as do water management paradigms, practices and processes. In addition, technology improves continually, social perceptions are dynamic and human-knowledge base, like the universe, is steadily expanding. Thus, the need for dynamic treaties is likely to be increasingly required in the future. It may not be an easy task to formulate dynamic treaties, but one that must be considered very seriously in the coming years.
- History generally shows that treaties function better if they result in visible benefits to all the parties concerned, irrespective of the overall inter-country relationships. A good example is the Indus Basin Treaty, where inter-country

conflicts have remained outside the water issue, and these conflicts, though very substantial, have not noticeably affected the functioning of the Treaty.

- Success in negotiating treaties over transboundary water bodies is often greater without intermediaries. The countries need to develop their own road maps based on their own requirements and expectations, and then negotiate the best possible agreement from their own perspectives as well as the needs of their neighbours. The overall agenda for cooperation between the countries concerned often encircle many issues, some of which could be political, and is likely to extend well beyond water. A good example is the recent window of opportunity between Bangladesh and India to resolve their inter-country water issues. The main driver for this change has not come from the water sector but from the energy sector. In a world that is becoming increasingly interdependent and globalised, many of the developments from outside the water sector may have major impacts on the water sector, including management of transboundary water bodies. These developments could provide new opportunities for negotiating inter-country agreements on transboundary water basins.
- The inter-country relationships between the co-basin countries invariably have historical roots. These are complex and extend well beyond water. The exact nature of these intricate relationships is mostly too nuanced to be understood only in terms of geography or a single issue like water. Any study or analysis that exclusively focuses on the river basin level is likely to miss this complex reality. Accordingly, it is essential for the analysts and decision-makers to understand the overall nuances in terms of patterns of cooperation and competition that exist in transboundary river and lake basins.
- The Johannesburg Plan of Implementation recommended that all major river basins of the world should have an IWRM and water efficiency plans by the end of 2005. The case studies clearly show that approaching the myriad of dimensions, problems and challenges of the world's major river basins, many of which are transboundary in nature, with a simplistic one-shot approach of management within the context of IWRM is far too simplistic to be useful, or applicable. It may be an attractive idea but is not an implementable approach. Not surprisingly, the Johannesburg recommendation to formulate such IWRM management plans by 2005 was not only met, but also is highly unlikely to be met in the foreseeable future.

The project on which the current book is based was carried out by the Helsinki University of Technology and the Third World Centre for Water Management. Leading authorities were carefully selected and then invited to prepare the case studies, which were presented and then extensively discussed at an International Workshop in Espoo, Finland, on August 17–19, 2005. A complex international project and a very high level meeting such as this one could not have been organised without the strong support of several institutions and individuals. The funding came from the Ministry of Foreign Affairs of Finland. Our special thanks go to Mr. Eero Kontula and Mr. Matti Nummelin for their insight in conceptualising and planning the project, as well as to Ms. Krista Napola, Ms. Silja Sukselainen and Ms. Kirsi Brolén for managing all possible organisational matters within the

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Olli Varis, Asit K. Biswas and Cecilia Tortajada

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1 Management of Transboundary Waters: An Overview

Asit K. Biswas

1.1 Introduction

Historically, global water demands have increased steadily with population growth and the subsequent rise of various types of human activities. With a steadily growing world population, and mankind's eternal quest for higher and higher standards of living, there is no doubt that the demands on our natural resources, both non-renewable and renewable, will continue to augment well into the foreseeable future. Water, a renewable resource, will be no exception to this general trend.

Even when the global population stabilizes, which is expected to be around the year 2050, the demands for certain resources such as water may continue to increase because of higher *per capita* demands from more and more people in the developing world, who will seek to attain better standards of living, and also as a result of changing lifestyles, both in developed and developing countries. These trends are now clearly visible in countries such as India, where already more than 100 million people have reached a middle-class standard of living. This rapidly emerging class is steadily flexing its new-found political and economic muscles and, in the area of water, unlike earlier generations, they are not likely to remain satisfied with the *status quo* of a few hours of intermittent supply of dubious quality every day. Changing lifestyles are also likely to increase their water consumptions. Under these conditions, the availability of adequate quantity and appropriate quality of water to an increasingly urban population of the developing world is likely to be an important political and social consideration in the coming decades for most such countries.

Three other factors should also be considered to meet the water requirements of the future in a timely manner. These are water requirements for agricultural production and energy generation, and increasing water contamination due to accelerating human activities, especially in developing countries. Efficient irrigated agriculture is essential for ensuring reliable food production in the 21st century, to meet the demand from a larger and increasingly affluent population. At present nearly 55% of all rice and wheat produced in the world comes from irrigated areas and some 2.4 billion people currently depend on irrigated agriculture for food, income and employment. Current estimates indicate that 80% of the additional food supplies required to feed the future world population will depend on the availability of a reliable water supply which can only be provided by irrigation. Reliable availability of adequate quantity and quality of water for increasing agricultural production will continue to be an important factor for the entire humankind well into the 21st century.

While water requirements for increasing global agricultural production have received considerable attention in recent years, water needs for energy production have been basically neglected by the water and development professionals. High development and economic growth rates cannot be achieved, especially in the developing world without the availability of adequate energy resources. No large-scale electricity generation is possible without large quantities of water. In addition to hydropower generation, construction and operation of new thermal and nuclear plants would require significant additional quantities of cooling water, a fact that has basically escaped both water and energy planners to date. No developing country has formulated, let alone implemented, a water policy which explicitly considers increasing electricity requirements of the country and its implications to the water sector in terms of resource availability and use. Water and energy have a symbiotic relationship, one depends on the other for its production. Thus, water requirements for the energy sector will require priority attention in the future.

A good example of the implications of massive increases in electricity generation on national and transboundary water resources is the Asian developing countries. These countries had a total generating capacity of 250,000 MW in 1990, nearly 70% of which was thermally generated (mainly coal), with the balance of 30% being accounted for mostly by hydropower. Another 240,000 MW was needed by the year 2000 to fulfil their own development plans. This almost doubling of electricity requirements within a very short period of only one decade means that the water needs of a rapidly expanding energy sector can no longer be ignored, especially as similar growth rates are expected to continue, and may even accelerate, during the early part of the 21st century (Biswas and Hashimoto 1996). Similarly, in countries as diverse as Brazil, China, India, Thailand and Turkey, electricity demands are now often growing by 6–10% annually. It should also be noted that for England and Wales, some 36% of all water abstracted at present is accounted for by the energy-generation industry alone. The corresponding figure for France is much higher, as is for Mexico. Thus, the future global water requirements for the energy sector cannot longer be ignored. It must be factored in for water planning and management processes. The demand for water for the energy sector will also be reflected in terms of impacts on the transboundary water bodies of Asia.

Another important issue is increasing water contamination, especially in the developing world. Many point sources of water must now receive expensive treatment before they could be used beneficially. In future, non-point sources will have to be considered to control water pollution. While much rhetoric can now be noted in terms of water pollution control and ecosystems conservation, in reality appropriate remedial actions on the ground are often conspicuous by their absence. Inadequate treatment of domestic and industrial wastewater (for example, in Latin America as a whole, only about 11% of the total wastewater produced is now properly treated and disposed in an environmentally-safe manner), and continuing neglect of properly controlling non-point sources of pollution, mean that water quality management urgently needs more than the lip-service it is receiving at present. This situation is affecting both national and transboundary waters.

The above issues, as well as other associated factors, like climate change, mean that efficient water management in the coming decades will face a challenge, the like of which no previous generation has had to confront earlier. In spite of the gravity of the situation, unfortunately we currently do no have even reasonably reliable assessments of the global situation in terms of water quantity and quality and associated factors. While these are continuing problems with exclusively national water bodies, the problems are generally even more serious and complex for many transboundary water bodies because of lack of trust and absence of meaningful cooperation between the appropriate co-basin countries. In Asia, Africa and Latin America, successful management of transboundary water bodies will experience continuing and conflicting pressures in terms of quantity and quality for several decades to come.

1.2 Importance of Transboundary Waters

The foregoing factors and other related issues, when considered together, indicate that water requirements in the arid and semi-arid areas will continue to increase steadily in the foreseeable future for a variety of reasons (Biswas 1994, 1997), among which are the following:

- All easily available and exclusively national sources of water have already been developed or are in the process of development. This means that the real costs of new projects per cubic metre of water supplied will continue to increase in the future, often very substantially. An analysis of domestic water supply projects supported by the World Bank indicates that the cost per cubic metre of water for the next generation of projects is often 2–3 times higher than from the present generation.
- Water needs for ecosystem and habitat preservation will increasingly be considered to be a ‘legitimate’ use in the future, most likely within a decade. This will put additional pressure on water available for existing ‘traditional’ uses and may contribute to some conflicts in terms of water allocation between all the users.
- For environmental and social reasons, the next generation of water projects will take significantly longer timeframe to develop than currently anticipated by the planners, which may further intensify and complicate the anticipated water shortages in the foreseeable future.
- Water planning and management practices are likely to improve only incrementally during the near to medium terms. Based on current trends, radical changes in such practices needed to resolve the water crisis appear to be somewhat unlikely within the next decade.

All these factors will most probably contribute to tremendous socio-political pressure to develop new sources of water. Since new sources of water that are exclusively national which could be efficiently developed techno-economically are generally no longer available in most developing countries, there would be tremendous pressure in this region to develop transboundary water bodies, that is those rivers, lakes and aquifers that are shared by two or more countries. This is because transboundary bodies are often the only sources of water left which could be developed economically. These water bodies were not considered for development in the past because of the absence of any agreements between the co-basin countries on their allocation and utilization. The political risks and economic complexities were considered to be too high for their unilateral development by only one country, without an explicit agreement with its co-basin countries. However, as water shortages in individual nations become more and more severe, and, if and when they create serious internal political and social tensions and unrest, some countries may decide to develop such resources, irrespective of potential external political risks even though it may imply a 'beggar thy neighbour' attitude.

This trend can be discerned by considering the following aspects. During the past two decades, there have been an increasing number of examples where countries have built dams and barrages on the main stems of transboundary rivers (some times even very close to the borders between the countries) and/or on major tributaries, which could affect the flow regime in the downstream countries. Furthermore, the number of studies that have already been completed, or are under preparation, on the development of the major tributaries of several transboundary rivers, especially when they are under exclusive national jurisdiction, is increasing all the time. All these developments on major tributaries would clearly have perceptible impacts on the flow regime of the main transboundary rivers. A good example of this development can be noted from the Mekong River experience. On April 5, 1995, the plenipotentiaries from Cambodia, Lao PDR, Thailand and Vietnam signed an agreement on cooperation for the sustainable development of the Lower Mekong River Basin at Chiang Rai, Thailand. Following the signing ceremony, the VIPs embarked on a boat tour of the Mekong River. The boat, however, got stuck in the river because, unknown to the participants, China was filling up the reservoir of a new dam on a major tributary of the Mekong upstream in the Chinese territory. China is not a member of the reconstituted Mekong River Commission, though it has an observer status. Currently several dams are under construction and/or are under active planning consideration upstream in exclusively Chinese territory, which is the most upstream country in the Mekong River system. Such developments in the exclusively national tributaries of the Asian transboundary rivers may become a norm, rather than an exception, in the future.

International development funding agencies, both multilateral and bilateral, have generally in the past declined to provide credits for the development of transboundary waters, until and unless the countries concerned have signed a mutually acceptable agreement. Without external financial assistance, developing countries have often been unable to construct capital-intensive water development projects on transboundary rivers, even if they had wished to do so unilaterally. An analysis of the latest trends indicates that this situation appears to be changing in Asia for the following reasons:

- Many of the countries concerned are now capable of raising the necessary investment funds from internal national sources (for example, in India, nearly 90% of the required investment funds are now internally generated: corresponding figure for Bangladesh is nearly 50%).
- Private sector funds, both international and national, can be harnessed for such developments, especially for hydropower projects (Birecik Dam on the Euphrates River was completed with private sector funding).
- Multilateral funding agencies appear to have been taking a somewhat more liberal approach recently to support such development activities. For example, while they are still continuing to decline to finance construction of the main structures like the dams and hydropower plants, they have began to support associated activities like agricultural development, even when they may use water from the project (an example is the GAP Project on the Euphrates River in Turkey (Biswas et al. 2004), where the funding agencies declined to support the construction of the Ataturk Dam, but they are providing funds for the related agricultural development activities).
- In many cases international financing supports only a small part of the total project cost. Absence of international funds thus could mean only an extension of the time needed for completing the construction of the project. Absence of external funding may not necessarily stop the project, as may have been the case in the past.

Herein will lie one of the principal challenges to the water profession in the 21st century: how to develop and manage the various transboundary water sources sustainably and efficiently in full agreement and cooperation between the appropriate co-basin countries so that they result in a ‘win-win’ situation for all the parties concerned. The development considerations would no longer be confined to the techno-economical and environmental factors alone, as is generally the case at present for the exclusively national water sources. Other factors would have to be considered. These would include binational or multinational political considerations, political and economic power of the country in which the water development would take place in relation to the other co-basin countries, importance of maintaining good relations between the countries concerned, and the general international and media interest in the project. These and other similar associated issues are likely to increase the complexity of the transboundary water management processes in the future, often by several orders of magnitudes. Hydropolitics, both nationally and internationally, is thus likely to become an increasingly important global issue in the coming years for the management of transboundary river and lake basins and aquifers (Biswas et al. 1999).

1.3 Magnitude and Distribution of Transboundary Waters

In the context of the present book, the various issues associated with transboundary waters will be discussed only in terms of freshwater. Coastal and ocean waters are not considered, since these sources need to be analysed and discussed in a different context, and within wholly different planning and management frameworks.

In the area of freshwater, three types of water sources need to be considered. These are rivers, lakes and groundwaters, even though often these sources are interconnected. While we now have considerable experience with the management of transboundary rivers, and to a lesser extent transboundary lakes, similar knowledge on groundwater-related issues is mostly conspicuous by its absence. While the legal regime for managing transboundary surface water bodies has progressively evolved over the past four decades, similar progress has not been made on management of transboundary aquifers.

The global magnitude and the distribution of the problem of transboundary rivers and lakes are reasonably known at present, though much work is still needed on several methodological aspects of the problems, before these could be accurately defined. The literature is replete with unscientific and hypothetical 'facts and figures' even for transboundary surface water bodies. The information base is basically non-existent for most transboundary aquifers, and whatever information that is currently available, its reliability is mostly unknown.

During the 1980–2000 period, it was assumed that there were 214 transboundary river and lake basins in the world. This number originated from a report that was completed in 1976, but published in 1978, by the now defunct Centre for Natural Resources, Energy and Transport (CNRET) of the Department of Economic and Social Affairs of the United Nations. This number itself was an upward revision of an earlier (1958) estimate of 166 transboundary river and lake basins by the same institution, CNRET.

While the CNRET analyses can be considered to be a very good beginning, its shortcomings are clearly evident more than two decades later. The study defined a river basin as an 'area within which waters of natural origin (rain, groundwater flow, melting of snow and ice) feed a given river'. It considered only those transboundary river basins which were 'separate' (that is, not tributary basins), and were connected 'directly with the final recipient of the water (oceans, closed island seas and lakes)'.

The study further indicated that nearly 47% of the area of the world (excluding Antarctica) falls within transboundary basins. It ranged from a high of nearly 60% of the area in Africa and South America to a low of about 40% in North and Central America. Viewed in a different fashion, the report indicated that there are 44 countries where at least 80% of the total areas are within transboundary basins. Of these 44 countries, 20 are in Africa, 7 in Asia, 13 in Europe and 4 in Latin America.

The CNRET study can be at best be considered to be a preliminary assessment of the magnitude of the problem, which incidentally was also the intention of its originators. It suffered from some serious methodological shortcomings. It was based exclusively on maps available at the United Nations Map Library: primarily a desk study with maps, some of which were of the scale of 1: 15,000 000, or even less.

Unfortunately, the results of the CNRET study have been repeated often in the past without any technical scrutiny. Not surprisingly, these figures were accepted as facts for nearly 25 years. This uncritical acceptance of the written words is all the more difficult to justify when one considers the fact that during the intervening period many countries such as the Soviet Union, Czechoslovakia, and Yugoslavia split up into new countries, thus creating new transboundary river and lake basins.

In retrospect, the uncritical acceptance of the CNRET study of transboundary river and lake basins has had at least one unfortunate side-effect (CNRET 1978). Since the number was an underestimate, it gave the erroneous impression that the overall magnitude and extent of the problem was much less serious than what it was, and was likely to become in the foreseeable future. This knowledge-base has improved further by the work of Wolf et al. (1999). This work was carried out with the financial and intellectual support of the Third World Centre for Water Management. The estimates of CNRET (1978) and Wolf et al. (1999) are shown in Table 1.1.

Table 1.1. Number of transboundary river basins

Continents	Number of basins	
	CNRET	Wolf et al.
Africa	57	60
Asia	40	53
Europe	48	71
North and Central America	33	39
South America	36	38
Total	214	261

Source: CNRET (1978) and Wolf et al. (1999)

This underestimation has been further compounded by the fact that the international organizations like the various United Nations Agencies, World Bank and the Regional Development Banks, have for the most part shied away from the issue of the management of transboundary basins, except for consideration of non-controversial and non-threatening issues like expert group meetings and confidence-building measure. Most of these have turned out to be activities which in reality often achieved very little. Unfortunately, during the past three decades, most international and bilateral development organizations have progressively become more and more risk-averse and politically correct. Even for the United Nations Water Conference held in Mar del Plata, Argentina, in March 1977, the issue of transboundary rivers was deliberately given a lower profile. This was because of the belief that discussions on this issue could prove to be politically charged and could create political tensions between the countries, which, in turn, could affect the overall outcomes of the Conference. These factors, to a significant extent, can explain why the issue of the management of transboundary waters has not been as high up the international political agenda during the 1975–2000 period, as it should have been because of its increasing importance and complexity.

1.4 Complexities of Managing Transboundary Waters

The issue of efficient management and development of transboundary rivers and lakes has not been an easy subject to deal with at major international fora. While there are many reasons for this uneasiness, probably the two most important reasons for this in the past have been due to the issue of national sovereignty and the absence of agreement on the management of vast majority of transboundary freshwater bodies.

The first reason, that of national sovereignty, is a most important political consideration at the nation-state levels. Historically, all the nation-states have jealously guarded their sovereign powers to manage the activities within their own borders. Thus, not surprisingly, the overall discussions on the management of transboundary rivers and lakes have often been somewhat controversial because of consideration of national sovereignty issues. For example, during the United Nations Conference on the Human Environment, held in Stockholm in 1972, Brazil took a very strong stand on the discussions on the management of shared natural resources because of national sovereignty considerations. The word “shared” in the context of this Conference meant natural resources that are shared by two or more countries. A very important concern for the Brazilian Government at that time was forest-related issues. Brazil was most concerned that through the use of international resolutions at the United Nations on shared natural resources, the country may be forced to take decisions in its Amazon region, which may preempt certain future national activities in the area, irrespective of the importance of such activities in terms of its own national interest. Brazil continued to take a strong stand against such international discussions on shared natural resources during the entire 1970s and part of the following decade. Because of such pressures, the resolution on shared natural resources at Stockholm had to be watered down significantly to ensure an unanimous agreement. Thus, the Principle 21 of the Stockholm Conference finally read:

> ‘states have... the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibilities to ensure that the activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction’.

During the 1970s and 1980s, because many countries strongly opposed discussions on the management of shared resources due to perceived national self-interests, the various United Nations organizations basically decided to stay away from serious considerations of management of transboundary rivers. To the extent the discussions took place, these were mostly on confidence building, mutual collaboration, information exchange, expert group meetings, general workshops, etc. Not surprisingly, in spite of considerable amount of resources being spent, there was no real progress in this area during the 1970s, 1980s and much of the 1990s.

The second reason is the perceived national self-interests of the various co-basin countries on numerous transboundary rivers and lakes on which operational treaties do not exist at present. The word ‘operational’ in this context is worth noting, since for some treaties, like the one on the Lower Mekong, the current treaty may be a step in the right direction but it is of very limited use since it did not address the complex but important issue of water allocation between the riparian countries in any form. Thus, many countries which are currently negotiating treaties on transboundary rivers with their co-basin counterparts, or likely to do so in the foreseeable future, often feel that they would prefer to resolve the problems on the basis of bilateral or multilateral negotiations, rather than through an intermediary international or foreign institution. The countries generally prefer not to be constrained by international norms or guidelines, which may reduce their degree of manoeuvrability, and thus the final outcomes. Accordingly, they often either take a strong stand against such norms or abstain from the discussions or voting. Behind the scene, however, many countries have often let their views known to the staff members of the international organizations in no uncertain terms: they would prefer them to stay away. These organizations, in turn, have preferred to play safe and not take any risk by taking a leadership position in terms of facilitating negotiations, which may prove to be controversial and may even annoy certain countries. For the most part, the international institutions have followed what some of these countries had recommended.

1.5 Roles Played by International Organizations

During the past two decades, international organizations have played a very limited role in terms of facilitating agreements on transboundary river basins. Unquestionably, the most noteworthy and successful case where an international organization played a very critical role as a catalyst and a facilitator to get the co-basin countries to agree to a treaty was for the Indus River Basin between India and Pakistan, some half century ago. Eugene Black, the then President of the World Bank, clearly and unambiguously indicated to the leaders of India and Pakistan, at the highest political levels, his own personal interest in resolving the conflict over the Indus basin amicably and speedily. He not only made the expertise and resources of the Bank available to both the countries in terms of mediation, but also kept himself fully briefed of the progress during the almost decade-long negotiation process. When there was an impasse, he was not afraid to play a critical role in person by assisting the countries to overcome it. The Bank played the role of an ‘honest broker’ properly and impartially, and its roles were perceived to be independent and constructive by both the countries. The ‘carrot’ that the Bank extended to facilitate the agreement was an irresistible offer to finance new water development projects, subject to a mutually acceptable agreement between the two countries on the sharing of the waters of the Indus River system. This proved to be a very attractive incentive for both the parties concerned. The

Indus Treaty was formally signed by India and Pakistan on 19 September 1960 (Biswas 1992).

It is interesting to note that even though the negotiations between the two countries took less than a decade, the subsequent agreement between the four provinces of Pakistan on the allocation of its share of the Indus water took an additional three and a half decades!

In retrospect, the entire negotiation between the two countries was completed within a remarkably short period, especially for such a complex treaty. The Indus Treaty is indeed a major tribute to the astute and dynamic leadership of President Black, who not only accepted the risk of potential failure but also was prepared to get involved personally and had no hesitation to put his own personal reputation and credibility, as well as the substantial resources of the Bank, on the line for its successful completion, and its subsequent implementation.

The most unfortunate aspect of the post-1960 period has been the near total absence of the type of courageous and prudent leadership that was shown by Black, either by the World Bank, for that matter, by any other international organization. In 1976, another World Bank President, Robert McNamara, did discuss the issue of the sharing of the Ganges waters between India and Pakistan, but no progress was made for many reasons, among which were the following:

- It was the technical professionals at the World Bank who were interested in the resolution of the problem, and not its main leaders. By the mid-1970s, the Ganges issue had already been highly politicized in the countries concerned. The Bank career professionals had very little, if any, access to the highest levels of political decision-making, especially in India. Without such high level access, it was simply impossible to find a solution that may have been politically acceptable to the two countries concerned.
- In contrast to the ‘honest broker’ role played by the Bank for the Indus River Treaty, the overwhelming perception in India, rightly or wrongly, was that the Bank’s own preference for a Ganges solution was closer to the one advocated by Bangladesh, compared to that of India. Not surprisingly, India distrusted that the Bank could play an impartial role in any mediating process, and thus it rejected the overture of the Bank. This distrust has basically continued up to the present.
- During the 1950s, when the Indus Water Treaty was being negotiated, the Bank’s independence and image were considered irreproachable by the developing world. It was also considered to be extremely powerful by the two newly independent countries. Some two decades later, when the Bank attempted to discuss a possible Ganges treaty, this ‘reverence’ for the Bank had declined very considerably. Accordingly, the Bank no longer was in a position to ‘nudge’ the countries towards a possible solution.
- Countries of the region are now much more economically developed, they have considerable technical and management expertise, and they are also more independent-minded. Thus, the Bank’s offer of any financial assistance, if a treaty on a transboundary river could be signed, was not as persuasive as it was in the 1950s.

Two other international organizations did subsequently attempt to play a role in managing transboundary rivers: the United Nations Environment Programme (UNEP) on the Zambezi River, and the United Nations Development Programme (UNDP) on the Mekong River.

First is the Zambezi basin, which covers eight countries: Angola, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe. UNEP convened a Conference of Plenipotentiaries on the Environmental Management of the Common Zambezi River system in Harare, Zimbabwe, in May 1987. The primary objective of the Conference was to approve the draft Zambezi Action Plan (ZACPLAN), which was prepared by UNEP in close consultation with most of the countries concerned. The plenipotentiaries of the five co-basin countries (Botswana, Mozambique, Tanzania, Zambia and Zimbabwe) did sign an 'International Agreement on the Action Plan for the Environmentally Sound Management of the Common Zambezi River system' (David 1988; Nakayama 1997). While initially considered to be a success for UNEP, real progress in terms of its implementation of the Plan in over more than two decades, has been very minimal. This is in spite of the fact that, unlike the Ganges, the Zambezi is a water-surplus river. Thus, at least conceptually, it may have been simpler to facilitate such an agreement on the Zambezi where there was no conflict over water allocation, compared to the Indus basin, where, by all accounts, water has been a scarce resource.

The second is the role played by UNDP in facilitating the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin. This was signed in 1995 by the four lower co-basin countries (Thailand, Cambodia, Laos PRD and Vietnam). While it is too early to make any authoritative judgement on the impact of this agreement, it is somewhat unlikely to have much impact on the future developments of the Mekong River system. It should be noted that for nearly four decades, UNDP had played 'the roles of godfather, referee, rich uncle and fund-raiser to the Mekong Committee' (Miller 1996), which had already spent hundreds of millions of dollars during its existence. The disappearance of the Interim Mekong Committee, which appeared to be a distinct possibility in 1992, would have been a serious moral and political blow to UNDP, since all these investments would have been lost and showed very limited returns. UNDP subsequently played a constructive role, which led to an agreement being signed on the Lower Mekong by Cambodia, Laos PDR, Thailand and Vietnam. However, China, the most powerful country of the region, and the most upstream country on the river, was not a signatory to this agreement. It has also declined to be a member of the new Mekong River Commission, in spite of considerable pressure from UNDP and urging from the four lower co-basin countries. This is likely to be a major constraint in the future for any basin-wide coordinated planning and development.

While the agreement on the Lower Mekong is a step in the right direction, it is unlikely to contribute significantly to the efficient management of the Mekong River Basin for at least two reasons. First, the water requirements for all uses in China are increasing rapidly, and thus it needs to develop its water resources as much as possible, and as quickly as possible. Currently several provinces of China have plans to develop the water resources of the Upper Mekong. China has steadfastly refused to join the earlier Interim Mekong Committee or the present Commission. In addition, China was only one of the three countries which voted in May 1997 against the resolution to establish an International Convention on the Law of the Non-Navigational Uses of International Watercourses at the United Nations. This may signify some negative implications for the future coordinated developments of the Mekong.

Second, the most difficult part of any international agreement in the developing world is the actual process of water allocation between the various co-basin countries. The Mekong Agreement does not include any specific allocation of water between the countries. It contains usual terminologies such as 'reasonable and equitable utilization', and 'prevention and cessation of harmful effects', on which even independent, objective experts may not agree, let alone countries with vested interests. In the final analysis, the Mekong Treaty is basically a framework agreement for the lower four riparian countries, primarily to consult and to cooperate. It does not address the most critical issue of under allocation between the four signatory countries. Accordingly, the potential for conflicts between the countries on this issue in the future, in spite of the existing treaty, is therefore quite high. This may come because the water requirements of the two most powerful countries on the Mekong, China and Thailand, are increasing steadily. Both of these countries are likely to further harness the waters of the tributaries of the Mekong that are in their own national jurisdictions, even though such steps may change the flow regime of the main stream.

Overall, no matter whatever criteria are used for analysis, international organizations have played a very marginal role in resolving conflicts on transboundary rivers and lakes in recent decades. Given real leaderships in the major international institutions, they could have played a significantly more effective role in this area during the past four decades. Regrettably, there are no perceptible signs that this situation is changing for the better.

1.6 Legal Regimes for Managing Transboundary Waters: An Analysis

Since water does not respect political boundaries, and it is mobile, countries on a transboundary river could use its resources as it moves sequentially from upstream to downstream. When a river forms a boundary between two countries, two political units which would have simultaneous authority over a mobile resource like water, could contribute to the generation of several types of transboundary water conflicts.

Because of potential conflicts between co-basin countries on transboundary rivers and lakes, historically many nations have negotiated mutually acceptable agreements as to how such water bodies can be used. Over 3,600 treaties can be noted on transboundary water bodies between 800 AD, and 1985, the majority of which deal with navigation, which was the primary form of transportation during the earlier times. Especially after the Second World War, several treaties were negotiated on transboundary water bodies, which dealt with non-navigational uses like flood control, hydropower development, water quality management and water allocation. It should be noted that generally it has been easier to negotiate treaties on the navigable uses of rivers, since these do not require water allocation, or use considerations. Historically, it has been most difficult to get the countries to agree on the actual allocation of water quantities between the appropriate co-basins, and to a lesser extent on water quality management.

The first important study on the legal aspects of using the waters of the transboundary rivers was carried out by Prof. H. A. Smith of London. His book on The Economic Use of International Rivers was published in 1931. He reviewed more than 100 treaties and studied several conflicts on the use of transboundary rivers. He emphasized the doctrine of riparian rights, which entitled the lower riparian states to a share of the natural flow of a river. He also noted that some of the treaties considered the concept of equitable utilization.

In 1956, the International Law Association (ILA) published the Dubrovnik Rules for the planning and management of transboundary rivers. Subsequently, in 1959, Bolivia introduced a resolution in the United Nations General Assembly which requested the Secretary General to prepare a report on laws related to transboundary rivers. This resolution was passed. However, what led Bolivia to propose this resolution is unknown at present.

In 1966, ILA adopted the so-called 'Helsinki Rules' for transboundary watercourses. Thereafter, in 1970, Finland, where the Helsinki Rules were formulated, introduced a resolution in the UN General Assembly on the laws for transboundary watercourses, which suggested that the Helsinki Rules should be considered as a model.

During the ensuing discussions in the United Nations, three reservations to the Helsinki Rules surfaced. These were the following:

- The Rules were formulated by a professional organization, which did not represent nation states.
- Since nation states had not participated in the formulation of the Helsinki Rules, their adoption as a model could preclude new considerations on this complex issue.
- The Rules were based on a drainage basin approach, which could be a potential problem in terms of national sovereignty considerations.

An analysis of the ensuing discussions in the United Nations indicates that the most important reservation centred on the use of the drainage basin concept. Belgium, Brazil, China and France argued that such an approach would be a radical departure from the traditional channel-based international law. In contrast, Finland and The Netherlands felt that the drainage basin framework was the most rational and scientific approach, and thus it should be followed. Certain other countries opined that the problem of transboundary river basins was so diverse that codification may simply not be possible, or advisable.

The resolution to refer to the Helsinki Rules was lost. However, a similar resolution was passed with only one negative vote (Brazil), after the reference to the Helsinki Rules was deleted. This resolution recommended that the International

Law Commission (ILC) should "take up the study of the law of the non-navigable uses of international watercourses with a view to progressive development and codification".

In 1974, the ILC sent out a questionnaire to all the members of the General Assembly soliciting their view on nine key questions. The responses, however, were not encouraging. By 1975, only 21 of the 147 UN members had bothered to reply. Four additional countries replied by 1978, one by 1979, four by 1980 and two by 1982. Not surprisingly, on the critical issue of the appropriateness of the drainage basin concept, the countries were sharply divided. Approximately half the countries supported the concept (Argentina, Finland and The Netherlands) and the other half were either strongly negative (Austria, Brazil and Spain) or ambivalent. Because of such sharp differences, ILC decided to begin with the formulation of general principles, and then determine the scope of the term "international watercourses" later. The scope of this term was finally addressed in 1991, when the ILC produced a draft report on the law of the non-navigational uses of international watercourses.

Considerable discussion took place during the 1991–97 period on the ILC draft. Finally, on 8 July 1997, the UN General Assembly approved the resolution on non-navigational uses of international watercourses. It is interesting to review the voting patterns on this resolution, especially in terms of existing disputes on various transboundary basins (Biswas 1997):

In favour: Bangladesh, Brazil, Cambodia, Jordan, Lao PDR, Nepal, South Africa, Sudan, Syria, Thailand, Vietnam.
Abstaining: Argentina, Egypt, Ethiopia, India, Israel, Pakistan and France.
Against: Burundi, China and Turkey.

The General Assembly resolution adopted the 'Convention on the Law of the Non-Navigational Uses of the International Watercourses', and it was left open for signature by the States for some three years. By 2000, the time up to when it was open for signature only four countries (Cote d′Ivoire, Finland, Germany and Hungary) had ratified it or approved it. Even though some 106 countries voted for the Convention, only 16 countries have ratified it thus far.

1.7 Future Implications of the UN Convention

If the Convention on Non-navigational Uses of International Watercourses becomes a reality within the foreseeable future, which at present appears to be somewhat doubtful, a major issue is what its potential impacts are likely to be in terms of resolving existing and future disputes. In all probability, it is likely to have somewhat marginal impact on the resolution of existing and future water conflicts, even if it is ratified, for the following reasons:

First, not all countries that are currently parties to disputes on transboundary watercourses are likely to sign the Convention. For example, let us consider some of the current conflicts and the voting patterns of the countries concerned on the above-mentioned Convention in the United Nations General Assembly.

Euphrates-Tigris:	Syria in favour, Turkey against, and Iraq not involved;
Ganges:	Bangladesh and Nepal in favour, but India abstained;
Jordan:	Jordan in favour but Israel abstained;
Mekong:	Cambodia, Laos PDR, Thailand and Vietnam in favour, but China against;
Nile:	Sudan in favour; Egypt and Ethiopia abstained and Burundi against;
Plata:	Brazil in favour but Argentina abstained.

This probably means that, if and when the Convention is ratified, there would be parties to specific conflicts who are unlikely to be signatories. As the past experience with the nuclear non-proliferation treaty has shown, moral pressures are likely to be of little value in the face of strong, entrenched, vested national interests. Experiences with this new Convention, even if when it comes into force, in all probability is unlikely to be any different.

Second, while the 1997 Convention could be considered to be an important benchmark, its two basic principles are similar to what had generally been accepted much earlier: equitable and reasonable utilization and obligation not to cause appreciable harm. Thus, the proposed convention, at least conceptually, did not break any new ground.

One of the main problems with the proposed Convention is that it is full of vague, broad and general terms (Waterbury 1997), which can be defined, and in certain cases quantified, in a variety of different ways. Accordingly, expert advice can be easily ‘tailored’ to legitimize each country’s political views and demands. Technical analyses can be produced to justify and support appropriate national positions. Such occurrences, however, are not new: they have happened in the past and will no doubt continue to occur in the future. Furthermore, the Convention does not give any practical guidance to the negotiators and no operational assistance to the technical experts. It simply outlines a very broad, general framework, within which everything is considered to be relevant and important. It is likely to contribute to the generation of significant differences of opinions among the negotiators and technical experts as to how such general articles should be interpreted in operational terms.

One can argue that the Convention outlines certain factors which could determine one of the fundamental principles, that of ‘equitable and reasonable use’. According to the Convention, such a process should take “into account all relevant factors, and circumstances”, including:

- geographic, hydrographic, climatic, ecological and other factors of a natural character;
- social and economic needs of co-basin countries;
- the effect of the uses of the watercourse on other co-basin states;
- existing and potential uses of the watercourse;

- conservation, protection, development and economy of use of the watercourse resources and the cost of the measures taken to that effect; and
- availability of alternatives, of corresponding value, to a particular planned or existing use.

Each one of the above factors cannot be defined uniquely or precisely since they are general and broad in character. Accordingly, when all the factors are integrated to define 'equitable and reasonable use', the countries in conflict would find it a very difficult task to arrive at mutually acceptable estimate. The estimates are likely to differ significantly even when groups of truly independent and objective experts make such attempts separately.

Third, the prevailing national political sentiments in each negotiating riparian countries, as well as the incentives to negotiate in good faith, are likely to be important factors in the resolution of all such conflicts. In addition, as the number of riparians increase to four or more in any transboundary basin, the importance and relevance of any proposed settlement could range from exceedingly important from one country to total indifference or even downright hostility, from another. For a basin such as the Nile, which has ten riparian, the incentives for all the countries to arrive at any specific settlement, at any specific point in time, are likely to vary from very high to of no discernable interest. Equally, the types of settlements preferred by the different countries are likely to vary somewhat significantly. The new Convention can at best be of only limited help in such cases.

Finally, ratification of the Convention is an important requirement. The Convention can enter into force on the 'ninetieth day following the date of deposit of the thirty-fifth instrument of ratification, acceptance, approval or accession with the Secretary–General of the United Nations'. The Convention was kept open for signature until 20 May 2000. During this 3-year period, only four countries ratified it (see Annex I). Legally, even though this deadline is long past, countries can still ratify this Convention. It is an open-ended ratification system, which means that whenever 35 countries ratify it, it would become an international legal instrument.

The critical fact that should be considered is that for nearly six years after the deadline expired, not even a single country ratified the Convention. In 2007, Germany and Uzbekistan ratified it. This means that, in over a decade, less than half the countries needed to ratify it, have done so. Thus, when this Convention will be ratified by 35 countries so that it becomes an internationally accepted legal instrument is now an open question. The probability that additional countries will ratify it in the foreseeable future must now be considered to be not so high, unless the Secretary General of the United Nations and/or one or more important countries take a special interest in its ratification.

The above considerations and other related factors most probably mean that agreements in individual transboundary basins will most probably continue to occur only through protracted negotiations between the riparian countries concerned. The Convention, even when it is ratified, is unlikely to speed up the time needed to reach mutually acceptable agreements in vast majority of disputes on transboundary river basins.

In August 2004, in Berlin, the ILA updated its Helsinki Rules on Transboundary Waters which were formulated in 1966, nearly four decades before. The new rules are now referred to as Berlin Rules. As noted before, the Helsinki Rules were an updating of ILA's earlier first effort to formulate a legal regime on transboundary waters at Dubrovnik, which were subsequently known as Dubrovnik Rules. These three rules show the progressive evolution of the legal regime for managing transboundary waters over nearly half a century. Since these rules have been formulated by a non-governmental organization, and not approved by the nation-states, they can probably be best regarded as guidelines for a legal regime for managing transboundary waters. However, since the UN Convention has still not been ratified, and is unlikely to be ratified for some years to come, the Berlin Rules have the moral and intellectual authority of ILA, a professional association with a proven, acceptable and effective track record in this overall area for some five decades.

1.8 Conclusions

Transboundary water management, like the management of any other natural resource in this continent, has been a gradually evolving process. Similarly, the international legal regime as to how transboundary water resources should be planned, managed and developed has also progressively evolved over the past half a century. As our overall knowledge-base in this complex area expands, experiences in managing transboundary resources increase over time and space, technology improves, social norms and aspirations change, water institutions become more efficient, and legal frameworks (both national and international) evolve, it should be possible to manage transboundary water bodies more and more efficiently in the coming years.

The legal regime for managing transboundary waters has evolved from the time of the Dubrovnik Rules that were first enunciated in 1956, to the Helsinki Rules, UN Convention on Non-navigational Uses of International Watercourses, and finally the Berlin Rules. While this gradual evolution has been an important achievement, these rules should mostly be seen as guiding principles during the negotiation process of a treaty on a specific transboundary water body.

Each transboundary water body is different, not only in terms of size, water availability and use requirements, but also because of its specific climatic, physical and environmental conditions, institutional and management capacities of the countries involved, historical relationships, power structure between the co-basin countries, economic conditions and social aspirations of the people concerned. Thus, it is highly unlikely that a specific treaty can be replicated willy-nilly in another location.

As the 21st century progresses, it is becoming evident that, like oil some two decades ago, the era when water could be considered to be a cheap and plentiful resource is now virtually over. Increasing water demands, limited availability of this resource and higher levels of contamination mean that the water management profession will face a problem, the magnitude and complexity of which no earlier generation has had to face. Countries now really have two fundamental choices in terms of managing their transboundary water resources in the future: carry on as before with only incremental changes and a 'business as usual' attitude and thus endow their future generations with a legacy of mostly inefficient water management practices, including potential serious conflicts on transboundary water bodies; or to continue in earnest in an accelerated effort to plan, manage and use their transboundary watercourses collaboratively, constructively and fairly. Global experiences indicate that if a constructive and positive approach is adopted by the co-basin countries, it invariably contributes to the creation of a virtuous cycle where people of both countries become winners. The reverse of this approach equally brings into play a vicious cycle, where there are no winners. Potential benefits are simply lost both to the countries and to the people of the region concerned .

The root for the English word *rival* is from the Latin term *rivals,* which originally meant using the same river *(rivus)*. But as the countries become increasingly interconnected in a rapidly globalizing world, nations sharing the same river should no longer consider each other as rivals. With properly conceived frameworks, management and use of the transboundary water bodies in developing countries should result in 'win-win' situation for all the parties concerned. Contrary to popular belief, these are not necessarily zero-sum games.

Acronyms

CNRET	Centre for Natural Resources, Energy and Transport of the Department of Economic and Social Affairs
ILA	International Law Association
ILC	International Law Commission
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
ZACPLAN	Zambezi Action Plan

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Annex I

Ratification Status of the Convention on the Law of the Non-Navigational Uses of International Watercourses

Article 36 stipulates: '1. The present Convention shall enter into force on the ninetieth day following the date of deposit of the thirty-fifth instrument of ratification, acceptance, approval or accession with the Secretary-General of the United Nations. 2. For each State or regional economic integration organization that ratifies, accepts or approves the Convention or accedes thereto after the deposit of the thirty-fifth instrument of ratification, acceptance, approval or accession, the Convention shall enter into force of the ninetieth day after the deposit by such State or regional economic integration organization of its instrument of ratification, acceptance, approval or accession. 3. For the purposes of paragraphs 1 and 2, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by States.'

Status: Signatories: 16; Parties: 14; Convention not yet in force

Article 34, the Convention shall be open for signature at the Headquarters of the United Nations in New York, on 21 May 1997 and will remain open to all States and regional economic integration organizations for signature until 21 May 2000.

Participants	Signature	Ratification, Acceptance (A), Accession (a), Approval (AA)
Côte d'lvoire	25 Sep 1998	
Finland	31 Oct 1997	23 Jan 1998 A
Germany	13 Aug 1998	
Hungary	20 Jul 1999	26 Jan 2000 AA
Iraq		9 Jul 2001 a
Jordan	17 Apr 1998	22 Jun 1999
Lebanon		25 May 1999 a
Libyan Arab Jamahiriya		14 Jun 2005 a
Luxembourg	14 Oct 1997	
Namibia	19 May 2000	29 Aug 2001
Netherlands	9 Mar 2000	9 Jan 2001 A
Norway	30 Sep 1998	30 Sep 1998
Paraguay	25 Aug 1998	
Portugal	11 Nov 1997	22 Jun 2005
Qatar		28 Feb 2002 a
South Africa	13 Aug 1997	26 Oct 1998
Sweden		15 Jun 2000 a
Syrian Arab Republic	11 Aug 1997	2 Apr 1998
Tunisia	19 May 2000	
Venezuela (Bolivarian Republic of)	22 Sep 1997	
Yemen	17 May 2000	

2 The Southern African Hydropolitical Complex

Anthony Turton

2.1 Introduction

The literature on international river basin management has recently undergone an upsurge in high quality empirical research, with a number of distinct schools emerging. Examples of this include the outputs of the team working on the Transboundary Freshwater Dispute Database (TFDD) under Aaron Wolf at Oregon State University[1]; the research into global water regimes by Ken Conca[2] and his team at Maryland University; the group working at the International Peace Research Institute in Oslo (PRIO) under the capable leadership of Nils Petter Gleditsch[3]; and the efforts by Peter Ashton[4] and his team working at the Council for Scientific and Industrial Research (CSIR) and the African Water Issues Research Unit (AWIRU) in South Africa. This chapter will focus on specific outputs of these four efforts by using the Southern African Hydropolitical Complex (SAHPC) as a case study example. The first output is the finding by Wolf et al. (2003:29) that 17 international river basins are at risk, 8 of which are in Africa. The second is the conclusion by Conca and his team that there are some doubts on the emergence of an international regime for the management of transboundary river basins that is based on a converging set of core normative elements, via a global-framework or a basin-cumulative path (Conca and Wu 2002; Conca et al. 2003; Conca 2006:106). The third is the finding by Gleditsch et al. (2005) that where endemic water scarcity occurs in a shared river basin, there are substantial long-term incentives for the investment in water management measures to avoid conflictual outcomes. Finally, the work by Ashton et al. (2005) and Turton et al. (2004) will be used to show how these trends are manifesting themselves in Southern Africa, because of the existence of a Hydropolitical Complex in the region. In short, this chapter seeks to add substance to these three global-level studies, by presenting facts from the Southern African Development Community (SADC) region, specifically with respect to changes in institutional capacity since the Basins at Risk study was completed in 1999.

[1] Referred to as the Oregon School for brevity.

[2] Referred to as the Maryland School for brevity.

[3] Referred to as the Oslo School for brevity.

[4] Referred to as the Tshwane School for brevity. Tshwane is the new official name for Pretoria, the capital of South Africa.

2.2 The Oregon School

Under the very capable leadership of Aaron Wolf, the Oregon School has evolved from two basic roots. The first was the unknown number of international river basins, when it was discovered that the Register of International Rivers was grossly inaccurate because of the rapid changes in the post-Cold War global political geography (UN 1978; Wolf et al. 1999). The second was the dominance of the Water Wars literature in the 1980s and early 1990s (see Box 1), an event that arose from the collapse of Cold War bipolarity, and closely associated with the emergence of a new field of study linking the environment and national security (see Box 2).

Box 1
Selected Example of Water Wars Literature

Bulloch and Darwish 1993; Cooley 1984; Cowell 1990; de Villiers 1999; Du Plessis 2000; Gleick 1993a, 1994a, b; Graham-Leigh 2000; Homer-Dixon 1999a; Irani 1991; Jenvey 1997; Klare 2001a, b; Meissner 2000; Mkone 1997; Rake 1997; Ramana 1992; Starr 1991; Turton 2000; Wolf 1997, 1998, 1999a, b, 2002a, 2002b; Wolf and Hamner 2000.

Box 2
Selected Example of Environment and Security Literature

Alcamo 2000; Ashton and Turton (in press); Bächler 1994; Bächler and Spillman 1995; Böge 1992; Boronkay and Abbott 1997; Caldwell 1988; Conca and Dabelko 2002; Dessler 1994; Deudney 1991; Diehl and Gleditsch 2001; Döös 1994; Doyle and McEachern 1998; Ehrlich and Ehrlich 1988; Ehrlich et al. 1989; Falkenmark 1994, 1995a, b, 1997; Gebramendhin 1991; Gleick 1988, 1989a, b, c, 1990a, b, c, 1991a, b, 1992a, b, c, d, e, 1993b, c, d; Haas et al. 1995; Harf and Trout 1986; Hjort af Ornas and Salih 1989; Homer-Dixon 1990, 1991, 1994a, b, c, 1995, 1996, 1999b; Homer-Dixon et al. 1993; Homer-Dixon and Percival 1996; Jacobson 1988; Jaeger 2001; Leroy 1986; Libiszewski 1992, 1995; Lonergan 1999; Lonergan and Kavanagh 1991; Lowi 1992, 1993a, b; Mascarenhas 1989; Mathews 1989; Molvaer 1989; Myers 1986, 1987a, b, 1989, 1992, 1993a, b; Okidi 1992; Percival and Homer-Dixon 1998, 2001; Porter 1998; Postel 1984, 1989a, b, 1992, 1993a, b, 1994, 1999; Postel et al. 1996; Redclift 1985, 1994; Renner, 1989a, b; Renner et al. (undated); Rubenson 1991; Smil 1992; Suhrke 1992; Trolldalen 1992; Turton 2003a; UN (undated); Warner 2000; Westing 1986, 1991.

These two elements became the core drivers for the establishment of the TFDD (Wolf 1999a), which is the earliest known centralized repository of data pertaining to both conflict and cooperation in the transboundary river basins of the world. Using various databases, including the Foreign Broadcast Information Service (FBIS), a structure within the Central Intelligence Agency (CIA); the Conflict and Peace Data Bank (COPDAP); the Global Event Data System (GEDS); the TFDD; and a literature review, a set of 1,831 water-related events was extracted (Yoffe et al. 2003; Wolf et al. 2003). Of this total number, 507 were conflictual, 1,228 were cooperative and 96 were neutral. These events were graded on a scale of 15 points, much like a pH scale, showing the intensity of the event based on the COPDAP scale, with –7 being the most intense conflict (war), 0 being neutral and +7 being the most cooperative (voluntary merging of countries). This was called the Basins at Risk (BAR) scale. This was fed into a Geographic Information System (GIS) platform that included approximately 100 layers of spatial data covering three specific categories: biophysical (topography, runoff, climate etc.); socio-economic (Gross Domestic Product (GDP), dependence on hydropower etc.); and geopolitical (style of government, present and historic boundaries etc.). Each of these was then linked to specific international river basins, which became the basic unit of analysis.

From this GIS platform, the data was interrogated and analysed in terms of a number of various parameters. Each dataset was subject to a single and multivariate statistical analysis of the recorded events against the parameters that defined their historic settings (Yoffe et al. 2003; Wolf et al. 2003:38), which concluded the following:

a) There were no events on the two extremes of the BAR scale in recent time.
b) Most recorded interactions are of a cooperative nature with a ratio of almost 2:1 in favour of cooperation (1,228 cooperative events compared with 507 conflictive events).
c) Most interactions are mild, with 784 events falling within the BAR scale range of –1 to +1, and 1,138 events occurring between the –2 and +2 values. Together these account for 62% of all the recorded events. Stated differently, two thirds of the recorded events are of a verbal nature only, with two thirds of these carrying no formal sanction. Of the 37 recorded acute-level conflicts (–5 and –6 on the BAR scale), 30 are between Israel and its various neighbours, with non-Middle East cases relating to only five of the events of this magnitude.
d) Water acts as an irritant between countries if left unaddressed.
e) Water acts as a unifier, even when other political tensions exist between countries.
f) The major water-related issues are about quantity and infrastructure, with a full 64% of all recorded events falling into these two categories. Quality-related issues are also important, but with only 6% of the recorded events falling into this category, this is a distant second.
g) Countries cooperate over a wide variety of issues relating to water.

h) The biggest single cause of events that are associated with high conflict (–6 on the BAR scale) are related to volumes of water and hydraulic infrastructure. These account for a staggering 87% of all recorded events.

Fig. 2.1. Africa's 63 International River Basins. Redrawn from UNEP (2002:27) as shown in Ashton and Turton (2007)

Building on these core findings, Wolf et al. (2003:42) focus on vulnerability being guided by Gleick's typology of indicators (Gleick 1993a). These consist of four specific indicators: the ratio of water demand to supply; water availability per person; the fraction of water supply originating from outside of the borders of the country concerned (exogenous water); and the dependence on hydropower as a fraction of the country's total electric supply. These were taken to represent the supply side of the overall water resources equation. The BAR methodology was developed to factor these into the overall capacity of the country concerned to absorb the impacts of stress, in the form of changes to that supply (Yoffe et al. 2003). The capacity to absorb stress was translated into institutional capacity. The working hypothesis which emerged was that, "the likelihood and intensity of dispute rises as the rate of change within a basin exceeds the institutional capacity to absorb that change" (Wolf et al. 2003:43). In this regard indicators of rapid change were developed. On the supply side, the indicator tracks changes to the hydrology as a result of major infrastructure development upstream. Statistically, the results showed that existing conflicts are their most intense in internationalized basins, specifically those associated with rapid changes in the political landscape. So, for example, the collapse of the British Empire gave rise to a number of newly internationalized river basins that have known high conflict, including the Jordan, Nile, Tigris-Euphrates, Indus and Aral (Wolf et al. 2003:44). There was also a strong statistical correlation with unilateral development in a given basin in the absence of a cooperative transboundary water management institution. In this regard basins without treaties were significantly more conflictive (–2.6 on the BAR scale) than basins with treaties. There was a definite convergence of exacerbating factors however, with no single parameter acting as a clearly discernable driver of conflict in its own right. The areas where convergence occurred included the overall level of friendship/hostility, the number of water-related treaties and the *per capita* GDP, all combining to form a significant set of factors.

Emerging from this analysis was the distillation of what became known as the Basins at Risk, which was an indicator of basins that had the potential for conflict, *ceteris paribus*, at the time of the study (1999) (Yoffe et al. 2003; Wolf et al. 2003:46). These consisted of 17 river basins globally, 8 of which occurred in Africa. Significantly, six of these are found in the SADC region (Incomati, Cunene, Limpopo, Okavango, Orange and Zambezi) (refer to Table 2.1). Of even greater relevance, three of these are basins to which South Africa is a riparian (Incomati, Limpopo and Orange). The significance of this arises from the fact that South Africa is the regional hegemonic power (Turton 2005), so the logical inference is that if the Water Wars thesis is correct, one would assume that it would use its economic and military power to gain access to, and control over, strategic resources like water. This logic is given some support from the environmental security literature, which shows that South Africa already has a history of environmental scarcity-driven conflict (Percival and Homer-Dixon 1998; 2001). The reader is referred to Figure 2.1 for details of the geographic location of all international river basins in Africa, including the Basins at Risk.

The core message from the Oregon School relates to the fact that institutional capacity is regarded as being a key element in the mitigation of potential conflict arising from shared river basins. In this regard the empirical study identified two substantial factors that are relevant if conflict is likely (Wolf et al. 2003:52):

- Basins that are internationalized after the break up of a former unifying power (what Buzan (1991: 219–221) and Buzan et al. (1998:12) would call the removal of "overlay[5]") have a higher propensity for conflict. This has clear

[5] Overlay is defined as that condition when great power interests transcend mere penetration and come to dominate a region so heavily that the local pattern of security relations

implications for Africa, specifically in the post-Colonial era where newly-independent states sought to project their new-found sovereignty and define their own national interests.

- Unilateral development of the water resources within a given international river basin in the absence of a treaty or functioning river basin commission.

Using various databases, the Oregon School concluded that these conditions were present in six international river basins in Southern Africa at the time of the study (1999) – Incomati, Cunene, Limpopo, Okavango, Orange and the Zambezi – and has labelled these as being Basins at Risk (Wolf et al. 2003: 52), suggesting that they be flagged for more detailed research (see Figure 2.1 and Table 2.1). The real value of the Basins at Risk project however, lies in the fact that it was the first large-n study that was designed to identify global trends, while highlighting the needs for more detailed local studies such as the one being presented in this chapter. In this regard, it is a paradigm-buster of note, shifting scientific thinking to a new area of interest by means of a more comprehensive methodology.

Table 2.1. Basins at Risk in the Southern African Hydropolitical Complex in 1999

Basin		Riparian States		International Regime (3)	
Name (1)	Type (2)	Name	Type (2)	Basin-level	Other
Incomati	PB	South Africa	PS	First Use	SARCCUS
		Swaziland	IS	Second Use	SADC FP
		Mozambique	IS	TPTC	SADC WP
				JPTWC	SADC TCM
				JWC1	NPA
				KOBWA	
				JWC2	
Cunene	IB	Angola	IS	First Use	SARCCUS
		Namibia	PS	Second Use	SADC FP
				Third Use (PJTC)	SADC WP
				JOA	SADC TCM
				Fourth Use	ANJCC
Limpopo	PB	Botswana	PS	First Use	SARCCUS
		Zimbabwe	PS	Second Use	SADC FP
		South Africa	PS	Massingir Dam	SADC WP
		Mozambique	IS	TPTC	SADC TCM
				JPTC	NPA
				LBPTC	JPCC
				Molatedi Dam	
				LWC	
Okavango/ Makgadikgadi	IB	Angola	IS	First Use	SARCCUS
		Namibia	PS	Second Use	SADC FP
		Botswana	PS	JPWC	SADC WP
		Zimbabwe*	PS	PJTC	SADC TCM
				OKACOM	ANJCC

virtually ceases to operate, such as occurred with the European colonization of Africa (Buzan et al. 1998:12).

Table 2.1. (Continued)

Orange	PB	Lesotho South Africa Botswana Namibia	IS PS PS PS	JTC JPTC LHDA TCTA LHWC PWC VNJIS JIA ORASECOM	SARCCUS SADC FP SADC WP SADC TCM
Zambezi	IB	Angola Zimbabwe Zambia Namibia Botswana Malawi Tanzania Mozambique	IS PS IS PS PS IS IS IS	ZRA ZACPLAN ZAMCOM	SARCCUS SADC FP SADC WP SADC TCM ANJCC JCC PCC PJCC JPWC PJTC

* Basin state not part of OKACOM.
Abbreviations used: IB (Impacted Basin); PB (Pivotal Basin); IS (Impacted State); PS (Pivotal State), after Ashton and Turton (2007), Turton (2003a) and Turton and Earle (2005).
Source: (1) Wolf et al. (2003:29). (2) Ashton and Turton (2007). (3) Turton et al. (2004:387-389); Ashton et al. (2005); Heyns (1995).

2.3 The Maryland School

Recognizing the value of empirical work, the Maryland School has launched a variety of initiatives in order to discover if a cooperative international approach to the management of water is emerging. Of the world's 263 known transboundary river basins that cross international political borders (Conca 2006:93; Wolf 2002a), a key question revolves on the possible convergence of central norms and values around specific areas of governance in shared aquatic ecosystems. Lamenting the fact that the global response to the management of such systems tends to be focussed on the intended reproduction of one particular institutional form –the negotiated international agreement among sovereign states known as the regime– the Maryland School set out to understand the evolution of such a process (Conca and Wu 2002; Conca et al. 2003; Conca 2006:6). Central to this endeavour is the attempt to find rules that contain and channel deeply divisive, often contentious debates that rage at the sub-national level, often with no broad consensus on substance being apparent (Conca 2006:8). In this regard a regime is taken to be the product of inter-state bargaining in the context of the structural anarchy of the international political system in which states are forced to interact, not because it is the ideal form, but rather because it is the form that the dominant coalition in favour of regimes wants (Conca 2006:26). This is an example of what Anthony

Allan and his London-based hydropolitics researchers are starting to think of as a form of hydro-hegemony.

A regime[6] is formally defined as, "a set of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given area of international relations" (Krasner 1982:186, 1983:2).

Informed on the one hand by databases such as the Systematic Index of International Water Resources Treaties, Declarations, Acts and Cases by Basin (FAO 1978), but also linking up with the TFDD at Oregon State University and the FAOLEX legal database, Conca (2006:28) notes that there are now more than 150 basin-specific treaties that set out the rights and responsibilities of states that share a specific international river basin. By analysing these, a set of protonorms have been distilled. A protonorm is defined as a norm that has become sufficiently recognizable and well established, so as to become available for application to watershed governance in basins and watersheds that are beyond the direct reach of the agreement concerned (Conca 2006:30). Seen through the conceptual lens of an international regime, the seeming absence of open conflict over shared rivers in keeping with the Water Wars thesis, along with the general proliferation of basin-wide agreements, suggests cautious optimism about the governance of international aquatic ecosystems (Conca 2006:94).

The best example of a global rivers regime in the form of a codified legal instrument is the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (referred to for brevity as the UN Convention) that was adopted by the General Assembly in 1997 (Conca 2006:95). At the opposite end of the scale are a range of bilateral or multilateral agreements that have been negotiated between riparian states at the level of the individual international river basin. Using the TFDD and FAOLEX as primary sources of data, Conca and his team began to extract a number of river management agreements – some 62 in total – which they then subjected to a rigorous statistical analysis with reference to the core principles of the 1997 UN Convention (Conca 2006:107). These 62 agreements covered 36 international river basins, or roughly one-seventh of the global total. Of these, only a quarter (16 in total), are the first agreements for the particular river basin. For the remaining 46 agreements, there was evidence of prior agreement in the same river basin, suggesting that at least three-quarters of the agreements studied occurred in basins with a previous history of cooperation between the respective riparian states. It therefore does not appear that the idea of creating an instrument of shared governance by means of a regime is rapidly diffusing to new, previously uncovered basins (Conca 2006:107). Of the entire dataset consisting of 62 agreements, 46 are bilateral in nature while 16 contain three or more parties (Conca 2006:108). Significantly, two-thirds of the bilateral agreements are in basins where there are more than three riparian states. This is what is

[6] Attention is drawn to the fact that the Oslo School uses the term "regime" in a different way, so the reader must be aware that when used by different Schools, the concept has different meanings. This conceptual muddle complicates trans-disciplinary research, but need not undermine the ultimate value of that research, provided the reader is aware of the nuances.

known as Pike's Law,[7] which is used to show that the complexity of negotiations increases exponentially as the number of riparian states increases. This means that in a basin with complex issues, the likelihood of reaching a multilateral agreement is significantly lower than reaching a bilateral agreement.

The existence of evidence of Pike's Law in the real world is significant for two basic reasons. Firstly, multilateral agreements are substantially over-represented in the dataset used by Conca and his team. Two-thirds of the world's international river basins are bilateral (176 of the 263 known basins or 67%), yet more than three-quarters of the agreements written during the study period (49 of 62 or 79%) were in basins that had three or more riparian states within their hydrological configuration. Secondly, within the multilateral basins, the most common agreement is a bilateral regime, by a ratio of 2:1. This is an agreement that deliberately excludes one or more of the riparian states within the given river basin. The patterns of fragmented cooperation that was found in the Maryland School study, supports the finding by Wolf and his team at the Oregon School (Conca 2006:109).

The same trend is evident when the temporal distribution of transboundary freshwater regimes was analysed. The temporal distribution of the 62 agreements is marked by three distinct features: relative consistency before the 1992 United Nations Convention on the Environment and Development (UNCED); a spike in agreements immediately following UNCED; and a noticeable drop-off in agreements reached after the UNCED (Conca 2006:107–108). Statistical analysis of the dataset showed that eight core elements seem to be emerging, but each of these are coalescing around different river basin configurations in different ways. The core normative elements found in the empirical analysis are (Conca 2006:110–111):

- Equitable use
- Avoidance of significant harm to other riparian states
- Sovereign equality and territorial integrity
- Information exchange
- Consultation with other riparian states
- Prior notification
- Environmental protection
- Peaceful resolution of disputes.

In-depth analysis of the dataset revealed the emergence of two specific clusters of principles. On the one hand there was a distinct correlation around the issue of openness and transparency, such as the commitment to information exchange, prior notification and the peaceful resolution of disputes. Significantly, none of these correlates with the core principles relating to the state's right to water. In similar vein, equitable use correlated with a few content indicators, such as specific water allocation formulae, or whether domestic waters were exempt from the provisions of the agreement. From this assessment it becomes evident that one sub-set of the dataset under investigation is anchored in principles of openness and

[7] Pike's Law says that "the effort required to reach any agreement increases by the cube of the number of parties involved" (Turton 2004:251).

sustainability, whereas a second distinct sub-set is anchored in the state's right to water (Conca 2006:116).

Interpreting this work in its totality, it becomes evident that there is a strong tendency for cooperation to be concentrated in international river basins where a prior-history of cooperation already exists (Conca 2006:118). However, nowhere is there strong evidence of the diffusion of these norms, and more significantly, most of these norms seemed to be well established already at the beginning of the study period, suggesting that they did not evolve more over time. More importantly, while the 1997 UN Convention goes well beyond merely codifying existing principles at the basin-level, some of the core themes – universal participation, equitable use and the avoidance of significant harm – appear only sporadically in specific basin-level agreements (Conca 2006:119). In fact, the UN Convention, as an example of the culmination of decades of regime creation in the global management of international river basins, makes a stark and polarized distinction between the domestic sphere of water resource management, which is the sole domain of state governance, and the international sphere between co-riparian states, which is the sole domain of inter-state agreements or regimes (Conca 2006:120). There is little compelling evidence that a common normative structure is emerging in the sphere of inter-state cooperation, and there is no evidence to suggest that international legal principles are taking on greater depth, or even moving in an identifiable direction (Conca 2006:121).

This has great significance in the context of the finding by the Oregon School that the Basins at Risk are areas that are likely to be flash-points in the next decade, specifically where river basins have been recently internationalized, or where there is little institutional resilience. This is particularly relevant to South Africa, where Percival and Homer-Dixon (1998, 2001) have found evidence of a history of environmental scarcity-related conflict. The core message from the Maryland School is thus derived from the findings of the Oregon School that a history of inter-state cooperation tends to mitigate against future conflict. Therefore the six Basins at Risk in Southern Africa, are likely to be crucial in terms of understanding the extent to which water scarcity (or more specifically the impact of the cumulative modification of aquatic ecosystems whose impacts are felt across international borders), is to become a potential driver of conflict in future.

2.4 The Oslo School

The Oslo School consists of a dedicated team of empirical scientists. While recognizing the value of the work being done by the Oregon School, the Oslo School has acted independently for a lot of its existence. The Basins at Risk project (Wolf et al. 2003; Yoffe et al. 2003) has served as an input into the Oslo School however, so there is a useful cross-pollination of approaches and ideas starting to occur.

The basic point of departure by the Oslo School has been the rise in prominence of the Water Wars literature, which was associated with the decline in ideological conflict after the Cold War and a perceived shift to inter-state competition for vital resources instead (Klare 2001a, b). The first large empirical research project was launched to test these ideas being put forward by the Water Wars pundits, and resulted in a large-n study on water and interstate conflict (Toset et al. 2000). Initial analysis of this dataset showed that sharing a river increases the probability of a militarized inter-state dispute in a pair of countries, which was called a dyad. The initial finding also indicated that water scarcity was associated with conflict; and the physical geography of the river basin played a key role. In this regard, a river that was shared across a border rather than a river forming a border was most frequently associated with conflict (Gleditsch et al. 2005). A new study was launched to determine whether these initial findings were spurious (Furlong et al. 2006). This new initiative generated a more sophisticated dataset on international boundaries, but it found that the relationship between shared rivers and conflict was not spurious with respect to boundary length (Furlong and Gleditsch 2005). Arising from this work comes a more nuanced understanding of the core problem, specifically associated with data limitations.

With respect to the Water Wars literature, the finding by Homer-Dixon (1999b:179–180) that war is most likely to occur over non-renewable resources, but where renewable resources were concerned, water had the greatest potential for violent conflict, became the foundation for the Oslo School. Noting that the Water Wars literature is divided into two broad camps, the research programme at the Oslo School was designed to test the various hypotheses that underscored the logic within each approach (Gleditsch et al. 2005). Neomalthusian authors foresee a growing level of water scarcity in a number of countries, which they hypothesize, will increase competition in the face of growing population, eventually becoming a trigger for a resource conflict (Homer-Dixon 1990, 1991, 1994a, c, 1996; Irani 1991; Klare 2001a, b; Starr 1991). The Cornucopian authors argue that cooperation over water is more common than conflict (Turton 2000; Wolf 1999a, b; Wolf et al. 2003).

In an effort to refine these empirical findings, a specific dataset was developed using the 1978 study from the Centre for Natural Resources, Energy, and Transport of the Department of Economics and Social Affairs at the United Nations (CNRET 1978). This attempted to distinguish between three specific categories of riparian relations: upstream/downstream shared across an international border; rivers demarcating an international border; and a mixed set. This proved problematic however, as only 9% of all coded rivers had a clear upstream/downstream categorization, while 39% ended up in a category that was not clearly definable (Gleditsch et al. 2005). This ambiguity left open one major challenge to the Water Wars hypothesis – the fuzzy boundary scenario – in which countries sharing a common resource might fight over the political boundary being formed by the river, rather than the resource itself. In developing a dataset that could test for this scenario, the CNRET database contained little information about either Asia or Africa. As a result a new dataset was created with four fundamental ambitions in mind:

- All principle river basins of the world were to be represented.
- The ratio between upstream/downstream and boundary-demarcating rivers was to be clarified with a high level of reliability.

- The magnitude of the resource was to be accurately captured in all cases.
- Non-contiguous basin-sharing dyads were to be accurately captured and represented.

In order to achieve this, a decision was made to test the Oslo dataset (Toset et al. 2000) against the most comprehensive dataset then in existence – the TFDD at Oregon State University. There was thus a convergence between the work being done by the Oregon and Oslo School's at this point in time. The first test indicated 51 missing basins from the Toset dataset, with many examples of different coding and names, adding to some degree of confusion. This resulted in the compilation of a new dataset that was capable of showing minute detail of each tributary and sub-basin within each of the TFDD's 261 known international river basins.[8] Within each contiguous boundary-crossing river basin the exact number of river crossings was measured, and the length of each boundary-demarcating river was assessed. This was processed into a GIS system for later analysis. Historic boundary data changes between 1944 and 1996 were sourced from O'Loughlin et al. (1998) and fed into the new dataset. From this a detailed assessment was made using both bivariate and multivariate analyses, designed specifically to test both the Neomalthusian and Cornucopian views regarding water and conflict (Gleditsch et al. 2005).

Some of the findings of this analysis were consistent with both the Oregon and Maryland School's with respect to a history of peaceful interaction. In this regard, it was found that a history of peaceful interaction tended to be a good indicator of future peaceful resolution of disputes (Gleditsch et al. 2005). The political make-up of the dyad was also found to be very important. What were identified as "Inconsistent Regimes[9]" was found to be the most likely to give recourse to violence (Mansfield and Snyder 2002; Hegre et al. 2001). The second most dangerous constellation was one involving a single democracy.[10] Another configuration that was found to have a propensity towards violence was a dyad containing two autocracies.[11] Significantly there was no statistical indicator that the level of development in one country within a given dyad had any correlation with the possibility of conflict. This is possible because there is a correlation between the level of development and regime type (democracy, autocracy etc.), so the resultant dynamics of this had been accounted for elsewhere in the analysis (Gleditsch et al. 2005). Another important finding was the correlation between basin size and conflict, which statistically was more relevant than either the length of the river boundary

[8] Attention is drawn to the fact that we now know of 263 international river basins (Conca 2006:63; Wolf 2002a; Wolf, personal communication).

[9] Attention is drawn to the issue of definition here. The Oslo School uses the word "regime" to describe a government type, whereas the Maryland School uses the word regime to define an agreement that has been reached between two sovereign states. This highlights the complexity when working across disciplines in an empirical study where datasets have been generated using different variables.

[10] This refers to a dyad in which one country is a democracy and one is not.

[11] This refers to a dyad in which neither country is a democracy, and where both countries are autocratic in nature.

or the number of river crossings within each basin. However, in contrast to the Neomalthusian literature, there was no statistical correlation between water stress and specific conflict events. While there is evidence to show that dry countries seem to have a higher risk of interstate conflict, which might indicate that where endemic water scarcity occurs in a shared river basin, there are substantial long-term incentives for the investment in water management measures that avoid conflictual outcomes (Gleditsch et al. 2005).

The core message from the Oslo School is that there is little statistical evidence to support the Neomalthusian view that water and conflict are causally related. Stated differently, the Water Wars thesis does not stand up in the face of rigorous interrogation via a statistical analysis of the real world. There is some statistical evidence to support the Cornucopian view however, specifically where shared rivers occur in dyads that have higher levels of economic development. This suggests that wealthier countries can afford to compensate for scarcities by means of either substitution or technological innovation. The strongest results were found where the overall importance of the given river basin was high – something that has been factored into the work by Ashton and Turton (2007). The most important message is that empirical analyses are only as good as the datasets on which they are based, so it is to this issue that we can now turn our attention.

2.5 Pulling It All Together: The Tshwane School

The findings of the three sets of empirical studies noted above show the following:

- The Oregon School has developed a robust methodology that makes use of a global database that contains every known international river basin in it, supported by an events database that is time-specific covering a period from 1979–1994. Analysis from this school has resulted in the identification of 17 international river basins that were deemed to be "at risk" at the time of the study, six of which are found in Southern Africa. The core message is that being at risk is a function of rapid changes to the hydrological aspects of a shared river basin in the face of institutional inability to deal with those rapid changes. The Basins at Risk are therefore in this category because of their apparent institutional weakness in the face of current and future demands on the resource-base. The value of the Basins at Risk study is that it developed a new methodology capable of showing global trends, and it flagged certain basins for more detailed future study.
- The Maryland School makes use of the TFDD that was developed by the Oregon School, supported by an events database covering the period 1980-2000. From this a set of 62 agreements was selected and these were analysed to determine the extent of normative deepening or convergence. The core message is that there is no evidence of normative deepening, but there is some evidence of the convergence around specific issue-clusters that do not challenge the notion of state sovereignty in regime negotiation. Specifically, a cooperative

history of inter-state cooperation tends to mitigate conflict, so a good indicator of river basins to be substantially at risk is detail of the history of that inter-state cooperation as evidenced in regimes, treaties or negotiated agreements.
- The Oslo School makes use of a variety of databases, including the TFDD. Events databases also come from a variety of sources including border changes[12] from 1944–1996 and militarized interstate disputes (MID[13]) from 1816–2001. Analysis of this more sophisticated dataset shows that cooperation is possible, and indeed likely, if there is a history of cooperative interstate behaviour in a given river basin. The core message is that dataset integrity has a major impact on the results of large-n empirical studies, and that Neomalthusian views have little support from a sophisticated analysis of the real world. There is some evidence of Cornucopian views being manifest however.

Having noted the evolution of these three schools, particularly when the findings of the Oregon School suggested the need for a more detailed study of the real-world context in Southern Africa, a series of research projects were launched. The first of these was a tentative study that examined existing theory and tried to gather some information on inter-state agreements in Southern Africa (Turton 1999). This was never formally published, but became the foundation for future work. From this a formal project was launched to capture and record a detailed hydropolitical history of the international river basins to which South Africa is a riparian (Turton et al. 2004). This was based on primary archival material from government, supported by secondary sources where they had made a useful contribution by interpreting historic events. Arising from this was the first compilation of formal agreements to which South Africa was a signatory. With thirty agreements being listed (Turton et al. 2004:387–389), this was immediately found to be at odds with the Atlas of International Freshwater Agreements that had been generated from the TFDD programme at Oregon State University (UNEP 2002). This variance was largely due to the difficulty of collecting data in developing countries for a large-n study, and was not the fault of the TFDD research team, or the result of a flawed methodology. In an attempt to gain greater insight, a second formal project was initiated (Ashton et al. 2005), which located 59 agreements to which South Africa was a signatory, and placed the full text of each agreement into a database that can be interrogated by means of specific search terms.

This is significant because the empirical research of the Oregon, Maryland and Oslo Schools is all highly dependent on quality events data, supported by a sophisticated and robust coding system capable of dealing with nuances. Conca (2006:94) cites Hamner and Wolf (1997) as having identified 145 international treaties that deal with some non-navigational aspect of international river basins. We now know that the Southern African component of that dataset was underrepresented, because of data unavailability, by at least 20 agreements for South Africa alone – one country in the SADC region consisting of 13 member states. Conca (2006:361–364) lists 19 agreements to which South Africa is a signatory,

[12] See O'Loughlin et al. (1998).

[13] See Ghosn and Palmer (2003) for the most recent MID dataset.

so we know that his dataset was under-represented for the same reasons. The greater number of agreements now known to exist in the SADC region is relevant in light of the finding by all three schools that a history of cooperation is a good indicator of conflict mitigation. It is to an assessment of these that we now turn our attention.

The six Basins at Risk identified by Wolf et al. (2003:29) are listed in the first column of Table 2.1. The second column gives the classification of each of these river basins in terms of the Southern African Hydropolitical Complex work that has been done by the Tshwane School (Turton 2003a; Turton and Earle; 2005:154; Turton and Ashton 2004; and Ashton and Turton; 2004; 2007). The third column lists the riparian states to each of these Basins at Risk. Attention is drawn to the Okavango Basin, which is listed in Table 2.1 as the Okavango/Makgadikgadi Basin, because in reality the Okavango is a sub-basin of the Makgadikgadi Basin to which Zimbabwe is also a riparian on the Nata River (Ashton and Neal 2003:34). For this reason Zimbabwe is listed as a special case as indicated by the asterisk in Column 3. The fourth column shows the classification of the riparian state in terms of the Southern African Hydropolitical Complex work noted above. This fifth column lists the abbreviated name of each known international regime applicable to each specific river basin, as sourced from Turton et al. (2004: 387–389), Ashton et al. (2005) and Heyns (1995). The final column lists the abbreviated name of each known international regime that is applicable in a context other than within the specific river basin as sourced from Turton et al. (2004: 387–389), Ashton et al. (2005) and Heyns (1995). The last two columns are relevant in terms of the findings by all three Schools that a history of prior peaceful inter-state interaction is a good indicator of future conflict mitigation capability (Conca 2006:118; Gleditsch et al. 2005; Wolf et al. 2003:43). This is introduced to support the finding by Gleditsch et al. (2005) that where endemic water-scarcity is the norm, there are substantial long-term incentives for the investment in water management measures to avoid conflictual outcomes. The weight of this evidence will be used to enhance the finding that these were Basins at Risk (Wolf et al. 2003:29), by determining the extent to which institutional development has evolved since the initial research was conducted in 1999.

2.6 The Southern African Hydropolitical Complex as a Concept

The SADC region is characterized by three critical facts. Firstly, it contains a large number of international river basins (see Figure 2.1) – at least 15 if the Okavango is treated as a sub-basin of the Makgadikgadi basin[14]– forming different patterns

[14] If the Makgadikgadi Basin is separated from the Okavango, then the Nata River becomes relevant because it crosses from Zimbabwe into Botswana, emptying into the Makgadikgadi pans, which is also the terminus of the Okavango system in rare years of high flood. Zimbabwe is not riparian to the Okavango, but both the Okavango and Nata rivers are

of hydraulic linkages across political borders. Secondly, four of the economically most developed states in the region – Botswana, Namibia, South Africa and Zimbabwe – are water scarce, and are known to be approaching the limits of their readily available water resources. Consequently endemic water scarcity is likely to impose limitations to their economic growth potential in the near future, potentially elevating the issue of water resource management to the level of a national security concern (Turton 2003b:88). This is what is known as the securitization of water resource management, which can become a driver of future conflict if left unmanaged. Finally, these four states are also linked by virtue of their co-riparian status in the Orange and Limpopo basins, both of which are strategically important to the respective riparian states, because of the high level of economic activity that they support. Even more significantly however, these four countries are all riparian to the Basins at Risk as defined by Wolf et al. (2003:29).

Seen in this light, it becomes necessary to understand de-securitizing dynamics at work. De-securitization is understood as being the normalization of inter-state interaction, through the institutionalization of the conflict potential, by removing water resource management from the security domain, and treating it as a technical issue only (Turton 2003b:90). This proceduralizes the processes involved (Conca 2006:8), making them less conflict-prone and hence more predictable. The SAHPC provides this crucial function, by linking riparian states in a series of inter-state arrangements at a level other than the river basin, showing the extent that water issues have become drivers of international relations in their own right. This is based on the core logic that water scarcity occurs at the level of the basin (also known as the watershed), but remedies are found at a level other than the international river basin, in what is known as the Problemshed (Allan 1999; Earle 2003). This is relevant in light of the finding by Gleditsch et al. (2005) that countries in which endemic water scarcity occurs in a given shared river basin have substantial long-term incentives for the investment in water management measures to avoid conflictual outcomes. Similarly, it is relevant that more economically developed countries tend to be less conflictual, because they can develop alternative coping strategies, by allocating water away from the thirsty agricultural sector using sectoral water efficiency as a vehicle, or by negotiating cooperative agreements with co-riparian neighbours. This is consistent with the ingenuity thesis that has been developed by Homer-Dixon (1994a, 1995, 1996, 2000), and the concept of second-order resource[15] scarcity that was developed by Ohlsson (1999:146). It is argued that this is the case in Southern Africa.

sub-basins of the Makgadikgadi Basin, which is an internally draining basin or endoreic system.

[15] A second-order resource is defined as the ability of societies, administrative organizations and managers responsible for dealing with natural resource scarcities (so-called first-order resources), to find appropriate tools for dealing with the social consequences of a first-order scarcity (Ohlsson 1999:161). It is consequently a scarcity of a specific form of resource, or what Homer-Dixon (2000:22) calls either technical or social ingenuity. Stated differently, it is second-order resources that need to be mobilized if water scarcity is to be prevented from becoming a driver of violent conflict, so this is the

The SAHPC is thus predicated on the understanding that two core facts are always relevant in any hydropolitical analysis. Firstly, all river basins are not equal. This is consistent with Gleditsch et al. (2005) as evidenced by the various attempts to develop datasets that accurately capture the nuanced nature of basins with respect to endogenous water, boundary-crossing, boundary-demarcating and other specific criteria that were shown to be statistically relevant. The issue of dependence on exogenous water has also been shown to be relevant by the entire range of empirical analyses noted above. Secondly, all riparian states are not equal. Some are more dependent on a given river basin for their future economic security than others. Some are also more reliant on exogenous water than others. Even more significantly, some have greater economic capacity than others, just as they have differing military capabilities. So for ease of reference, the Southern African Hydropolitical Complex as a concept is based on the analytical distinction between river basins and riparian states, using the simple terminology of "pivotal" versus "impacted".

Using the work by Buzan (1991), Buzan et al. (1998) and Schulz (1995) as a point of departure, a conceptual model was developed that factors in the hydropolitical dimension of international relations within the SADC region (Turton 2003a, c; Turton and Earle 2005; Ashton and Turton; 2007). The rationale for this is based on the fact that international rivers provide permanent linkages between different states within the Southern African Regional Security Complex as originally defined by Buzan (1991:210), but the *exact* nature of the relationship is too nuanced to be understood merely in terms of geography, and a study that focuses only on the river basin level misses this complex reality. Definitions of the four key components of the Southern African Hydropolitical Complex are as follows (Turton 2003a; Ashton and Turton, 2007):

- Pivotal States are riparian states with a high level of economic development[16] that also have a high degree of reliance on shared river basins for strategic

critical independent variable that is missing from the finding by Gleditsch et al. (2005) that there are substantial incentives for the investment in water management measures that avoid conflict. It is a core element of the argument being presented in this chapter, that the presence of second-order resources in Southern Africa, at the right time and in the appropriate format, are what has allowed the Basins at Risk, to evolve from the high risk profile evident during the original study (Wolf et al. 2003:29), to the lower risk profile evident in 2005. If the Oslo School had to develop a suitable indicator of second-order resource mobilization, then they would probably be able to show why some countries succeed in mitigating water-related conflict, while others do not.

[16] This higher level of economic development means that the Pivotal States also have the capacity to project their power outside of their borders. It is significant that all four of the Pivotal States have a history of military activities beyond their own sovereign territory. South Africa was active militarily across many countries in Africa during the Cold War (Bernstein and Strasburg 1988; Turner 1998). In the immediate post-Apartheid period, South Africa was involved in Operation Boleas in Lesotho, along with Botswana, in an action that was officially sanctioned by SADC (Turton 2004:268). Namibia and Zimbabwe both have troops in the Democratic Republic of Congo (DRC), engaging in

sources of water supply. In southern Africa, four states fall into this category: Botswana, Namibia, South Africa and Zimbabwe.
- Impacted States are riparian states that have a critical need for access to water from international river basins that are shared with a Pivotal State, but appear to be unable to negotiate what they consider to be an equitable allocation of water. In southern Africa, seven states are seen to be in this category: Angola, Lesotho, Malawi, Mozambique, Swaziland, Tanzania and Zambia.
- Pivotal Basins are basins that face closure,[17] and which are also strategically important to any one (or all) of the Pivotal States by virtue of the range and magnitude of economic activity that they support. In southern Africa, three basins fall into this category: Orange, Limpopo and Incomati. Significantly, all three of these were Basins at Risk in 1999 (Wolf et al. 2003:29).
- Impacted Basins are those where at least one of the Pivotal States is a co-riparian, and where there appears to be less freedom of choice for an Impacted State to develop its water resources in a manner that is deemed to be fair and equitable. In southern Africa, six basins are in the category: Cunene, Maputo, Okavango, Pungué, Save-Runde and Zambezi. Significantly, three of these were Basins at Risk in 1999 (Wolf et al. 2003:29).

By using the Southern African Regional Security Complex as defined by Buzan (1991:210), it is possible to use these concepts, linked as they are via the SAHPC, to develop a more nuanced understanding of the patterns of co-operation and competition in international river basins. More specifically, a nuanced understanding is possible by analyzing the hydropolitical configuration[18] of Pivotal States versus Impacted States in each basin. This gives an indication of the hydropolitical

military actions that have not been sanctioned by SADC. Zimbabwe also deployed troops inside Mozambique to protect its interests during the Mozambique Civil War (Turner 1998:131–145).

[17] Basin closure is defined as a river with no utilizable outflow of water (Seckler 1996). A basin is said to be facing closure when all of the available water has been allocated to some productive activity and there is no more water left to be allocated (Svendsen et al. 2001:184). Basin closure therefore becomes a key variable in our understanding of Basins at Risk, because once that threshold is reached, water scarcity can become a trigger for conflict, unless sufficient second-order resources can be mobilized to mitigate that potential conflict.

[18] A simple ratio of Pivotal States to Impacted States in a given basin can give some indication of likely strategies that can be considered by each state. For example, a basin with a Pivotal State downstream, is likely to have a regime that is negotiated upstream, in order to protect the interests of the Pivotal State. Similarly, a basin with a Pivotal State upstream, might not have enough incentive to negotiate a basin-wide regime downstream, and might thus manifest as a bilateral arrangement in a multilateral basin. Where more than one Pivotal State occurs in a given basin, there is more chance of a basin-wide agreement being negotiated, because it suits the combined interests of those states. The theoretical work by Lowi (1990:386) is useful in this regard, even if it is couched in the language of Realism (a trend that is outdated in contemporary International Relations literature).

dynamics, and more importantly, the level of incentive for the negotiation of a conflict mitigating solution. Within the SADC region, water has a long history of politicization, having played a prominent but subtle role during the conflict years of the last three decades (Turton 2004: 254–266). While the overt nature of southern African hydropolitics has changed somewhat in the post-Apartheid era, the underlying drivers remain largely unchanged. The four economically most developed states in the region are also those facing the greatest scarcity of water; they all share international river basins with other states, they are all riparian to the Basins at Risk, and they all face significant limitations to their future economic growth prospects as a result of looming water shortages. In short, the jury is still out as to whether this range of issues will drive conflict in future, so it becomes a good case study for both the Neomalthusian and Cornucopian views on hydropolitics. Stated differently, the SAHPC becomes a good case study to show the extent of change that has occurred in the Basins at Risk since the initial TFDD study in 1999.

The structural configuration of the SAHPC is presented in Figure 2.2, which shows the cross-cutting linkages across various river basins in which specific states have a strategic interest. It is an alternative to a river basin perspective of the region such as that presented in Figure 2.1, so it represents the Problemshed, rather than the individual watersheds.

As stated above, not all international river basins are equal in strategic importance or in terms of their inherent conflict potential. The Orange, Limpopo and Incomati basins in the SADC region have been classified as Pivotal Basins, based on three critical criteria: a significant portion of the basin falls within Pivotal States; those Pivotal States have a high reliance on the water from these basins; and each basin is approaching the point of closure.

Returning now to the Basins at Risk that Wolf et al. (2003:29) identified in 1999 (Table 2.1), an assessment of the current state of affairs with respect to the evolution of international agreements, regimes and river basin organizations can be made. This will enable the reader to assess the extent and direction of change, if any, to the Basins at Risk status over time.

2.7 The Incomati River: A Pivotal Basin in the SAHPC

The Incomati River is a Pivotal Basin with three riparian states. South Africa (a Pivotal State) is upstream, with a portion of one of the tributaries (the Komati) flowing through Swaziland (an Impacted State) and back again into South Africa, making the latter both an upstream and downstream riparian in the basin. The downstream riparian is Mozambique (an Impacted State). The basin is strategically important to South Africa because the energy-base of the country consists of coal-fired electricity generation, with most of the coal-fields located across the watershed in the Limpopo Basin. The Incomati and its various tributaries are thus a significant source of the water needed to convert coal into electricity. For this reason there are a number of transfers out of the basin. This can be regarded as being a form of resource capture. The basin is important for Swaziland because hydropower is generated at Maguga Dam on the Komati, and irrigated agriculture forms the foundation of the local economy. The Mozambique portion of the basin lies in a semi-arid area that supports the population around the capital city of Maputo.

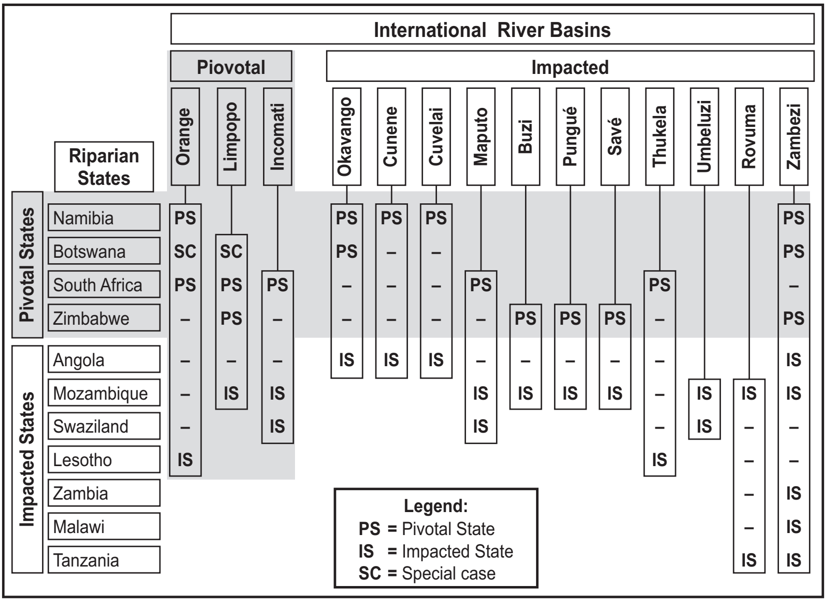


Fig. 2.2. Structural configuration of the Southern African Hydropolitcal Complex (Ashton and Turton 2007)

The hydropolitics of the basin have been described in detail by a number of authors (Turton 2004:273–274; Turton et al. 2004:324–363; Turton and Earle 2005:157–164; Vas and Pereira 1998; Vas 1999) and space precludes a detailed analysis of these processes here. What is relevant however, is the evolution of water management regimes and river basin institutions over time. Table 2.1 shows seven different basin-specific regimes that have evolved over time. The foundation of this regime creation lies in an agreement that was entered into between South Africa and Portugal in 1926 (Ashton et al. 2005; Heyns 1996:264; Turton et al. 2004:387). This agreement, commonly known as the First Use Agreement, was actually about the management of the Cunene River, but it also included so-called rivers of mutual interest between South Africa and Portugal as the colonial power of the time, controlling both Angola and Mozambique. While the First Use Agreement is primarily about the Cunene, it is also relevant to the Incomati, Maputo and Limpopo as well, because it laid the foundation for all future cooperative arrangements in those basins.

In 1964 the so-called Second Use Agreement was reached between South Africa and Portugal (Ashton et al. 2005; Heyns 1996:264; Turton et al. 2004:387). As with the earlier agreement, it was also applicable to the Cunene, Incomati, Maputo and Limpopo basins. In 1967 Swaziland acceded to the Second Use Agreement (Turton 2004:273), showing the significance of this historic evolution from the Cunene and so-called rivers of mutual interest, specifically to the Incomati and Maputo. In 1983 the Tripartite Permanent Technical Committee (TPTC) became the first basin-wide regime in Southern Africa, applying to the Limpopo, the Incomati and the Maputo river basins. This did not function well, largely because of the Cold War that strained relations between South Africa and Mozambique (Vas and Pereira 1998:119; Turton 2004:273). As a direct result of this failure, a bilateral agreement was reached between Swaziland and Mozambique in 1991, called the Joint Permanent Technical Water Commission (JPTWC), but it did not function well (Turton 2004:274). Two bilateral agreements were then negotiated between South Africa and Swaziland in 1992 (Turton 2004:274; Turton et al. 2004:388; Ashton et al. 2005). The first established the Joint Water Commission (JWC1), and the second established the Komati Basin Water Authority (KOBWA). This was based on the successful model that had evolved from the Lesotho Highlands Water Project (LHWP) and is an example of Pike's Law at work. In 1996 a Joint Water Commission (JWC2) was established bilaterally between South Africa and Mozambique, to manage both the Incomati and the Limpopo basins (Turton et al. 2004:388; Ashton et al. 2005)

With the cessation of hostilities associated with the demise of the Cold War, the civil war in Mozambique came to an end, and Apartheid collapsed in South Africa. This acted as a strong stimulus for the normalization of relations between all riparian states, which was done via the rejuvenation of the TPTC, being the first basin-wide regime to have been created in the region. This was brought to a successful conclusion when the Incomaputo Agreement was signed in 2002 (Ashton et al. 2005; Turton et al. 2004:389). This is a complex agreement recognizing the rights of all riparian states along with detailed water allocation and water quality formulae.

From this it is evident that no less than seven different regimes have existed in the Incomati River Basin over time, not counting the smaller agreements that were negotiated in support of these agreements, and excluding the agreements that existed at a regional level, but were no less applicable. In the latter category we find the Southern African Regional Commission for the Conservation and Utilization of the Soil (SARCCUS) that was signed in 1948 (Turton 2004:268). This has ten standing committees, one of which deals with water (Ohlsson 1995:60). The Southern African Development Community was established in 1992 when the SADC Founding Protocol (SADC FP) entered into force, after the collapse of the Cold War (Turton 2004:264). This created a regional political framework through which all future inter-state relations will be structured. While this is not a water agreement, it is a profoundly important regime, because it creates the enabling environment through which all other interstate-relations are regulated, including water. It comes as no surprise therefore, that the very first issue-specific protocol to be signed after South Africa became a member of SADC, was the SADC Water

Protocol (SADC WP), which was signed in Johannesburg in 1995 (Turton 2004:264). The SADC Protocol on Transport, Communications and Meteorology (SADC TCM) was signed by 12 Member States in Maseru on 24 August 1996, establishing a regional cooperative framework for infrastructure and meteorological affairs. The Nkomati Peace Accords (NPA) were signed in 1984 between South Africa and Mozambique, in the hope that a non-aggression pact could form the foundation of inter-state relations during the years of intense military conflict (Turton 2004:261). There are consequently at least four non-basin specific regimes that are applicable to the Incomati River Basin, as well as a non-aggression pact[19] that created an enabling environment for water resource management to be used as an instrument for peace.

In conclusion, the Incomati River Basin has at least seven basin-specific regimes, four non-basin specific regimes and one non-aggression pact. It also contains the first basin-wide regime ever created in the Southern African region, which was dysfunctional during the height of the hostilities associated with the Cold War, but which survived nonetheless, and is fully functional today. This comprehensive basin-wide agreement recognizes the right of all riparian states to specific volumes of water, elaborating water-sharing formulae, and specifying water quality standards. In short, the Incomati is no longer a Basin at Risk, because while there are high demands being placed on the resource-base, the institutions have survived during difficult years, have shown a high level of resilience, and have evolved substantially since 1999. The KOBWA Agreement is a complex bilateral arrangement, with specific water allocation formulae, and it is nested[20] within the larger basin-wide arrangement known as the Incomaputo Agreement.

2.8 The Cunene River: An Impacted Basin in the SAHPC

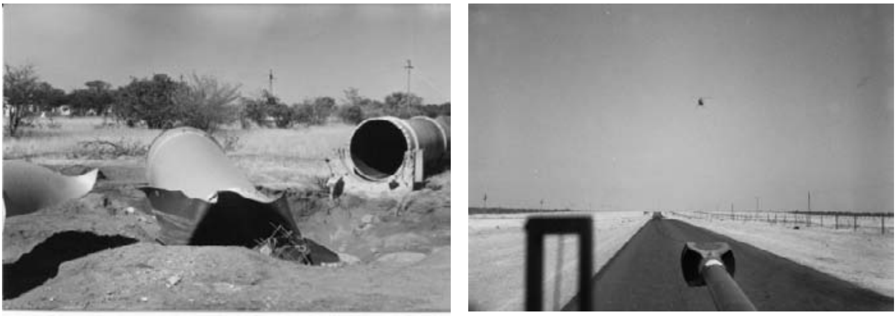
The Cunene River is a relatively uncomplicated basin. There are two riparian states – Angola (an Impacted State) upstream and Namibia (a Pivotal State) downstream – with the river forming a significant portion of the border between these two countries. The real significance of this basin lies in three specific issues. Firstly, it is one of the few that has actually seen military action,[21] with attacks on

[19] The non-aggression pact became relevant in halting the further deterioration of relations between South Africa and Mozambique at the height of the Mozambican Civil War, leading immediately to an agreement on the Zambezi Basin (Turton 2004:261–262), and subsequently to the launch of the LBPTC in the Limpopo, and a revitalization of negotiations in the Incomati and Maputo basins a few years later.

[20] This is similar to the situation in the Orange River basin where two bilateral arrangements are now falling under the coordination of a larger basin-wide regime.

[21] The other river basins that saw military action were the Cuvelai, the Okavango and the Zambezi. In the case of the latter, the Zambezi Basin was the home of the Angolan rebel movement UNITA, and it also saw a lot of action during the Zimbabwean Second War of Chimurenga and the Mozambican Civil War.

hydraulic infrastructure forming a feature of the hydropolitical history of the basin (Photos 1 and 2).



(a) **(b)**

Photo 1. The Cunene River Basin was a theatre of military action during the Namibian War of Independence, and the Angolan Civil War. The water transfer pipe from the Cunene to the Cuvelai system was bombed on occasion (**a**), necessitating protection by combat patrol in the Ruacana area (**b**).

Secondly, the basin is strategically important for the downstream country due to its hydropower potential, and because it supports the people in central southern Angola and economic activity for a large portion of the Namibian population. Finally, the Cunene is a strategic donor for the adjacent Cuvelai Basin, which is an ephemeral river system that supports a major part of the Namibian population and is thus of great political and social importance. It is therefore impossible to understand the Cuvelai without also appreciating its link to the Cunene. However, in terms of generally agreed practice in IWRM and the provisions of the SADC Water Protocol, a river basin should be managed as a unitary whole. In the case of the Cuvelai, negotiations are currently taking place between Angola and Namibia to establish a River Basin Commission. While there is a hydraulic connection between the two basins, the hydrology, socio-economic and environmental issues differ to such an extent, that they need to be managed by different entities capable of close liaison. For these reasons functioning commissions are needed on both basins.

Photo 1a shows battle damage to the Cunene-Cuvelai pipeline during the Namibian War of Independence, when it was bombed by Cuban pilots. The transfer pipeline was so important that it was buried in a minefield to the right of the road in Photo 1b, which shows a helicopter gunship giving support to a ground-based combat patrol. The nature of the military action as it occurred in the Cunene and Cuvelai basins has been graphically documented by Hooper (1990), who describes the activities of a Special Operations Unit called Koevoet[22] with a high degree of

[22] The word "koevoet" means crowbar in Afrikaans. This was the name of a special operations counter-insurgency police unit. They saw extensive action along both sides of the border between Namibia and Angola, specifically in the Cunene and Cuvelai river basin

accuracy, *albeit* in dramatic fashion. The historic elements of these events have been covered by Turner (1998:34–55), specifically as they pertain to the Cunene region (Turner 1998:39–45); and Steenkamp (1983) who gives precise detail of a number of operational actions in both the Cunene and Cuvelai basins. Specific detail of some of the operations around Ongiva (in the Cuvelai Basin) and Xangongo (on the banks of the Cunene) are given by Steenkamp (1983:246). This suggests that the Cunene Basin is a prime candidate for analysis of the propensity of a transboundary river to give rise to violent inter-state confrontation, because it was a theatre of both conventional and guerrilla war.

(a)

(b)

Photo 2. Clearing land mines before advancing through Namacunde in the Cuvelai Basin (**a**) and into Ongiva (**b**) where the main water tower was destroyed because of fears that it was being used as an observation post.

Photo 2a shows combat engineers sweeping for anti-tank mines before advancing through Namacunde in Angola. This also gives an idea of the relative flatness of the terrain in the Cuvelai Basin. The town of Ongiva, formally known as Pereira d'Eça, was home to a large contingent of Angolan forces, so it was captured by South African soldiers on 26 August 1981 after two days of fighting during Operation Protea. This happened after the SADF knocked out the Angolan military base at Xangongo on 24 August 1981. In this action the water supply infrastructure at Ongiva was severely damaged (Photo 2b). Significantly, the axis of advance during Operation Protea was the Cunene River, with one task force being deployed on each bank (Turner 1998:40). After being captured, both Xangongo and Ongiva were held by the South Africans for many years, and used as forward operating bases for strikes deeper into Angola (Turner 1998:41). A number of Russian T34[23] tanks were knocked-out in the process (Photo 3a). These actions have tended to destroy the infrastructure in the entire Angolan reach of both the

areas. Koevoet operated up to Namacunde in Angola, mostly in a counter-insurgency (COIN) role, with the SADF operating from Namacunde northwards, mostly in a conventional role.

[23] The T34 tank was a World War II fighting vehicle, having seen action mainly along the Russian Front and in the Battle of Stalingrad. It was therefore a surplus tank based on old technology, with thousands having been sold into Africa during the Cold War period. Their shot-out hulks litter many an African landscape today.

Cunene and the Cuvelai river basins (Photo 3b), decimating the human population and destroying the economic viability of southern Angola. This places major emphasis on post conflict reconstruction, with water resource management and infrastructure as a substantial component of that initiative.

(a)

(b)

Photo 3. A Russian T34 Tank that was shot-out during the battle for Xangongo (**a**) and the destroyed bridge over the Cunene River (**b**). Infrastructure is always damaged in times of war.

The hydropolitics of the basin has been described by a number of authors (Ashton 2002; Heyns 1996; Meissner 2000:103–131; 2003:258–268; Turton 2004:254–267) so additional analysis will not be done here due to space limitations. Table 2.1 shows five different basin-specific regimes that have evolved over time. As with the Incomati case noted above, the foundation of regime creation was the First Use Agreement between South Africa and Portugal, which was finalized in 1926 (Ashton et al. 2005; Heyns 1996:264; Turton 2004:271; Turton et al. 2004:387). This was followed in 1964 with what became known as the Second Use Agreement (Ashton et al. 2005; Heyns 1996:264; Turton et al. 2004:387). Both of these agreements were specific to the Cunene, although they also dealt with other rivers of mutual interest between South Africa and Portugal. With the planned development of the hydropower capacity around Ruacana and Calueque, an agreement was reached between South Africa and Portugal in 1969 (Third Use Agreement) (Ashton et al. 2005; Heyns 1996:264), creating the Permanent Joint Technical Commission (PJTC) and the Joint Operating Authority (JOA), but these never really got off the ground due to the war. Engineering started on the Calueque Dam, the Ruacana hydropower scheme and the Cunene-Cuvelai interbasin transfer, but this was disrupted at different times because of the war (Heyns 1996:264) (see Photo 1a). Regime development became stalled during the various wars[24] that occurred in the Cunene Basin, but immediately after hostilities had ended, the Fourth Water Use Agreement was reached between Angola and Namibia in 1990 reinstating the PJTC, charged with the responsibility of managing *inter alia* the Epupa Dam hydropower scheme and the supply of water to northern Namibia (Heyns 1995, 1996:264). At the same time another agreement was

[24] These include the Namibian War of Liberation and the Angolan Civil War.

reached between the two riparian states that established the JOA, charged with the responsibility of managing the regulating structure at Gové Dam, and the Ruacana hydropower infrastructure (Heyns 1995, 1996:264). Included in the ambit of the JOA is the repair to the Gové Dam arising from damage caused by military action.

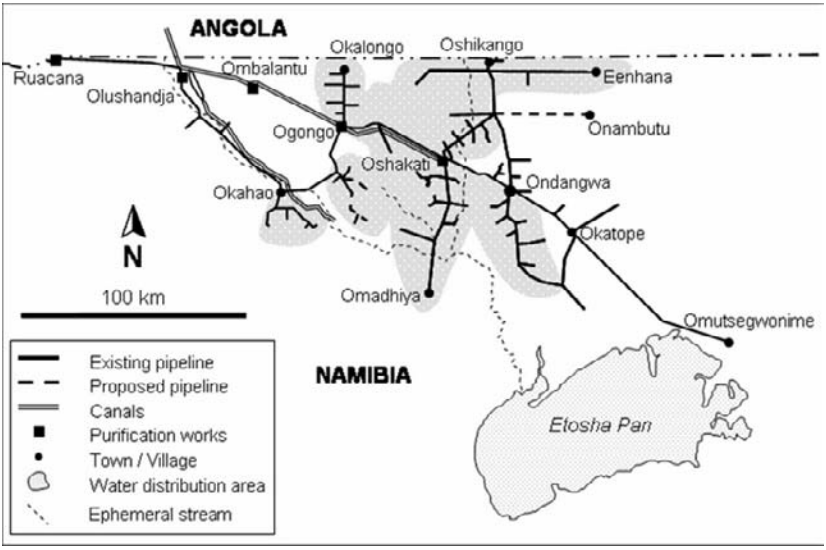


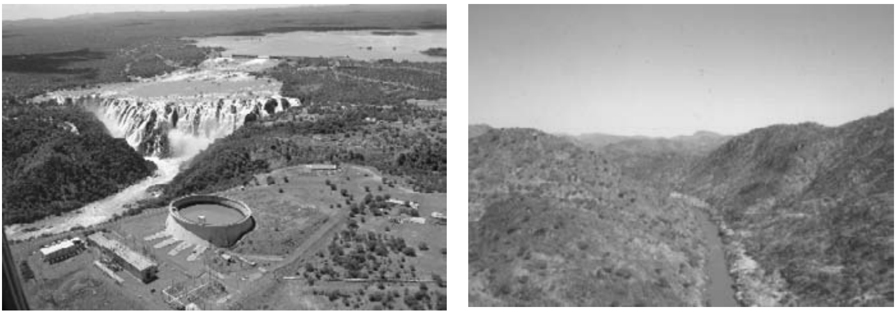
Fig. 2.3. Detail of the Cunene-Cuvelai inter-basin transfer. The substantial hydraulic infrastructure in Namibia is now being linked back up to Angola via Santa Clara, Namacunde and Ongiva as part of post-conflict reconstruction. This will take Cunene water via the Cuvelai back into the Cunene Basin.

From this assessment it is evident that at least five regimes have existed in the Cunene River, excluding the non-basin-specific agreements, of which five exist. Four of these (SARCCUS, SADC FP, SADC WP and SADC TCM) have been described in the section on the Incomati. The fifth is the Angolan Namibian Joint Commission of Cooperation (AMJCC) which was formed in 1990 (Heyns 1995; Ohlsson 1995:59). This is an enabling instrument that has a large number of functions, all of which are of a cooperative nature, one of which relates to water resource management.

In conclusion the critical element in understanding the Cunene River Basin is that even though it was a hot theatre of the Cold War, there was still a degree of cooperation between the Angolan and Namibian water resource managers throughout the conflict. It is also important to note that the conflict was about ideology and national liberation, but never about water. Where water infrastructure was damaged, it was because of the perceived tactical advantage that it yielded at the time. Water towers were destroyed because they were used as forward observation posts in the absence of high ground throughout the flat and geologically featureless Cuvelai Basin (Photo 2b). Pipelines were destroyed to deny combat troops on both sides access to the water during protracted hostilities (Photo 1a). Water infrastructure was therefore a target of war, but never a cause of it. The water management structures that have evolved are therefore resilient, and serve as the foundation for future post-conflict reconstruction and economic development. From this assessment it is evident that the Cunene River is no longer a Basin at Risk as defined by Wolf et al. (2003:29), having five basin-level regimes and being supported by five other non-basin-specific regimes. It must be noted that the Cunene is probably the most important single water resource for Namibia, given that there are no permanent flowing rivers on Namibian soil (other than a small reach of the Okavango and Zambezi to be described later), associated with the substantial human population that is supported by this resource.

The Cunene at Ruacana Falls (Photo 4a) is a source of hydroelectric power and an inter-basin transfer to the Cuvelai system, which has the densest human settlement of any river basin in Namibia. The Cuvelai is also an ephemeral river (Marsh and Seeley 1992:5; Jacobson et al. 1995; Heyns et al. 1998:66; Seeley et al. 2002:199) so the flow regime is highly erratic and the resource is therefore unreliable as a foundation for human security on its own. In the future the construction of the Epupa Dam (Photo 4b) will become a source of hydrological security of great strategic significance to Namibia.

This bears testimony to the conclusion by Gleditsch et al. (2005) that a country with endemic water scarcity has a vested interest in developing water management measures that avoid conflict. It is this rationale that is central to the logic of the SAHPC as a vehicle to reduce the risk that was identified by Wolf et al. (2003:29).



(a) **(b)**

Photo 4. Shared water resources play a major role in developing both Angola and Namibia, particularly during post-conflict reconstruction. The Cunene river flows over the Ruacana Falls (**a**) and makes its way down to the future site of the Epupa Falls Dam (**b**), where it becomes a linear oasis in the desert.

2.9 The Limpopo River: A Pivotal Basin in the SAHPC

The Limpopo River Basin has four riparian states. Botswana, a Pivotal State, is upstream and is a very arid country. South Africa and Zimbabwe, both Pivotal

States, are in the middle reaches of the basin with the border between them being formed by the main stem of the Limpopo River. Mozambique, an Impacted State, is the downstream riparian where the Limpopo meanders across a huge flood plain. There are no dams on the main stem of the river where it forms an international border, so there has never been a need to jointly manage hydraulic infrastructure. There is the possibility of future dams on a tributary that divides South Africa and Botswana (JPTC 1991). The basin is strategically important to each country for different reasons. For Botswana, it supports the bulk of the human population that live in a belt wedged between the Kalahari Desert and the narrow belt of better-watered land adjacent to the South African border. For South Africa it sustains a lot of mining and agriculture, and it also forms a substantial ecological resource for the Kruger National Park. For Zimbabwe, it is the only reliable source of water other than the Zambezi, which for geological reasons is impossible to develop for irrigated agriculture. In Mozambique, it is the only reliable water in a very arid portion of the country with a large population density. The river basin is closed and the water has been over-allocated, so it is a Pivotal Basin in the SAHPC. There is no chance for substantial future development of the resources, although some dams are still being considered (JPTC 1991), so a major challenge in the basin relates to three specific issues. Firstly, the need to re-allocate water out of the agricultural sector to the industrial sector is a pressing and complex one. Secondly, water quality management is a growing concern, specifically as the result of non-point source pollution arising from mine closure, acid mine drainage and sewage effluent return flows. Finally, equity issues are of major concern, with a number of different dimensions to this problem. International equity relates to water sharing arrangements, specifically with Mozambique having been disadvantaged over time. Intergenerational equity relates to ecological flows through the Kruger Park. Racial equity issues are specific to South Africa, where historically disadvantaged farmers in particular, have the need for re-allocation and government support. Recent land claims have re-allocated farms to communities that were previously dispossessed and their expectations are high, placing additional demands on the already over-allocated resource.

The hydropolitics have been described in detail by a number of authors (Mohammed 2003; Turton 2004:271–272; Turton et al. 2004:263–323; Turton and Earle 2005:166–167; Vas and Pereira 1998). The evolution of water management regimes has been complex as shown in Table 2.1, with at least eight basin-specific regimes. As with the Incomati and Cunene river basins, regime creation started in 1926 with the First Use Agreement (Ashton et al. 2005; Heyns 1996:264; Turton et al. 2004:387). Following a similar trajectory to these other basins, the Second Use Agreement was signed in 1964. Evolving from these Rivers of Mutual Interest Agreements was the Massingir Dam Treaty that was signed in 1971 (Ashton et al. 2005; Turton et al. 2004:387), allowing the development of a dam downstream from the Kruger Park in Mozambique. In 1983 the TPTC was established between South Africa, Swaziland and Mozambique, significantly leaving out Zimbabwe. The reason for this omission was Zimbabwe's refusal to join the Constellation of Southern African States (CONSAS) that had been proposed by South Africa, as a non-aggression pact, based on regional economic development (Turton 2004:259).

Zimbabwe became particularly belligerent towards South Africa in 1980, placing pressure on the so-called Front Line States to join forces in the struggle against colonialism, capitalism and racism, which they did by founding the Southern African Development Coordination Conference[25] (SADCC) (Bernstein and Strasburg 1988: 11; Turton 2004:259; Turton and Earle 2005:162). A low intensity civil war in South Africa got under way as a direct result of this, with the first military attacks inside the country occurring after the announcement by the African National Congress (ANC) that it would intensify the armed struggle (Gutteridge 1990:167). Guerrilla forces took hostages in what became known as the Silverton Bank Siege, an oil refinery was attacked with rocket propelled grenades (RPGs) and a train was derailed, each of which underlined the intention of the liberation movements to intensify the armed struggle inside South Africa (Gutteridge 1981:8). As a direct result of these events, the first cross border military assault was launched by South African Special Forces in 1981, where they attacked a guerrilla base in Mozambique (Geldenhuys 1984:140). A year later pre-emptive strikes were launched into Lesotho to clear out guerrilla forward bases (Gutteridge 1983:35). In 1983 a massive car bomb was detonated outside Military Intelligence Head Quarters in Pretoria, taking the war right into the heart of the Limpopo River Basin (Turton 2004:261). It was against this political background that the decision was taken to exclude Zimbabwe from the TPTC, which was designed to foster better relations with the other riparian states in an attempt to offer sufficient development inducement to them not to allow their territories to be used by guerrilla forces infiltrating into South Africa. This is why the NPA were signed in 1984 (Turner 1998:131–145), so that a non-aggression pact could form the foundation of interstate relations in all fields of development, including water resource management (Turton 2004:261).

As a result of the exclusion of Zimbabwe, the TPTC did not function very well, so applying Pike's Law to the problem, a bilateral regime was negotiated between South Africa and Botswana during 1983, giving rise to the Joint Permanent Technical Committee (JPTC) (Ashton et al. 2005; Turton 2004:272; Turton et al. 2004; 387). This was followed in 1986 by the establishment of the Limpopo Basin Permanent Technical Committee (LBPTC) with all four riparian states as signatories (Ashton et al. 2005; Turton 2004:272; Turton et al. 2004:388). This took place after the Nkomati Peace Accords came into effect, which served to stabilize interstate relations to the extent that joint development of the resource again became feasible. Botswana was experiencing an acute water shortage in the capital Gaborone, so an agreement was reached in 1988 for the cross-border supply from the Molatedi Dam. This agreement has escaped the notice of most scholars, because it was negotiated at the height of Apartheid, and it involved the so-called independent

[25] The SADCC is the fore-runner of the present-day SADC, which had as its core objective, the isolation of South Africa and the prosecution of the various wars of liberation and independence that were then raging (Bernstein and Strasburg 1988). The effect of this was to securitize water resource management in South Africa with all foreign relations falling under the ambit of the State Security Council (SSC) (Turton 2004:260; Turton and Earle 2005:163).

Bantustan of Bophuthatswana. Given the strategic significance of water and the need to secure the supply for Gaborone, the Government of Botswana overcame the political dilemma of negotiating with a Bantustan, by having the agreement signed by their national water utility rather than by a Government Department (Turton et al. 2004:320). The bilateral JPTC was upgraded to a full commission in 1989 (Turton et al. 2004:388). Regime evolution was completed when, in 2003, a basin-wide agreement was reached between all riparian states to establish the Limpopo Watercourse Commission (LWC) (Treaty 2003).

From this it is evident that there are eight basin-specific regimes pertaining to the Limpopo River. In addition to this there are six non-basin specific regimes that are relevant to the Limpopo. The SARCCUS, SADC FP, SADC WP and SADC TCM have been described in the section on the Incomati River, so they will not be discussed further. The NPA are also relevant to the Limpopo, because they created an enabling environment that eventually led to the normalization of relations between South Africa and Mozambique, and hence played a role in the evolution of the basin-wide LBPTC, and subsequent LWC over time. Hydropolitical scholars tend to ignore this fact by filtering out non-aggression pacts from datasets, on the pretext that they are not about water resource management. The bilateral agreement between South Africa and Botswana in 1997 that established the Joint Permanent Commission of Cooperation (JPCC) is also an enabling instrument, covering a range of issues from crime to migration, but significantly also including water resource management (Turton et al. 2004:403). Based on this evidence it is clear that the Limpopo is no longer a Basin at Risk, having a number of regimes that have proven to be remarkably resilient over time. It must also be noted that the failure of the TPTC can be explained by the fact that it was a very ambitious agreement – in essence an agreement between three sovereign states to manage three different river basins (one of which had four riparians) – something that exceeds the norms of contemporary river basin regimes as determined by the Maryland School. Failure was therefore almost inevitable, simply because the scope of the intended regime was too wide in the first place. It should therefore be seen as a learning curve experience, rather than a direct failure, remembering that river basin regimes are a relatively new phenomenon. Regime evolution in this case also provides evidence of Pike's Law at work, when bilateral arrangements were negotiated after the failure of more inclusive basin-wide agreements. Significantly however, this case also shows how basin-wide arrangements are negotiated once the political climate is conducive to a normalization of relations. Under these conditions the country that pulled out of the relationship for reasons of protest, usually returned in a significantly weaker position than before (Turton and Earle 2005:167). There is consequently an important lesson to be learned from the Limpopo basin as a result of these hydropolitical dynamics.

2.10 The Okavango/Makgadikgadi River: An Impacted Basin in the SAHPC

The Okavango River Basin has three riparian states, flowing from an area of high rainfall into the Kalahari Desert where the water is finally lost to evaporation in the Okavango Delta (Mendelsohn and el Obeid 2004:63). Technically the Okavango is a sub-basin of the Makgadikgadi basin, of which the Nata River is also a component (Ashton and Neal 2003:34). It is an endoreic system that does not flow into the sea, much like the Cuvelai Basin alongside it. Angola, an Impacted State, is upstream and is well-watered, having access to a number of large river basins for their own national development. In the middle reach of the system, it becomes the only river[26] to flow across Namibian soil, which it does for a short distance as it crosses the entrance to the Caprivi strip. This is the only well-watered part of Namibia, a Pivotal State, being the location of the Zambezi as well. Botswana, also a Pivotal State, is downstream with a large human population deriving livelihoods from the resource-flows associated with the Okavango Delta. The Okavango Delta was created because of tectonic activity, with fault lines that are associated with the Great Rift Valley of Africa defining the physical boundaries and ecological dynamics of the wetland, which is also a RAMSAR site (McCarthy and Ellery 1993; Scudder et al. 1993:45). There is a hydraulic connection to the Zambezi River via the Selinda spillway, with back-flooding into the Okavango during periods of extreme high flow in the Chobe/Linyanti/Zambezi (Davies et al. 1993:94). On occasion the Okavango Delta floods over the Thamalakane fault line via the Boteti River into the Makgadikgadi salt pans, which are also fed by the Nata River that comes into Botswana from Zimbabwe. Therefore depending on how one defines the overall river basin, there are either three or four riparian states.

The basin is strategically important to each of the riparians for different reasons. For Angola, it represents a potential hydropower and irrigation resource for the post-conflict reconstruction of an area that was devastated by the Angolan Civil War and Namibian War of Liberation. For Namibia it represents the second most important river basin (after the Cunene), with planning for the use of the resource as a strategic back-up, thereby allowing the dams in other parts of the Eastern National Water Carrier (ENWC) system to be drawn down to lower levels. This is important because of the high evaporative losses in Namibia, so a strategic reserve like the Okavango will enable Namibia to make better use of its existing resources, secure in the knowledge that during times of drought, there will be a reliable back-up. Planning underway will develop a pipeline from Rundu at the entrance to the Caprivi strip, to join with the existing ENWC, finally delivering the water into the reticulation system that supports the capital city, Windhoek (Ashton 2000b; CSIR 1997). Research is ongoing regarding the possible use of confined

[26] The Kwando River is a tributary of the Zambezi and it also flows across the Caprivi strip roughly parallel to the Kavango, as the Okavango is locally known in Namibia. See Mendelsohn et al. (2002:11) and Mendelsohn and el Obeid (2004:9) for more detail.

aquifer systems for the storage of this water, in order to conserve as much of the resource possible from evaporative losses. For Botswana, it represents a substantial resource for rural livelihood support, as well as the generation of foreign currency through ecotourism. Botswana has previously tried to use the resource for mining, but this was vigorously opposed (Scudder et al. 1993). If Botswana does develop the resource, then it opens the door to Namibian plans, so there is somewhat of a checkmate situation prevailing. Public pressure in Botswana is high, where Namibia is portrayed by the media as being the "bad" neighbour intending to dry up the delta (Jenvey 1997; Mkone 1997; Ramberg 1997; Weekly Mail and Guardian 1996a, b). This rhetoric is devoid of any truth and the Namibian Government is known to be responsible, with a track record of cooperation throughout its short[27] but stable existence.

The hydropolitics of the basin have been described by a number of authors (Ashton 2000a, 2002, 2003; Ashton and Neal 2003; Turton et al. 2003). A significant feature of the basin is that it is internationalized via a global stakeholder in the form of the environmental movement that will not allow the Okavango Delta to be harmed in any way (Scudder 1990; Scudder et al. 1993), even though the best available scientific research has shown that the proposed pipeline in Namibia will have an impact so small that currently available technology will be unable to measure it (Ashton 2000b; CSIR 1997: I–15). The basin was also the scene of intense fighting during the Namibian War of Liberation and the Angolan Civil War.

Major fighting took place around Caiundo during Operation Askari on 3–6 January 1984, when the FAPLA[28] 11th Brigade, with support from Cuban troops, attacked an SADF task force moving north-east of Cuvelai (Turner 1998:44). There was a fierce battle and the attackers were driven northwards in disarray. After this the territory fell under alternative control, oscillating between UNITA[29] and FAPLA. Fighting between August 1987 and July 1988 was heavy, being seen by some commentators as the climax of the Cold War in the region (Turner 1998:115). During the course of fighting in Cuanda Cubango and Moxico provinces, FAPLA suffered one of the largest defeats to befall any army since the Second World War (Turner 1998:115). Operation Modular began modestly, as UNITA, with the support of the South Africans, began to harass FAPLA forces along the Lomba River. South African mechanized units became fully engaged, leading to a major battle on 3–4 October 1987. This was followed by the FAPLA withdrawal to Cuito Cuanavale, where the final battle of the war took place after Operations Hooper and Packer softened the target. The existence of heavy armour

[27] Namibia became independent on 21 March 1990 when UN Resolution 435 was implemented, and has been an active and willing participant in river basin management regimes since then, often playing a leading role in regime creation and subsequent evolution.

[28] This is the acronym for the Angolan armed forces, which were called Forcas Armadas Populares de Liberaçao de Angola (Popular Armed Forces for the Liberation of Angola).

[29] This is the acronym for the US and South African backed rebel movement known as the Uniao Nacional para Independencia Total de Angola (National Movement for the Total Liberation of Angola).

in the form of Russian T54/55 tanks[30] is significant (Photo 5a), as this represented a substantially stronger and more modern force than was present in the Cunene and Cuvelai basins around Xangongo and Ongiva (Photo 3a). This drew in South African heavy armour from 82 Brigade, with the loss of three Olifant main battle tanks, when they got bogged down in a minefield around Cuito Cuanavale and drew heavy fire. This was the final battle of the war, with the Cubans losing the will to fight, and with the SADF seeing the chance for genuine peace in the region as a result of secret negotiations[31] between senior officers of the South African security forces and Mr. Nelson Mandela. Both sides claim victory, but in truth the war was a dirty affair, with no clear victor in the professional opinion of the author, himself a veteran. When the author returned to the scene some years later, he counted no less than 100 tanks and their support vehicles on the Caiundo-Menongue road alone, all of which lay destroyed, either from aerial strafing, or through close combat when they become bogged down in minefields. As with the Cunene and Cuvelai basins, the Okavango saw heavy fighting with substantial loss of life and the total destruction of all infrastructure. There are many minefields throughout the basin, most of which are unmapped. There is consequently a major role to play in post conflict reconstruction, with water resource management being a key instrument for the return to reasonable levels of household food security.

(a)

(b)

Photo 5. The Okavango River Basin was a theatre of war and has been devastated as a result. A Russian T54/55 tank lies destroyed in a minefield near Caiundo (**a**) while the people of Menongue are forced to draw water daily after negotiating a minefield (**b**). Post-conflict reconstruction is a major priority.

[30] Unlike the T34, the T54/55 was a formidable fighting vehicle. It had been developed by Russia as the main battle tank during the early part of the Cold War, so it contained sophisticated armour and technology.

[31] This has been documented in Turton, A.R. (2004), An Untold Story: The Private Memoirs of Anthony Richard Turton., Unpublished Manuscript. Many of the photos in this chapter have also been sourced from this manuscript.

The number of regimes in the basin is presented in Table 2.1. As with the Incomati, Cunene and Limpopo river basin's noted above, regime creation started with the First Use Agreement in 1926 (Ashton et al. 2005; Heyns 1996:263; Turton et al. 2004: 387). This was followed in 1964 with the Second Use Agreement (Ashton et al. 2005; Heyns 1996:264; Turton et al. 2004:387). This facilitated contact between the Angolan and Namibian authorities, although the latter were at that time South African citizens, because Namibia was being administered as a *de facto* province of South Africa under United Nations mandate.

Regime creation stalled from 1969 to 1990 because of the Namibian War of Liberation, the Angolan War of Liberation and the Angolan Civil War, during which time hydraulic installations became the target for military forces (Turton 2004:276) (Photo 1a). Again Pike's Law came into play during 1990 when a bilateral agreement was signed between Botswana and Namibia that established the Joint Permanent Water Commission (JPWC) for the management of both the Okavango and the Chobe-Linyanti-Zambezi transboundary aquatic ecosystems (Turton 2004:26). This is one of the few river management regimes that has groundwater management as a component to it. As hostilities receded, a bilateral agreement was reached between Angola and Namibia, endorsing the Third Water Use Agreement that was reached between the former colonial powers in 1969, creating the PJTC (Turton 2004:276). As the Cold War ended, the political processes started to normalize, and South Africa gave Namibia its independence. This led to the Permanent Okavango River Basin Water Commission (OKACOM) being created in 1994 (Turton 2004:277). It is significant that this happened shortly after Namibia gained its independence, lending credence to the finding by Gleditsch et al. (2005) that water scarce states have substantial long-term incentives to develop water management measures that avoid conflict. It also happened at a time when the Kasikili/Sedudu Island dispute was referred to the International Court of Justice for a ruling, thereby settling the issue in a peaceful manner (Ashton 2000a:96–98; 2002).

Consequently there are five basin-specific regimes at work within the Okavango River Basin. These are supported by five non-basin specific regimes, all of which have been described already (SARCCUS, SADC FP, SADC WP, SADC TCM and ANJCC). Based on the balance of evidence presented, the Okavango River Basin is probably no longer a Basin at Risk, although it has had little substantial institutional development[32] since 1999, and the outbreak of regional peace is allowing post-conflict reconstruction to be considered for the first time.

2.11 The Orange River: A Pivotal Basin in the SAHPC

The Orange River is a complex basin. Unlike many of the other Basins at Risk, there has never been any prolonged military conflict in the Orange Basin. Where it

[32] A secretariat for OKACOM is in the process of being formed with foreign donor assistance.

has existed it has been short, sharp and focussed, usually conducted by Special Forces with surgical precision, but once using conventional forces under SADC mandate during Operation Boleas. The upper riparian is Lesotho (an Impacted State) with a high economic reliance on South Africa. The other three riparians are all Pivotal States. The hydropolitical configuration has all three Pivotal States in downstream positions with a ratio between Pivotal States to Impacted States of 3:1, making it somewhat unique[33] in the context of the SAHPC. South Africa has a high economic dependence on the Orange, with a staggering 100% of the gross geographic product (GGP) of Gauteng Province being dependent on inter-basin transfers involving the Orange system (Basson et al. 1997:55). Namibia is the downstream riparian with a high reliance on the Orange for economic activity in the southern portions of that country. Botswana is an interesting case, because it contributes no stream-flow and uses none of the surface water in the basin, but it is riparian because of the ephemeral Nossob and Molopo rivers, both of which form the border with South Africa, and neither of which have made a hydraulic contribution to the Orange in living memory. Botswana has made use of its legal rights to engage in all the activities of a "normal" riparian state, and by so doing has opened the door to future water supply from the LHWP, which is technically feasible but probably too expensive to be realistic at this time. Nonetheless, Botswana now plays an important role in decisions around the future development of the basin, wielding hydropolitical power beyond its own expectations, because of the change in dynamics that it can create by voting either one way or another in the basin-wide management structure. It is for this reason that the details of the Zambezi River, to be explained in the next section, are so critically important within the overall framework of the SAHPC.

The Orange River is best understood in terms of six strategic issues. The first relates to the high reliance on the resource for two of the Pivotal States in the SAHPC (South Africa and Namibia). The second relates to the complexity associated with water allocation away from the agricultural sector to industry and the services sector. The third relates to the deteriorating water quality, specifically associated with managing a closed river basin, where base flow in years of drought

[33] The PS:IS ratios in the rest of the Basins at Risk are as follows: Incomati (1:2); Cunene (1:1); Limpopo (3:1) – similar to the Orange but the location of the Pivotal States is different (all three being upstream in the Limpopo); Okavango (2:1); Orange (3:1); and Zambezi (3:5). The PS:IS ratio is a very crude indicator, but it does give some insight into possible negotiation strategies and hence the prognosis for future conflict preventing regimes. For example, where a PS is downstream of a significant resource, it is likely to tie in the upstream neighbour by means of a regime. Where a PS is upstream, it is more likely to favour unilateral development of a significant resource, or where an agreement is needed, then it is likely to favour a bilateral arrangement. Where a number of PS's are clustered together, they are likely to form a coalition and negotiate a solution that favours their joint positions, because they all have a vested interest in a cooperative arrangement. These nuances are possible to assess in the context of the SAHPC, but are not possible to detect if an analysis focuses only on the river basin as the unit of analysis, even when basins are compared to each other.

is adversely affected by effluent return flows and specific pollution arising from acid mine drainage. The fourth relates to good neighbourliness, as enshrined in the South African National Water Act, which stipulates that minimum ecological flows and volumes agreed to in specific water sharing regimes must be adhered to. At the heart of this issue is the emotive aspect of balancing resource protection with resource use. The fifth relates to inter-basin transfers, which is a central feature of the Orange River system. Finally, the Orange River forms a border between Namibia and South Africa. This border is being disputed (Ashton 2002; Hangula 1993; Meissner 2001), making the Orange River an excellent case for an empirical study of how water resource managers deal with sovereignty issues that are typically conflict-drivers in their own right, and presumably more so under conditions of endemic scarcity.

The hydropolitics of the basin have been described in detail by a number of authors (Ashton 2000a; 2002; Blanchon 2001; Turton 2003c:136-163; Turton 2004:267-271; Turton and Earle 2005:165-166; Turton et al. 2004:88-262) and space precludes a more detailed analysis here. Regarding regime creation, the basin history starts in 1948 with SARCCUS. The first major inter-basin transfer was developed in response to the Sharpeville Massacre, taking water from the Orange River, via the Fish River to the Sundays River (Turton et al. 2004:183-188). This is the birth of the aggressive phase of the South African hydraulic mission, creating the mindset that water security was essential for future economic growth and political stability. In 1978 the Joint Technical Committee (JTC) was created to investigate the feasibility of what was later to become the LHWP (Turton 2004:268). This led to the signing of the LHWP Agreement in 1986, which created the JPTC, the Lesotho Highlands Development Authority (LHDA) and the Trans-Caledon Tunnel Authority (TCTA) (Ashton et al. 2005; Turton 2004:269). Various new agreements were signed, each dealing with specific issues as they arose, during the different evolutions of the LHWP. Details of these are excluded from this analysis for brevity (see Ashton et al. 2005; Turton 2004:269; Turton et al. 2004:241). In 1999, the JPTC was upgraded to the Lesotho Highlands Water Commission (LHWC).

As the Cold War ground to an end and South Africa could disengage itself from the various regional wars of liberation, the independence of Namibia became a reality. As a result the Permanent Water Commission (PWC) was established in 1999 between South Africa and Namibia. At the same time the Vioolsdrift and Noordoewer Joint Irrigation Scheme (VNJIS) was developed. This scheme is interesting because the feed canal crosses the border between South Africa and Namibia, largely because of geophysical reasons, but this means that one canal feeds both countries, so there can never be a situation such as that which exists on the shared rivers between India and Pakistan. The Joint Irrigation Authority (JIA) was established to manage this scheme. As soon as Namibia became independent, negotiations were started on the establishment of the Orange-Senqu River Commission (ORASECOM), which came to fruition in 2000. This became the first basin-wide regime to be established in terms of the SADC WP, but the fourth to be established in Southern Africa (Turton 2004:270).

From this it is evident that nine different regimes have evolved over time. While the initial focus was on bilateral arrangements between South Africa as the regional hegemon and the other riparian state (Turton 2005), a basin-wide regime was negotiated with relative ease when the circumstances were right. The two bilateral agreements both have complex water sharing formulae, and the LHWP Agreement eventually formed the foundation on which KOBWA, PWC and the Incomaputo Agreement was based. This shows evidence of cascading from basin to basin, contrary to the global trend identified by Conca (2006:106). In addition to this, there are four non-basin specific regimes – SARCCUS, SADC FP, SADC WP and SADC TCM – each of which have already been describe elsewhere in this chapter.

In conclusion, the Orange River Basin is the most stable international river basin in the entire SADC region, with the highest number of basin-specific regimes, some of which occurred after 1999 when the initial Basins at Risk study was done. It has the most sophisticated water resource management structures and the underlying agreements that have evolved over time, have shown a deepening in complexity, to the point where they have become the foundation for subsequent agreements in the other Basins at Risk. More significantly, the Orange River case provides some of the best evidence in support of the SAHPC, because of the activities of Botswana, specifically in linking the Orange issue to the Zambezi *problematique* to be discussed in the next section.

2.12 The Zambezi River: An Impacted Basin in the SAHPC

The Zambezi River Basin is the most complex of all the Basins at Risk, given the sheer number of riparian states. With eight riparians, three are Pivotal States (Zimbabwe, Namibia and Botswana), while the rest are Impacted States (Angola, Zambia, Malawi, Tanzania and Mozambique). It has a hydropolitical configuration of three Pivotal States in the middle reaches of the river, and five Impacted States in both an upstream and downstream location. With the large number of riparian states, it is a classic example of the likelihood of Pike's Law to be at work, given the inherent complexity of reaching consensus between so many different sovereign states, each with different levels of development and each with possibly opposing perceptions of their respective national interest.

The Zambezi Basin has been the location of different forms of military conflict during the Cold War period. In Angola, the rebel UNITA movement had its headquarters at Jamba, between the Cuito River (a tributary of the Okavango) and the Cuando River (a tributary of the Zambezi). There was consequently a lot of heavy fighting in that area, mostly of a conventional nature, with many minefields still in existence (Photos 5a and b). Further downstream, the Zambezi Valley formed a theatre for the guerrilla activities associated with the Rhodesian Bush War[34], also

[34] For a description of some of the combat in the Zambezi valley, see Reid-Daly (1982) and Stiff (1985). This gives some insight into the government Special Forces side of the Rhodesian Bush War, but these perspectives are not balanced and are likely to be contested by guerrilla veterans. It gives an insight into the mindset of the time however. For an alternative view see Frederikse (1982).

known as the Zimbabwean War of Liberation or the Second[35] War of Chimurenga (Frederikse 1982:366). The fighting here consisted mostly of skirmishes with guerrilla forces as they infiltrated from Zambia. Two specific incidents took place that illustrates the type of warfare that was being conducted in the then Rhodesian reach of the Zambezi Valley. Guerrilla forces operating inside present day Zimbabwe used shoulder-fired SAM 7 surface to air missiles to bring down two commercial airliners. The first attack occurred on 3 September 1978 when Air Rhodesia Flight RH 825 was shot down *en route* to the capital city from Kariba (Stiff 1985:215–217; Turner 1998:27). Of the original 48 civilian passengers on board, 18 survived the subsequent crash, but guerrilla forces were waiting on the ground and ten of these survivors were bayoneted to death (Reid-Daly 1982:346–347). The second attack occurred in 1979 where all 59 passengers were killed when the SAM 7 rocket hit the aircraft in flight. The conflict in Rhodesia was thus a dirty war with emphasis on Counter Insurgency operations in which Special Forces were mostly used. Atrocities were committed on both sides (Frederikse 1982:119–147), with a strong undercurrent of terrorist-styled actions against non-combatants, such as the downing of the two civilian airliners in an act similar to the Lockerbie air disaster, and various forms of brutal state repression.

Similarly, the rebel RENAMO[36] movement in Mozambique was based around Meringue and the Gorongosa massif, with heavy fighting in the Zambezi Basin area (Turner 1998:126). It was here that the war was probably the most protracted and intense. The Beira corridor, a vital economic life-line for land-locked Zimbabwe, was threatened by RENAMO forces, prompting the Zimbabwe Government to commit troops to the defence of this infrastructure on 31 May 1982. This deployment did not meet its tactical objective as RENAMO expanded its base of operations in Tete and Zambezia Provinces. In January 1983, a RENAMO spokesman claimed that during the previous year, 1,582 actions had been engaged in, with 123 acts of railway sabotage having been initiated, resulting in the destruction of 57 trains. Furthermore, the communiqué stated that 1,521 soldiers of the Mozambique Armed Forces (FAM) had been killed. At that time RENAMO had around 6,000 trained fighters in Mozambique, with new operational initiatives expanding their area of operations out of the Zambezi Basin into the Limpopo. FAM launched a counter-offensive in 1983 under the official name of "The 50'th Birthday of President Samora Machel", but was only able to claim 318 RENAMO killed, with 102 captured. By the winter of 1984, the Mozambique Government decided to open serious negotiations with the South African Government, designed to stop support of the latter to the RENAMO forces. This is the background to the NPA that were signed in 1984 (Turner 1998:131–145). From this it is evident that the armed conflict in the lower Zambezi Basin was mostly of a guerrilla and counter insurgency nature, with few of the conventional battles that were typical of the Angolan reach of the Cunene/Cuvelai and the Okavango basins. The

[35] The First War of Chimurenga took place from 1896 to 1897 (Frederikse 1982:366).

[36] The acronym for the Resistencia Nacional de Moçambique (National Resistance Movement of Mozambique).

type of terrain dictated the battle plan in Mozambique, with RENAMO forces generally controlling the ground while government forces had total control of the air. The unintended consequence of this was the near total destruction of all villages by air bombardment, in the belief that support was being given to RENAMO forces on the ground. This literally wiped out villages in their entirety with non-combatants being forced to live under the canopy of dense bushes in constant fear of air attack. Photo 6a shows a small unit of RENAMO soldiers crossing a river in a rudimentary boat, while Photo 6b shows a team of South African Special Operations personnel navigating through the thick bush around Meringue during the latter phase of the Mozambican Civil War. Both photos show the type of terrain and general lack of infrastructure in the Zambezi Basin in Mozambique.

(a)

(b)

Photo 6. RENAMO operations in the Zambezi Basin used rivers in the absence of roads (**a**), which were at best tracks in the dense bush (**b**). All bridges and conventional roads were mined and regularly ambushed. The dense bush provided cover from air strikes.

The hydropolitics of the basin have never been described accurately in great detail, but some authors have covered aspects of the core drivers at work (Bannink 1996; Borchert 1987; Borchert and Kemp 1985; Dale 1992; Matiza et al. 1995; Maluwa 1992; Mpande and Tawanda 1996; Nakayama 2003:101–113; Tumbare 1997; Turton 1998; Wellington 1949; Williams 1986). Regime creation in the basin dates back to the construction of the Kariba Dam in the 1960s, with the negotiation of the Zambezi River Authority (ZRA) for the sole purpose of managing the hydropower associated with the project. The ZRA is a bilateral arrangement between Zimbabwe and Zambia and it has a limited mandate. In the 1980s there was considerable foreign donor interest in the basin, and an initiative was launched to establish a basin-wide commission. Given the name of Zambezi Action Plan (ZACPLAN), agreement was reached between the riparian states on the need for such an approach (Nakayama 2003:101), but this was largely a donor-driven initiative. One of the positive spin-off's from ZACPLAN was the drafting of the SADC Water Protocol (Ramoeli 2002:105), which the riparian states felt would be necessary to support the Zambezi Water Commission (ZAMCOM) when it would eventually be established. Agreement on the establishment of ZAMCOM has been reached between all riparian states, with seven of these signing the treaty on 13 July 2004 at Kasane in Botswana (Treaty 2004). The eighth riparian state has committed themselves to the agreement, but needs time for additional internal consultations. The ZAMCOM Treaty will enter into force when two-thirds of the signatory states have ratified the agreement through their respective parliamentary systems. This is set to occur by the end of 2008. Before the ZAMCOM Agreement comes into force, the provisions of the SADC WP act as a surrogate basin-wide agreement.

There are also a number of regimes that foster cooperation between the various riparian states outside of the immediate ZAMCOM configuration. There is SARCCUS, SADC FP, SADC WP and the SADC TCM described in the Incomati Basin section of this chapter. In addition to these, there is the ANJCC that fosters cooperation between the Angolan and Namibian governments in the field of water resource management. The Joint Commission of Cooperation (JCC) between Malawi and Tanzania; the Permanent Commission of Cooperation (PCC) between Malawi and Zambia; the Permanent Joint Commission of Cooperation (PJCC) between Malawi and Mozambique; the Joint Permanent Water Commission (JPWC) between Botswana and Namibia; and the PJTC between Angola and Namibia; all act in a similar way, by bringing together commissioners from the various countries, but in smaller groups where it is easier to gain consensus (with Pike's Law in mind). The NPA also played a role, when it was linked to the revitalization of the Cahora Bassa project, within weeks after South Africa and Mozambique having agreed to the non-aggression pact (Turton 2004:262). This is not listed in Table 2.1 because South Africa is not a riparian to the Zambezi. The existence of so many bilateral agreements raises the spectre of Parallel National Action (PNA) as an approach to regional integration, as described by Nielsson (1990) in general; and Turton (2002:526–530), Braid and Turton (2004) and Turton and Earle (2004) in the specific context of water resource management.

An interesting aspect of the Zambezi Basin relates to the river as a component of the SAHPC. The Zambezi River has three of the four Pivotal States as riparians (Botswana, Namibia and Zimbabwe). All three of these have a pressing need to secure water from the Zambezi in future, but there are subtle complications in each case. Zimbabwe has major water needs, but the Zambezi valley is so steep and high that the cost of pumping water out of the river makes it prohibitive (Turton 1998:227–230). This is one of the reasons why the Batoka Gorge Dam was mooted – by reducing the pumping head and by generating surplus electricity – it could allow for Zimbabwean use of the resource. Zambia does not want to support the plan however, and given the current state of the Zimbabwean economy, the Government is unlikely to be able to mobilize the money needed for the project. Namibia has a pressing need for improved assurance of supply in the Windhoek area. This is why the Namibian Government has announced its intention of building a pipeline from the Okavango River. This is being opposed on environmental grounds, much the same as the Botswana Government plans to use Okavango water for the Orapa diamond mine were opposed (Scudder et al. 1993). This is causing Namibia to look to the Zambezi for solutions. The one remedy is to build an inter-basin transfer from the Zambezi into the upper reaches of the Okavango (Heyns 2002:166), thereby creating a surplus for Namibia to use downstream, theoretically without reducing the base-flow to the delta. Botswana has a similar problem, but for different reasons. The Botswana energy-base is derived from coal, but there is not enough water to generate sufficient steam. It cannot use Okavango water because such actions were vigorously blocked before by international environmentalists (Scudder et al. 1993). This leaves only the Zambezi open as an option, but here there are problems. Both Namibia and Botswana have only a very small frontage onto the Zambezi River, in an area where the geology precludes dam construction. The only option open is to develop a cooperative basis for the use of the Zambezi, and then to develop a communal pipeline that serves the interests of various stakeholders. Such a pipeline has been mooted by the Botswana Government (Heyns 2002:167), taking water from the Zambezi at a point where Namibia could also be serviced, then delivering water to Bulawayo in Zimbabwe, via Francistown in Botswana, where it would connect to the existing North-South Carrier at Selibe Phikwe, for onward delivery to the capital city, Gaborone.

This is an ambitious plan, that would cost a lot of money, but it is a plan that has a viable future because it looks after the strategic interests of the three Pivotal States in the Zambezi Basin. What is really significant about this plan however, is the way that the Botswana Government has shown that water could also be delivered to Pretoria in South Africa through the same system (Heyns 2002:167). This is a tantalizing dangle for the South African Government, whose possible involvement in such an ambitious plan would ensure the economic feasibility by increasing the throughput of the system, and by increasing the investment-base of the project. South Africa has been interested in the Zambezi River as a strategic supply of water in the past (Borchert 1987; Borchert and Kemp 1985; Davies et al. 1993:143; Scudder et al. 1993:263; Turton 2004:259), with some detailed planning having been done (MacDonald et al. 1990:2–10; Turton 1998:231). The Post-Apartheid South African Government no longer harbours such aspirations, either in private, or in official policy documents, but it is considering a major financial loan to Zimbabwe at the time of writing. This loan can create leverage for future negotiations about access to the Zambezi, if such access is deemed to be strategically significant by South Africa. Seen in this light then, the strategic interests of the four Pivotal States in the SAHPC could be met, to the mutual benefit of all, including the Impacted States that lack the financial capacity to raise the funds to develop the necessary infrastructure. This is one of the key reasons why the existence of a Hydropolitical Complex in Southern Africa is so important, because it enables strategic trade-off's to be made at a level other than the river basin.

Another indication of inter-state relations over water has been provided in the Zambezi basin. The Kasikili/Sedudu Island is in the Chobe River, a tributary of the Zambezi, on the border between Namibia and Botswana (Ashton 2000a:96–98). When Namibia became independent, a dispute arose over sovereignty of this small island. Tension rose when a flag was hoisted on the island, prompting a vigorous response. This evolved over time to an agreement to refer the matter to the International Court of Justice at The Hague. The International Court of Justice finally ruled in favour of Botswana, thereby settling the dispute in an amicable way. From this it is evident that the favoured channel for dispute resolution, at least between some of the Zambezi riparian states, is by recourse to legal processes.

In conclusion, the Zambezi Basin has one functioning bilateral regime (ZRA), with a basin-wide agreement that is about to launch ZAMCOM. This commission does not yet exist formally, but the treaty has already been signed by seven of the eight riparians, is awaiting the ratification process, and should enter into force by the end of 2008. This is the result of decades of work under ZACPLAN. Compensating for the absence of a basin-wide regime is the existence of a large number of non-basin specific arrangements – ten in all – which is the highest number in this category of any of the Basins at Risk (see Table 2.1). While it was called a Basin at Risk by virtue of the absence of a dedicated river basin institution at the time of the initial TFDD study, the existence of the SADC Water Protocol can be regarded as a surrogate regime, because it provides the necessary legal framework. Significantly however, the Zambezi Basin has the largest number on non-basin specific regimes in place (Table 2.1), and it also gives empirical evidence of the peaceful resolution of disputes by means of recourse to the ICJ. This trend should also be interpreted against the background of the global norm, with a direct relationship known to exist between the number of riparian states and the likelihood of a multilateral regime. Very few international rivers with eight riparian states have negotiated a functioning basin-wide regime, so the absence of such an institution does not mean that the basin is still at risk. On the contrary, the fact that negotiations have taken so long, suggests that the riparian states are taking the process very seriously indeed –an interpretation supported by the fact that the SADC Water Protocol was spawned from the ZACPLAN deliberations.

2.13 Conclusion

The Basins at Risk study (Wolf et al. 2003) by the Oregon School was extremely useful for three main reasons: it identified global trends; it established the importance of understanding the relationship between rapid changes to the water-use patterns of a given system in the face of the institutional capacity to absorb those changes; and it flagged various basins for further, more detailed study, suggesting that with the best available data at the time, those basins were potentially at risk.

The six Southern African Basins at Risk are therefore valuable to study, because half of them have been theatres of both conventional and guerrilla war, thereby creating a starkly polarized background against which water resource management was practiced. Notwithstanding the depth of armed conflict, at no time did the war ever focus on water as a causal factor, and in all cases the water management institutions proved robust enough to withstand the rigours of protracted military conflict. The extent of the shift in institutional development in the Basins at Risk in the SAHPC, between the time of the original study (1999) and the current work by the Tshwane School (2005), is truly remarkable. This provides strong support to the Oslo School's finding that where endemic water scarcity occurs in international river basins, there are substantial long-term incentives for the investment in water management measures to avoid conflictual outcomes (Gleditsch et al. 2005). The water governance structures and management institutions are robust in Southern Africa, only because water is so important for each riparian state. Too important to fight over, to the extent that water agreements are significant enough to be considered as drivers of international relations in their own right, leading to the conclusion that a Hydropolitical Complex exists in Southern Africa. This is a distinct component of the Regional Security Complex that was originally defined by Buzan (1991:210).

There is strong evidence in the SAHPC that regimes are cumulative in nature, but the analysis in this chapter is methodologically incapable of refuting Conca's (2006:106) finding that regimes are not emerging via a basin-cumulative path. It does seem probable however, that the dataset used to achieve that result, might have been too small to generate truly conclusive findings. This will need more robust research in future. What is more significant is the finding by Conca (2006:109) that bilateral regimes were more common in river basins with three or more riparian states, by a ratio of 2:1. This is evidence of Pike's Law in action. It is also very significant when one notes that in six of the Basins at Risk, basin-wide regimes now exist in all cases except the Zambezi, which is an extremely complex basin given the large number of riparian states involved. This includes the three basins in which armed conflict was endemic for substantial parts of the Cold War – the Cunene/Cuvelai, Okavango and parts of the Zambezi. While no multilateral basin-wide agreement exists in the Zambezi yet, there are a number of bilateral arrangements between riparians in other basins, and the basin-wide ZAMCOM Agreement is expected to enter into force before the end of 2008. The SADC Water Protocol can also be regarded as being a surrogate regime in the case of the Zambezi, mitigating against conflict potential and providing the necessary legal recourse when needed. As such the case of the SAHPC goes contrary to the global trend in the evolution of river management regimes, again suggesting that Gleditsch et al.'s (2005) finding about the incentive to negotiate peaceful interstate water management mechanisms has some validity.

With respect to internationalized basins and conflict potential, the SAHPC case is interesting, because it shows no propensity towards conflict as the colonial overlay was removed. In fact the opposite holds true. As overlay was removed, so too was the external support to the various wars of liberation and civil wars. One explanation is that the SADC Water Protocol came into play so soon after the ending of the Cold War, that it acted as a regime of sufficient robustness to withstand the rigours of national liberation and independence. Another explanation is that the Cold War rivals were the main protagonists in the various local conflicts, so once the Cold War ended, so too did the external support for the various surrogate militarized political groupings. The coincidence of the outbreak of peace in the Southern African region and the demise of the Cold War is too stark to be dismissed as being merely coincidental. These nuanced facts have not been captured in any of the literature that has been reviewed. This is significant in terms of Wolf et al. (2003:44) finding that newly internationalized basins have a higher risk profile, making the subsequent shift to basin-wide management approaches in all of the Basins at Risk that much more noteworthy. In this regard the early flagging of the Southern African Basins at Risk was valuable, because it created awareness of the need to find cooperative solutions.

The hydropolitical configuration of river basins is important. Such nuances are not possible using current methodologies, but the Oslo School seems best placed to rectify this problem. In the SAHPC there are four Pivotal States, each hegemonic in their own right, but to a different degree and in a different form. It is significant therefore that each regime has been initiated by one of the four Pivotal States, with the two most water-scarce of these (Namibia and Botswana) being avid participants in all recorded cooperative arrangements. This is a nuanced form of Hegemonic Stability Theory (Lowi 1990:386) that is only visible when using the SAHPC as an analytical construct. More importantly though, all three of the Pivotal Basins in the SAHPC have basin-wide regimes. This is no small achievement in the face of finding that while two-thirds of the world's international river basins have more than two riparian states, the most common form of regime is a bilateral one by a ratio of 2:1 (Conca 2006:109). The trend in the SAHPC therefore does not fit this global pattern, suggesting that where endemic water scarcity is a potential limiting factor to future economic growth and political stability, the incentives are high for the development of conflict mitigating arrangements. The Oslo School is to be encouraged as they pursue this direction of future research, because it is likely to yield considerable insight into the nuances of the desecuritization of water resource management in international river basins.

With respect to the Oregon School, their work is very useful when it shows the propensity for riparian states to cooperate, along with the distribution of events at specific levels of intensity using the BAR Scale. Their initial flagging of the Basins at Risk, using data that was available at the time, also helped by raising awareness of global trends in hydropolitical conflict dynamics, thereby creating additional incentives for the development of mitigation strategies. All of the empirical schools have found that a history of peaceful co-existence is more likely to result in peaceful resolution of future resource-related conflict.

With respect to the Maryland School, the SAHPC case suggests that there is a cascading of regimes from basin to basin, because merely by virtue of the signatory status of each SADC Member State to the SADC Water Protocol, each country has bound themselves to the UN Convention (Ramoeli 2002:109). Subsequent amendments to the SADC Water Protocol have also been made, each reflecting evolving international legal norms. Conca (2006:119) found that the core norms in the 1997 UN Convention were not present in most basin-level agreements. The ZAMCOM Agreement is interesting in this regard, because Article 12 makes specific reference to eight legal principles, which are sourced from wider than the UN Convention alone. Similarly, the finding by Conca (2006:116) that water allocation formulae are generally missing from river basin regimes does not reflect the SAHPC reality. A number of agreements within the SAHPC have such specific water allocation formulae, most notably the LHWP, KOBWA, the Incomaputo Agreement and the VNJIS.

Finally, with respect to results of all three schools that a history of cooperation between riparian states is a strong indicator of future cooperation, the Tshwane School findings provide factual evidence to support this. In short, the institutional evolution of the six Basins at Risk in the SAHPC is a remarkable achievement for a developing region. Every effort should be made by the various riparian states, the SADC Secretariat and the New Partnership for Africa's Development (NEPAD) Secretariat, to establish a central depository for data, so that it can be assessed by researchers outside of the region, similar to the project recently finished by the Tshwane School (Ashton et al. 2005). This is an African success story and it deserves to be told with accuracy and in context.

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Acronyms

AMJCC	Angolan Namibian Joint Commission of Cooperation
ANC	African National Congress
AWIRU	African Water Issues Research Unit
BAR scale	Basins at Risk scale
CIA	Central Intelligence Agency
	CNRET Centre for Natural Resources, Energy, and Transport, Department of Economics and Social Affairs at the United Nations
CONSAS	Constellation of Southern African States Southern African
COPDAP	Conflict and Peace Data Bank
CSIR	Council for Scientific and Industrial Research
DRC	Democratic Republic of Congo
ENWC	Eastern National Water Carrier
FAOLEX	FAO Legal Database
FAM	Mozambique Armed Forces
	FAPLA Forcas Armadas Populares de Liberaçao de Angola (Popular Armed Forces for the Liberation of Angola)
FBIS	Foreign Broadcast Information Service
GEDS	Global Event Data System
GIS	Geographic Information System
GGP	Gross Geographic Product

JIA	Joint Irrigation Authority
JOA	Joint Operating Authority
JPCC	Joint Permanent Commission of Cooperation
JPTC	Joint Permanent Technical Committee
JPTWC	Joint Permanent Technical Water Commission
JTC	Joint Technical Committee
JWC1	Joint Water Commission
JWC2	Joint Water Commission
KOBWA	Komati Basin Water Authority
LBPTC	Limpopo Basin Permanent Technical Committee
LHDA	Lesotho Highlands Development Authority
LHWP	Lesotho Highlands Water Project
LWC	Limpopo Watercourse Commission
MAWRD	Namibian Ministry of Agriculture, Water and Rural Development
NEPAD	New Partnership for Africa's Development
NPA	Nkomati Peace Accords
OKACOM	Okavango River Basin Water Commission
ORASECOM	Orange-Senqu River Commission
PJTC	Permanent Joint Technical Commission
PNA	Parallel National Action
PRIO	International Peace Research Institute in Oslo
RENAMO	Resistencia Nacional de Moçambique (National Resistance Movement of Mozambique)
SADC	Southern African Development Community
SADC FP	SADC Founding Protocol
SADC TCM	Protocol on Transport, Communications and Meteorology
SADC WP	SADC Water Protocol
SADCC	Development Coordination Conference
SADF	South African Defence Force
SAHPC	Southern African Hydropolitical Complex
SARCCUS	Southern African Regional Commission for the Conservation and Utilization of the Soil
SSC	State Security Council
TCTA	Trans-Caledon Tunnel Authority
TFDD	Transboundary Freshwater Dispute Database
TPTC	Tripartite Permanent Technical Committee
UNCED	United Nations Conference on Environment and Development
UNITA	Uniao Nacional para Independencia Total de Angola (National Movement for the Total Liberation of Angola)
ZACPLAN	Zambezi Action Plan
ZAMCOM	Zambezi Water Commission
ZRA	Zambezi River Authority

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3 Okavango River Basin

Thayer Scudder

3.1 Introduction

The Okavango River Basin presents an incredibly dynamic and complex situation. It is a double challenge: first to convey the river's importance in a policy-relevant way to all kinds of people interested in its management, and second to draw upon a vast literature in hopes of making useful suggestions for the way forward. Four sections follow. The first deals with the basin's exceptional bio-cultural diversity. The second examines ongoing political economy, environmental, and international constraints to the basin's sustainable conservation and development. The third section deals with the pioneering shift in the mid-1990s for Southern and Central Africa from a conflict-laden nationalist approach to international waters to the formation of the Permanent Okavango River Basin Water Commission (OKACOM) in 1994 and to a "water for peace" approach. The final section presents some suggestions on the way forward during the 21st century.

Let there be no mistake. Managing the Okavango River Basin to meet both conservation and development goals is going to be an incredibly difficult task. Constraints are many. But two major advantages are that to date no major infrastructure has yet to impede the natural flow regime of the Okavango or any of its major tributaries and that off-takes of water in the three riparian states remain small. Viewed internationally the Okavango presents a rare case – a major river basin of high conservation and development value that has yet to be dammed.

What happens now and over the longer term has local, national and global significance for all of us.

3.1.1 The Natural Environment

Placing the Okavango in a wide context is important because it emphasizes the complex history of the lower basin as well as the importance of such natural and expected events as drought, floods and earthquakes. The Okavango Delta, for example, is traversed by three major faults. It also has historic connections with the Zambezi River system when flooding backs up the Chobe River to cause flows into the upper portion of the Delta. Figure 3.1 introduces the Okavango River Basin and shows its relationship to both the Zambezi River system and the Makgadikgadi Basin.

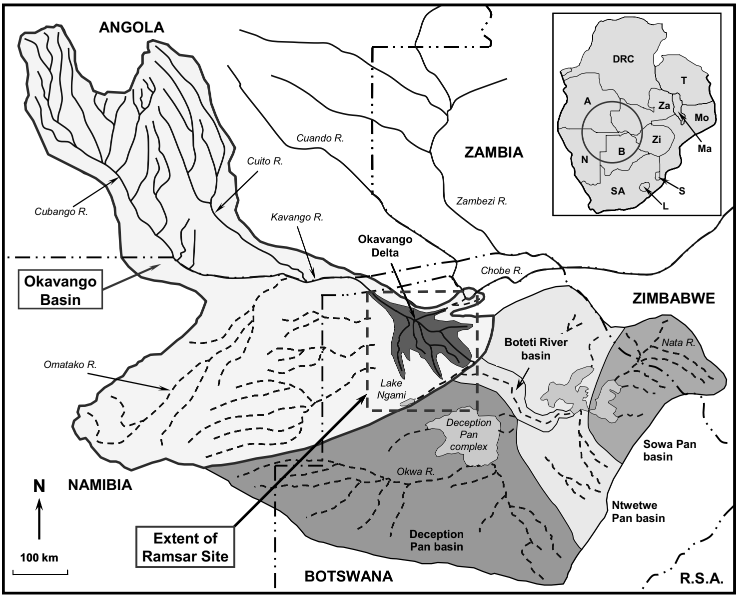

Fig. 3.1. Map showing the extent of the Okavango–Makgadikgadi River Basin and its sub-basins, as well as the extent of the Okavango Ramsar site as it was first declared. Inset shows the position of the basin in Southern Africa. Map redrawn from Ashton and Neal, 2003

During periods of heavier rainfall Okavango flows down the Boteti filled the Makgadikgadi Pans and, en route to the pans, a reservoir that served the diamond mines at Orapa (Figure 3.2). Today both the reservoir and the pans are dry.

Some sources include the Okavango system as a sub-basin of the Makgadikgadi basin to illustrate such connections. Geomorphologically they are important, but for the purposes of this Chapter I deal with the Okavango River Basin only from its headwaters in Angola to the Thamalakane River which defines the lower end of the Okavango Delta as it flows past Maun and drains into the Boteti. The Okavango is about 1,100 kilometres long. Including such seasonal tributaries as the Omatako in Namibia, it drains a catchment of about 430,000 km² of which about 15,000 km² constitute the Okavango Delta.

Annual flows over the longer term have averaged about 10,000 million cubic meters (MCM) with variation ranging from 5,321 MCM to 16,145 MCM between 1933 and 2001 (communication from Peter Ashton). Approximately 95 percent of runoff comes from Angola, 2.9 percent from Namibia and 2.6 percent from Botswana (Ashton and Neal 2003: 36). Vegetation zones reflect rainfall. The better-watered uplands in Angola are part of the *miombo* savanna woodland (dominated by species of *Brachystegia* and *Isolberlinia)* that extend across the Angolan plateau into central Zambia. At lower elevations in southwest Angola the river, with its major tributary the Cuito, flows through semi-arid desert scrub which also characterizes the middle and lower portions of the basin in Namibia and Botswana. Rainfall throughout the basin is seasonal, ranging from 1,200 mm in the headwaters to 300–400 mm in Namibia and Botswana (Pinheiro et al. 2003: 106).

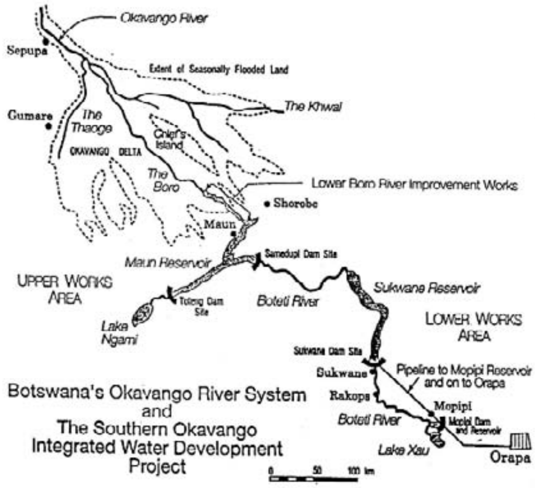

Fig. 3.2. Botswana's Okavango River System and the Southern Okavango Integrated Water Development Project (Scudder 1993)

Throughout its length, the river, including the delta, is nutrient poor (oligotropic). Flowing as it does for much of its length through semi-arid desert country, the luxuriant wetland vegetation quickly gives way inland to desert scrub. The river banks support riverine forest where not cleared while the "juxtaposition of contrasting land and waterscapes" (ODMP 2005: 19) in the delta create one of the most valuable global wetlands which Botswana declared as the world's largest Ramsar site in April 1997. Plant species number at least 1061 of which 208 are aquatics and semi-aquatics. Up to 450 species of birds, 104 different mammals, including 32 large mammals, and 71 species of fish have been identified (ODMP 2005: 20–22).

Cultural Resources

The incredible biodiversity of the delta, and to a lesser extent of the river system as a whole, is complemented by a rich cultural diversity of ethnic groups, some of which have lived in the area for over 1000 years. Figure 3.3 illustrates the basin's linguist diversity to which should be added the language of the Ovimbundu people who are the dominant ethnic group in the uppermost reaches of the Cubango River. It emphasizes why, in spite of a commitment to comprehensive stakeholder involvement, it has been difficult to involve local communities in the planning process. The majority practice complex, diversified economies that include flood recession and rain-fed agriculture, livestock management, gathering, fishing and hunting, crafts and brewing of alcoholic beverages, trade, local commercial businesses, eco-tourism and community-based natural resource management, and migratory and local wage labour. The relative importance of different components varies from one ethnic group to another and within any one community or household from one season to another depending on rainfall, flooding, labour and capital resources.

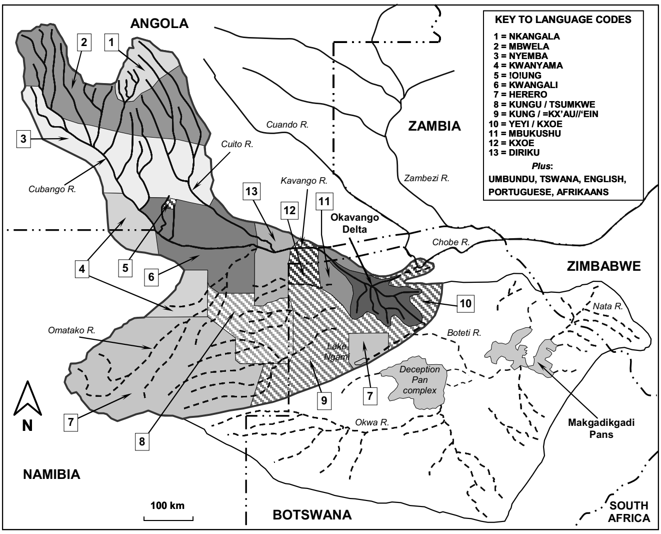

Fig. 3.3. Map of the Okavango–Makgadikgadi River Basin showing the distribution of the main languages spoken in the Okavango sub-basin. Inset also shows the "official" languages that are used within the Okavango sub-basin. Map re-drawn from Ashton and Neal (2005)

Population in Angola is in flux as local residents who fled the basin during the long civil war, and those who did not, attempt to restore and improve their livelihoods. Ashton and Neal refer to "recent population estimates" which suggests that Angola, with an estimated population of 13 million, contributes about 76 percent of inhabitants of the Okavango basin as opposed to Namibia's 13 percent and Botswana's 11 percent (ODMP 2005: 53). In Namibia, other figures estimate that approximately 140,000 people live close to the Okavango with another 100,000 living elsewhere in the catchment (Pinheiro et al. 2003: 111). In Botswana approximately 125,000 people lived in Ngamiland, the district that includes the Okavango Delta, at the time of the 2001 census (ODMP 2005: 33).

3.1.2 Off-take of Okavango River Basin Water Resources for Development Purposes

Especially fortunate for planning purposes is that none of the three riparian states have yet to use a significant amount of Okavango River flows. That is true even though the figures that follow are underestimates that do not include, for example, boreholes controlled by individuals and communities (communication from Peter Ashton). In Botswana current off-takes from the delta under the auspices of the Department of Water Affairs are about 3.84 MCM annually with 11.4 MCM planned for 2020–25 which is only 0.011 percent of the river's mean annual flow (ODMP 2005: 39). Current off-take in Angola is even less. Current use in Namibia is 24.095 MCM, with proposed use (mainly for irrigation) to rise to 135.345 MCM. That would utilize only 0.134 of the annual flow of the Okavango, although the proportion off-taken during the dry season would be considerably higher. Namibian off-take would increase to 0.154 MCM if plans were implemented to extract 17 MCM at Rundu (Figure 3.4) for transfer south by pipeline as described later in this paper.

3.2 Constraints

3.2.1 Introduction

Three major constraints threaten the sustainable conservation and development of the Okavango River Basin. They are not the only threats. Proliferation of such invasive aquatic plants as *Pistia and Salvinia* continues to be a major problem in the delta. But the three chosen for mention are sufficient to illustrate the magnitude of threats that need be addressed. The first is a nationalistic sovereignty issue involving the political economies of the three countries, there being no common basin-wide, country or local vision as to how the Okavango River and the delta should be managed. Especially threatening are past, current and/or future intentions of some politicians and government officials to build mainstream dams and other major infrastructure for off-taking water.

The second constraint is environmental and the third involves the inadequate coordination and the lack of a common vision within the international community of NGOs, consulting firms, donors and researchers that are currently involved in the basin or seek such involvement.

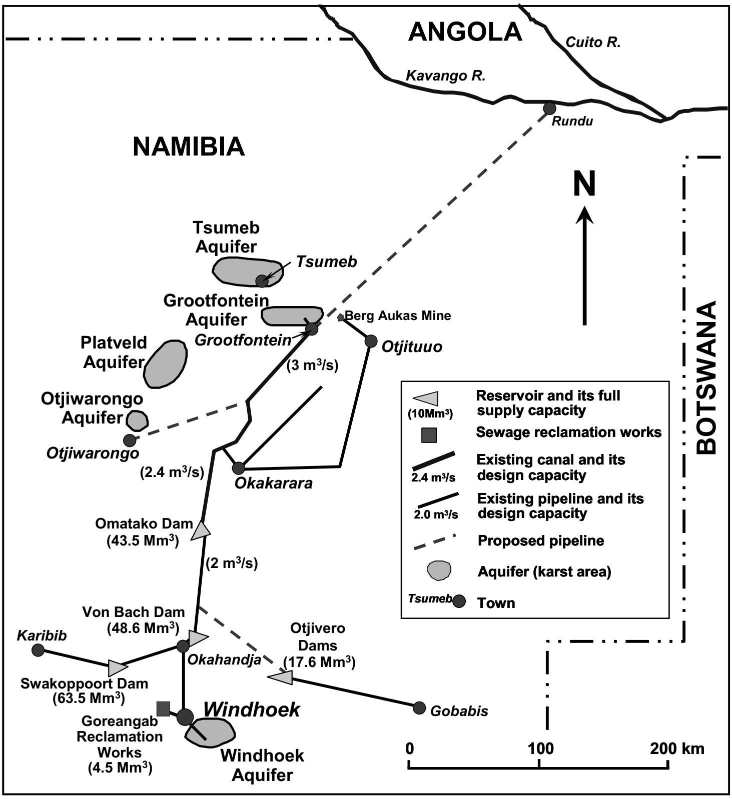

Fig. 3.4. Map showing the extent and components of the Eastern National Water Carrier in Namibia. Map redrawn from diagram provided by Mr Piet Heyns, Department of Water Affairs, Namibia

3.2.2 Political Economy Constraints

Introduction

The problem requiring a solution is how best to meet the legitimate needs and rights of each basin state for water without infringing on the other states' rights for an equitable share and without doing irreparable harm to the Okavango River Basin in the process. OKACOM's success will be determined by its ability to facilitate the necessary decisions.

Botswana

Botswana has come the closest of the three states to implementing unilaterally large-scale development projects for utilizing Okavango water resources. A summary of such efforts is important for showing the kind of thinking and planning that is ongoing in each of the three countries and which remain a threat to the integrated management of the Okavango River Basin.

Plans for major infrastructure date back to 1908 (Turton et al. 2002: 1). Based on the recurring fallacy about Okavango waters being "wasted" on hippos and crocs, grandiose proposals were made by officials, private sector firms and academics for irrigation and other uses within Ngamiland and for diversion to water scarce areas as far away as Johannesburg. Randall (1957) listed 18 such proposals. The geographer Wellington (1949a and b) visualized irrigation in the Okavango rivalling the Sudan's Gezira scheme with a specially built railroad for transporting cotton to an Atlantic port in Namibia from where it would be carried to Europe.

Following independence in 1966, the government requested assistance from the United Nations as well as from bilateral donors in assessing how to use Okavango waters for such schemes. Sweden completed a study dealing with water transfer to Eastern Botswana. Most important for the Okavango Basin were two sets of studies (1968–1972 and 1974–1976) completed under UNDP/FAO auspices. Sixteen schemes were evaluated, one of which approximated the Southern Okavango Integrated Water Development Project (SOIWDP). Simultaneously, the Department of Water Affairs and safari companies continued minor diversionary works until the early 1970s when the Anglo American Corporation completed a programme of dredging, bunding, and weir formation to improve flows into a reservoir built on the lower Boteti from which water was piped to the mining community at Orapa.

Following the completion of the UNDP/FAO studies, the government convened in 1982 an Okavango Water Development Committee to consider the various options. With the Department of Water Affairs being the responsible agency, the Committee favoured the SOIWDP option from the start (Figure 3.2). In December 1985, Snowy Mountains Engineering of Australia was awarded the feasibility study, followed by the environmental impact assessment in 1985 and the detailed design study on April 1988. Even while design studies continued, the cabinet approved the project in December 1988, with the Upper Works (Figure 3.2) tendered.

SOIWDP was designed as an integrated project. Components included 10,000 hectares of commercial irrigation and five thousand hectares of improved flood recession agriculture, raising local living standards, and improved water supplies for Maun, riverain villages, Rakops (a town on the Lower Boteti), and the mines at Orapa. As for project design, the Delta's main tributary (the Boro) was to be further channelized to increase downstream flows to be impounded behind two large dams. Including the Boro component, the Upper Works would involve the construction of the first large dam near the top of the Boteti that would back up water as far as Maun within the Thamalakane. To keep water from flowing into Lake Ngami at the southern end of the reservoir, a small dam would be built at Toteng. Further up the Thamalakane beyond Maun another small dam would be built to receive Boro water in a second small reservoir for the benefit of flood recession agriculture. Scheduled for completion at a later date, the Lower Works would consist of a second large dam across the Lower Boteti at Sukwane. That would provide water to Rakops and, via pipeline, to the diamond mines at Orapa.

Supported by local and international environmental institutions, Ngamiland residents and safari operators were incensed when the contractor selected to initiate the Upper Works arrived in Maun in November 1990. In response "the government organized a meeting in Maun on January 11, 1991 – just several days before project construction was to start. Over 700 people participated, most of whom were local villagers. The outpouring of opposition to the government's position may well have been the strongest attack on any government policy since independence in 1966" (Scudder 2005: 202). Clearly taken by surprise by the vehemence of the opposition, the government decided to suspend the project temporarily while seeking further assessment.

The government's reaction to the outpouring of opposition was pioneering. Not only was the project temporarily suspended but, for the first time to my knowledge, the government sought a detailed evaluation, in this case by IUCN, of a major water resource development project from an outside nongovernmental organization. Their willingness in this regard "sets an example for other nations faced with similar difficult problems of natural resource development" (Scudder et al. 1993: 36). Over a four month period IUCN pulled together a 13-member team from four different nationalities and recruited from 12 different organizations. With some of the 13 team members trained in two disciplines, the team comprised biologists, computer modellers, engineers, hydrologists and hydro-geologists, land use and regional planners, and social scientists.

Between October and December 1991, the IUCN team with supporting consultants was impressed with SOIWDP aspects such as the engineering design of the infrastructural components and the hydraulic modelling. As more and more negative features appeared (including adverse impacts on local communities and failure to re-evaluate the project when claimed benefits such as the flood recession agriculture component were deleted), it was, however, the unanimous opinion of the team by March 1992 that SOIWDP should be cancelled in favour of an alternative that did not require major infrastructure or further manipulation of Boro flows.

During the remainder of the field study, the team developed what came to be called the IUCN preferred alternative which was designed to meet major SOIWDP goals but without the construction of major infrastructure. Supportive of policies in the government's Seventh National Development Plan (1991), the IUCN alternative emphasized the conservation of the natural resource base in the Okavango region, and the planning approach of Ngamiland's Land Use Planning Unit, Land Board and District Council. As for development of the existing economies at village and district levels, "special attention that paid to ensuring that the IUCN alternative was strongly participatory and that it built on the multi-stranded initiatives that villagers used to maintain and improve their living standards" (Scudder 2005: 203).

New development initiatives were not neglected, however. Based on the research and recommendations of team consultant Norman Reynolds (1992), productive activities and administrative services were linked to a hierarchy of markets for the better integration of rural and urban areas. For meeting "Maun's increasing demand for water, the conjunctive use of surface and ground water was emphasized, while groundwater was seen as sufficient for meeting the needs of the diamond mines" (Scudder 2005: 203).

The IUCN team report was presented to the government in May 1992. It was not well received. Though the government made a radio announcement that the project had been suspended just before the report was publicly released, no mention was made either of IUCN or the report. Rather, suspension of the project was based on opposition in the Ngamiland District. That was shrewd with the announcement made in such a way as to reinforce the government's democratic procedures.

SOIWDP had been suspended; but not cancelled. Eighteen months later, in a December 1993 article, the *Okavango Observer* quoted Botswana's President Masire as stating "that within 25 years, Maun and Boteti would benefit from the Southern Okavango Integrated Water Development Project." He expressed a similar view during 1994 which was the same year that OKACOM was established. A March 3 headline in Botswana's *Midnight Sun* stated that the President "longs for Okavango Delta utilization." That was at the end of a state visit by Zimbabwe's President Mugabe during which the two presidents visited the Okavango region. During the visit Mugabe told those at local meetings that the Okavango should be exploited for irrigation in the same way that the lower Nile was being exploited.

In April 1994 Botswana's President was interviewed again by the editor of the *Okavango Observer*. In noting how local people and tourist interests had stopped a dam that would have provided "water galore," he stated that "in a democratic set up, people must make their beds and lie on it." When asked if the government would revisit the project if "people's mood changed," the President replied, "of course we would. But there must be demonstrable interest in the locals because we would not like to come and waste resources here again." Six months later President Mugabe offered Zimbabwe's assistance at the Southern African Environmental Management Conference. Irrigation schemes for growing wheat, rice and other crops should be established in the Delta.

In June 1995, Vice President and Minister of Finance and Development Planning Festus Mogae, who is now Botswana's President, is reported to have said while greeting well-wishers in Ngamiland "I have always had a vision for Maun, a dream of Maun, which like Gaborone would have a dam, no water shortages, so that the many developments that I have had the opportunity to open, would flourish. In the future, if we have a problem, I hope we can discuss it amongst ourselves, before we call in foreigners" (Okavango Observer 1995).

The tri-national agreement to establish OKACOM was signed in September 2004, with government officials now admitting privately that the IUCN recommendation had been a blessing in disguise. In recent years both former President Masire and President Mogae have been supportive of OKACOM. Nonetheless, prominent voices still raise questions in Parliament and elsewhere about the desirability of using infrastructural projects to export water to users outside the Okavango basin as indicated by an April 11, 2005 query to the Minister of Minerals, Energy and Water Resources that was reported in the government's online website (www.gov.bw/cgi-bin/news.cgi). In his answer to an MP's question about the feasibility of drawing off water from the Okavango and Chobe rivers as a long-term strategy to deal with drought, the minister replied that "water developments in the Okavango are very sensitive and at the moment there is no intention to develop any large-scale water transfer schemes other than for riparian residents." He reminded Parliament that the Okavango presented "a highly sensitive environmental ecosystem, hence its protection under the Ramsar Convention." The Minister added, however, that his ministry "had identified the Chobe and Zambezi rivers as potential future water supply sources to be connected to centres in the interior of the country."

Currently the government practices what it preaches with the Department of Water Affairs planning to meet Maun and local community water needs by pumping groundwater from three new well fields that surveys indicate can provide 9.84 MCM per year to Maun and the vicinity by 2020–25 (ODMP 2005: 39).

Angola and Namibia

Angola's longstanding civil war came to an end in April 2002 with the signing of a Memorandum of Understanding by the military leaders on both sides. At that time, "the various cycles of war" since independence in 1975 had destroyed the country's "economy and infrastructure, leaving the majority of Angolans destitute and impoverished," a third of the country's population internally displaced, and the country "at the bottom of the development ladder" with "an economy under siege" (Porto and Clover 2003: 66, 67, 69).

Angola's current emphasis is on post-war resettlement, livelihood restoration and reconstruction. According to the Okavango Delta Management Plan (ODMP) (2005: 38) "There are currently still no plans to build dams or major abstraction infrastructure on the river; there are currently no existing structures". There are, however, many sites for hydro dams in the upper basin which had been identified by the colonial regime before 1970 (ODMP 2005: 41), and Angola's reconstruction plans include dam building. That could well be for both hydro and irrigation, the scale of which could be large if the government pursues state schemes and/or if the government follows through on plans to restore former land concessions to large-scale private entrepreneurs at the expense of the customary tenure of local communities. In Huambo Province, for example, the government has re-allocated "about 95,000 hectares" with 11 proprietors getting "46% of the total land allocated" (Pacheco 2001: 99).

Since independence in 1990, Namibia has continued to propose three large-scale infrastructure projects. The first arose from a preliminary, pre-independence study in 1969 to build a 40 MW hydropower station at Popa Falls in the Caprivi strip (Pinheiro et al. 2003: 111). More recently an Environmental Impact Assessment has been commissioned to further examine that option. The second was a 1974 plan to build a 250 kilometre pipeline to carry 17 MCM of water annually from Rundu on the Okavango to the Eastern National Water Carrier at Grootfontein for delivery to Windhoek and other towns (Figure 3.4). According to Ashton the pipeline has always been "planned as an emergency scheme…where water would only be drawn from the Okavango when other sources were incapable of meeting the needs for water in Central Namibia" (2005 communication to the author). A third project is suggested by an assessment, also through the Department of Water Affairs, of a possible large-scale irrigation scheme of up to 30,000 hectares (Pinheiro et al. 2003).

Progress on all three schemes has been slowed down since OKACOM's formation. Nonetheless, as stated by Namibia's Minister of Agriculture, Water and Rural Development, "Namibia has been developing its Eastern National Water Carrier in phases as the managed water demand increased over time since the late 1960s eventually to link the ephemeral water sources in the interior of the country to the Okavango River… Namibia is also interested in harnessing the hydropower and sharing in the irrigation potential of the Okavango River" (Turton et al. 2003: 7).

3.2.3 Environmental Constraints

Introduction

The main environmental constraints are drought, earthquakes, environmental degradation and disease. The uplands of Angola are the least affected by the first three. Though Pachero refers to environmental degradation and deforestation due to reduced fallow periods because of population increase in Huambo Province and no doubt elsewhere, during the war years re-growth of *miombo* woodland has occurred in some areas. In both Namibia and Botswana, however, encroaching land pressure on the Okavango River and Delta, respectively, is an increasing problem affecting grazing and economic plants as well as fisheries in Namibia but apparently not in the Delta. Angolan refugees who crossed over to Namibia during the war to live on the south bank of the Okavango also increased pressure on the natural resource base (communication from Peter Ashton 2005).

Drought

Drought is the main risk in the semi-arid scrub land of all three countries. It adversely affects agricultural yields and livestock management. The number of cattle in Botswana decreased from 3 million to less than 2.3 million during drought in the 1980s and from 2.7 million to 1.8 million between 1990 and 1993 (ODMP 2005: 54). It is an expected hazard which is affected by known climatic cycles – with a period of reduced rainfall from the 1980s to the present that increases calls for major water extractions from the Okavango in Namibia and Botswana. An unexpected event involving uncertainty is global warming which climatologists worry will have an especially adverse impact on Southern Africa which would significantly reduce both rainfall and river flows while increasing rates of evapotranspiration. It is a threat which could force all three countries to off-take increasing amounts of Okavango flows.

Earthquakes

The lower Okavango basin falls at the southern end of a series of rifts that extends from the Levant through East Africa to the Zambezi and Okavango River systems. Especially affected is the Delta which "is not a true Delta but an alluvial fan whose primarily origin and, to some extent, evolution has been controlled by regional earth movements and land subsidence" (Manley and Wright 1996: 213). Currently the Boro is the main tributary carrying water through the Delta, with lesser flows down a number of other tributaries along the northeastern fringe and the Thaoge (Figure 3.2) along the southwestern margin. Instability is such that the magnitude of flows shifts historically between tributaries and can be expected to involve further shifting in the future. In addition to seismic events, siltation in slowly flowing areas, blockage by detached masses of papyrus and floating grasses, human activities, and even the movements of hippos can influence the direction and volume of incoming flows.

Disease

Disease is an ongoing threat for people and livestock. HIV/AIDS is by far the greatest threat to people; indeed in Botswana it is a major threat to the country's political economy. At the end of 2003, the adult (15–49) HIV prevalence rate estimate ranged between 35.5–39.1 percent (www.unaids.org), life expectancy had dropped to "only 39 years" (www.avert.org) and the epidemic "threatens to reverse Botswana's political and economic gains" (www.achap.org). Indeed, "an epidemic of such proportions has the potential to undermine every facet of life in Botswana. National productivity has decreased, the government's ability to deliver essential services and sustain human development has been weakened, and efforts to promote foreign investment, diversify the economy, and create employment are in jeopardy. Most distressingly, an estimated 42,000 children have already been orphaned because of HIV/AIDS" (www.achap.org).

In Namibia, adult HIV prevalence rates ranged from 18.2–24.7 percent with infection among young women accounting "for 50% of reported cases" (www.unaids.org). Whereas Botswana has the financial resources to "become the first African country to aim to provide antiretroviral therapy to its citizens on a national scale" (www.avert.org), poverty, an unemployment rate of 35 percent and food insecurity, have "significant implications for the spread of HIV and other diseases" in Namibia (www.unaids.org).

Owing to over 20 years of civil war since independence in 1976, prevalence estimates in Angola are unreliable. The data that is available suggests an adult HIV prevalence estimate ranging from "1.6–9.4%" (www.unaids.org). As with fostering reforestation, the civil war "may have slowed the spread of HIV" and given Angola "a window of opportunity" to avoid the high prevalence in Namibia and Botswana (www.unaids.org). On the contrary, Angola's population is more at risk than those in Botswana and Namibia because of war-induced malnutrition and diminished health services. Porto and Clover (2003) discuss how Angola's basic health indicators in 2000 were "among the worst in the world – one mother in five died while giving birth, and 42% of all Angolan children were underweight for their age" (Porto and Clover 2003: 71).

Disease in livestock is especially serious for cattle which continue to be the most important form of savings among rural households. Spreading from contact with wildlife (buffalo in particular) foot and mouth disease is an ongoing concern, especially as it relates to exports to the European Union. Though periodically the tsetse fly carriers of bovine trypanosomiasis have been eliminated from the Okavango Delta, re-encroachment from Namibia's Caprivi strip and from Angola remains a threat. In the mid-1990s, in spite of expected impoverishing impacts, the Government of Botswana had to slaughter over 300,000 cattle in Ngamiland District because of the appearance of Contagious Bovine Pleuro-pneumonia (CBPP).

3.2.4 Constraints Arising from the Influx of Concerned International Institutions

Introduction

The global significance and internationalization of the Okavango River Basin, and especially the Okavango Delta, has attracted an incredible number of well-meaning international institutions to assist OKACOM and the three basin states to plan and implement a sustainable management plan. Unless they can better coordinate their activities for achieving a unified vision, their sheer number poses a threat simply because it overwhelms the institutional capacity of the three states. The first section that follows deals with the Okavango Delta; the second section deals with the entire Okavango River Basin.

The Okavango Delta

Botswana, a small country of less than two million people, has the world's largest Ramsar site. One requirement under the Ramsar Convention is preparation of a Management Plan to be followed by its implementation – which of course is the "name of the game." Responsibility for formulating a plan falls to the ODMP Project. ODMP's principle donor is the Government of Botswana. International donors include IUCN, the Danish and Swedish International Development Agencies and the German Development Service. National responsibility for formulating the management plan falls under the National Conservation Strategy Agency within the Ministry of Environment, Wildlife and Tourism, with IUCN providing technical assistance for policy, planning and strategy. Striving to maximize stakeholder involvement, project management has incorporated at least 13 other Botswanan agencies within the planning process. They include, for example, the Harry Oppenheimer Okavango Research Centre which is linked to the University of Botswana as well as departments at the national level such as Water Affairs, Tourism, Wildlife and National Parks, Crop Production, and Animal Health and Production. From within Ngamiland District, the North West District Council and the Tswana Land Board linked with the District Land Use Planning Unit are represented. All 15 agencies are represented on the Project Steering Committee along with "project donors, NGOs and the private sector" (ODMP 2005: 13).

The ODMP Project also works closely, or seeks additional contacts, with other agencies working in the Delta and the Okavango River Basin. Those specializing on the Delta include, among others, the Leseding Project of the University of the Free State, South Africa (fish ecology and Ngamiland livelihood) and the Tiger Partnership between the European Space Agency, Switzerland's Federal Institute of Technology and Botswana's Department of Water Affairs (remote sensing-based monitoring programme). Those dealing with the Okavango River as a whole and hence with interest in the Okavango Delta, include OKACOM, and the Global Environment Facility (GEF)/UNDP's Environmental Protection and Sustainable Management of the Okavango River Basin which is being executed by FAO.

Also involved are the European Union's Okavango Challenge project using the Water and Ecosystem Resources in Regional Development methodology and implemented by Sweden's Linkőping University as well as the EU's twinning research project for developing knowledge to a level that allows integrated water resource management in the Okavango River Basin along with four other twinned river basins; the US Government's Improved Management of Selected River Basins that includes strengthening OKACOM and other basin institutions with Associates in Rural Development, a US private sector firm, as prime contractor in association with selected local NGOs; the National Heritage Institute/IUCN's US funded collaborative Sharing Water: Towards a Transboundary Consensus on the Management of the Okavango River; a coalition of local NGOs' "Every River Has Its People" Project that surveys household and community livelihood systems within the basin; and Green Cross International Okavango initiatives.

If just listing the various institutions involved does not emphasize why capacity, coordination and common vision issues are important, the ODMP Project makes that point in its February 2005 Inception Report. With regard to capacity, all of the Botswanan partner agencies "feel that their capacity to deliver their general mandate is restricted by insufficient staff numbers" (ODMP 2005: 69). This includes the National Conservation Strategy Agency (NCSA) whose secretary general is the project manager. NCSA is also concerned that its location within the Ministry of Environment, Wildlife and Tourism "puts limitations on its capacity to deliver, especially given its cross-sectoral mandate" (ODMP 2005: 74). As for the ODMP Project secretariat, it has "largely been staffed by officers on short-term project contracts", while the project itself has "yet to develop clear proposals to address the issue of staff resources" (ODMP 2005: 76).

The Harry Oppenheimer Okavango Research Centre feels constrained by lengthy staff recruitment procedures which often fail to recruit permanent staff and hence jeopardize the Centre's data management and research responsibilities under the management plan. The Department of Tourism "is faced with manpower and budgetary constraints," while the three agencies dealing with Ramsar project vegetation "feel that there is insufficient skilled manpower, e.g. rangeland ecologists, botanists, modellers and managers" (ODMP 2005: 70). At the district level the Tswana Land Board "is also constrained by a lack of sufficient numbers of professional and technical staff" (ODMP 2005: 70), a constraint that not only slows down the processing of land applications but often requires relying on other government agencies for "technical and professional advice in relation to coordination of land related issues" (ODMP 2005: 70).

The need for upgrading capacity through staff training was emphasized by all partner agencies, with emphasis on, among other topics, data and database management, participatory rural appraisal and other techniques to improve stakeholder involvement, statistics, EIA, conflict resolution and project management techniques, and presentation skills. Specifically mentioned by NCSA was environmental economics with emphasis on wetland evaluation, policy analysis and review, environmental law and strategic environmental assessment (ODMP 2005: 67). The Department of Water Affairs emphasized the need for hydrological and other modelling techniques and remote sensing, while the Tswana Land Board stressed multi-zone land use planning and integrated water resources management.

All partner agencies also believed that their capacity will be further undermined by expected staff transfers during the life of the planning exercise. Inadequate budgets and transport were also mentioned frequently as were inadequate facilities and insufficient information technology and other equipment. Staff of the Division of Fisheries, for example, claimed to have inappropriate accommodation in Maun where their office facilities were "old and dilapidated. There are no offices at all for field staff who use their two-roomed residences both as offices and homes" (ODMP 2005: 73). Moreover, while current research is being carried out at the opposite end of the Delta in the panhandle below the border with Namibia "there are no research facilities there" (ODMP 2005: 73).

What about there being a common vision for the Delta? The ODMP Inception Report states in bold print that there is "No common vision for the Delta" which also lacks coherent policies, laws and guidelines. As for coordination, the ODMP deals with that under communication whereby "the aspirations of each community of stakeholders should be known to each other and the exchange of information organized systematically" (ODMP 2005: 61). Realization of that goal requires "an extensive communication programme" (ODMP 2005: 61) which is to be developed by the National Conservation Strategy Agency and IUCN. Then once a management plan has been formulated, "Regional collaboration must also be sought and secured to ensure that the upstream countries (Namibia and Angola) share the fundamental philosophy behind the ODMP and will respect its provisions" (ODMP 2005: 14).

Obviously all such constraints are also applicable to Namibia and Angola and to the efforts of all three nations to design a sustainable management plan for the Okavango Rver Bsin and to formalize the treaty necessary for its implementation.

3.3 Permanent Okavango River Basin Water Commission (OKACOM)

3.3.1 Events Leading to the Formation of OKACOM

The reasons for the shift from a nationalist to an international approach that led to the formation of the Permanent Okavango River Basin Water Commission remain unclear. They require further analysis of government documents and especially those of Namibia and Botswana. My analysis is based primarily on research by Turton, Earle and their colleagues in the Africa Water Issues Research Unit (AWIRU) at the University of Pretoria complemented by my own dealing with Botswana's Southern Okavango Integrated Water Development Project, and a written 2005 communication from Peter Ashton.

Southern African countries have a history of forming binational Joint Permanent Technical or Water Commissions to deal with water sharing issues on particular rivers. An early example from the 1980s was the Lesotho/South African Joint Permanent Technical Commission for the Lesotho Highlands Water Project. In November 1990, recently independent Namibia established such a commission with Botswana to deal with the "bilateral management of the Okavango River and the Kwando–Chobe–Linyati reach of the Zambezi River (Green Cross International 2003: 26). Two years later, discussions between the three Okavango River Basin states led to OKACOM's formation in September 1994.

Turton and Earle argue convincingly that Botswana's SOIWDP (Figure 3.2) and Namibia's plans for the Rundu–Grootfontein pipeline (Figure 3.4) played an important, but still undefined, role that led up to OKACOM's formation. They also played an important role in the "internationalization of the Okavango River Basin" (Turton and Earle 2003: 4) and in creating a suspicion in both countries, and within OKACOM, of outside interests. Suspicion between the two countries also carried over into OKACOM and may have been highlighted when Namibia "announced its intentions to proceed with the pipeline at the first meeting" (Turton and Earle 2003: 5) of the commissioners. Moreover, Botswana's declaring the Delta a Ramsar site in 1997 may well have been an effort to constrain Namibia's intentions to off-take Okavango waters. That interpretation would follow from Namibia also being a signatory to the Ramsar Convention – a guiding principle of which requires policies of upstate members to take impacts on downstream wetlands into consideration (Green Cross International 2003: 35; Turton and Earle 2003: 6).

It may well be that GEF and other international actors were influenced to an extent to become involved in the basin as a conflict reduction mechanism, an interpretation consistent with the need for the International Court to resolve a conflict between the two states over an island in the Chobe River. Turton, Brynard and Meissner, on the contrary, emphasize that it was Namibia's strong desire to cooperate that was behind an initial proposal to Botswana and Angola to meet in April

1991 to discuss formation of a possible trilateral river basin commission (Turton et al. 2002: 2–3; see also Pinheiro et al. 2003: 115). This interpretation is strengthened by the fact that at the first (2002) Green Cross/AWIRU collaborative workshop, the "OKACOM commissioners declined the offer to present individual papers, and choose instead to present a joint paper" (Turton and Earle 2003: 8). It is further strengthened by both Botswana and Namibia being among the signatories of the 14 member Southern Africa Development Community's 2001 Revised Protocol on Shared Watercourse Systems. This is a state-of-the-art protocol that closely follows the still-to-be-endorsed UN Convention on the Laws of Non-Navigational Uses of International Watercourses (Turton and Earle 2003: 8–9).

3.3.2 Permanent Okavango River Basin Water Commission (OKACOM)

OKACOM is institutionally weak as a commission. As set up by the three basin states it was to have no "sovereign" powers (Turton et al. 2002: 4) but only an advisory function to the member countries, each of which would appoint three part-time commissioners. Between 1995 and 2003 only eight meetings were held and 10 years after OKACOM's formation the parliaments of the member countries are still in the process of allowing the Commission to establish its own secretariat. Nonetheless, "In terms of its original mandate, OKACOM has been reasonably effective and continues to be so" (communication from Peter Ashton 2005). Furthermore, while member states are free to proceed with their own investigations of possible schemes for using Okavango waters, they are required to inform their partners of their intentions and, especially important, decisions to proceed with a project require the agreement of all three states (communication from Peter Ashton 2005).

Though progress forward has been slow, the most valuable international assistance has come from Green Cross International/AWIRU's collaboration with OKACOM which draws its inspiration from Green Cross and UNESCO's 2001 Rivers for Peace project which includes the Okavango along with five other rivers around the world. Collaboration has emphasized two workshops (2001 and 2003) for OKACOM Commissioners and other participants, plus a book incorporating results (Turton et al. 2003), which have moved the Commission forward in a number of important ways.

Six accomplishments are especially important (Turton and Earle 2003). One is to show how outside interests can work constructively with OKACOM. Another is to model how such collaboration can occur – important granted the lack of a vision and a strategy among donors and international NGOs, private sector firms and other organizations for working with OKACOM and the three river basin states. A third is an emphasis on benefit sharing which expands options for conservation and development beyond water sharing. A fourth is making available to the Commissioners and the public the most recent research on the Okavango River Basin, a result which has benefited from the involvement of international donors and researchers. A fifth is the gradual evolution of a Strategic Report on the

Okavango River Basin which described and categorized components such as those over which no, and some, human control was possible and discussed the varying significance of those forces for the three states, and those on which OKACOM – as institutionalized by the member states – can expect to have an impact. A sixth was to familiarize, through the workshops and presentations at the Third World Water Forum in Kyoto and elsewhere, the outside world with the Okavango situation.

Other projects have also worked in close cooperation with OKACOM. Over a 10-year period, however, results are disappointing when examined in relationship to the conservation and development problems facing OKACOM and the basin states and other tasks that remain to be done. Coordinated by OKACOM and in collaboration with the GEF/UNDP project, one such task involves completion of a Transboundary Diagnostic Survey and a Strategic Action Programme. Two others, assisted by the US Government's Improved Management of Selected River Basins and Sharing Water projects, are concerned with capacity building including building an effective secretariat in Maun once its establishment has been approved and funds allocated. During 2003 and 2004, for example, Sharing Water sponsored a workshop in each of the three riparian countries with participants trained in conflict management and negotiation, facilitation skills, and use of a shared data management system as well as on modelling software.

3.4 Suggestions on the Way Forward

Suggestions are presented as a series of bullet points, as the Okavango River Basin situation is far too complicated to warrant firm recommendations.

- A common vision for the Okavango River Basin's management plan and international treaty should be based on OKACOM's current approach to water for peace through the sharing of benefits rather than the sharing of water supplies since the Okavango "simply does not carry a large enough volume of water to satisfy all of the needs of the respective riparian states" (Turton and Earle 2003: 3).
- I believe that the number of international actors involved in the Okavango River Basin drama is potentially dysfunctional if not already dysfunctional. There is major need for a facilitating institution to help OKACOM bring the major actors together to develop a common "how do we help" vision and a common strategy for implementing that vision. A possible model is the UNDP round table for bringing together key donors with national stakeholders (and perhaps other stakeholders) to review project outcomes and future needs. The focus of such a round table needs to be expanded, however, so that the fund-raising function is only one of several key components. Especially important is to reduce duplication of effort and avoid key topics from being neglected. Though a strong believer in survey methodologies [as outlined in the World Bank's 1993 Rapid Appraisal Methods (Kumar 1993)] I suspect that too many projects are placing too much emphasis on their own overlapping community surveys without considering the need for more detailed livelihood and other

studies, which – though too often ignored – can be cost effectively completed by graduate students from Southern African universities for dissertation purposes.

- Institution building and staff capacity building and training should receive an even higher priority as a common goal in all three countries. I realize that this suggestion presents difficulties to countries under World Bank and IMF pressure to reduce the number of government employees. That said, my experience with projects in small countries like Lesotho, Swaziland, Laos and Nepal is that lack of institutional and staff capacity is a major constraint and at times, the major constraint. What evidence is available suggests the same is the case with Botswana (population less than two million) and Namibia (population approximately two million). While Angola is a larger country with a larger population, capacity has been adversely affected by 25 years of civil war since independence in 1975.
- No mainstream dams, including on the mainstream of the Cubango River and the Cuito River in Angola, should be built because of the dependency of the Okavango Delta on natural environmental flows with regard to the movement of both sediment and water. Where to-be-expected tributary dams are built in Angola for hydropower and irrigation purposes, downstream impacts on the livelihood of riverside communities (including on flood recession agriculture, dry season grazing, fishing, and aquifer recharge), as well as ecosystem system impacts of sediment and water flows, must be considered during options assessment. The options assessment process should also consider the advantages and disadvantages of a cascade of dams on one or a limited number of tributaries versus single dams on many (Figure 3.1).
- Participatory stakeholder involvement, as intended by OKACOM and practiced by the Okavango Delta Management Plan process, is critically important at all stages of options assessment, planning, plan implementation and evaluation. Readers interested in the justification for such a statement are referred to the World Bank's 2003 Stakeholder Involvement in Options Assessment: Promoting Dialogue in Meeting Water and Energy Needs (see also McCreddin et al. 1996). That said, the increasing heterogeneity of viewpoints within local communities, not to mention within government agencies, makes stakeholder selection a difficult task. The same goes for participatory involvement of which stakeholders are selected as the ODMP Project has found out. Problems relate not just to capacity issues, but also to attendance, with less than two percent of community members attending Ngamiland meetings during 2003 and 2004 (ODMP 2005: 33) of which only one third were women among whom only an estimated one percent spoke. There is no easy solution to this problem other than being aware of it and, in the Okavango River Basin case, studying carefully how best to proceed.
- The results of options assessment for conservation and development purposes within the basin can be expected to vary between countries. A risk to be avoided by all three states, however, is restricting possible options to too narrow a number. In Botswana, for example, options considered should include the possibility of phasing out cattle exports from Ngamiland now that tourism

nationally is a greater source of foreign exchange and granted the effect that some (but not all) livestock fences have had on impeding game movements.

Botswana options to consider that involve Namibia include one suggested by Turton (Green Cross International 2003: 26) that would involve Botswana sharing some income from tourism with Namibia which could then be used to purchase food; hence reducing Namibian demands on Okavango flows for irrigation. That would also be cost effective since a food security approach in semi-arid countries with water demanding soils makes more sense than trying to achieve food self-sufficiency.

Angola in particular needs (through OKACOM and the Government of Angola with strong support from international donors) a wide ranging approach that carefully links refugee resettlement, rehabilitation of refugees and host communities, and post conflict development to Okavango River Basin conservation and development policies.

Fernando Pacheco's 2001 *Rural Communities in Huambo* deals with a province that impinges on the uppermost tributaries of both the Cunene and the Cubango rivers. It charts what I believe may be the necessary way forward. Of most importance his focus is on the low income majority in rural and urban communities and on the variety of farm and non-farm opportunities that are necessary to move them beyond subsistence – in other words on diversified production systems at household and community levels rather than emphasis on a single intervention such as irrigation. As with my experience with communities traumatized by dam-induced displacement, he rejects the view of government officials and NGOs involved in relief activities that war-affected communities are passive; indeed "we must not believe the impression… that there is just a vacuum.... Instead, the discussion must be about actions to validate and improve [local] initiatives that have already begun" (Pacheco 2001: 109–110).

In regard to Pachero's approach to rehabilitation and development, he is very explicit that it is at cross-purposes with the policy of the government to hand over large colonial land holdings to entrepreneurs. Not only is the past record with such holdings unsatisfactory, but there is insufficient land and (at least in some areas he visited) local communities were united in their opposition to that policy. In one case "the people's ancestral lands were taken over by two settlers who used them for raising cattle" and "they violently oppose the idea that rich large-scale farmers or speculators might take over the former Portuguese farms" (Pacheco 2001: 92 and 96). Though the author does not mention it, such farmers and speculators are far more likely to press the government for large dams in the upper basin than would be the case with local villagers. As for Pacheco's approach to rural communities in addition to access to sufficient land (and credit-worthy title to that land), what is needed is a credit programme available to all for restoring the cattle needed for security and plow agriculture and for the purchase of such essential inputs as fertilizers and improved seeds. Also production activities must be linked to marketing and to markets.

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Acronyms

AWIRU	Africa Water Issues Research Unit
FAO	Food and Agriculture Organization
GEF	Global Environment Facility
IUCN	The World Conservation Union
NCSA	National Conservation Strategy Agency
OKACOM	Permanent Okavango River Basin Water Commission
ODMP	Okavango Delta Management Plan
UNDP	United Nations Development Programme
SOIWDP	Southern Okavango Integrated Water Development Project

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4 Water Management in the Jordan River Basin: Towards an Ecosystem Approach

Odeh Al-Jayyousi and Ger Bergkamp

4.1 Introduction

The sustainable governance and management of river and drainage basins of the Middle East is of critical importance for economic development in the region. Arriving at a sustainable use of the region's water resources forms a major challenge in the context of the region's aridity, rainfall variability and water scarcity. The long-term sustainability of the resource is also affected by a number of volatile factors. These include, for example, conflicting territorial and resource claims, continued population growth, and immigration and refugee flows. These challenges have often raised the question over water resources ownership and management at the local level and between riparian states. Increasingly, however, these challenges are also seen as opportunities to start-up or intensify dialogue amongst stakeholders and institutions and stimulate innovations at different levels.

A key feature for moving towards sustainable water management in the Middle East is a management of water and other natural resources in an integrated manner. No longer can water challenges be analysed from one sector, discipline or perspective only. Policy interventions and investments for sustainable water management have to be considered from at least two angles: (a) the perspective of water resources development, including allocations of water to maintain downstream ecosystems that support rural and (peri)-urban livelihoods and societies, and (b) the perspective of ecosystem services – enhancing the contribution that ecosystems make to water supply and management (IUCN 2003, Falkenmark and Lindh 1993). Examples of the latter include, for example, upper-watershed (land) management to reduce soil erosion, and enhance infiltration and groundwater recharge. Other examples include treating effluents and improving water quality through using wetland ecosystems, and reducing risks of droughts and flooding by restoring (soil) water storage and buffer capacities in agriculture and grazing lands. The challenge is to develop new approaches that combine those two perspectives and provide a direct contribution to improved livelihoods, local economies and well-being. For any approach a major challenge is to establish improved collaboration between and amongst stakeholders and institutions.

The Jordan River Basin is a good example where these new approaches are urgently needed. Here governance issues have been a major factor in the unsustainable use of its resources over the last decades. To understand the multi-dimensions of the water issues in the Jordan River Basin, it is critical to appreciate the historical context of the water allocations and the rationale adopted by each riparian state for its water abstractions.

The aim of this chapter is to provide an overview of the legal and institutional frameworks for managing water of the Jordan river and to put forward alternative approaches and transitions needed to address the unsustainable management of the resources in the basin.

4.2 Water Allocations along the Jordan River: A Historical Perspective

The Jordan Basin can be divided into two parts, the Upper Jordan, from its source(s) to Lake Tiberias and the Lower Jordan, from Lake Tiberias to the Dead Sea. Since the construction of Israel's water carrier in 1964, Israel began withdrawing 320m^3/year from the source of the Jordan river (Inbar and Maos 1984: 21), the coastal aquifers also need to be considered when analysing the water allocations and use in the Jordan River Basin.

Since 1967, the Upper Jordan Basin is shared by Syria, Israel, and Lebanon and has one main tributary, the Yarmouk River, shared by Lebanon, Syria, Palestine, Israel, and Jordan (Kliot 1994). The Upper Jordan, to its southern exit towards Lake Tiberias, has three sources: the Hasbani River, located in Lebanon, the Banias River, which was part of Syria until 1967 and has since been under Israeli control, and the Dan River, which is on Israeli territory. The total flow of the Upper Jordan is about 540 million m^3/year and is delivered to Lake Tiberias. Currently, Israel is the predominant user of this resource, mainly through its National Water Carrier, which abstracts an average of 450–500 million m^3/year (Kliot 1994; Lonergan and Brooks 1994).

The Lower Jordan is shared by Syria, Israel, Jordan, and Palestine as shown in Figure 4.1. The total discharge of the Jordan into the Dead Sea declined from 1,370 million m^3/year to 250–300 million m^3/year between 1967 and 1995. This decline is due to increased abstraction by all riparian states predominantly for agricultural purposes. The current flow into the Dead Sea consists of irrigation return flows, intercatchment runoff, saline spring and sewage discharges (Salameh 1992; Kliot 1994).

Besides surface water, groundwater in the Jordan Basin forms a critical resource for economic development. Currently only some of these resources are shared by Israel and Palestine. The Jordan groundwaters include two major aquifer systems: the Mountain aquifer and the Dead Sea aquifer as shown in Figure 4.2. According to Article 40 of the Water and Sewerage Agreement between Israel and Palestine signed in 1995 as defined in the Oslo II Agreement (Kliot 2000), the maximum Palestinian abstractions from the Mountain aquifer are 118 million m^3/year. Israel currently utilizes 483 million m^3/year of this resource amounting to 63% of the total abstractions. The total annual recharge of the mountain aquifer is 679 million m^3/year (Abu-Sway 1994). The Coastal aquifer in Gaza Strip has an annual replenishment of around 60 m^3, but it is overexploited by about 30–50 m^3/year (Nassereddin 1994; Abu-Sway 1994).

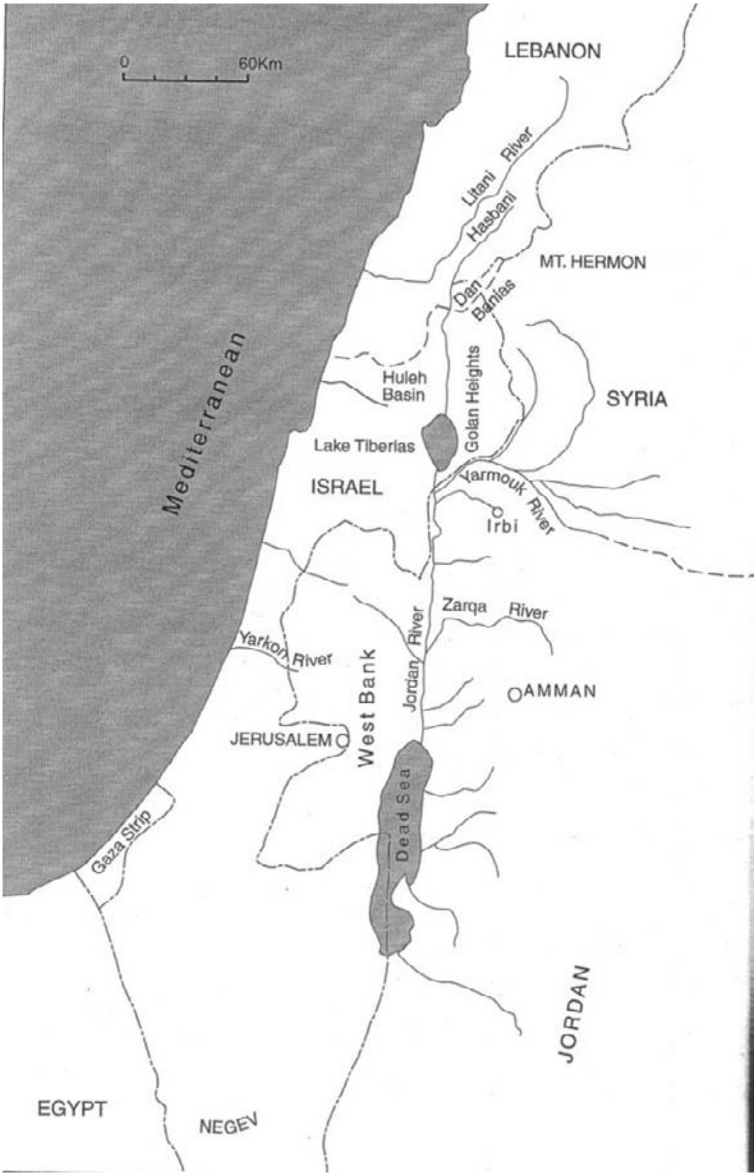

Fig. 4.1. General map of the Jordan River Basin System

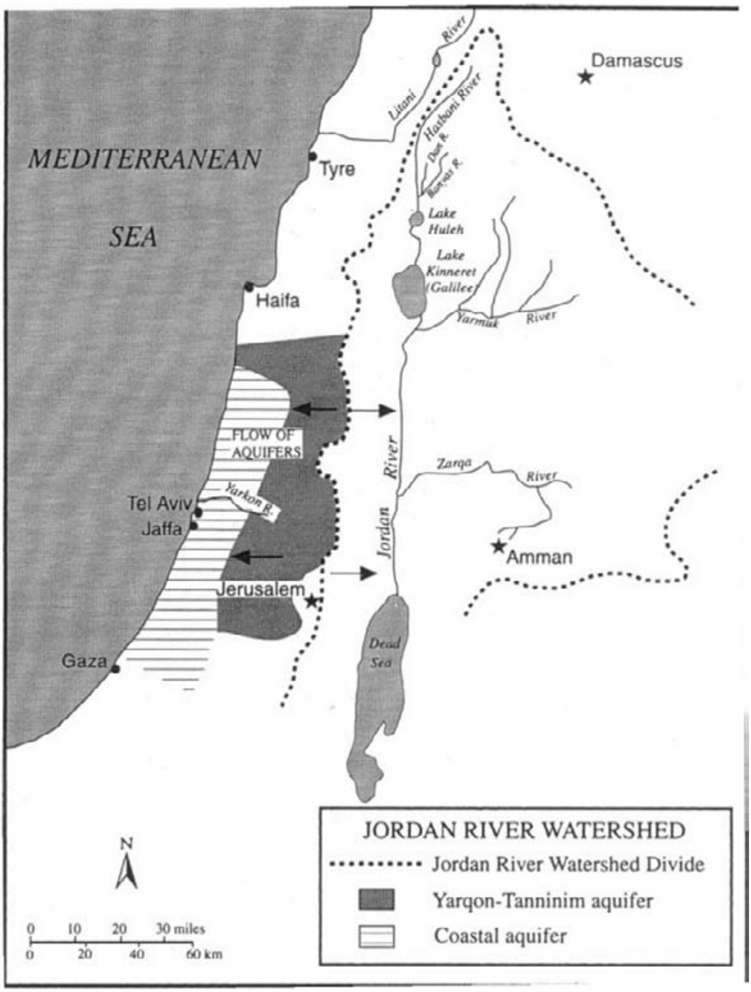

Fig. 4.2. Water system in the Jordan River Basin

In the years that followed World War I, the location of water resource influenced the boundaries, first between the British and French mandate powers that acquired control over the region, then between the states that developed subsequently. As documented by Ra'anan (1955), the border formulation for a "national home" in Palestine presented at the Paris Peace Talks in 1919, for example, was determined by three criteria: historic, strategic, and economic. Economic considerations were defined almost entirely by water resources. The entire programme of immigration and settlement in Palestine required water for large-scale irrigation for hydropower. The development plans and the boundaries required were "completely dependent" on the acquisition of the "headwaters of the Jordan, the Litani River, the snows of Hermon, the Yarmuk and its tributaries, and the Jabbok". Between the world wars, water became the focus of an even greater political argument over what the "economic absorptive capacity" would be for immigration (Naff and Matson 1984). Table 4.1 presents a brief historical evolution of water allocations of the Jordan River Basin.

Table 4.1. Historical evolution of water allocations of the Jordan River

Year	Event
1939	"Ionides Plan", a British study, suggests that water would be a limiting factor for any additional immigration to Palestine.
1944	"Lowdermilk Plan", suggests in contrast to the "Ionides Plan" that, with proper water management, resources would be generated for 4 million Israeli refugees in addition to the 1.8 million predominantly Arabs and minority Jews living in Palestine at the time. British policymakers come down on the side of the "Ionides Plan", invoking "economic absorptive capacity" to limit Jewish immigration and land transfers during World War II.
1948	The legacy of the mandates and the 1948 war, divides the Jordan River in such a way that future conflicts over water resource development are almost inevitable.
1950	By the early 1950s, Arab states discuss organized exploitation of two northern sources of the Jordan, the Hasbani and the Banias. The Israelis make public their "All Israel Plan" which includes the draining of Huleh Lake and swamps, diversion of the northern Jordan River, and construction of a carrier to the coastal plain and Negev Desert: the first transfer of water out of the basin.
1953	(October) U.S. President Dwight Eisenhower sends his special envoy, Eric Johnston, to the Middle East to brooker a comprehensive settlement on the Jordan River system water allocations. Johnston's initial proposals are based on a study carried out by Charles Main and the Tennessee Valley Authority (TVA) at the request of the United Nations to develop the areas water resources and to provide for refugee resettlement. The proposal, known as the "Main Plan", allocated 393 million m^3/year to Israel, 774 million m^3/year to Jordan, and 45 million m^3/year to Syria. Allocations under the Unified Plan, later known as the "Johnston Plan", included 400 million m^3/year to Israel, 720 million m^3/year to Jordan, 35 million m^3/year to Lebanon, and 132 million m^3/year to Syria (U.S. Department of State 1955, 1956).
1964	Israel completes major parts of its National Water Carrier and starts with water diversions. These led to the first Arab Summit.
1965	The Arab states begin construction of their Headwater Diversion Plan to prevent water from reaching Israel. Israel attacks the water diversion works in Syria. These events led to the 1967 War between Israel and Jordan.
1967	Israel gains territory and improves its geostrategic and "hydrostrategic" position. With the occupation of the Golan Heights, Israel has full control over the headwaters of the Jordan, with the exception of a section of the Hasbani River. It now has strategic control over the Yarmuk River Basin.
1992	Jordan and Israel start multi-lateral water talks and sign a declaration of principles.
1994	Jordan and Israel sign a Peace Treaty on 26 October 1994.

After the 1967 War, Israel integrated the West Bank and Gaza into the economic and hydrologic networks which in turn have led to increasing hydropolitical tensions. Besides, the Israeli occupation of the West Bank and Gaza in 1967 implied the seizure of the recharge areas for aquifers that flow west and northwest from the West Bank into Israel, and east to the Jordan Valley (Kahan 1987). The entire renewable recharge of these first two aquifers is already being exploited and the recharge is very small leading to a near depletion of this aquifer.

During the years of Israeli occupation, the Jewish settlements have increased the burden on the limited groundwater supply and through this contributed to the already tense political relations. Palestinians have objected to Israeli control of local water resources and to settlement development, which they see as being at their territorial and hydrologic expense. The Palestinians argue for their riparian rights in the Jordan River since the West Bank has about 90 km frontage on the banks of the Lower Jordan River (Abu-Sway 1994). The rationale of water allocations for the Palestinians is based on the "Johnston Plan" negotiations. The "Johnston Plan" allocated 100 million m^3/year from Jordan's total allocation of 720 million m^3/year to cater for the West Banks' water demands. A summary of the water allocations of the Jordan River and Coastal aquifers prior to and after the 1994 Peace Treaty is shown in Tables 4.2, 4.3 and 4.4.

Table 4.2. Sources and Uses of the Jordan in million m^3/year along the Yarmuk and Shared aquifers (Before the Agreements on Water Sharing, 1994)

Sources	Volume	Syria	Jordan	Palestinian Authority	Israel	Flow to the Dead Sea
Yarmuk	400–500	190–200	120–130		70–10	250–300 (return irrigation water)
Jordan	540	None	None		450–500	Inter catchment runoff, saline springs and sewage)
Coastal	60	Syria and Jordan are not riparians to groundwater resources		90–100	3	
Coastal	60	Syria and Jordan are not riparians to groundwater resources		90–100	3	
Mountain Aquifer	679			118	483	

Sources: Salameh (1992), Bakour and Kolars (1994), Hof (1995), and Abu-Sway (1994).

Table 4.3. Water allocation between Jordan and Israel – Yarmuk River according to the 1994 Peace Treaty (Flows in million m^3year)

Water Source and Season	Jordan	Israel	Notes
Winter Period [1] 16 October -14 May	The rest of the flow	13 +20[1]	According to Jordanian sources a net gain for Jordan is 37 million m^3/year. Israel used to pump 50 million m^3/year during the winter and deliver it to Lake Tiberias
Summer period [1] 15 May -15 October	8	12	Israel used to pump 20 million m^3/year.

[1]Refer to Water Peace Treaty between Jordan and Israel (1994), Annex II (Paragraph 1A and 1B).

Table 4.4. Water allocation between Jordan and Israel along the Jordan River according the 1994 Peace Treaty in 1994 (Flows in million m^3/ year)

	Jordan	Israel	Notes
Winter Period 16 October -14 May	Allowed to: (a) 20 million m^3/year from the Jordan River upstream from Degnia; (b) Store 20 million m^3/year of floods in the Lower Jordan; (c) Use 10 million m^3/year of the desalinated water of the Lower Jordan.	Allowed to: (a) Use up to 3 million m^3/year of stored water (b) Use 10 million m^3/year of desalinated water in the Lower Jordan, (c) Increase the current use of Wadi Arava Groundwater by 10 million m^3/year.	(1) Up-stream Degnia off-take by Jordan is a swap for the 20 million m^3/year of winter flow which Israel is allowed to pump during the winter. This allocation is based on Israel's capacity to store winter floodwater in Lake Tiberias and transfer it to Jordan, which lacks water storage facilities. The water is provided in the summer. (2) In the long term, investment is needed for a desalination plant in the Lower Jordan. The water will be divided equally. (3) Storage for floods in the Lower Jordan is also a long term project. (Jordan: 7, Israel 3 million m^3/year) (3) Until the desalination plant is built, Israel will provide Jordan with 10 million m^3/year upstream from Degania during the winter. (4) Israel is permitted to increase its use of the groundwater in the Wadi Arava to 20 million m^3/year.

(Continued)

Table 4.4. (Continued)

Total gain Short-range	50 million m^3/year increase (currently: 30)	30 million m^3/year reduction
Long–range	Up to 100 million m^3/year increase a) storage on the Yarmuk: 20 b) storage on the Jordan 20 + 10 c) desalinated water: 50 million m^3/year	23–30 million m^3/year increase

This amount is compensated for by the 20 MCM which Jordan receives from Israel. Refer to Annex II of the Peace Treaty between Jordan and Israel, Article I and II, 1994.
Syria's Withdrawal: 200 MCM, Israel 50–70, Jordan 130, and 44 MCM flow to the Dead Sea.
Sources: Treaty of Peace 1994 (Hof 1995).

According to Annex II of the 1994 Peace Treaty, Israel will limit its withdrawals from the Yarmuk River to 25 million m^3/year. Jordan has rights to the rest of the long term annual average flow of the river plus 10 million m^3/year of desalinated brackish spring water (out of a total of 20 million m^3/year to be desalinated). Jordan will effectively store 20 million m^3/year of winter floodwater in Israel by allowing Israel to pump it from the Yarmuk in the winter and returning it to Jordan in the summer. Floodwater use, in addition to current uses, will be equally split between the two riparian states. In addition, two dams will be constructed, one on the Yarmuk River and one on the Jordan River.

Furthermore, Israel is allowed to increase pumping of groundwater in the Wadi Arava area by 10 million m^3/year. According to the redefined border, this area now falls within Jordanian territory. An additional 50 million m^3/year of water of drinkable standards will be developed through joint Israeli – Jordanian projects to be determined by a Joint Water Committee.

4.3 Principles for Allocations of Water in Shared Drainage Basins

Water flows do not necessarily follow human-made geographic boundaries, institutional arrangements or legal principles. Managing water resources within the boundaries of watersheds therefore challenges institutional and legal capabilities of nations. Many international agreements and water policies provide little guidance on water rights, environmental issues in general and water quality in particular. Despite this it may be argued that rivers can be conceptualized and viewed as "legal structures". The viability and complexity for such a notion is discussed next using the Jordan River Basin situation.

International Law does not provide clear guidelines on water allocations and, as such, reflects the challenges one faces when developing legal frameworks that fit with hydrological realities. However, International Law provides a number of principles for joint management and cooperation on water resources by calling for the "equitable use" and the obligation "not to cause appreciable harm". These general principles are complemented by many site-specific treaties that have provided some solutions for water allocations in specific river basins.

The concept of a "drainage basin" was accepted by the International Law Association (ILA) in the Helsinki Rules of 1966, which also provided guidelines for "reasonable and equitable" sharing of common waterways (Caponera 1994). Article IV of the Helsinki Rules describes the overriding principle:

> Each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin.

Article V lists a number of factors which must be taken into account when defining what is "reasonable and equitable". It is argued that one of the important shifts that the Helsinki Rules established is the right to "beneficial use" of water, rather than to water *per se* (Housen-Couriel 1994). Biswas (1993) documented that states showed some reservations with respect to the Helsinki Rules in 1970 and that they raised some objections to the prominence of the drainage basin approach, which may be seen as a source of creating tensions between riparians with respect to governance and sovereignty.

According to Caponera (1994) and Kliot (1994), the principle of "absolute sovereignty" (or the "Harmon Doctrine") is often used by an upstream riparian. The downstream riparian claim often depends on climate and relates to a "natural flow" that is needed to maintain a river and a water supply. In humid drainage basins, lower riparians often use the doctrine of "absolute river basin integrity". This suggests that every riparian is entitled to the natural flow of a river system crossing its borders. This principle has limited acceptance as a reflection of "absolute sovereignty". Often, lower and upper riparians both use the "prior appropriation" principle; i.e, first in time, first in right.

Kliot (1994) argued that conflicting doctrines present divergent interpretations and rationales for water allocations depending on the relative power of a nation state and its location in a drainage basin. Historically, downstream riparians in the Middle East like Jordan, Iraq and Egypt, have received less rainfall than their upstream neighbours and therefore are known to be highly dependent on river and groundwater flows from upstream riparian states. As a result, recent "right-based" disputes often have taken the form of upstream riparians, such as Ethiopia and Turkey, to argue in favour of "absolute sovereignty". In contrast, downstream riparians have used the "prior appropriation" principle to substantiate their case for water allocations.

The doctrine of "limited territorial sovereignty" reflects rights to a reasonable use of international waters without causing harm to any riparian state (Caponera 1994). The challenge is that the Helsinki Rules include provisions for both "prior appropriation" and "absolute sovereignty", without setting a clear priority between the two. For instance, Article 5: "Equitable and reasonable utilization and participation", stipulates that "States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner." Article 7: "Obligation not to cause significant harm" states that "watercourse states shall exercise due diligence to utilize an international watercourse in such a way as not to cause significant harm to other watercourse States". Dellapenna (1995) argues for equitable use and the World Bank recognizes the importance of equitable use in theory but in practice gives the principle of "no appreciable harm" precedent.

The Jordanian and Israelis reached agreement on a common agenda as a framework for a peace treaty. The 1994 Peace Treaty's Article 6 deals with water issues. There is mutual recognition of the rightful allocations to both countries from the Jordan, Yarmouk and Wadi Araba. Annex II of the Agreement allocates water from the common water resources in a manner in which Jordan could gain immediate relief from water scarcity in its urban centres. There are a wide variety of measures to prevent harm or damage to the common resources, arrangements of joint monitoring of common water resources, and the establishment of a Joint Water Committee. The 1994 Peace Treaty can therefore be categorized as using an "equitable utilization" principle with respect to international water resources.

4.4 The Institutional Imperative of the Jordan River Basin

Water managers generally advocate the concept of a river or drainage basin as the appropriate unit of analysis for watersheds. However, the regional water institutions are challenged to deal with complex nation-state development priorities. Appropriate guidance is available on the notion of "institutional imperative" in the context of international transboundary water management (Buck et al. 1993) and coordination between levels of management (Young et al. 1994). Nevertheless, Wolf (1997) and Frederiksen (1992) argued that while, ideally, water institutions should provide for ongoing evaluation, comprehensive reviews and consistency among actions, in practice these goals are rarely achieved.

Currently, the Jordan River Basin is facing a major challenge in developing the institutional mechanisms needed to make sustainable management of its water resources a reality. The 1994 Peace Treaty (Israel-Jordan) and the Oslo II Interim Agreement between Palestine and Israel (the Oslo Accord is also known as the Declaration of Principles, 1993) contain the concept of mutualism on specific water sharing schemes and the establishment of the Joint Water Commission (JWC) (Newman 1994). The Joint Water Commission was designed to fulfil the provisions of Annex II in the 1994 Peace Treaty and is composed of three members from each country. The committee will specify its work procedures, the frequency of its meetings, and the details of its scope of work. The committee may invite experts and/or advisors as required, and can also establish a number of specialized subcommittees and assign them technical tasks.

In 1995, a Water Commission with members from both riparians was also proposed as the institutional mechanism that implements the undertaking of the Agreement on Water and Sewerage between Israel and Palestine. The functions of this Water Commission include the coordination of (a) the management and protection of water resources and water and sewage systems; (b) the exchange of information; (c) the oversight of the operation of the joint supervision and enforcement mechanisms; and (d) the resolution of water- and sewage-related disputes. As for the structure, the Water Commission is composed of an equal number of representatives from Israel and Palestine, and all decisions will be reached by consensus. An immediate result of the agreement was the establishment of the Joint Supervision and Enforcement Team to supervise the enforcement of the agreement. Besides, the two sides could establish subcommittees to deal with all issues of mutual interest (Kliot 2000).

Building on the work of the two Commissions, Jordan, Palestine and Israel signed a common Declaration of Principles for Joint Development of Water Resources in the Jordan –Yarmouk Basin. This treaty focuses on the joint development of new water resources in the Jordan and Yarmouk basins. The declaration calls for full coordination among water institutions and on water law issues amongst the three parties. Paradoxically, the issue of shared water resources was not addressed and Syria and Lebanon are not identified as being part of the Jordan – Yarmouk Basin. However, the parties acknowledge water rights in quantitative terms.

One of the most valuable parts of the agreement between Israel – Palestine is the establishment of a Joint Palestinian – Israeli Supervision and Enforcement Team. This team was subsequently able to control some illegal water drilling in the Jenin area. The agreement also helped to create a sense of trust and contributed to confidence-building measures between the two sides. However, the challenge now is that political realities on the ground prohibit further cooperation and as a matter of fact made the Water Commission quite inactive (Kliot 2000).

Given the challenges facing the collaboration at the Jordan Basin level, alternative approaches need to be developed that strengthen sustainable management at sub-basin and local levels. In doing so, trust and capacities can be built that can form the basis for future basin-wide agreements and collaboration. These new approaches, however, need to create an innovation dynamics around water allocations in the Jordan Basin. A way forward is the development and implementation of an ecosystem approach to water management for the Jordan Basin.

4.5 Towards an Ecosystem Approach for the Jordan River Basin

4.5.1 Transitions towards Sustainability

An ecosystem approach to water management is based on the notion that water, biodiversity and environmental protection require the establishment of interdisciplinary, intersectoral, and interinstitutional initiatives. These initiatives define strategies for actions and investments building primarily on the needs of the people living in a specific river or drainage basin. They focus on allocating enough water to downstream ecosystems so these continue to provide critical services to livelihoods and economies. They typically invest in ecosystem services that are essential to maintain water supply, such as groundwater recharge, erosion control and water purification. To make those investments sustainable they address the combined demands for space from natural ecosystems and people, and to restore basic processes so that water moves through ecosystems with the appropriate flow regime, temperature and chemical composition. To establish such initiatives in the Middle East in general and in the Jordan Basin in particular, a number of innovations need to occur. These include:

Transition 1. A Shift in Water Resources Thinking

The first transition required is one that brings us beyond the conventional "blue" water bias in water resources policy and management. This thus entails a more holistic approach in which rainfall, evapo-transpiration, soil water, groundwater, sewage and agricultural return flows are all appreciated as part of the water resource and services provided by ecosystems and which need to be managed in an integrated manner. Widening the scope on what water and ecosystem service can and needs to be managed will enable stakeholders to put all available options on the table to improve water productivity and incorporate ecosystem services into planning and decision making. This broadened "water resources and ecosystem services" view needs to be shouldered by a broadened sectoral involvement in which all water dependent production and water uses are given due consideration.

Transition 2. A Shift in Science and Engineering

A second transition is needed that brings further innovation in science and engineering. This entails further developing the practical engagement of science and engineering in enhancing ecosystem services for local livelihoods throughout the Jordan Basin. Plot-level innovations in agriculture, water efficient sanitation, and desalinization are just some of the examples of areas for further development and collaboration. Other innovations need to occur more broadly in resource management, in particular with a focus on a sub-catchment or drainage area. These units are small enough to assure local decision-making but are sufficiently large to enable sustainable resource use. Improved drainage area planning incorporating biophysical conditions (e.g., slope, soils, rainfall, vegetation), technological options (e.g. covering agro-forestry, horticulture, agronomy, livestock, etc.) and livelihood opportunities (e.g. local/regional produce branding, local credit schemes and SME skill development) can generate synergies resulting in improvement in ecosystem services and livelihoods.

Transition 3. A Shift in Governance and Institutions

Administratively, the decision-making around water and other natural resources is split up amongst a number of "institutional silos". Management within these silos is often carried out in a piece-meal fashion with little cause/effect considerations in time or space. Agriculture, environment, water resources, health and infrastructure, generally fall under different line ministries with little or no linkages in terms of policy, laws, regulations and enforcement. A severe gap with respect to integration is the lack of collaboration between the water, food and environment line ministries and stakeholders. There is an urgent need to develop effective and efficient mechanisms that enable the different line ministries to develop common policies, investment priorities, legal frameworks, and regulations.

The challenge is that such reforms are unlikely to occur as long as policy makers are not provided with a sound scientific, economic and political rationale for a more integrated approach. Without a clear definition of the outcomes and the costs and benefits of such an integration, a close collaboration between departments and ministries around water resources and ecosystem services in the Jordan Basin is unlikely to be brought about swiftly.

Transition 4. A Shift towards Active Stakeholder Participation

Any development effort has to ensure a broad stakeholder involvement and ownership. A first element of stakeholder participation is the recognition of legitimate rights of stakeholders to access and use water resources. This refers not only to those rights established through official laws, rules and regulations, but also those established through customary law. More attention needs to be given to existing local arrangements and using local rights-based approaches for establishing more sustainable practices.

A second element that needs to be taken into account is the risks of stakeholders associated with water resources. For example, a small-scale farmer is an entrepreneur who calculates investment ventures not only based on cash-flow but also on risks involved. Risks in the Jordan Basin are directly proportional to rainfall variability and much less to rainfall amounts. Innovative technologies to cope with temporal rainfall variability can shift farmers from the present attitude of risk aversion to an attitude of sustainability and productivity.

A third aspect is the responsibility of stakeholders to engage in truthful negotiations and contribute actively to a genuine development process. This includes the responsibility to participate in, and respect outcomes of, negotiated decision-making processes and comply with negotiated agreements. It also includes the responsibility to comply with provisions of agreements for service provision to local stakeholders. Governments, investors and local stakeholders all have responsibilities to comply with existing laws and standards and to contribute to improving these where needed.

4.5.2 New Tools Supporting Innovation

Environmental Flows

One of the approaches that will be critical to develop a sustainable management of the Jordan River Basin is the development and implementation of "Environmental

Flows". An "environmental flow" is the water regime provided within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated. These benefits are often directly linked to downstream economies and livelihoods.

For the Jordan River Basin this implies developing a sound scientific basis for priority setting and defining water requirements of downstream ecosystems. A number of techniques can be used for this, including look-up tables, desk-top analysis, functional analysis, and habitat modelling (Dyson et al. 2003). The choice of the most appropriate technique will often depend on the specific purpose of the exercise as illustrated in Table 4.5. Look-up tables that define river flows according to simple rules of thumb, are typically used in national level policy and priority setting. They are also used in river basin planning. For the latter, desk top studies are also used. These studies typically draw from available literature and use basic information to come up with a required flow regime. Desk-top studies are also used for impact assessment studies, where the impacts of planned infrastructure or changes in operations of existing infrastructure are assessed in different parts of a river system. These analysis that elaborate on the amount and regime of water required to maintain those areas (wetland, floodplain) or stretches of a river that provide the services. More sophisticated are definitions of water requirement based on habitat modelling. With this technique, detailed studies on specific habitats are often carried out and combined with sophisticated modelling. These are normally used in an advanced stage of planning where detailed information is needed, for example for the restoration of stretches of a river system.

Table 4.5. Techniques for valuation of environmental flows

Method type	Sub-type	Advantages	Disadvantages
Look-up table	Hydrological Ecological	Inexpensive, rapid to use once calculated	Not-site-specific. Hydrological indices are not valid ecologically Ecological indices need region-specific data to be calculated
Desk top	Hydrological Hydraulic Ecological	Site specific Limited new data collection	Long time series required No explicit use of ecological data Ecological data time consuming to collect
Functional analysis		Flexible, robust, more focused on whole ecosystem	Expensive to collect all relevant data and to employ wide range of experts may not be achieved
Habitat Modelling		Replicable, predictive	Expensive to collect hydraulic and ecological data

Valuation of Ecosystem Services

For the Jordan River Basin, it will be increasingly important to incorporate the value of ecosystem services in the planning and decision making around water resources. Where most water was allocated to agricultural purposes in the past, a new allocation scheme needs to incorporate the water demands associated with a much wider range of ecosystem services.

A range of techniques is now available to determine the value of ecosystem services (Emerton and Bos 2004). The simplest and most commonly used method for valuing any good or service is to take its market price. Thus the price of products directly harvested from ecosystems determines their value. When these products and services are not directly traded in markets, their value can be derived from their contribution to other production processes or their impact on the prices of other commodities.

Cost-based approaches are commonly used to calculate ecosystem services.

Ecosystem values can also be determined through assessing the cost of man-made products, infrastructure or technologies that could replace ecosystem goods and services. Alternatively, the costs of mitigating or averting the impacts of lost ecosystem services can be used to determine their value. Finally, the damage that is avoided to downstream infrastructure, productivity or populations by the presence of ecosystem services can be ascertained. This often provides a good basis for investment in ecosystem maintenance as a good alternative for investing in infrastructure development. A third value is knowing the technique to determine ecosystem values, is people's willingness to pay. Ecosystem values can thus be defined by asking people directly what they are willing to pay for ecosystem goods and services or their willingness to accept compensation for their loss. More complex methods that measure people's appreciation for ecosystem values also exist.

For the Jordan Basin it will be critical to determine the values of the various parts of the ecosystem and the services these provide and can provide in the future. This would provide a sound scientific and economic rationale for investing in the maintenance of the ecosystems of the Jordan Basin. By doing so, one would be able to define those ecosystems to be part of the basic infrastructure one would need to manage the basin's water resources. Investments in this "ecosystem-infrastructure" can then be much better substantiated and linked to direct economic and livelihood returns.

4.6 Conclusions and Lessons Learned

A number of lessons can be learned from the experience of river basin management and the Peace Treaties with riparian states along the Jordan River. The history of the Jordan Basin provides an insight in how the rationale of sovereign states to use and develop water resources has evolved over time. It shows that significant steps forward were made during the 1980s and 1990s but that major setbacks have occurred since. These relate mostly to the wider political process and much less to specific water-related issues.

Given the current stalemate of the water dialogue at the basin level, water managers and stakeholders in the Jordan Basin need to develop new and strengthen existing, more local approaches towards sustainable water management. A critical aspect of this is to establish innovations at several levels, both technically and institutionally.

Tools are available that can support innovation on water management in the Middle East. Environmental Flows and Economic Valuation of natural resources can provide an impetus to improved spatial and water resources planning and investments. There is an urgent need now to distribute and test those tools in a Middle East context.

The history of sharing water in the Middle East represents a transformation of visions and paradigms. There is increasingly a change in the rationale used to define water investment priorities, moving from a more ideological (or value), and economic sector specific argumentation to a more adaptive and sustainable basis. During the coming years, the support to an adoption of new approaches to water management will determine not only the water use of and water sharing amongst riparian states in the Middle East but provide the underpinning of any future economic development.

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5 Transboundary Cooperation Between Finland and Its Neighbouring Countries

Timo Kotkasaari

5.1 Introduction

5.1.1 Finland's Transboundary Watercourses

Finland, which is situated in northern Europe, is very rich in water resources. It has about 60,000 lakes of various shapes and sizes and is a Baltic Sea riparian country. Most of the aquifers are situated in gravel and sand eskers. According to the Water Poverty Index, Finland is the highest-ranking country in the list of the world's water-rich nations. Only 2.2% of the water available in Finland is actually used each year.

Finland – like many other countries – has many watercourses and groundwaters that do not follow national borders. Instead, they extend across boundaries or actually serve as boundaries themselves. Finland has transboundary watercourses with Sweden, Norway and the Russian Federation (Figures 5.1 to 5.3). Finland shares the Muonionjoki River and part of the Tornionjoki River with Sweden. The Tornionjoki – Muonionjoki catchment area covers about 40,000 km^2, of which 15,000 km^2 lies on the Finnish side and 25,000 km^2 on the Swedish side. Because of the flat terrain most of the river is fairly shallow.

The largest river basins between Finland and Norway are the catchment areas of the Tenojoki (Tana), Näätämöjoki (Neidenelva) and Paatsjoki (Pasvikelva) rivers. The Finnish – Norwegian border is 715 km long and forms the northernmost border of the European Union. The total length of the Tenojoki River is 344 km, of which 255 km is on the frontier, and the catchment area totals about 16,000 km^2 – a third of which is on the Finnish side. The unharnessed river is one the most famous salmon rivers in Europe that is still in its natural state, and the money spent by sports fishermen in the area is a major source of income for local people.

Fig. 5.1. Tornionjoki watershed

Fig. 5.2. Paatsjoki watershed

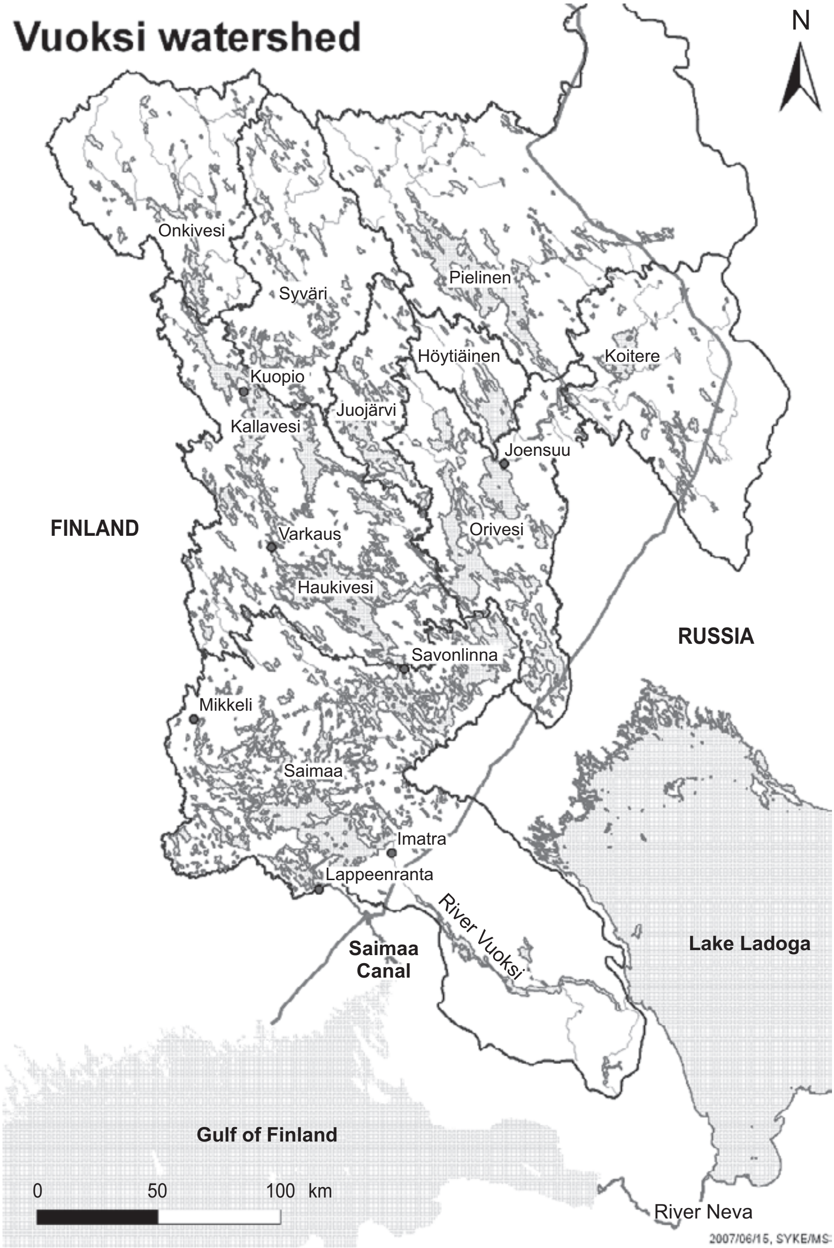

Fig. 5.3. Vuoksi watershed

The Vuoksi catchment area is the largest of the transboundary watercourses between Finland and Russia (69,500 km^2).

However, there are no rivers following the border between Finland and Russia. Far more water runs into Russia than away from Russia through the transboundary watercourses. The volume of water flowing from Russia into Finland across the frontier is, on average, 100 m^3/s. The corresponding flow from Finland into Russia is 900 m^3/s, the bulk of which, 600 m^3/s and 150 m^3/s, is carried by the Vuoksi and Paatsjoki rivers, respectively. About 15% of the water in the Vuoksi River originates on the Russian side.

5.1.2 Legal Principles

Over 40% of the world's population live in about 260 international river basins that cover almost half the earth's land surface. Water should be seen as a shared resource and not as a cause of conflict. Cooperation between countries is needed in order to achieve an equitable use of water resources and to protect transboundary watercourses. International water law plays an important role in the management of international watercourses. The treaties between riparian countries create a basis for this cooperation. The Treaty of the Great Lakes between the United States of America and Canada was signed in 1909 and its "International Joint Commission" is well-known all over the world. This treaty later formed a pattern for many other treaties throughout the world.

In Europe, a good example of long-lasting cooperation is the river Rhine. The International Commission for the Protection of the Rhine against Pollution was founded in 1950 to establish cooperation between nine countries bordering the Rhine. Joint efforts have been successful, especially in the field of water protection. Today, the work of the Commission encompasses sustainable development of the entire Rhine ecosystem. In Asia, the Mekong River Commission (Cambodia, Laos, Thailand and Vietnam) celebrated its 10th year of cooperation in sustainable development of the Mekong River Basin.

Sovereignty over water is a complex issue. Although water has been a political and military issue since antiquity, it is only since the 20th century that we have developed the means to dramatically alter, store and divert the natural flow of rivers and access the vital sources of deep groundwater (Green Cross International 2000). The old doctrine on absolute territorial sovereignty (the Harmon Doctrine) states that riparian countries may use water resources of an international watercourse that is situated within the boundaries of its territory, even to the detriment of another country. The opposite doctrine (principle of absolute territorial integrity) gives the downstream country the absolute right to the continuous flow of a river flowing from the country upstream. The third theory is the principle of prior appropriation, which confers on the first user superior rights to the water compared with the rights of the later users ("first in time, first in right"). The fourth of these theories is restricted territorial sovereignty. States are entitled to use their own watercourse in transboundary river basins in a way that does not have an undesirable impact on the other riparian countries. The "No harm" principle is linked to the above-mentioned principle of the restricted territorial sovereignty (Wolf 1999; Mechlem 2003).

The above doctrines are extreme and are not contained in the transboundary cooperation between Finland and its neighbouring countries. The signed agreements certainly manifest the principle of restricted territorial sovereignty.

The principles of the International Law Association's (ILA) Helsinki Rules were adopted in 1966. The rules emphasize a basin-wide approach. Each basin state is entitled to an equitable and reasonable share of the waters in international drainage basins within its territory. The equitable and reasonable utilization of transboundary watercourses is a largely accepted and well-balanced principle and is a principle that respects the sovereign equality of states. The doctrine of equitable utilization in international water law appeared first in the Helsinki Rules. This guiding principle is at the heart of international law (Dellapena 2001). The Convention on the Law of the Non-Navigational Uses of International Watercources (UN WCC 1997) also contains the principle of equitable and reasonable utilization (Art. 5) as well as factors relevant to equitable and reasonable use (Art. 6). The International Court of Justice delivered a judgement on equitable utilization in 1997 (Gabcikovo-Nagymaros Dam Dispute) (McCaffrey 2001). Nowadays, the interests of riparian countries are even more far-reaching and countries are inclined towards engaging in joint efforts to protect the natural resources and ecosystems of the whole international river basin. The Principle of Integrated Water Resources Management (IWRM) aims to promote the coordinated management of water, land and related resources for sustainable development in the transboundary watercourses.

The Helsinki Rules need to be updated because they no longer cover the development of customary international water law. Modern concepts, such as integrated management, sustainable development and precautionary principle were established after the Helsinki Rules were adopted in 1966. The Water Resources Committee started to draft and develop new rules, which were finalized at the Berlin Conference in 2004. The International Law Association approved the Berlin Rules on Water Resources. These Rules present a comprehensive revision to the Helsinki Rules and are a full collection of customary international environmental law and international human rights law that apply to all waters both nationally as well as internationally. Most of the rules are applicable to all waters, although Chapters IV, IX and X apply principally to waters in international drainage basins. For example, the principles of equitable utilization (Art. 12), sustainability (Art. 7), precautionary principle (Art. 10) and minimization of environmental harm (Art. 8) are included in the Rules. Article 6 suggests integrated management as a goal that basin states should strive towards rather than as an immediate obligation. Integrated management is essential for realizing the sustainable use of waters and other resources (International Law Association 2004).

I would like to mention one other Convention with respect to this topic: the ECE Water Convention in 1992 (Convention on the Protection and Use of Transboundary Watercourses and International Lakes), often referred to as the Helsinki Convention. It entered into force in 1996, and its main objectives are to prevent, control and reduce transboundary pollution. The principle of equitable and reasonable use of transboundary waters is clearly expressed in the Convention. The Convention includes many provisions that concern all parties to the agreement and riparian parties. Its objectives are achieved chiefly through bilateral or multilateral agreements between countries that share watercourses. These agreements are primarily applied in accordance with the provisions of the ECE Water Convention. In fact, the ECE Water Convention seems to have acted as a catalyst for the implementation of new treaties. The inspiration for signing several agreements, both multilateral and bilateral, has come out of this Convention (Wouters and Vinogradov 2003/2004). The Convention also stresses the role of broad public participation in effective environmental decision-making.

The Johannesburg Summit in 2002 (WSSD) took the issue of water as one of its 10 key areas. The two main goals in this area are (1) to halve the number of people with no access to safe drinking water and (2) to improve sanitation by 2015 (Action Area 1 and 2) . The target of Action Area 3 is to develop integrated water resources management (IWRM) frameworks, including integrated coastal area and river basin management (ICARM), and to prepare and implement water management action plans at the country level. The Summit put IWRM at the top of the international agenda. IWRM has become a mainstream initiative discussed by many governments, although effective implementation in the field remains a major challenge (Mizanur and Varis 2005).

There are some indicative milestones in the Summit document, including the requirement for all water-stressed countries to prepare water management action plans by 2005, which should include measures to meet the water deficits. Countries should also develop national and regional strategies and IWRM and ICARM programmes, which should be implemented by 2005. In practise, the international community is expected to assist countries in preparing water policies, strategies and regulations and to strengthen IWRM and ICARM planning and implementation capacities at the basin, coastal zone and country levels.

The EU Water Framework Directive (2000/60 [EC, WFD]) established a new, integrated approach to the protection, improvement and sustainable use of Europe's water resources. It sets a framework for the comprehensive management of water resources in the European Community with common objectives, principles and basic measures. The Directive's three fundamental objectives are to maintain the "high status" of waters, prevent any deterioration in the existing status of waters and achieve at least "good status" in all waters by 2015.

The Water Framework Directive considers the river basin as the unit for water management. A river basin is a natural geographical and hydrological unit, therefore administrative and political boundaries are not relevant in the implementation of this Directive. Each river basin within a Member State must be assigned to a river basin district. Member States must ensure that a river basin management plan is produced for each river basin district lying entirely within the territory of the Member State.

According to the common implementation strategy, the river basin management plans "act as the central focal point for the outcome of river basin planning."

The plan must include the following:

- all the results from the analysis of the river basin's characteristics;
- a review of the impact of human activity on the status of surface water and groundwater, including an estimation of point and diffuse source pollution;

- protected areas to be identified;
- a list of environmental objectives, established in accordance with Article 4, for surface waters,
- groundwater and protected areas;
- a summary of an economic analysis of water use (basis for pricing policies and efficiency analysis);
- an evaluation of the effect of existing legislation;
- a summary of the programme or programmes of measures to be adopted for waters that do not achieve the objectives of Article 4.

Member States must identify the appropriate competent authority for each river basin district.

Public information and consultation under Article 14 encourages all interested parties to become actively involved in the implementation of this Directive. In particular, all parties are entitled to obtain information and to comment on the formulation, review and revision of the river basin management plans. The first river management plans must be completed by 2009 and updated every six years; clearly a very demanding timetable.

The Water Framework Directive also encourages cooperation with non-member states. Where a river basin extends outside the European Community, the relevant Member State must endeavour to establish the appropriate cooperation with the relevant non-member state with the aim of achieving the objectives of the directive throughout the river basin district (Art. 3). The Water Framework Directive requires that international river basin districts are defined for transboundary waters, and that analyses of the river basins together with action plan programmes and river basin management plans are drawn up. In the case of an international river basin district extending beyond the boundaries of the Community, Member States shall endeavour to produce a single river basin management plan. If this is not possible, the plan shall at least cover the portion of the international river basin district lying within the territory of the Member State concerned (Art. 13).

5.2 Finland's Cooperation with Sweden

The natural conditions of transboundary watercourses between Finland and its neighbouring Nordic countries are very similar. The countries' social systems also have much in common; water and environment legislation, as well as social structures in Finland and Sweden, closely resemble each other. This is partly a consequence of common historical origins, but is especially a consequence of European environmental legislation which both countries have had to implement since their admission to the EU in 1995.

The border river agreement on water management between Finland and Sweden was signed in 1971. The agreement was inspired by the Helsinki Rules on the use of water in international rivers by the ILA. The principles that unilateral decision-making should be limited and that there should be a fair division of economic assets with joint bodies for administrative arrangements are good examples of these rules in the agreement. From the very beginning of the border river agreement, its objectives have been (1) to use water resources for mutual benefit, (2) to support the development of local society, (3) to protect nature, (4) to protect fish resources and to prevent the water from becoming polluted.

The agreement between Finland and Sweden established a joint Commission. The Commission can institute inquiries and investigations, enter into direct contact with the authorities of either member state and employ the services of experts for special investigations. The Commission has six members and the government of each state appoints three of these. One member from each State must be a legal expert with experience as a judge. The Finnish – Swedish Frontier Commission plays a unique role, because it has the authority to permit undertakings that may have an impact on the aquatic environment or cause damage to the watercourse in question.

The principal function of the Commission is, in fact, the handling of permit applications. The Commission deals especially with permits for construction of water projects and activities that may cause pollution. Decisions of the Commission are final when it is a question of granting permits. In matters of compensation, an appeal can be lodged with the Administrative Court of either country. The Commission also controls the use of the border water systems and monitors the quantity and quality of water. In addition, matters concerning fisheries have played a significant role in the work of the Commission. Fishery issues have created the most debate in the implementation of the border river agreement because fishing regulations regarding the migration of Baltic salmon up the Tornionjoki River have proven to be a very difficult issue.

Finland and Sweden have recently negotiated a new border river agreement. A new agreement was considered necessary for a number of reasons. First, the present agreement does not provide mechanisms for wider cooperation in water management other than the issuing of permits. Second, it is not possible to appeal fully against permit decisions issued by the Commission. Thus, the present agreement does not provide sufficient legal protection for third parties. Third, the present Commission, which closely resembles a water court, is not an adequate organization with regards to implementing the cooperation required by the EU Water Framework Directive. Moreover, joint arrangements are also needed in order to improve the flood risk management of the border river system.

The new Finnish – Swedish Border River Agreement established a new Commission with a broad range of coordination tasks focusing on integrated river basin management. The present Commission will be abolished and its functions as an authorizing body will be transferred to the appropriate national authorities. The new Commission will focus on cooperation with the aim of implementing the Water Framework Directive. This will include, for example, monitoring water quality and quantity, as well as proposing projects for specific activities and plans for river basin management. Flood risk management strategies will also be addressed. Therefore, the new agreement is expected to improve the prospects for achieving integrated river basin management, compared with the previous agreement in which cooperation was limited to a case-by-case handling of permit applications.

Bearing in mind the close relationship between the Finnish and Swedish legal systems, it is not anticipated that transferring the granting of permits to national authorities will result in any major problems. However, the new agreement looks to provide sufficient mechanisms to cross-border procedures, as well as adequate cooperation between national bodies when issuing permits for activities that have a transboundary impact.

5.3 Finland's Cooperation with Norway

The Governments of Finland and Norway signed an agreement in 1980 establishing the Finnish – Norwegian Transboundary Water Commission. The task of the Commission is to preserve transboundary watercourses in their natural conditions and to safeguard the environmental interests of both states and residents in the border region. The Commission has three representatives from both states who are appointed by their respective Governments. The Commission is chaired by the regional authorities, and has secretariats in both countries: the Lapland Regional Environment Centre in Finland, and the County Governor of Finnmark in Norway. The Commission meets at least once a year.

The Commission is an advisory body that has no decision-making powers. It submits proposals and motions, and issues statements on matters relating to water management. The Commission has issued recommendations concerning the preservation of the unique natural landscape, prevention of deterioration of water quality and safeguarding the multiple uses of rivers. The Commission has prepared integrated water resources management plans (multiple-use plans) for the Tenojoki (Tana), the Näätämöjoki (Neiden) and the Paatsjoki (Pasvik) rivers.

The first plan for the Tenojoki River was published in 1990. It included common objectives and recommendations for the management of the river basin. The aim of the recommendations was to preserve the natural heritage and cultural aspects of the river basin, as well as to improve the living conditions of the local population, which were dependent on the sustained use of natural resources. These plans contained special characteristics. Promoting local livelihoods included promoting the Sami culture, and the Sami are the last remaining indigenous people in the north of Europe.

The recommendations, for example, concerned the discharges of watercourses, waste management, fishing, tourism and recreational use, off-road traffic, reindeer husbandry and air pollution. The IWRM plans cover the whole river basin in which each country – including Russia – is responsible for the plan relating to its own area. The Tenoki plan is going to be updated by the municipalities along the river. It will be under the overall responsibility of the Commission, which will implement the principles of Local Agenda 21 (Kinnunen, no date).

The experiences of Finnish – Norwegian transboundary cooperation have proved the fact that it is very important to include the interests of the local population in transboundary water agreements.

The threat of acid rain is especially important in the eastern part of the river basin because the industrial plants situated in the Kola Peninsula are near the border, which contributes to pollution. Another major challenge for the parties is the preservation of natural Atlantic salmon. The Tenojoki River is home to the most important wild Atlantic salmon population in Europe. The stocks of this fish are being threatened by overfishing, fish farming and the spread of parasites.

The EU Framework Directive will also be implemented in transboundary river basins. Norway is obliged, as an EEA country, to implement the EU Framework Directive similarly to the EU Member States under which the river basin management plans have to be prepared by 2009. Long-term planning through the IWRM processes will facilitate the implementation of the Water Framework Directive.

5.4 The Frontier Watercourse Agreement Between Finland and Russia

5.4.1 Background

The longest and largest transboundary agreement on water management was established with the Soviet Union, nowadays the Russian Federation. The Vuoksi and Paatsjoki river basins are used for a variety of purposes, for example, there are several hydroelectric power plants located in these river basins. In the early 1960s, the transboundary water agreement with the Soviet Union was considered important for regulating hydroelectric power, flood control and fisheries. In those days, reducing water pollution was a new issue that required serious attention. The initiative to prepare an agreement on transboundary watercourses between Finland and the Soviet Union came from the Finnish side. The agreement, concluded in 1964, encompasses most of Finland's eastern frontier (about 1200 km) excluding its sea areas (Finnish-Russian Commission on the Utilization of Frontier Water Courses 1995; Kotkasaari 2003).

The principles of international water law were taken into account when drafting the treaty. The treaty covers the principles of the ILA's Helsinki Rules and, as a result, it emphasises a basin-wide approach. The agreement specifies the principles for the joint utilization of the frontier watercourses, as well as the procedures which are to be followed on carrying out various undertakings in transboundary watercourses.

5.4.2 The Joint Finnish – Russian Commission on the Utilization of Frontier Waters

The agreement covers all sectors involved with surface water management and provides a basis for reaching agreement on a variety of questions concerning the utilization and conservation of watercourses. Regulations in the agreement prohibit watercourses from being altered or polluted, and there are also provisions that concern keeping main fairways open. Furthermore, the provisions also cover water quality monitoring, and set forth general prescriptions regarding indemnities in the event of damage caused by either party.

The agreement established a Joint Finnish – Russian Commission on the Utilization of Frontier Waters (hereafter the Commission) and had the objective to oversee any actions that might have a bearing on transboundary watercourses. The Commission handles all kinds of activities which may have a transboundary impact and it also supervises and monitors the transboundary watercourses. Contracting parties can empower the Commission to arbitrate on an agreement, or give an advisory opinion. Decisions are made unanimously and are binding on both sides. The annual meeting of the Commission acts as the formal decision-making body. If the Commission cannot reach mutual agreement, it conveys the issue to the governments of both parties, although this has not occurred to date. The Commission usually gives its opinion to the national authorities when a case is under deliberation.

Both sides appoint three members and their deputy members. The members and deputy members represent central and district levels of administration and their activities include natural resources and the environment, foreign affairs, fisheries, energy companies and "border guard" (the border guard authorities assist and supervise the work of the experts of the Commission in border areas. These experts need approval from the border guard authorities to work in the border areas. The participation of the border guard is crucial: without it, the work of the Commission would be very limited). Each party appoints a chairman and provides the Commission with experts and secretaries. The practical work of the Commission is mainly carried out by its permanent working groups in accordance with the annual work plan. The frontier guard assists and supervises the work of the Commission's expert groups in border areas and especially in areas where there is no official border crossing. The role played by the frontier guards has been especially crucial.

Reports from each expert group are discussed and adopted at the Commission's annual meeting. Reports for the Commission's annual meeting contain a lot of information (usually some 20 annexes). These reports are distributed to relevant authorities and stakeholders, but they are also made available to members of the public on request. The participation of energy companies in the Commission's activities has been essential, because these concern the use of hydroelectric power plants. The Commission also handles initiatives proposed by NGOs and citizens.

5.4.3 Results

Water Protection

The Commission's long-standing cooperation has been successful and well respected, especially in the field of water protection. Monitoring transboundary waters started in 1966 and initially included all major rivers. As most transboundary waters were in a relatively natural state, monitoring was concentrated in the southeastern part of the river basin, which was exposed to waste-water loading from communities and industrial plants. Several Finnish pulp and paper mills are located around Lake Saimaa and along the Vuoksi River area. In the 1960s and early 1970s, industrial effluents led to serious deterioration in the water quality of the Vuoksi River. This pollution load has now been substantially reduced, for example, in the Finnish part of the Vuoksi catchment area. The load has been is now a fraction of the level of the early 1970s, despite a considerable increase in the local production of paper and pulp.

In 1994, the monitoring programme was revised: the monitoring frequency was increased and some parameters were added. The annual programme currently includes the rivers flowing into Lake Ladoga (Vuoksi, Hiitolanjoki) and into the Bay of Vyborg in the Gulf of Finland (Rakkolanjoki, Urpalanjoki and the Saimaa Canal). The monitoring reports can nowadays be examined comparatively, which greatly facilitates water protection work. In fact, most of the recommendations concerning monitoring contained in the ECE Water Convention can be implemented. However, there is still work to be done, and therefore evaluations are being carried out to find new methods of reducing pollution in transboundary waters.

The Discharge Rule of the Lake Saimaa and the Vuoksi River

One of the most significant results of the cooperation has been the Discharge Rules of Lake Saimaa (18,000 km^2) and Vuoksi (68,500 km^2) enacted in 1991. On the basis of these Rules the discharge volumes can be changed rapidly and flexibly. The floods in the Lake Saimaa area showed there was the need to establish new discharge rules. Very low water levels can cause problems, for example, for navigation. The shores of the Vuoksi River in Russia are low in some places and are subject to flooding. Thus, the way in which the Vuoksi River can be discharged is also a significant issue for the Russian side. Improving the energy production capability of the Vuoksi River power plants is also an important issue from the Russian perspective.

The Discharge Rules state that the amount of water discharged from Lake Saimaa, and consequently, its water level, will follow natural limits provided that the water level remains within the so-called normal zone or is 50 cm above or below the average level for the season. If the water level is expected to rise above the normal zone, the volume of water discharge will be gradually increased to reduce flooding. If the water level is expected to decrease below the normal zone, the volume of water discharged will be correspondingly reduced to avoid damage caused by droughts. As soon as the situation ceases to be a threat, discharge rates can be returned to normal and water levels will return to their natural level (Figure 5.4).

The Finnish party monitors the water situation and prepares the necessary report regarding the development of the water regime for Lake Saimaa and the Vuoksi River for the coming year. Both parties give opinions on reports, and inform each other of relevant projects, plans and developments. For example, once a month a forecast of the water level for the next four months is sent to the Russian side and once a week the hydroelectric power companies on the Vuoksi River are informed of the discharge for the coming week. If the discharge is expected to cause damage, the discharge volume will be agreed on in consultation between the parties.

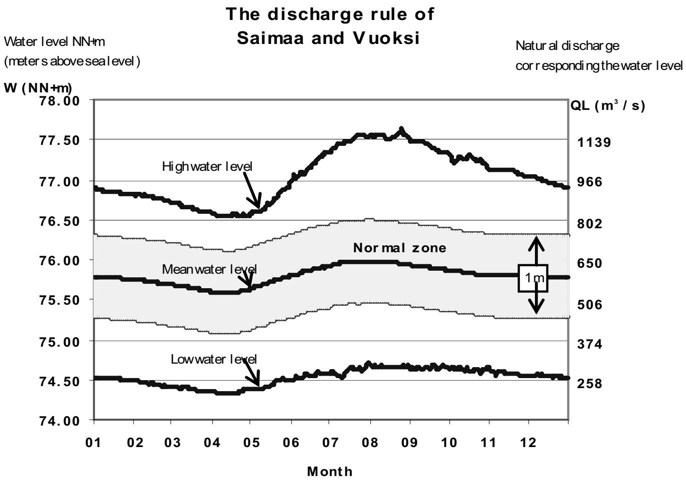

Fig. 5.4. Discharge rules for Saimaa and Vuoksi

The advantage of the Discharge Rule is that flooding occurs less frequently, while the potential loss of energy production capacity caused by changes in diversion volumes is simultaneously reduced. Thanks to the Discharge Rule, flooding in the Lake Saimaa area was less severe in 1992, 1995, 1998 and 2005 as a result of discharge volumes. In some instances, Finland and Russia have agreed on compensation for the loss of energy production.

The habitat of the endangered Saimaa Seal is also taken into account when planning discharges. The change in the height of the water level must not be so great as to destroy the seals' dens.

Fisheries

The transboundary agreement requires fish stocks and fishing rights to be guaranteed in boundary watercourses. Article 3 of the agreement states that the fairways should be kept open for the passage of fish. Therefore, it has been agreed that passages for migrating fish will be left open. Numerous fishing studies and plans have been conducted over the years in frontier watercourses on the management and enhancement of fisheries.

The Hiitolanjoki River is 53 km long and takes its water from Lake Simpele on the Finnish side of the border and flows into Lake Ladoga in Russia. The river's four rapids on the Finnish side are harnessed to produce electricity, although the hydroelectric power plants are small because of the limited nature of the water resources. A major challenge that has been identified is to bring back the salmon inhabiting Lake Ladoga to their spawning areas on the Finnish side of the border. Fishways are needed for the salmon to be able to pass the hydropower plants freely during their spawning run; options for such fishways should be decided on soon.

Both sides inform each other of relevant studies and results of research aimed at improving fish stocks and their management. The fisheries group of the Commission has also made efforts to develop scientific methods for assessing fish stocks. Fish stock studies are currently being undertaken on brown trout, e.g. in Pääjärvi, a large lake in Karelia. Moreover, efforts have been made, partly with the support of the EU Tacis programme, to restore the salmon stock in the river Tuloma and thus improve the local economy of the Kola Peninsula through the development of fisheries, sport fishing and tourism activities.

The Karelian Lake Pyhäjärvi (248 km^2), a transboundary lake in Finnish and Russian Karelia is a valuable clear water lake. This lake is particularly well suited to studies of the dynamics and interactions of lake fish stocks. It also provides an opportunity to study the impact of fishing on the fish community and fish stocks, as pressures of fishing and, to a certain extent, fishing methods, too, are very different in Finland and Russia. Research into Lake Pyhäjärvi began in 1978 and the results have provided material for two doctoral dissertations, which have subsequently been used to provide information on the organization of vendace fishing and for fishing disputes in Finland. They would also be useful sources of information for planning recreation fishing areas.

Illegal, uncontrolled, fishing and poaching are some of the biggest problems facing many lakes and rivers in Russia. The best way to reduce these threats would be to change the current fishing culture and make it more difficult to obtain money from poaching.

The VIVATVUOKSIA Project

The Commission has put forward several projects to improve the management of transboundary waters. One of the most important is a project called VIVATVUOKSIA funded by the TACIS CBC Programme. This project, "The Sustainable Use of the Water Resources and Shore Areas of the River Vuoksi", was implemented during 2001–2003. The total cost was EUR 387,000. The project has produced a number of principles and methods to develop the sustainable use of water resources and shore areas of the Vuoksi River.

The 150 km long Vuoksi River is located in a rather remote border area of Russia. Therefore, there has been relatively little pressure on the use of the river's shore areas, most of which are uninhabited and excellent recreational areas. During the project, many future research and development areas were pinpointed where land-use planning was identified as being of key importance. The project adopted a new principle prohibiting the construction of new buildings in areas prone to flooding. In addition, information on water conditions has fundamentally improved as a result of the project. The different users of the river now have access to water-level information from four new gauges. A plan to transmit information on the water-level situation and forecasts has been drawn up. Another key result of the project has been the improved cooperation and mutual understanding between local people, local and regional authorities and other stakeholders inside and across the Russian and Finnish project areas.

As a result of the project, stakeholders have started to pay more attention to the environmental concerns of the Vuoksi River and its shore areas. The success of the VIVATVUOKSIA Project has encouraged the participants to continue working on a new project named VUOKSIAGAIN. This project has taken a holistic approach as it combines water and land management issues in the development and protection of the river basin as a whole ecosystem. For example, the project experts are developing a special 700-metre zone along the shoreline along which all construction activities are examined and adapted to suit the conditions of the zone.

5.5 Conclusions and Future Challenges

Finland's cooperation with its neighbouring countries has been successful in the field of managing transboundary watercourses. Finland and its Nordic neighbours, Sweden and Norway have much in common – a similar social system and similar natural conditions. This has largely facilitated the arrangements for cooperation in transboundary river systems. Despite the different social system and the Soviet Union's role as a super power, cooperation between Finland and the former Soviet Union, now Russia, has also been very constructive. The most important objectives of the cooperation between these countries seems to be equitable use, protection and control of watercourses. Water scarcity is not a problem because the transboundary watercources around Finland are blessed with a plentiful supply of water. Neither has there been any conflict over water between the countries.

The long and successful cooperation between Finland and Russia in transboundary matters has become a pattern for Russia. The country has signed a number of new agreements with states that have emerged since the collapse of the Soviet Union. A good example is the cooperation between Russia and Estonia, which established a Joint Transboundary Water Commission in 1997. Its structure resembles that of the Joint Finnish – Russian Commission and it plays an important role in promoting sustainable development in the Lake Peipsi basin.

The roles of these three Commissions vary. Only the Finnish – Swedish Frontier Commission has its own bureau with a few officials and authority to issue permits. The Finnish – Norwegian Commission does not have any decision-making power and in the near future the Finnish – Swedish Commission will also become solely an advisory body, although they will continue to play a significant role in the future. The mandate of the Joint Finnish – Russian Commission is much stronger. However, in practise there has been no need to use direct decision-making powers. The national authorities are involved in the work of all these Commissions. In fact, the Commissions are as strong and effective as governments allow them to be (Brunnee 1999).

Transboundary watercourses are managed in a basin-wide context. If the Vuoksi River is taken as an example, it can be seen that both the regulation of the Discharge Rules and the measures for monitoring them cover the whole river basin. Integrated water resources management plans should not be seen as an end in themselves. Finland has avoided establishing separate planning systems in its co-operation with transboundary watercourse management. However, in many project initiatives taken by the Commission the principles of integrated water resources management has played a significant role. The Finnish – Russian projects VIVATVUOKSIA, its successor, VUOKSIAGAIN, and the IWRM plans developed by the Finnish – Norwegian cooperation are examples of this pragmatic approach.

There are four major hydroelectric power plants on the Vuoksi River, two in both countries. A basin-wide management approach is also necessary in this context; dams and other hydraulic constructions should be a part of the integrated water resources management. Finnish and Russian energy companies have a lot of experience of this kind of activity. In the near future, an early warning system for environmental accidents and other exceptional incidents will be introduced.

A future challenge for this sector includes the EU directive for establishing a framework for Community action on water policy. Finland, Sweden and Norway are to implement the Directive including transboundary watercourses. Existing joint bodies and long-standing cooperation will help the implementation process in relation to Nordic transboundary watercourses.

In my opinion, transboundary cooperation between Russia and Finland should increase to further accomplish the objectives of this Directive. The collection of basic information for implementing the Directive can start immediately and further cooperation could be gradually deepened. The Joint Finnish – Russian Commission could serve as a coordinating body for the activities required by the Water Framework Directive. The Commission's Russian partners have announced their willingness to cooperate in implementing the EU Directive by creating the necessary monitoring, analysis and planning systems. I also believe that parts of the river basin management plans for the international river basin districts mentioned in the Directive together with its planning systems contain the same elements as the integrated water resources management plans in the documents from the Johannesburg Summit.

Another future challenge is the pressure caused by climate change and extreme events on water resources. Climate change will affect the amount of runoff and recharge. The European Commission’s Directorate General Joint Research Centre (DG JRC) has published a Report on “Climate Change and the European Water Dimension”. According to this report, annual precipitation over Northern Europe has increased by between 10% and 40% in the last century. Winter and spring precipitation may increase in Northern Europe and summer precipitation will decrease. Weather-driven natural hazards are predicted to increase. However, climate change modelling is still unable to make precise regional predictions. In any case, climate change is a huge challenge for IWRM and the implementation of the Water Framework Directive.

Flood hazard is likely to increase across the Europe. In the past, flood protection was addressed largely at a local level, without upstream or downstream coordination, thus frequently shifting the problem from one area to another. Some years ago, severe floods in Central Europe caused a large amount of damage. Therefore, it is important that new flood risk management plans are created for those countries with areas prone to flooding. Flood protection should be dealt with in a concerted and coordinated manner along the whole length of the river. The transboundary nature of many of Europe’s most important river basins means that international cooperation can bring important added value to the efforts of individual Member States. That is also why the European Commission is preparing an Action Programme on Flood Risk Management, which is a package of three distinct, but closely linked components: research and information; EU funding tools, and a proposal for a flood directive. According to preliminary information, the main elements of the future Floods Directive are flood mapping and flood risk management plans. It is probable that in the future, flood risk management plans will become elements of integrated river basin management for transboundary rivers.

Transboundary cooperation is worth pursuing for many reasons: the favourable status and equitable use of transboundary watercourses are to every nation’s advantage.

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6 Management of Ganges-Brahmaputra-Meghna System: Way Forward

Asit K. Biswas

6.1 Introduction

The Ganges-Brahmaputra-Meghna (GBM) system is considered to be one transboundary river basin even though the three rivers of this system have certain distinct characteristics and flow through very different regions for most parts of their lengths. Not only each of these three individual rivers are big, but each one of them have tributaries which are important by themselves in social, economic and political terms, as well as in terms of water availability and use. Many of these tributaries are also of transboundary nature (Ahmad et al. 2001; Biswas and Uitto 2001).

Therefore, in planning and management terms, it is simply impossible to consider GBM as one system because of its sheer size, complexities and multinational character. Accordingly, following the Ganges Treaty between India and Bangladesh, the main focus of bilateral negotiations between these two countries at present has been on the Teesta River, an important tributary of the Ganges. Currently, these negotiations are ongoing, and no mutually acceptable framework for the management of the Teesta River is in sight. Furthermore, Bangladesh has been so concerned with the Indian plan that is considering the interlinking of major rivers in recent months that any other issue, including a possible treaty on the Teesta, is now receiving a somewhat low priority.

Even some of the major tributaries of the Ganges, Brahmaputra or the Mekong have proved to be too complex to plan and manage. For example, the Indian Government has decided to consider managing the Yamuna River, a tributary of the Ganges and an interstate river, in parts, because it became evident that it would be very difficult to make a plan for the entire river as a whole. Even if such a plan could be prepared, realistically its implementation would be almost impossible. Accordingly, the current planning framework considers Upper Yamuna River only.

In addition, in India, like in Canada or United States, water is generally under the jurisdiction of the states, though the central government could have certain specific but limited roles, both direct and indirect, for inter-state and transboundary waters. Past experiences indicate that formulating a planning and management framework for an interstate river in India, or Pakistan, has many times proved to be as complex, cumbersome and time-consuming task, comparable to negotiations on transboundary rivers. In a few cases, negotiations on inter-state waters have even proved to be much more difficult than on transboundary rivers.

Currently, negotiations leading to successful completion of a treaty on an interstate river in India are taking an average 15–20 years. Steadily increasing water demands for various water uses in each state, availability of limited water resources, rivalries and conflicts between the neighbouring states on many development-related issues, and the presence of multiplicity of political parties who are continually fighting each other, do not contribute to the presence of an enabling environment wherein acceptable and optimal interstate water treaties can be negotiated within reasonable timeframes. In fact, some interstate treaties in India and Pakistan have taken more time to negotiate compared to transboundary treaties. For example, the Indus River Treaty between India and Pakistan (Biswas 1992) was finally signed in 1960, after four years of intensive negotiations. However, an agreement between the four provinces of Pakistan (Baluchistan, North-West Frontier Province, Sind and Punjanb), as to how to allocate the Indus water among themselves, took slightly more than 30 years before it could be agreed to by all the four parties. Even now, the political bickering between these four states as to how the Indus water has been allocated between them continues unabated. Thus, the political wrangling between the state parties concerned for the management of both national and transboundary rivers, in many instances, have continued to intensify rather than diminish.

6.2 Partnerships for Regional Development

In most Asian transboundary rivers, including the GBM Basin, agreements have been difficult to negotiate between the co-basin countries because of factors like historical mistrust and rivalries, asymmetrical power relationships, short-term requirements of the national political parties as opposed to long-tern national interests, exclusive negotiations on water issues alone (which often reduce the water allocation process to a zero-sum game), non-formulation of a negotiating framework which considers an overall development spectrum that could result in win-win results for all the concerned parties and emergence of numerous single issues, as well as vociferous and media-savvy NGOs who are more interested in promoting their own agendas and dogmas compared to improving the quality of life of people whom they claim to represent. All these constraints have seriously hampered the development of mutually beneficial projects and activities between countries like India and Nepal and India and Bangladesh. Because of the deep-rooted mutual distrust and sometimes even hostility, progress on the development of transboundary rivers has mostly been minimal. Accordingly, benefits foregone by each of these three countries from such developments have been very substantial (Verghese 2001). In reality, considering the extensive poverty that exists in all of these three countries, none of them can afford to continue with this unacceptable level of cooperation. Another factor that should be considered is that if the developments of fossil fuels or mineral resources are delayed, these resources are not lost to the nations. They stay in the ground, untouched, and the same resources can be exploited in the future whenever countries decide to do so. The benefits will accrue whenever such resources are used. In contrast, if water is not used for hydropower generation or agricultural production, the potential benefits are gone forever: they can never be recovered.

The GBM Basin provides excellent examples of very substantial benefits that can be obtained by the countries when they decide to collaborate with each other (Ahmad 2004), and also equally the very substantial costs when the countries concerned eschew pursuit of common development goals for whatever reasons, some of which may be real but other could be imaginary. The cooperation between Bhutan and India has brought very significant benefits to these two countries. Equally, lack of collaboration between India and Nepal, and Bangladesh and India has meant that all the three countries have foregone very substantial benefits, which can never be recovered.

6.2.1 India and Bhutan: Excellent Example of Partnership

In the area of management of transboundary rivers, the positive collaboration between Bhutan and India is probably one of the very best examples from anywhere within the developing world. It shows that given enlightened leaderships, political will and mutual trust and confidence, the benefits of developing transboundary water bodies can be very substantial to all the countries concerned. Regrettably, even though Bhutan-India partnership has yielded very significant benefits to both the countries, the positive results of this collaboration are mostly unknown, even in the Indian subcontinent, let alone in the world as a whole.

The collaboration between Bhutan and India provides an excellent example as to how transboundary water bodies can be used as an engine for economic growth or development of an impoverished region with concomitant benefits to each country.

Bhutan, often known as the Hermit Kingdom, was basically inaccessible to the world until 1960. When this landlocked country, located on the Himalayan mountain range, initiated its first development plan in 1961, it had the lowest *per capita* income in South Asia and one of the lowest in the developing world. Because of the mountainous nature of its terrain, its agricultural potential is very limited. Its high mountainous location, however, provides the country with unique special advantages, especially in terms of its hydropower potential, which is estimated at 20,000 megawatts (MW), slightly less than one-quarter of the potential of its Western neighbour, Nepal. However, in terms of population, Bhutan is much smaller than any of the other GBM Basin countries. The demographic details of the four GBM countries for 2004, are shown in Table 6.1.

Bhutan realized sometime ago that one of its main natural resources is water, and if the country is to develop economically, it must wisely and efficiently develop its water resources. Since nearly all of its water is transboundary in character, it really has no alternative but to cooperate closely with India to develop these resources. It further recognized the following issues:

- Water development is not an end by itself, but only a means to an end, where the end is to improve the lifestyles of the people of the nation through a variety of complex interrelated socio-economic pathways.
- It cannot develop by itself its water resources efficiently and quickly because the country lacks investment capital and adequate technical and management expertise.
- Even if its water resources are developed, it will not be able to take full advantage of the resulting benefits within the national territory because of its small and very decentralized population. In other words, the country simply does not have enough absorptive capacity for all the benefits that may be generated.

Table 6.1. Population details of the GBM countries

Countries	Population (millions)			Annual population growth rate 1975–2004 (%)	Urban population as % of total 2004
	1975	2004	2015 (estimate)		
Bangladesh	73.2	139.2	168.2	2.2	24.7
Bhutan	1.2	2.1	2.7	2.1	10.8
India	620.7	1087.1	1260.4	1.9	28.5
Nepal	13.5	26.6	32.7	2.3	15.3

Source: Human Development Report 2006, UNDP, New York, pp 299

Accordingly, Bhutan embarked upon a very different path, compared to either Bangladesh or Nepal, to develop its transboundary water bodies. It concluded that its most optimal solution would be to develop its water resources in close collaboration with, and the support of, its southern neighbour, India, with whom it shared its transboundary waters.

Around 1980, Bhutan initiated a plan to develop the hydropower potential of the Wangchu Cascade at Chukha, in close cooperation with its much bigger neighbour. Following extensive consultations, India agreed to construct a 336 MW run-of-the-river project at Chukha, on the basis of a 60% grant and 40% loan. The estimated cost of the project was Rs. 2,450 million. It was commissioned in stages from 1988 onwards. The project was so successful that it had paid by itself by 1993. The generating capacity was later increased to 370 MW. Because of the Indian support to plan and construct the project, Bhutan agreed to sale the excess electricity from the project which is cannot use, to India at a mutually agreed rate. A 220-kilovolt (kV) transmission line was constructed which linked the Bhutanese capital, Thimpu, and the city of Phuntsholing on the Indian border, from where electricity was subsequently supplied to four Indian states.

The agreement between the two countries is that the electricity generated will be first used to satisfy Bhutan's own internal needs. Before the construction of the Chukha plant, electricity was generated by diesel and mini-hydro plants. Thus, total electricity generated was very limited. Transporting diesel to a landlocked and mountainous country was an expensive and complex process. It was also inefficient. Not surprisingly, in 1980, *per capita* energy consumption in Bhutan was only 17 kWh, which was less than 10% of that of India, at 173 kWh (see Table 6.2).

Table 6.2. *Per capita* GDP, GDP growth rates and electricity consumption for South Asian countries

Countries	GDP (US$) *per capita* 2004	GDP Growth rate (%) 1975–2004	Electricity consumption *per capita* (kWh)	
			1980	2003
Bangladesh	406	1.7	30	145
Bhutan	751	4.0	17	218
India	640	3.4	173	594
Nepal	252	2.0	17	91
Pakistan	632	2.9	176	493
Sri Lanka	1,033	3.3	113	407

Source: Human Development Report 2006, UNDP, New York, pp 332, 333, 354, 355

Bhutan's *per capita* electricity consumption has steadily increased since the Chukha project became operational. For example, by 2002, compared to 1980, *per capita* energy consumption had increased by a factor of nearly 14–235 kWh. During the same period, India's *per capita* electricity consumption increased by a factor of "only" 3.3 at 569 kWh (see Table 6.2).

The unit cost of hydropower generation has steadily declined since the Chukha plant was first constructed because of higher and more economic scale of production and increasingly more efficient management. The electrical network has steadily expanded to different parts of Bhutan, which has meant reduced use of fuelwood than what might otherwise have been the case, as well as that of diesel which had to be imported from India. Reduced fuelwood use has had a beneficial impact on the forests and the environment.

The electricity produced in excess of the requirement of Bhutan is purchased and used by India as peak power through its eastern electricity grid. Initially, the two countries agreed to have two different pricing patterns for firm and secondary power. Later on, the two tariffs were amalgamated into one, and subsequently, the tariff initially paid by India was revised upwards four times. The revenue that Bhutan has been receiving from its electricity sales to India not only has serviced its debt load for the Chukha project without any difficulty, but also has left enough surpluses to finance other development activities, and support some social services, including increasing the salaries of its civil servants. In addition, electricity provided the impetus for Bhutan's industrialization.

Since the construction of the Chukha project proved to be beneficial to both the countries, they have agreed to expand their collaborative efforts to other new hydropower projects. Bhutan realized that the revenues from the development, use and export of its hydropower potential can accelerate the economic and the social development processes of the country, and can contribute very significantly to poverty alleviation. The arrangement has also been beneficial to energy-thirsty

India, whose electricity requirements have been increasing in recent years at 8–9% per year, compounded. The decision for mutual collaboration which led to the development of transboundary water bodies, has proved to be an important win-win situation for both the countries.

India and Bhutan have subsequently collaborated with the funding and construction of a 45-MW run-of-the-river hydropower station at Kuri Chu. Similar collaborative efforts have taken place, or are under active consideration, for Chukha II (1,020 MW) and Chukha III (900 MW, with a storage dam). In addition, the two countries signed an agreement in 1993 to study the feasibility of a large storage dam on the Sunkosh River. When all these projects are completed, and assuming the unit price paid by India for electricity will continue to be revised upwards periodically, Bhutan can easily earn over $100 million annually in the foreseeable future from the sale of hydropower alone to its neighbour. Considering its present population is only little over 2 million, this sale of hydropower to India means a very substantial income for this relatively small country, which will accrue regularly, year after year. Because of this success, not surprisingly, Bhutan's development framework, Vision 2000, envisages careful and progressive utilization of its 20,000 MW hydropower potential as an important means to propel the country forward and upward so as to ensure a better quality of life for all its citizens.

The win-win approach used by Bhutan and India is a good example of how transboundary water bodies can be successfully managed by the co-basin countries for regional economic development, which can directly contribute to the improvements in the quality of the people of both the countries through income generation, poverty alleviation and environmental conservation.

Viewed from any direction, the collaboration between the two countries has been mutually very beneficial, including enhancement of regional peace and stability. These water-based developments have meant that Bhutan's *per capita* GDP has increased from being the lowest of any south Asian countries in 1980, to being the second highest (only Sri Lanka has a higher *per capita* GDP) in the region at present, within a very brief time span of only a little more than two decades. If the current trends continue, and there does not appear to be any reason as to why this should not, by 2015, Bhutan is likely to have by far the highest *per capita* GDP in the south Asian region, all primarily because of its farsighted and enlightened approach to develop collaboratively its transboundary water bodies with its neighbour, India.

6.2.2 India and Nepal: A Missed Opportunity

In contrast to the approach of Bhutan and India, which has resulted in significant benefits to the two co-basin countries because of managing transboundary water cooperatively in a constructive spirit, the last 20 years have proved to be a missed opportunity for India and Nepal because of continuing mistrust, and perhaps to a certain extent, the presence of big-country-small-country syndrome. It is a good case which graphically illustrates the validity of the perceptive views of Jawaharlal Nehru, the first Prime Minister of independent India, who urged the people to override national conflicts. Nehru further deplored the inability to overcome not only the “narrow boundaries of geography but, what is worse, of the minds.”

Had the two countries approached jointly the planning and management of transboundary rivers that flow from Nepal to India in a positive and constructive spirit, the benefits to the two countries in terms of regional development, poverty alleviation and improvements in the quality of life of the people of the region most certainly would have been very substantial. Regrettably, this did not happen, partially because of political uncertainties that clouded the negotiations and partly because of asymmetrical interrelationships between the two countries. Much of these constraints should have been overcome by the Gujral doctrine of the mid-1990s, which very specifically eschewed absolute reciprocity in India’s interrelationships with its smaller neighbours. While this new doctrine produced a burst of enthusiasm and activities between the two countries, this momentum could not be sustained for many different reasons. Accordingly, this proved to be a missed opportunity for both the countries. In retrospect, it perhaps has hindered the progress and economic development of Nepal, which has far fewer development options compared to India.

The overall situation of the region is not encouraging, since half the population of this region currently live currently under the poverty line. In fact, in spite of recent economic advances, the total number of poor people in this region (Nepal and the neighbouring states) has continued to increase. Not surprisingly, the various health and the social indicators for the countries are still poor, as indicated in Table 6.3.

Table 6.3. Selected social indicators

Countries	Adult illiteracy rate 2004	Infant mortality per 1,000 live births 2004	Physicians per 100,000 people 1990–2004	Population without access to improved water sources (%) 2004
Bangladesh	58.9	56	26	26
India	39.0	62	60	14
Nepal	51.4	59	21	10

Source: Human Development Report 2006, UNDP, New York, pp 293, 303, 317

Since the current development situation in Nepal and the Indian territories adjacent to Nepal are poor, and water is one of the few resources this region has which can promote economic development, the two countries need to formulate and implement cooperative strategies and joint action plans where water could act as the catalyst for economic take-off (Onta 2001). A number of options and opportunities have existed for decades for collaborative efforts in areas like hydropower generation, flood management, drought mitigation, and agricultural development. However, progress has been slow, even though the two countries managed to sign a Treaty for the Mahakali River in January 1996. Nearly ten years have since passed, but the implementation of the Mahakali Treaty has made very limited progress because the two countries still do not see many issues eye-to-eye.

Let us consider hydropower development, where the potential for Nepal is significantly higher than in Bhutan. The country's theoretical hydropower potential is estimated at 83,000 MW, of which already identified economically feasible potential is about 40,000 MW. Nepal's *per capita* electricity consumption is very modest: it was only 62 kWh in 2002. Thus, if Nepal can generate additional electricity, not only can its people have access to more commercial energy (in contrast to high use rates of non-commercial electricity, mainly biomass), but also sell any excess electricity to India, and possibly to Bangladesh and even to Pakistan. Nepal's hydropower can serve as an expensive peaking power for use in the neighbouring Indian states. Hydroenergy is not bankable. What is not generated is lost forever. The income and benefits from such lost electricity generation can never be used for poverty alleviation or other productive development purposes.

While the recent NGO movements against the construction of large dams have had perceptible impacts on both India and Nepal, the fact remains that Nepal has developed only 0.6% of its total hydro potential, compared to nearly 87% in Switzerland, 73% in Sweden, 68% in Japan, 56% in both Norway and the United States, 52% in Canada, and 14% in India. Viewed in another way, the dams on the Colorado, Mississippi and Columbia rivers store many times their annual average flows. In contrast, Nepal has so far stored not even one percent of its annual runoff. Even if the nine currently identified large storage dams are constructed in the tributaries of the Ganges, they would account for less than 20% of the annual average discharge of the Ganges. A monsoon country, with a very seasonal rainfall, simply cannot meet its water requirements at such a low level of storage.

The Mahakali Treaty can be considered to be a framework agreement, whose centrepiece is the Pancheswar Dam. It establishes the general parameters within which binational cooperation could be developed. However, the progress on the implementation of this Treaty has been agonisingly slow. The joint detailed project report is still not ready, some 10 years after the treaty was signed. If and when the dam is constructed, it would have major positive development impacts on the underdeveloped far-west region of Nepal, and Pithoragarh District of Uttar Pradesh in India, which is also a backward area. The concept should be to integrate the hardware of the hydropower development with the software of area development, like education, health services, nutrition, employment generation, transportation, communication and gender empowerment. Combination of this hardware and software has the potential to revolutionize the lifestyles of the people of the region within one generation (Verghese 2001).

There is no doubt that much of the momentum and enthusiasm that were generated by the Mahakali Treaty have now been mostly lost. The cooperation between the two countries has become a hostage to mutual mistrust and small- country-big-country syndrome. There is a strong perception in Nepal that it got a raw deal from India on the earlier projects on the Sharda, Kosi and Gondak rivers. India does not subscribe to this view. Whatever may be the actual facts, it is the overall perception that shapes the national opinions, which then often dictates political actions and the approaches adopted by the bilateral negotiators.

To a certain extent, the fact that Nepal perceived that it did not receive a fair deal from India for the earlier development projects is reflected in its new Constitution that was approved in 1990. It incorporates a new article which requires parliamentary ratification by a two-third majority for any agreements on transboundary water bodies. In spite of this high bar, the Mahakali Treaty with India was approved by the Nepalese Parliament.

The Mahakali River forms a major stretch of the Western Nepalese border with India. A high dam is to be constructed at Pancheswar on the border. The project will have two powerhouses of equal capacity on each bank. Each country will also have equal entitlement for utilising the waters of the river without prejudice to existing consumptive uses. The costs of the project will be shared by the two countries in proportion to the benefits they will receive. Irrigation benefits will be estimated by the incremental value of agricultural production, and flood control benefits by damages averted.

The 315 m high rockfill dam at Pancheswar is expected to have a generating capacity of 6,480 MW. India is obliged to purchase any excess electricity that Nepal wishes to sell at a mutually agreed price. While there has been considerable discussion on what could be a fair price that will be acceptable to both parties, there has been no agreement so far. The absence of an agreement is primarily because of lack of confidence between the two countries, and the presence of an environment where the issue is not given high enough priority by either of them. And yet, Nepal requires electricity for improving the quality of life of its people and also export earnings and investment funds to promote its social and economic development. Equally, India currently cannot meet its electricity requirements, as a result of which regular blackouts are a fact of life in many parts of the country. Thus, even though there are demonstrable needs from both sides to proceed with the construction of the Pancheswar Dam, which will bring considerable benefits to both the countries, political will has simply not been there in recent years to cut through the misgivings, and entrenched mistrust. One can even argue that national sentiments can sometimes become the enemy of rational solutions which can hinder national progress and development. This appears to have happened in this particular case.

6.2.3 India and Bangladesh: Need for a Regional Approach

The GBM River systems constitute the second largest hydrologic region in the world. The total drainage area of the GBM region is about 1.75 million km^2, tretching across five countries: Bangladesh, Bhutan, China, India (16 states in the north, east and northeast, in part or fully), and Nepal. While Bangladesh and India share all the three river systems, China shares only the Brahmaputra and the Ganges, Nepal only the Ganges, and Bhutan only the Brahmaputra. About 10% of the world's population live in this region, representing only 1.2% of the world's land mass.

The GBM region is characterized by endemic poverty. It is home to about 40% of the poor people of the developing world. The performance of the region with respect to such social indicators as economic growth, education, and health is disappointing in comparison to other regions of the world. About two-fifths of the developing world's poor people (with a daily calorie intake of less than 2,200–2,400 Kcal) live in this region; and even though there has been a decline in the poverty ratio in recent years, the absolute number of poor people has increased due to population growth. Adult illiteracy is still very high. The situation is worse in the case of women, compared to men. The three countries spend a lower share of public expenditure on education, compared to the world average.

Health indicators are also dismal in the region. Infant (under 1 year) and child (under 5 years) mortality rates in these countries are much higher than those of other developing countries as well as the world average. Although access to safe water has significantly improved in the recent years, only a limited population have proper access to sanitation.

Nearly 45% of the land of the GBM region is arable, but *per capita* availability of arable land is very small - around one-tenth of a hectare, which is almost half of the global average. One other crucial element to be taken into consideration in envisioning a sustainable development framework for the GBM region is the trend in urbanization. In Bangladesh, India, and Nepal, annual urban growth rates (1995–2000) were 5.2, 3.0, and 6.5% respectively. These rates are much higher than those of Europe (0.5%), Latin America (2.3%), Australia (1.2%), the US and Canada (1.2%), and Japan (0.4%). While the proportions of urban population in the three GBM countries are 20, 27, and 14% respectively, they are expected to rise to over 50% in the case of India and Bangladesh, and to about 22% for Nepal by 2025. This change in the spatial distribution and localization of population would have significant implications for water, energy and other related demands for natural resources.

In the energy sector, the GBM countries have a very low dependence on and utilization of commercial energy. *Per capita* average energy use in the world is about 1,680 KgOE. In comparison, the corresponding figures for Bangladesh, India, and Nepal are 197,476, and 320 KgOE respectively. It is also reflected in similarly lower than world average rate of *per capita* electricity consumption in these GBM countries.

Despite the poor socio-economic status of the region, it has rich natural endowments of water, land, and energy. It is indeed an agonizing paradox. The development and utilization of these natural resources in an efficient manner have never been sought by the countries due to past perceptional difference, legacy of mistrusts, and lack of goodwill. The abundance of water in the GBM region as a shared resource could be a principal driver of development for the millions of poor people living in the region. The shared river systems can be optimally developed only through collaborative efforts. It is imperative, therefore, to formulate a framework for the sustainable development of this region in a long-term time frame on a cooperative basis. The objective would be to enhance the quality of life through accelerated human development, environmental conservation, and efficient institutions for governance.

The GBM region is a water-rich region. Water is the single-most natural resources of the GBM regional countries. Properly harnessed, water could be the most important factor for development. This could very significantly improve the quality of life of millions of poor people living in this region.

The average annual water flow in the GBM region is estimated to be around 1,350 billion cubic metres (BCM), of which nearly half is discharged by the Brahmaputra. The three rivers constitute an interconnected system which ultimately falls into the Bay of Bengal. Compared to an annual average water availability of 269,000 m^3/km^2 for the world, the availability in the GBM region is 771,400 m^3/km^2, which is nearly three times the world average. In addition to surface water, the GBM region has an annually replenishable groundwater resource of about 230 BCM.

Water is abundant during the monsoon but scarce during the dry season. Harnessing the GBM rivers will require storing the monsoon flows and redistribute the water available over space and time, when and where required (Shah 2001).

The real challenge is to utilize this resource in an efficient manner. It offers the most promising entry point for achieving a social and economic transformation in Nepal, northern, eastern and northeastern India, Bangladesh, and Bhutan. This will require formulation and implementation of a framework for multidimensional cooperation in related sectors such as energy, environment, health, flood management, water quality, navigation, and trade and commerce. In the absence of a long-term cooperative vision, the GBM region would continue to stagnate and millions of people would remain in a state of deprivation. There is no question that water resources development can play a catalytic role in bringing about wider changes and promoting sustainable development in the GBM region.

A climate of goodwill and confidence was created during the late 1990s with the signing of the Mahakali Treaty between India and Nepal, in January 1996, and the Ganges Water Sharing Treaty, between Bangladesh and India, in December 1996. These treaties are landmark events which offered a window of opportunity for water-based collaborative development endeavours in the region.

Properly managed, and given political will in all the co-basin countries, water could act as an entry point to trigger economic and social development in the region. As opportunities unfold, emphasis could shift from more irrigation to sustainable agricultural productivity, from electricity production to energy grids and industrialization, from flood control to flood management, and from inland navigation to inter-modal transport. The ultimate goal should be to attain a mutually beneficial synergy between national interests, people's well-being and regional prosperity, initiated through the best possible utilization of the huge potential of the region's water resource.

Floods, Riverbank Erosion, Sedimentation

The region is severely handicapped by recurrent floods which cause serious damages to life, property, and infrastructure. It is the poor who occupy the more floodprone areas and constitute the bulk of the victims. The general flooding pattern is similar in all the three countries, characterized by some 80% of annual rainfall occurring in four to five monsoon months, often concentrated in heavy spells of several days, or even hours.

Floods have become an annual feature in the GBM plains of India. Of the total estimated floodprone area in India, about 68% lies in the GBM states, mostly in Assam, West Bengal, Bihar and Uttar Pradesh. The Ganges in northern India, which receives waters from its northern tributaries originating in the Himalayas, has a high flood damage potential, especially in Uttar Pradesh and Bihar. Likewise, the Brahmaputra and the Barak (headwaters of the Meghna) drain regions of very heavy rainfall and produce floods from overbank spilling and drainage congestion in northeastern India.

Bangladesh, being the lowest riparian, bears the brunt of flooding in the GBM region. Even in a normal year, up to 30% of the country is flooded and up to about 80% of the land area is considered floodprone. Flooding in Bangladesh is caused by a combination of factors like flash floods from neighbouring hills, inflow of water from upstream catchments, overbank spilling of rivers from in-country rainfall, and drainage congestion. The conditions could be disastrous if flood-peaks in all the three rivers synchronize.

A natural result of flooding is riverbank erosion, especially in the Brahmaputra system. Large seasonal variations in river flows and the gradual loss of channel depth cause banks to erode and river courses to change. Wave actions during high flows further accelerate the process.

The GBM rivers carry an enormous amount of sedimentation load from the mountains to the plains, which compound the adverse effects of floods. The Kosi and some tributaries of the Brahmaputra are particularly notable in this regard. Bangladesh is the outlet for all the major rivers and receives, on average, an annual sediment load varying between 0.5 billion and 1.8 billion tons. Most of this sediment load ends in the Bay of Bengal, but a part of it is deposited on the floodplain during overbank spilling. This process gradually changes the valley geometry and floodplain topography, often reducing the water conveyance capacity and navigability of the drainage channels.

Demand Management

Efficient water management requires a comprehensive, cost effective, market-oriented, and participatory approach to water demand management. Nepal has formulated liberal policies for strengthening the economy and made corresponding changes in the role of the state and the market in its water resources policy. The National Water Policy of India, adopted in 1987, defines priorities for different water-using sectors, treats water as an economic good, and proposes the use of water pricing in a manner that would cover the costs of investment, operation, and maintenance. The National Water Policy of Bangladesh, approved in January 1999, emphasizes the principle of accessibility of water to all, and proposes to develop sustainable public and private water delivery systems, including delineation of water rights and guidelines for water pricing (Huda 2001). However, all these policies need to be efficiently implemented.

Two types of demand-side approach are feasible. The first is entirely market-based, dependent on a market-determined price mechanism for economic use of water. This requires certain prerequisites like an efficient water distribution system, full dissemination of information relating to water demand and supply, appropriate regulatory conditions, and absence of corruption, all of which are mostly lacking at present in the GBM region. The second approach, which is partly in operation in the region, is through a system of administered control which determines water allocation and pricing according to social, economic, and environmental criteria. This approach still continues to be inefficient.

Institutions and Governance

Institutions and the manner in which they foster good governance determine the long-term ability of a country to manage its water resources. Institutions which are responsible for implementing water policies and strategies suffer from serious deficiencies and drawbacks in the region. They lack efficiency, or perform sub-optimally, with respect to such components as legal and regulatory aspects, implementation of rules, accountability, and responsiveness to the needs of the users.

Water sector planning in the region is slowly changing from a top-down technocratic approach to a bottom-up grassroots approach. The goal is to establish a genuine participatory water management environment. Along with the participatory approach come the steps to develop a nexus between public and private sectors in water development and management. Public sector water institutions of this region, like in most of the developing world, have a poor record of cost recovery. The involvement of the private sector may, to some extent, help to reduce public sector deficiencies, improve the level of governance, and attract investment in infrastructure.

6.2.4 Towards a GBM Regional Vision

The enormity of the development potential of the huge water resources of the GBM region stands out in stark contrast to the region's socioeconomic deprivation (Ahmad et al. 2001). It is a direct reminder to formulate a long-term vision in order to develop a regional development framework for water utilization. Because of the seasonal availability of water in the Himalayan rivers, harnessing the resource requires that it be stored for meeting year-around demands. Run-of-the-river projects may help, but they can not store water. Flood control benefits cannot accrue without storages. Thus, good storage schemes are essential for economic and social development of this region.

The terrain of the northern and middle belts of Nepal offer excellent sites for storage reservoirs. Nepal has identified 28 potential reservoir sties. Nine of them are classified as large, with an aggregate gross storage capacity of 110 BCM, and each site having a gross storage capacity of over 5 BCM. The 1986 Brahmaputra Master Plan of India has identified 18 storage sites in northeastern India, five of which are classified as large, having a total gross storage capacity of 80 BCM. In the Meghna (Barak) system, one large storage site (Tipaimukh), with gross storage potential of 15 BCM, has been identified (Mohile 2001).

These potential sites provide the opportunity to construct dams for storing excess water in the Himalayas for a variety of downstream uses. Hence, by definition, they are multipurpose in nature, providing benefits (beyond national borders) in such areas as power generation, flood moderation, dry season flow augmentation, irrigation, and navigation. The hydropower potential of these reservoir sites is the most significant aspect of water development in the GBM region, especially since *per capita* energy consumption in the region is among the lowest in the world. However, the construction of such storage dams involves high costs and requires long gestation periods.

High dams and other large water resource development programmes have encountered severe criticism and opposition in recent years due to a variety of technical, social, and environmental considerations. This sensitivity ranges from concerns for seismic hazards, submergence, population displacement, loss of farmland, forests and biodiversity, and downstream physical impacts. It should be noted that development and environment are complementary aspects of the agenda for poverty eradication. In the past, things have gone wrong in certain instances due to lack of knowledge, experience, and coordination, use of wrong technology, inefficient/poor implementation and management, corruption, and insensitivity towards project affected persons. The key does not lie in doing nothing, but doing differently and wisely. Lessons learnt from the past mistakes could serve as one of the most important building blocks in the context of promotion of sustainable development.

With respect to dam construction in the Himalayas, which is a dynamic tectonic region, the seismicity issue deserves serious consideration. The GBM regional countries should monitor seismicity and understand the Himalayan tectonics comprehensively. That would help in identifying the potential zones of seismic activity.

The environmental impacts of large dams and water projects must also be addressed adequately (Mukherhee 2001). The national guidelines of the GBM regional countries and the norms of international funding agencies are both specific and stringent in matters of resettlement and rehabilitation and mitigation of potential negative impacts on the environment. The basic rule for the resettlement and rehabilitation exercise should be that the people should preferably be better off after the project. Employment creation, capacity improvement to shoulder new responsibilities in work places, and self employment (income-generating) opportunities, with emphasis on education and skill development, may therefore constitute the areas of critical focus as the means of rehabilitation. In addition, the dam sites which are generally remote and inaccessible would witness the development of transport routes and other infrastructure that would open up the area and, in turn, foster mobility, market access, and all-round development. Properly planned, such developments could be harbingers of economic growth, social change and improvement of quality of life.

A number of options and opportunities exist for regional collaborative efforts in such sectors as hydropower development, flood management, dry season flow augmentation and water sharing, water quality improvement, navigation, and catchment/watershed management. Policy environment in the region has to be favourable for such cooperation, requiring mutual confidence-building measures.

Hydropower Development

Energy consumption is often a useful index of a country's level of development and standard of living. The GBM region's consumption of energy is very low. The energy economy of the region's countries is highly dependent on non-commercial sources, mainly biomass. This is not a sustainable situation, especially in view of the growing energy demands of a rising population and expanding economic activity. Yet, the hydropower potential of the region is vast. In the past, efforts have been made by each of the regional countries to develop hydropower within its own borders to meet domestic needs. But cooperative efforts to produce and trade hydropower have not been pursued.

Nepal's theoretical hydropower potential is estimated at about 83,000 MW. However, the identified economically feasible potentials are about 40,000 MW (Kayastha 2001). Given its modest load curve, Nepal's energy market lies in the northern and eastern regions of India as well as in Bangladesh, and possibly even in Pakistan. Nepal's hydropower could serve as peaking power to the adjacent thermal-based load in India. A three-pronged approach to hydropower development is necessary: small decentralized projects to meet local needs, medium scale projects for national needs, and large scale multipurpose and mega projects to meet transborder regional demands. The installed capacity of hydropower generation in India is about 22,000 MW, which is only 25% of the country's total installed power capacity. The demand for electricity in India is growing at an average annual compound growth rate of 8–9%. In order to reduce the current imbalance in the hydro-thermal mix and the general consensus to go more for environment-friendly water-based power, the future planning would incorporate a need to exploit maximally the GBM region's hydropotential through a regional grid. Bangladesh had an installed power capacity of about 3,000 MW as of 1997–98. The country's hydropower potential is limited by its flat terrain.

Some have argued that Nepal, India and Bangladesh are inefficient consumers of electricity owing to system loss through transmission/distribution anomalies, and pilferage; and, hence, production of more power from large hydroelectric projects is both socially and economically undesirable. Yet, the per capita electricity consumption in these countries is minuscule, compared to countries like Canada, US, Norway, Sweden or Switzerland. It is also difficult to accept the contention that Nepal, India, and Bhutan should refrain from undertaking large storage schemes to produce electricity, when all the identified future storages would together harness a little more than 10% of the annual flows. A more striking comparison would relate to the proportion of the installed hydropower to total hydro potential, which is only 0.6% in Nepal compared to 56%, 73% and 87% respectively in similar mountainous countries like Norway, Sweden, and Switzerland.

Hydropower has many advantages. It is a renewable source of energy without any recurring fuel cost which also obviates uncertainties relating to future costs of inputs. It exhibits a declining unit cost of generation over time with amortization of the initial capital expenditure. Above all, a hydropower generation plant can, and usually does, generate other benefits: it fosters a development process through opening up remote areas. Interconnecting the various national power systems through a regional grid could open up the power market, and enable Nepal and Bhutan to export surplus electricity to India and Bangladesh.

Flood Management

The recurrent floods in the GBM region demand a regional approach requiring co-operation among all the co-basin countries. Both India and Bangladesh have undertaken certain in-country measures for flood mitigation during the past four decades. These include embankments, river training, and channel/drainage improvement. Upstream storage reservoirs can play a vital role in flood management. Multipurpose reservoirs on the Ganges and Brahmaputra systems, with provision for a dedicated flood cushion and well planned reservoir operation and regulation instructions, will be beneficial in moderating floods in northern, eastern, and northeastern India (particularly in Uttar Pradesh, Bihar, West Bengal and Assam) as well as in Bangladesh.

Among the non-structural flood management approaches, the greatest potential for regional cooperation lies in flood forecasting and warning. Currently, bilateral cooperation exists between Nepal and India, and between India and Bangladesh, for transmission of flood-related data, which needs to be strengthened further. More reliable forecasts with additional lead time would be possible in Bangladesh if real time and daily forecast data are available from additional upstream points on the three rivers. Such effective flood data sharing arrangements are also necessary with upper riparians, Nepal and Bhutan, for providing Bangladesh with greater lead time to undertake disaster preparedness measures. A review of the current status of flood forecasting methods in India and Bangladesh shows that both countries are using similar technologies for data observation and transmission. This provides an excellent opportunity to exchange expertise and experiences between the two countries for mutual benefit.

As a broader vision, the flood forecasting and warning system needs to be integrated with the overall disaster management activity, both nationally and regionally. This will require free flow of data relevant to flood forecasting amongst them on a real time basis. The importance of satellite observation, especially for early warning of heavy rainfalls, should be recognized; and, for that purpose, the installation of adequately equipped satellite ground stations throughout the region should be considered.

Flow Augmentation and Water Sharing

The dry season flows of the GBM rivers, particularly of the Ganges, are inadequate to meet the combined needs of the GBM countries. As early as 1974, the Prime Ministers of India and Bangladesh had recognized the need for augmentation of the dry season Ganges flows. The Ganges Water Sharing Treaty of 1996 also includes a provision for the two governments "to cooperate with each other in finding a solution to the long-term problem of augmenting the flows of the Ganga/Ganges during the dry season." With Uttar Pradesh, Bihar, and West Bengal in India also seeking additional water to meet their requirements, the issue of augmentation deserves serious attention. The Calcutta port authorities are concerned that the Ganges Treaty has diminished lean season diversions into the river Bhagirathi, which would affect drafts requiring increased dredging.

One possible option for substantial augmentation of the Ganges flows, which could benefit Nepal, India, and Bangladesh, would be to construct large storages on the Ganges tributaries originating in Nepal. A highly favourable project from this perspective is the Sapta Kosi High Dam in Nepal, the revived third phase of the original Kosi project. The Kosi Dam will have a significant storage capacity that should provide both north Bihar (India) and Bangladesh with flood cushion and augmented dry season flows after meeting Nepal's full irrigation requirements.

One other option for augmenting dry season flows could be the proposed Sunkosh Dam in Bhutan, with a power generating potential of 4,000 MW. Water stored behind the dam could be released into a canal, designed to provide a two-stage link to the Teesta and Mahananda barrages in West Bengal. Augmentation of about 340 m^3/s is expected, a part of which could supplement the water needs of the two Teesta barrages (one in West Bengal and the other in Bangladesh) while another part could reach the Ganges at Farakka.

The issue of augmentation has direct relationship with concerns for trans-boundary water sharing among the co-riparians. The Ganges Treaty of 1996 called on India and Bangladesh to make efforts to conclude water sharing agreements with regard to other common rivers. One river which has received priority in the water sharing negotiations has been the Teesta, especially because the lean season flows are inadequate to meet the requirements of both the countries. Each country has constructed a barrage on the river. Although some *ad hoc* water sharing ratios were proposed earlier, it is necessary to examine seriously the option for Teesta augmentation as well as whether some arrangements could be made to operate the two barrages in tandem. In such a case, parts of Bangladeshi land lying outside its barrage's command area could be irrigated by extending canals from the barrage in India.

In the same track of regional cooperation, various other arrangements for augmentation and sharing could be conceived in the backdrop of probable trade-offs between the two countries. One such possibility is westward diversion link (through Indian territory) between the Brahmaputra and the Ganges, with provision for diversion along a lower alignment to augment Teesta waters in Bangladesh, or a further alignment southward to revive derelict streams and link up with the Ganges above the proposed barrage site at Pangsha. Some of these options are futuristic in nature, yet they deserve consideration within a long-term time development for the region.

Linked to the issues of water sharing, lean season water availability, and augmentation options are the state of environmental health of the rivers. Environment is a recognized stakeholder in the water demand nexus. Hence, apart from meeting the requirements of irrigation, power generation, domestic supply, and other consumptive uses, a reasonable quantity of water must be available in the rivers in order to sustain the channel equilibrium as well as to maintain acceptable water quality standards. This question of setting aside a proportion of water in the river received attention in past Indo-Bangladesh negotiations relating to the sharing of the Brahmaputra and Teesta waters (Nishat 2001). All future planning for water resource development needs to take special note of this requirement.

Following the 1996 Ganges Treaty, Bangladesh now has the opportunity to plan for environmental regeneration of its southWestern hydrological system. One option is to construct a barrage on the Ganges at Pangsha to pond the river and force its backwaters into the Gorai River (the principal distributary of the Ganges in Bangladesh). India has offered to assist in the feasibility study for such a venture and extend whatever technical support it can towards its construction. However, several international funding agencies have expressed reservations about such an intervention and stressed that Gorai resuscitation through dredging with the aim of helping a rejuvenation of a network of moribund channels, ox-bow lakes, and other wetlands in the southwest could be sufficient. Work on Gorai restoration and associated studies are now in progress. An options study for the best utilization of the water available as a result of the Ganges Treaty, including a barrage on the Ganges, has recently been initiated. In spite of Gorai dredging, siltation proneness at its intake point from the Ganges necessitates additional measures like the Ganges Barrage to supplement the flows in the Gorai and other channels for achieving long-term environmental sustainability.

Water Quality

In all the GBM countries, the deterioration of both surface and groundwater quality is now a matter of serious concern. Water is essential to sustain agricultural growth and productivity. More than half the morbidity in the GBM region stems from the use of non-clean drinking water. Safe water supply and hygienic sanitation are basic minimum needs which the GBM countries are yet to meet in both rural and urban areas. A holistic approach is required to monitor the water quality in each country together with regional initiatives both to prevent further deterioration and bring about improvement in the quality of water.

The mitigation of the additional problems of salinity and arsenic in Bangladesh involves special action plans. Saline intrusion in coastal areas could be addressed through dry season flushing of channels by means of such methods, cited earlier, as storing monsoon water and resuscitating moribund channels. The Bangladesh Arsenic Mitigation Water Supply Project (BAMWSP) funded by the World Bank/Swiss Development Corporation is presently engaged in assessing the extent, dimensions, and causes of the arsenic problem with a view to developing a long-term strategy for supplying arsenic-free water.

The monitoring of water quality in the GBM rivers is not as extensive as it should be except in the case of the Ganges in India and the Buriganga in Bangladesh. The GBM countries need to set uniform standards relating to water quality parameters along with establishing an effective water quality monitoring network. The countries should review their existing water quality/pollution laws, and make efforts to enforce the polluter pays principle. At the regional level, they should also coordinate their actions to deal with transboundary transmission of pollution, and evolve a mechanism for real time water quality data exchange, which could then lead to efficient water quality management.

Inland Navigation

The Ganges, Brahmaputra, Meghna and their principal tributaries had served as major arteries of trade and commerce for centuries. However, in recent years, their importance has diminished, especially as traffic has moved away from waterways to road and railway nodes. Yet, even today, the lower part of the GBM system is dependent on waterways, especially in Bangladesh and northeastern India.

For landlocked Nepal, Bhutan, and northeastern India, an inland water outlet to the sea is of great significance. The establishment of links with the inland water transport networks of India and Bangladesh would provide Nepal access to Kolkata (India) and Mongla (Bangladesh) ports. Potential exists for the development of water transport in Nepal in all the three major rivers (Karnali, Gandaki and Kosi) which are tributaries of the Ganges. Construction of high dams on these rivers could improve navigability in these channels.

The Karnali River (known as the Ghagra in India) has the maximum potential for navigation, from the Indo-Nepalese border to the confluence with the Ganges. The Gandaki River is an important waterway serving central Nepal and has the navigation potential to serve eastern Uttar Pradesh and eastern Bihar in India if it is linked with India's National Waterway No.1 in the Ganges, running from Allahabad to Haldia, below Kolkata. The upper reaches of the Kosi River is too steep for navigation, but river training works could facilitate the operation of shallow draft barges. Among the multiple benefits to be derived from the proposed Sapta Kosi High Dam is the provision for a navigational channel with a dedicated storage. The principal focus for Nepal's navigational development would be to gain exit to the sea through the Ganges, and obtain linkages with the inland ports of India en route. The strategy should be to ensure that structures constructed under water development projects do not impede the development of inland water routes.

With a view to reviving the past significance of inland water routes, India has already designated the Ganges between Allahabad and Haldia (1,629 km) as the National Waterway No.1, and the Brahmaputra between Sadiya and Dhubri (891 km) as the National Waterway No.2. The maintenance and further development of the requisite minimum navigable width and depth coupled with provision of navigation aids and terminal facilities would enhance the navigation potential in the GBM region. India and Bangladesh have a bilateral protocol, renewed every two years, for India to use the Ganges-Brahmaputra-Meghna riverway for water transit between West Bengal and Assam. The potentials of these routes (not optimally used at present) could expand through channel improvement, better piloting and navigational aids, and simplification and standardization of rules and regulations. A dedicated willingness to integrate the waterways network in the GBM regional countries would benefit all the countries in the long run.

Catchment Management

The geographically interlinked character of the major rivers in the GBM region warrants an integrated regional approach to the care and management of the catchments. Sound basin-wide catchment management is an essential long-term strategy to combat the threat of floods and erosion and to preserve the ecosystem. The sediment load in the rivers, which is largely the consequence of geomorphologic processes in the upper catchment areas, tends to increase with the progressive removal of vegetative cover on slopes.

Soil conservation and reforestation in the upper catchments of Nepal and India, and also within Bangladesh, could help in substantially reducing sedimentation.

6.2.5 Looking Forward

The framework for sustainable development of the GBM region can be based on a vision of poverty eradication and sustained improvement in the living conditions of the millions of its inhabitants (Biswas et al. 2004). The world's largest concentration of economic misery is to be found in this region. There is no reason for such abject poverty here, given the rich bounty of its natural resources, especially water, waiting to be harnessed.

But a lack of trust and transparency has consistently bedevilled the relationship among the co-riparians for nearly half a century and compounded poverty and deprivation in the region. This pernicious mindset has eroded goodwill and confidence, and has generated mutual mistrust and suspicion. The situation is further compounded by the failure of political leadership in creating a public opinion in favour of developing a vision for regional cooperation.

The drivers which would influence the conditions towards achieving the regional vision include population growth, urbanization, technology, globalization, governance, and environment. The demographic factor in the GBM region would be a very important determinant of the total *quantum* of water needs, implying the necessity of conservation and demand management. A related driver would be rapid urbanization (with more than half of the total population in India and Bangladesh living in urban areas by 2025), creating increased demands for safe water, sanitation, and management of solid and liquid wastes. Technological changes, manifested through adoption/innovation of new products and techniques, can enrich human capability through capacity development. The GBM region might benefit from transferring water-related technology from industrialized countries as well as from within the region, especially concerning irrigation efficiency, pollution control, water storage, disaster management, and management information systems. The contemporary process of globalization could be another driver in the region's long-term vision for sustainable development. The GBM region should benefit from trade liberalization, greater capital mobility, and technology transfer; but, at the same time, it is important to be vigilant against potential instability and the risk of greater inequality in income distribution. To address this issue effectively, it is necessary to establish good governance at all levels of society, reflected in accountability, rule of law, elimination of corruption, and participatory approaches. The governance challenge in the water sector calls for transparency and community participation in water resource development from the planning to the operational phases, which is so important towards ensuring a humane society. The vision driver of environment aims at ecological harmony, which should be addressed by way of mitigation of negative impacts, adaptation to changes, enhancement of the ecosystem, and water conservation.

The regional vision formulation can be approached under three scenarios: pessimistic, optimistic, and plausible. A scenario is a possible course of events. The pessimistic scenario is basically a business-as-usual approach under the assumption of *status quo* and "do nothing" response strategy. This approach is unsustainable and unacceptable for the long term. The optimistic scenario is the other extreme, which is overly ambitious, utopian and an unrealistic goal to pursue. In between lies the plausible scenario. It is pragmatic to seek to attain sustainable water resource management for the region through genuine cooperation and collaboration.

The overriding goal in water vision formulation for the GBM region is sustainable human development for peace, stability, and an enhanced quality of life to be achieved through water-based regional cooperation, i.e., a regime of regional cooperation of which the entry point is water but which then expands and embraces all possible directions as it gathers momentum. Clearly, the approach has to be holistic, multidisciplinary and integrative. It requires congruence of macro, meso and micro policies within each country and their coordination across the regional boundaries. It will be not easy to formulate and implement an approach that will be acceptable socio-politically to all the co-basin countries concerned, especially under the existing political conditions, institutional frameworks, and inter-country tensions and misunderstandings. However, on a longer timeframe, the region simply has no other choice if poverty alleviation, economic development and environmental conservation are to be objectives of all the countries concerned.

Acronyms

BAMWSP	Bangladesh Arsenic Mitigation Water Supply Project
GBM	Ganges-Brahmaputra-Meghna

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7 Indus Waters and the 1960 Treaty Between India and Pakistan

Chandrakant D. Thatte

7.1 Introduction

The internationally shared river Indus and its five main tributaries rise in the Himalaya, carry a very large flow seasonally and have served as a cradle for one of the ancient civilizations of the world. The river basin supports the largest irrigated agricultural area and can be viewed as the birth-place of the art and science of irrigation. This chapter, while tracing the history of irrigation in the Indus, also lists the politically profound changes that engulfed this region and shaped the destiny of one of the most densely populated and agriculturally productive regions in the world. In particular, the chapter focuses the readers' attention the tumultuous developments of the past 60 years, the conflicts around the Indus waters intricately woven with the political conflicts, partition of India, the much acclaimed Indus Waters Treaty of 1960 between the two successor countries, and how the Treaty has been worked thus far. It tries to capture the present-day events and project the author's perceptions for the future.

7.2 The Indus River Basin

7.2.1 Ancient Agriculture-Based Civilizations

Historians and archaeologists believe that about 10,000 years ago mankind started moving away from 'hunting–gathering' to tilling the land and domesticating cattle, for meeting its food and fodder needs. The population of the world at that time possibly totalled just a couple of million people. Farming at this time was just dependent on rainfall, but soon augmentation of rainfall moisture by abstracting and applying freshwater from streams and rivers for irrigation was found necessary. Rivers overflowing, breaching their banks and sending water into the farmland, initially taught mankind the art of inundation irrigation. But the variability of rainfall in space and time taught mankind to build reservoirs for water use all year round. Agriculture spread out far and wide to support population growth, and irrigated agriculture became the focus of water resources development. Today, agriculture supports the food needs of over six billion people in spite of Malthus, although about 800 M remain undernourished. Incidentally, world population in

Malthus' time was about 900 M only. Optimists believe that the needs of the ultimate world population of nine billion could also be met from available land and water resources, albeit with further expansion of irrigation in arable land, development of remaining water resources and improved water management. India, China, US and Pakistan currently account for 50, 50, 21 and 17 Mha of irrigated lands, respectively, out of a global coverage of 250 Mha. Irrigation grew from 25–50, 30–50, 14–21, 11–17 Mha in India, China, US and Pakistan, respectively, from 1960–2000. Cropland irrigated in these four countries is 29, 52, 11, 80% respectively. India and Pakistan co-basin countries of the Indus Basin cover 67 Mha, that is 27% of the world's irrigated area.

Gradually, the use of freshwater developed for drinking, domestic purposes, industry, generation of hydropower and sanitation. All riparian civilizations, however, grew around the rivers essentially for agriculture, such as those of Euphrates and Tigris rivers (7th millennium BC), the Indus River (5th millennium BC), the Nile River (4th millennium BC) and the Huang Ho (Yellow) River (2nd millennium BC). The basin waters induced nomads to settle down in deserts and wastelands and take to farming. Since ancient times, land and water usage in the basin no doubt underwent profound changes with every wave of administration of the Aryans, Buddhists, Jains, Persians, Greek, Mauryas, Guptas, Arabs, Afghans, Tughlaqs, Moguls and lastly the British. Today, the basin boasts the largest contiguous irrigated area on a single river system in the world. Evidence of irrigation practices in the Indus Basin at Mohen-jo-daro on the Lower Indus and Harappa on its tributary Ravi is chronicled by archaeologists. In terms of water carried, the Indus flow is three times that of the Nile, 10 times that of the Colorado in US and Mexico, and equal to that of the Columbia in Canada and the United States.

7.2.2 The Himalaya

The Indus and its tributaries rise from the Himalayan ranges that block and capture the monsoon. Snowfall in the higher Himalayas is due to westerlies. Its accumulation over millennia has resulted in over 3000 large and small glaciers, covering the valleys. Siachen glacier on the Indo-Pakistan border for instance, is 72 km long. The Gangotri glacier gives rise to the river Ganga. The snowmelt from the Himalaya provides freshwater not only to South Asia but also to China, Afghanistan and Central Asia. The Himalaya takes its name from a joint Sanskrit word, 'Him' meaning snow and 'Alaya' meaning a storehouse. The mountain range is comparable in its length to the Sierra Nevada, about 1,500 km, bordering the eastern side of the California valley of the United States. On the top and behind, it has a high, cold and arid plateau. Situated in the Himalaya range is the highest peak in the world – Mount Everest (8,869 m above mean sea level or El 8,869 m), while peaks above El 6,115 m abound in all parts of the range. Figure 7.1 shows the glaciated Himalaya region.

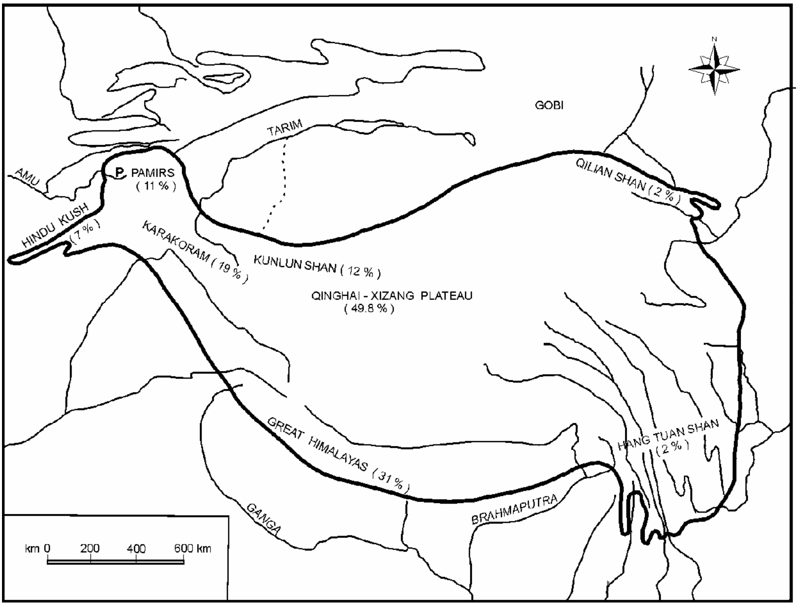

Fig. 7.1. Himalaya glacial region and rivers

7.2.3 Climate and Rainfall

Climatically, the area has three natural divisions representing fairly homogeneous meteorological zones – the Himalayan, sub-Himalayan and plains. Basin climate varies from sub-tropical arid and semi-arid in plains to temperate sub-humid and alpine in the mountain highlands of the north. In the Himalayan zone, precipitation occurs at elevations even above El 5,000 m. The sub-Himalayan zone has an annual rainfall of nearly 800 mm towards the east and about 375 mm in the west. In the plains, annual rainfall decreases generally from north-east to south-west from about 750 mm to less than 125 mm. The highest rainfall in the basin is about 1600 mm in the hills. In upper catchments, annual equivalent precipitation is more or less equally divided between summer and winter. In the rest of the basin most of the rain comes during the monsoon, though some winter rains do occur. Figure 7.2 indicates rainfall figures in the basin. Figure 7.3 indicates the basin with its hinterland.

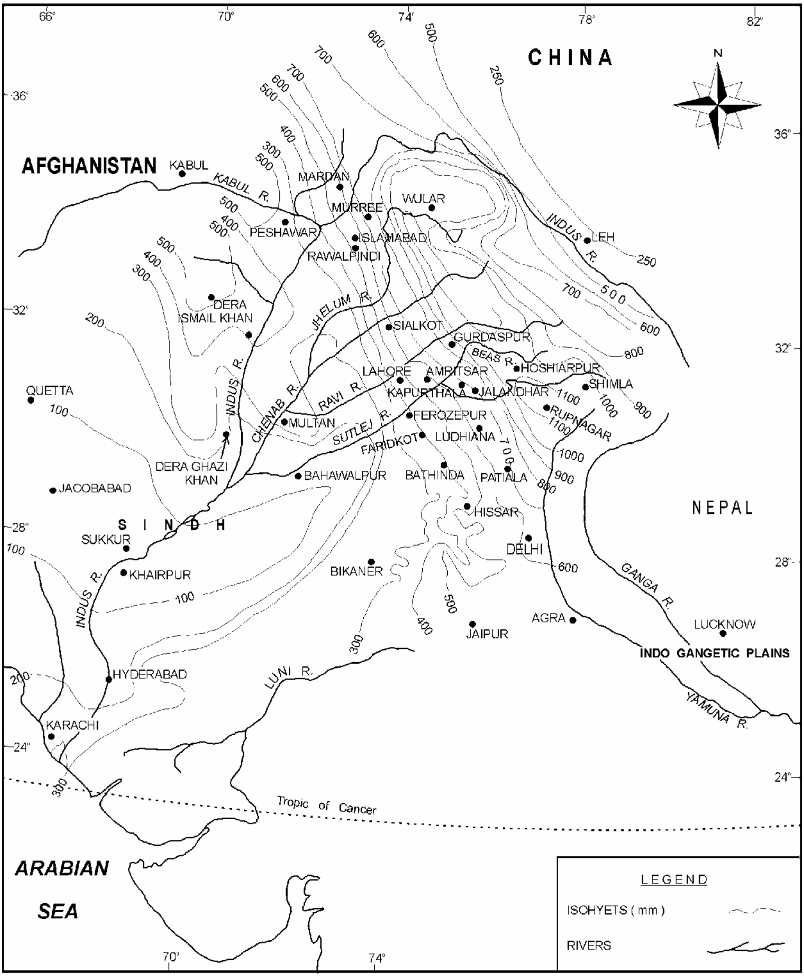

Fig. 7.2. Rainfall (mm) in Indus Basin

7.2.4 The Indus River, the Basin and the Doabs

Some distance south of the trans-Himalaya is the Kailash range parallel to and north of the Ladakh range. About 16 km north of Mansarowar Lake, the Kailash range contains a cluster of peaks, the chief peak of which is Mount Kailash El 6,724 m. The Indus rises in its north-west slopes from a spring called Singikabad in Tibet (China) at El 5,494 m; the Brahmputra rises on the eastern slopes, and the Ganga on the southern slopes. The name Indus is derived from 'Sindhu' (meaning ocean) associated with the early Hindus settlers. The Sindh Province in the lower part of the basin, the word Hind for the country, the word Hindi as language spoken, and the word India emanating from Indus are all inter-related. The river flows to the north-west in the first lap of 190 km from its source, then crosses over to the south, and taking a west-north-west course nearly 480 km along the southern flank, cutting across the range northward just before it is joined by the Shyok River. The northern boundary is surrounded by high Himalaya, while the Karakoram and Harmosh ranges lie in the north-west, and the Suleiman and Kirthar ranges form its Western boundary. The river is nearly 2,880 km long up to the Arabian Sea.

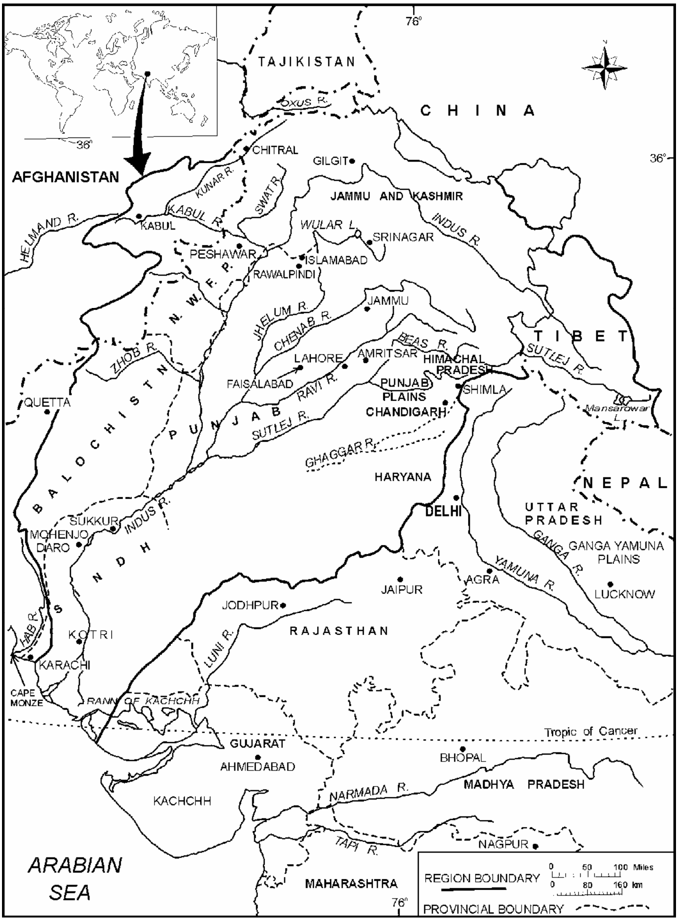

Fig. 7.3. Indus and Hinterland

The Indus and its tributaries drain a total area of 115 Mha. The Upper Indus segment comprises its first 2145 km length, up to which point all significant tributaries meet. In the 735 km-long segment below, inflow is small. Out of the entire catchment area, the mountainous area totals around 44 Mha, which yields most of the runoff. Snowmelt from higher altitudes above El 2,500 m contributes to summer runoff. In the first lap of the river course of 1,280 km up to Tarbela (El 336 m), five right-bank and three left-bank tributaries join. The total catchment up to

Tarbela is about 17.5 Mha. Downstream of the Tarbela reservoir, the river reaches Attock (El 266 m) traversing through a 64 km-long gorge. Below Attock, the river flows in a south-easterly direction for a total of 160 km to reach Kalabagh in the plains at about El 181 m. The Indus River receives the waters of two left-bank and three right-bank tributaries in between Tarbela and Kalabagh. At Kalabagh Rim Station, the average annual flow is about 112 billion cubic metres (BCM). The river covers another 1,440 km from Kalabagh before joining into the sea. The basin's southern boundary extends up to the Arabian Sea. The eastern boundary is shared by India and Pakistan. The narrow fringe of plain country west of the Indus and the large flat areas south of Sutlej and the Indus are mostly comprised of sand dunes. The Indus plains consist of relatively flat tracts between the Indus and its major tributaries on the east, viz. Zhelum, Chenab, Ravi, Beas and Sutlej. Each flat is called a doab, literally meaning 'two waters', a land bound by two river-waters. Each doab takes its name from the rivers (Table 7.1). The plains yield only a small runoff in comparison with the hills, which yield a major runoff. Therefore, it has been measured at the 'Rim Stations' for basin planning, where the main river and its tributaries emerge from the hills.

Table 7.1. Doabs and boundary rivers

Doab	Area lying between rivers
Sindh Sagar (Thal)	Indus and Jhelum
Chaj	Chenab and Jhelum
Rechna	Bavi and Chenab
Bari	Beas and Ravi
Bist	Beas and Sutlej
Cis Sutlej	Sutlej and Yamuna

The other rivers from the east, besides the five main rivers, are three directly joining the Indus; while another three large and two smaller rivers join Jhelum. Chandra and the Bhaga make Chenab. The Indus system comprises 13 tributaries in hilly areas from the west and 14 in the plains.

The overall slope of the plains is flat (0.014%). Most of the area in the plains is cultivable when irrigated. The Indus plains merge into the plains on the right bank of Yamuna with a relatively low-lying ridge in between. There are projections of Aravali hills south of these plains while sand dunes of Thar Desert constitute the south-east flank of plains. Its southern-most segment is the delta of the Indus River dropping into the Great Rann Desert of Kachchh, gradually lowering under the Arabian Sea. The width of the Indus plain is about 325 km in the Punjab. The Ghaggar River in the east, known as Saraswati in ancient times, rises near Shimla in the Himachal Pradesh state of India. It flows into the Haryana state and has a small weir across it at Ottu. It occasionally brings high floods but normally is an abandoned landlocked river course. It becomes activated only in high floods, disappears in the Thar Desert and rarely spills into the Indus.

Important landmarks along the Indus River from upstream to downstream comprise: Warsak Dam west of Attock on river Kabul, Jinnah Barrage; on east downstream of Kalabagh Thal main line (1947) takes off; next is Taunsa Barrage on the east of which Mujaffargadh canal tails off, while on the west DGKhan canal (1958) takes off; next is Panjnad Barrage (1933). On the east is Abbasia canal (1932). Mithankot and Guddu barrages follow in the downstream. On the west of Guddu Barrage, Desert and Segri canals start. Sukkur Barrage at Rohri then follows, where El is only about 60 m. On the west side the NW, the Rice and Dadu canals start. On the east, the river has Rohri, Khairpur, eastern Nara (1932), Mithrao, Jamrao canals. Next in downstream is the Hyderabad (Mohammed) Barrage. On its west, Beghar feeder takes off, whereas on the east is the lined canal, Pinyari canals (1959), and the Fulleli canal starts here as well.

7.2.5 Jhelum

Jhelum rises from a large spring at Verinag in the Indian state of Jammu and Kashmir at El of about 1,590 to 1,830 m. The river passes through Srinagar, receiving waters of its main tributaries, Liddar, Sind and Poonch. At Baramulla, at El 1,540 m, Jhelum passes through a narrow gorge as a torrent. At Uri, the river takes a bend and follows the range up to Muzaffarabad, where tributary, Kishan Ganga (also called Neelam) joins her. The river now turns south and flows to Mangla reservoir, and into the Punjab plains at about El 265 m, until it reaches Trimmu to join Chenab. The total length of Jhelum is 820 km. From Baramulla to Muzaffarabad, the river-bed slope is about 1:160, reducing to 1:250 downstream up to Rim Station Mangla. Here, the annual river flow is about 29 BCM. The river slope flattens in downstream to about 1: 5,000. Jhelum has 10 tributaries including Kishan-Ganga, Poonch, and others.

Important landmarks along Jhelum are Wular and Mangla where, on the east bank, the Upper Jhelum canal (1915) starts. On downstream east of Rasul Barrage Lower Jhelum canal (1902) starts. Next in downstream is Khanki Barrage at Trimmu. On its east, Haveli canal (1939) starts near the confluence of Jhelum and Chenab. On the west is Rangpur canal (1939). Ravi meets Jhelum near the tail of Haveli. Next in downstream, Sutlej meets upstream of Panjnad Barrage, where Abbasia canal takes off.

7.2.6 Chenab

Chenab rises at Lahaul in the Indian state of Himachal Pradesh where its two upstream branches – Chandra and Bhaga – rise on opposite sides of Baralacha Pass (El 4,880 m) joining at Tandi (El 2,780 m). The river below is called Chandra-Bhaga or Chenab. From here, it flows for a distance of 160 km through the mountains, makes a right-angled bend at Kishtwar, where it escapes the Pir Panjal through a gorge. Below Kishtwar, it runs in a south-westerly direction and after crossing the Shivalik hills, enters the plains above Marala at about El 245 m. Two major tributaries, the Jammu Tawi and the Manawar Tawi, join it upstream of Marala Barrage. The annual average flow of the river at this Rim Station is about 29 BCM. On the east, Maralu Ravi link (1956) takes off. At Trimmu, Upper

Chenab canal (1912) and Bambanwala-Ravi-Bedian-Dipalnur Link canal (1952-58) take off. After flowing in the plains for 636 km, it is joined by Jhelum at Trimmu and a further 64 km downstream by Ravi. Chenab then joins the Indus below Panjnad near Mithankot. The length of the Chenab up to the confluence with the Indus at Mithankot is 1,361 km. The catchment area is 6.7 Mha. Chenab has 12 major tributaries which include the Chandra, Bhaga, Jammu Tawi, Manawar Tawi and eight smaller streams joining the Chenab in Pakistan.

7.2.7 Ravi

Ravi, with a length of 894 km, has the smallest catchment of 3.97 Mha amongst Indus rivers. It rises near Rohtang Pass in Kangra of the Himachal Pradesh state of India and drains the southern slopes of Pir Panjal and northern slopes of Dhauladhar. Leaving the Himalaya at Bisolee and after crossing the Shivaliks, it enters Punjab plains with an average annual flow of about 8 BCM below Madhopur at about El 348 m. to Upper Bari Doab canal. From 25 km downstream to Jessar Railway Bridge, its course is more or less parallel to the India–Pakistan border. The river runs parallel to the border for another 93 km, until it enters Pakistan at about 32 km above Lahore, then continues across the plains until it meets Chenab, about 64 km below Trimmu.

Important landmarks along the river are Rohtang pass, Chamba, Thein Dam, Shahpur Kandi and Madhopur. On its east, Madhopur Beas Link, Upper Bari Doab canal (1859), and Dipalpur canal take off. The river passes west of Lahore followed by the Kashmir canal. Next in downstream is Balloki weir at El 163 m. On its east, Beas Sutlej Link (1954) takes off which meets Sutlej upstream of Suleimanki. Sidhnai canal (1886) then takes off before the Ravi joins the Chenab.

7.2.8 Beas

The river rises at El 4,000 m in Kulu of the Himachal Pradesh state of India on the southern face of Rohtang Pass at the eastern end of Pir Panjal ranges, and enters the Kangra district of Himachal Pradesh at Singbol. It drains a relatively small catchment area limited to the lesser Himalaya and Shivaliks. On meeting Shivaliks during its journey in the Hoshiarpur district in India, the river swings sharply northwards. It then bends around the base of the Shivaliks and takes a southerly direction passing through a precipitous gorge for a distance of 120 km before entering the Punjab plains near Talwara. The river flows wholly through India to finally join the Sutlej near Harike after having traversed a length of 467 km with a catchment area of 1.67 Mha at the Rim Station Mandi. The annual average flow of the river there is 16 BCM.

Important landmarks along the river are Manali, Kullu, Pandoh Dam, Mandi, Pong Dam and Harike Barrage. On its east, Rajasthan canal and Sirhind feeder take off. Farther downstream is Ferozpur Barrage, where on its east Eastern and Bikaner canals take off. On downstream is Suleimanki Barrage where on the eastern side the Fordwah, Siddiqia and Hakra canals take off. On downstream is the Islam Barrage where on its west, the Mailsi canal starts and on its east, the Bahwalpur Desert canal takes off.

7.2.9 Sutlej

The river rises in highlands of Western Tibet (China) in the Kailash mountain range. It emerges from Shivalik hills at the Bhakra gorge and flows in a narrow deep stream with low hills on either side for about 16 km, before it widens into an alluvial river. It enters Pakistan below Ferozepur and joins Chenab, 4.8 km above Panjnad. River length is 1,542 km, with a catchment area of 12 Mha and is the longest of the Punjab rivers. The river has eight tributaries, all except one join the river during its passage in India. Beas is its largest tributary. Annual average flow of the river at the Rim Station Ropar is about 18 BCM.

Important landmarks along the river are Pareechu (China), Bhabha, Nathpa Jakhri Power Corporation, Bhakra, Nangal and Rupar. On the west Bist Doab canal (1954) takes off. On the east, Bhakra main, Fatehabad branch (1954), Narwana branch and Satluj-Yamuna canal take off. The Sirhind, Bhatinda, Kotla and Ghaggar canals take off from Bhakra main.

7.2.10 Kabul

The river rises in and drains the south-eastern slopes of the Hindu-Kush range in Afghanistan and Chitral valley in Pakistan. Its length is 480 km with a total catchment area of 7.8 Mha in Afghanistan. At Warsak Dam, located 42 km down the border, the inflow is 21.4 BCM. The river enters Pakistan at about 42 km above Warsak and joins the Indus near Attock. The catchment area of the river and tributaries in Afghanistan is about 6.7 Mha.

7.2.11 Kurram

The Kurram and Gomel rivers are the other two Western tributaries with a length of 187 km and a catchment area of 0.68 Mha. The Kurram originates near Kabul in Afghanistan and after passing through the towns Parachinar and Thal in Pakistan, it joins the Indus 24 km u/s of Kundian.

7.2.12 River Flows

The principal rivers of the Indus system are all perennial, but their flow varies enormously during the year. Tributaries are more dependent on monsoon rains than the main Indus. Summer months (April–June) bring an average flow that is four times the flow of 6 months of winter (October–March) while the monsoon season (July–September) brings seven times the winter (6 months) flow. Glacial areas in the Indus system lying above El 5,500 m make the most of the snowmelt contribution during the months of April to June or even up to September. Table 7.2 indicates the flow of the Indus system at corresponding Rim Stations. It also indicates the area covered by glaciers to appreciate the snowmelt contribution. The Indus, Chenab and Sutlej have the highest glacial coverage in their catchment. Figure 7.4 shows hydrographs of rivers at Rim Stations.

Table 7.2. Percentage of annual flow during various months

Period	Indus at Kalabagh	Jhelum at Mangla	Chenab at Marala	Ravi at Madhopur	Beas at Mandi plain	Sutlej at Ropar
April–June	26.8	44.2	29.6	30.9	15.9	31.0
April–July	53.7	60.2	52.2	50.7	36.1	48.8
April–August	65.8	72.9	73.7	71.5	66.5	73.2
Catchment area in km^2	307,533	36,352	29,043	8,532	14,142	57,344
Glacial area in km^2	36,902	363	3,776	256	708	6,318
% of glacial area	12	1	13	3	5	11

Source: Dhir and Singh (1956)

Unlike other river basins, the Indus system receives most of its flow from the upper mountainous catchments. Surface flow into rivers from relatively large but arid plains is small. The Indus and the Kabul together bring around 110 BCM of water into the plains at Kalabagh (Jinnah Barrage), which is a little more than 50% of the total supply of the Indus River system. The Jhelum and the Chenab individually bring in over 28 BCM of water each, that is more than 25% of the total. Ravi with 7.80 BCM, Beas with 16.2 BCM and Sutlej with 17.8 BCM, taken together, carry a little less than 20% of the supply of the system. The Indus River and the tributaries together carry on an average runoff of over 212 BCM. Table 7.3 indicates the flow in the Indus system and withdrawals from canals in 1947.

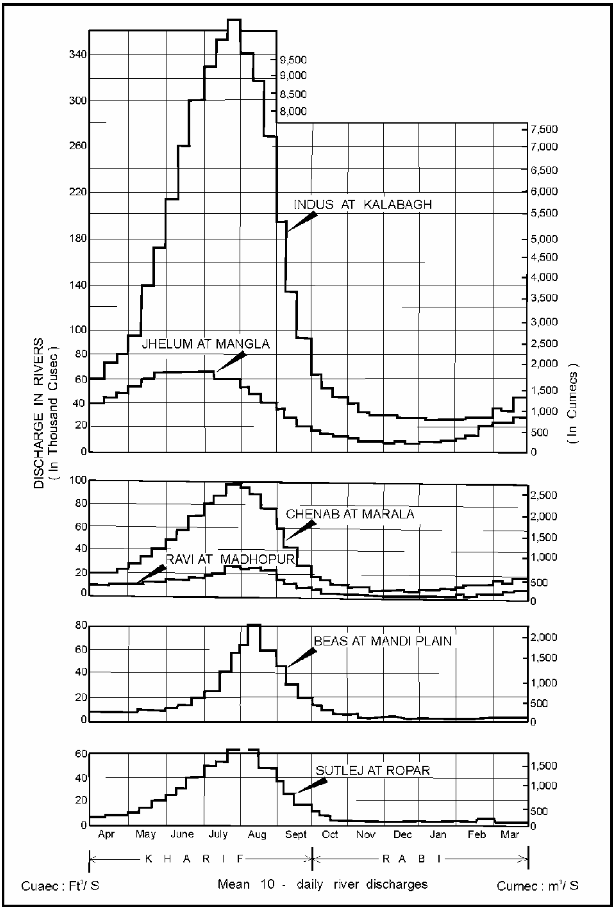

Fig. 7.4. Indus rivers, hydrographs at rim

Table 7.3. Annual average flow in Indus System and withdrawals in 1947

River	Rim station	Average flow (BCM)	Average withdrawal (BCM)
Indus	Kalabagh	112	40
Jhelum	Mangla	29	Jhelum + Chenab
Chenab	Marala	29	21
Ravi	Madhopur	8	11
Beas	Mandi	16	Beas + Sutlej
Sutlej	Ropar	18	20
Total	Addition of five stations	212	92

7.3 Irrigation Up to the Twentieth Century

7.3.1 Inundation Canals

Although irrigation was practiced in a rudimentary manner in the Indus Basin from prehistoric times, the basin was basically an arid area with narrow strips of cultivation along rivers supporting a relatively small population. Irrigation mode prior to the Mughals and also the British in a good measure, was the ‘Sailaba’ (flood or inundation), in conjunction with groundwater. The period of Chandra-Gupta Maurya I (321–298 BC) witnessed construction of storage tanks of small-to-medium size. The first millennium also saw the beginning of organized irrigation with small diversion structures. The Mughal Emperor Aurangzeb constructed inundation canals in the dry Multan district and in Sutlej-Chenab doab from 1658 to 1707. Twelve inundation canals on the west bank of the Indus followed. Another 12 canals came up on east of Chenab. In all, 4000 km of inundation canals irrigating 0.4 Mha then existed in Punjab. They were built up in the Sindh and Bahawalpur area also from Sutlej and Panjnad.

7.3.2 Two Seasonal and Perennial Canals

The next stage of irrigation was two seasonal or perennial canals. Grand Anicut in South India was built in AD 300. Ferozshah Tughlaq built off-Yamuna for Hissar, a perennial canal. Emperor Akbar did it in 1568. Jehangir (in exile) in 1620 built a water supply scheme on the Indus at Lahore. In 1633 on the left bank of Ravi, Shahjehan built an irrigation canal (Shah Haslie) taking it to Amritsar Temple. However, no permanent headworks, no barrages were planned. With the decline of the Mughal Empire in the 1740s, the British East India Company gained control of a large part of India. Notable developments in the basin gained momentum in the 18th century. All along, there existed several princely states in the basin, administering the irrigated areas on different footing and established huge systems both in the Gangetic plains and peninsular India. The Ganga canals, for instance, opened by the British in 1857, were the largest in the world at that time. For comparison, it may be recalled that the Nile perennial irrigation started in 1860 AD with Mohammed Ali Barrage.

7.3.3 Advent of the British

The British Government took up the reins of administration from the East India Company in 1854. It had penetrated the Indus Basin in 1809 and had gained virtual control of Punjab and Sindh during the 1840s. Sindh was annexed in 1843 and attached to Bombay Province. Until 1850, only narrow fringes along the Indus Rivers enjoyed irrigation. Punjab Public Works Department with irrigation as a major component was formed in 1849 under Robert Napier. Military works were separated in 1895 and railways in 1905. An electrical/industries wing was added to Public Works Department in 1930. Irrigation activities had preceded Public Works Department, but got a boost with the set-up of the Public Works Department. A shuttered weir was built for canal intake in Uttar Pradesh from 1869 to 1872. Madhopur on Ravi came up soon. Sirhind was surveyed in 1861–1863 at Ropar; work started in 1869; opening was in 1882. Responding to the 1878 famine, Punjab proposed Sidhnai (Lower Ravi) canal in 1882. It was opened in 1886. Khanki weir down stream of Wazirabad on Chenab opened in 1892. Rasul weir on Zhelum for Chaj came up in May 1901.

7.3.4 Fighting Famines

The motive for promoting irrigation basically came from chronic famines and later in Punjab for colonizing (employment and settlement) in crown waste land of Sikh armed veterans, disbanded in 1849, making waste-land productive and earning revenue. Irrigation got impetus from the middle of the 19th century when existing irrigation works were renovated to extend benefits to more areas. The middle of the 19th century saw the construction of the following large canal systems.

The Upper Bari Doab canal in Punjab from Ravi was completed in 1859. The Sirhind canal of 170 m^3/s capacity, opened in 1872. Inundation canals of Punjab from Sutlej, Chenab and the Indus were improved by weir control. In Sindh, improvements/extension of canals with headworks and embankments were undertaken. Lower Sohag and Para canals were built in 1882 and the Sidhnai canal was built in 1886. From Chenab, Lower Chenab canal opened in 1887. From Jhelum, the Lower Jhelum canal opened in 1901. In 1890 Lower Swat canal in the North West Frontier province was completed. The Kabul River canal, Paharpur and Upper Swat canals, were completed in 1907 and 1914. The Kashmir canal on the upstream of Madhopur headworks was built for Jammu province.

7.4 Developments Until the Independence and Partition in 1947

7.4.1 Rapid Pace of Development

By 1901, all rivers except Beas were tapped. Ravi headworks was kept at the Rim Station. Severe famine occurred in 1899–1901. Lord Curzon therefore set up the 1st Irrigation Commission of India under Sir Colin Scott-Monorieff. It was convened in October 1901 calling for, possibly the first time, a major investment programme in public infrastructure, assistance to private irrigators through surveys, loans, grants, etc. It also considered for the first time a proposal (by James Wilson, the Punjab Settlement Commissioner supported by Col S L Jacob Retired Chief Engineer) comprising transfer of Western rivers eastwards. With hindsight, this proposal seems to have carried a seed of the Indus Water Dispute leading to the Indus Water Treaty (IWT) itself. The commission considered but recommended 'in- depth' studies for the proposal.

In 1905, the Triple Canal Project was started. Lower Bari Doab canal was started in 1907. Parties to the Satluj Valley Project were GoI, Punjab, Bahawalpur and Bikaner. An Agreement was achieved in 1919; the project was sanctioned in 1921. It provided four new barrages, three of which were completed in 1927; the fourth barrage at Panjnad was started in 1927 and completed in 1933. Gross irrigation was planned at 2.3 Mha. Bombay/Sindh had objected to Bhakra as it seemingly would affect Sindh's interests. The restoration of the Begari canal above Sukkur was undertaken in 1852–1853, Fuleli in 1856 and Mithrao in 1879. By 1900, Sindh had 11,860 km of canals, 3.8 Mha of command, irrigation for about 1.1 Mha, when Panjnad was irrigating 1.8 Mha. The Sukkar Rohri project of Sindh was under consideration since 1847. It was revived and revised seven times. Dr Summers proposed three weirs in 1906: the Mithankot (Guddu), Sukkur (Rohri) and Kotri (Hyderabad). The Rohri project was submitted in 1910 but was finally approved in 1921 and completed in 1932, to cover 3 Mha of CCA.

7.4.2 Sindh Versus Punjab

Sindh versus Satluj Valley project remained a contentious issue. In any case, both changed the inundation system into barrage controlled perennial systems. For Sindh, fair weather flow until the next monsoon was critical and hence it guarded that availability zealously. After India's partition, Punjab-Sindh interests continued to be at loggerheads. Punjab had proposed three schemes but did not favour Sukkur. The projects were: (1) Bhakra, (2) Thal doab (above Sukkur) and (3) Eastern Thal and Lower Rechna-Bari Doab (Trimu or Haveli scheme). Punjab went for projects (2) and (3). In 1935, the 'Indus Commission' (or the Anderson Committee) was set up to recommend equitable/acceptable allocation of waters between six parties. The Haveli scheme was approved in 1937 by Punjab. It was opened in 1939. Scheme 2 for Thal was sanctioned at a site below Kalabagh and was completed in 1942. The canal was named 'Mujahir' (meaning refugees) canal to commemorate the refugees. It was indeed symbolic of changes resulting from partition. In 1954, Sindh finally accepted Bhakra as a key Sutlej project.

The 20th century heralded an unparalleled era of development in the basin. In 1915, the Triple Canals Project (Upper Jhelum canal, Upper Chenab canal, Lower Bari Doab canal) was completed providing irrigation to about 1.5 million ha. Another two canals (Ranbir and Pratap) were constructed from Chenab to irrigate 60,000 ha in Jammu. Another project for augmenting inundation canals of Sutlej, in Thar Desert of Bahawalpur and Bikaner was completed. It involved four gate-controlled barrages at Ferozepur, Suleimanki, Islam and Panjnad to feed 11 canal systems for 3.26 million ha. The Trimmu Barrage was constructed in 1939. Haveli was one of the first lined canals with a double layer of burnt clay tiles with a sandwich of cement mortar. The Sukkur project on the main Indus was completed in 1932. It consisted of seven canals for irrigating 3.16 Mha.

The Indus Commission headed by B N Rau was appointed in 1941. Sindh was the plaintiff, and Punjab was the defendant. Complaints were about Haveli in operation, Thal under construction, Bhakra under contemplation, besides issues related to the Patiala state and Sirhind waters. A comprehensive report came in 1942 averring that a most satisfactory settlement requires agreement that considers parties as one community undivided by political/administrative frontiers. Reasonable drawal of waters has to mean greatest aggregate advantage with the smallest outlay. Events that followed almost totally eclipsed these lofty concepts. There was no complete agreement on the draft prepared in 1945. The Partition of India followed. Pak inherited Sindh and a part of Punjab case; India the rest of east Punjab and Bikaner cases. Perceptions changed. IWT negotiations started with the new boundaries. Studies made for earlier reports were deployed to derive maximum support as was appropriate.

7.4.3 The Twilight Period

The status of irrigation development in the basin through various water sources before 1947 is indicated in Table 7.4.

Table 7.4. Irrigated area (average for 5 years) prior to 1947 (million ha)

Year	Government canals	Private canals	Tanks	Wells	Others	Total
1890	6.0	0.25	6.0	9.5	4.5	20.25
1900	8.0	0.15	5.2	10.5	5.0	29.85
1910	11.0	2.0	8.0	1.5	6.5	39.0
1920	12.3	3.5	8.5	12.5	7.0	44.0
1930	13.0	4.0	9.0	13.0	7.0	46.0
1940	17.0	3.0	10.0	14.0	6.0	50.0
1947	22.0	4.0	90.0	14.0	7.0	56.0

Source: Malhotra and Ahuja (1951)

Investigation for a canal 400 km in length (Shah Huslie modernization) was taken up for Upper Bari Doab canal in Ravi-Chenab Doab in 1949–1950. A series of weirs/barrages was built until 1950. WYC, Upper Bari Doab canal and Sirhind converted settled inundation system into assured irrigation supply. New schemes afforded settlement in new lands. It relieved congestion in existing systems, converted wasteland into productive units, and built granary for India. The name of Pophan Young was built in the local folklore. James Lyall, Lt. Gov. of Punjab was made immortal when the most prosperous district and city of Punjab were named after him, Lyallapur. We also have Montgomery and other places in Punjab named after well-known figures. Another novel feature is ‘alpha-numeric’ titles given to canal colonies/cities in Punjab.

7.4.4 Independence and Partition

In 1947, after a struggle spread over 90 years, India obtained freedom but was partitioned on the basis of the religious concentration of people in India and Pakistan. The two not only inherited the legacy of the British provinces and the Princely states, the bruises of the partition, but also the fragmented water resources, the massive irrigated tract, the dense population, and consequent intensification of water-sharing differences of the Indus Basin. Drawing lines of division in such an area interwoven by irrigation systems was indeed difficult but was pushed through in great haste. It awkwardly divided the basin, the irrigation system and the doabs. Partition itself was traumatic for millions of refugees and relatives on both sides of the border who lost their lives. Political events leading to the partition were murky and had bred deep distrust. Viceroy Mountbatten suddenly announced on 4 June 1947 that the 'D' date would be 15 August 1947. It left just 10 weeks for the separation of administration, assets, records, personnel, equipment and drawing of the 'boundary' of two countries in the states of Punjab in the west and Assam-Bengal in the east. Two separate Partition Commissions were set up on 30 June under Jurist Cyril Radcliff who arrived in India on 8 July. Boundary Awards were announced a full two days after the 'D' date on 17 August. The whole effort must rank as a sort of world record of speed in dividing a huge population and landmass.

The development in a period of 100 years preceding partition had converted the area into an intensively cultivated, populous and productive irrigated area. Some of the canals of the area carried more water than the British Thames in floods, or the average flow of the American Potomac River. In 1947, about 88 BCM in all was already being diverted from the Indus. The population in the basin at the time of partition was 42 million. Pakistan inherited 22 million and India the rest. Also, Pakistan and Indian shares in irrigated land of 28 Mha at that time was 30 and 70% respectively. However, out of the Indus irrigated area of 9 million ha, Pakistan got 7.3 Mha and India 1.7 Mha. Most of the productive and food growing lands in the Punjab and the Sindh went to Pakistan.

The partition was not simply the drawing of a boundary line between the two countries. It disrupted the very hub of life in the basin. Pakistan suddenly became a lower riparian nation. Two important headworks for Pakistan irrigation, Madhopur on Ravi, and Ferozepur on Sutlej, went to India causing administrative, regulation and irrigation water problems. Ongoing development suddenly looked a bit vulnerable. Thus the problem of Indus water management became a critical human problem concerning 46 million dependent people spread over 26 Mha of arid irrigable area which otherwise had held large scope for future development. Out of 207 BCM of water flowing annually through the Indus River system, only about 88 BCM was being put to beneficial use, 9.8 BCM in India and 77.7 BCM in Pakistan. This flow was almost equal to the entire mean annual runoff of the Columbia River at Grand Coulee Dam, much more than the mean annual runoff of the Nile at Aswan Dam, and about twice the mean annual discharge of the Colorado river at Hoover Dam.

7.4.5 Post-Partition Development

To avoid paralysis of administration and irrigation in the divided Punjab, some Stand-Still Agreements were reached between the successors on the day of partition for operation, until the end of March 1948, unless renewed beyond the date. Intra-national differences all of a sudden became international ones. East Punjab notified West Punjab on 29 March that Stand-Still Agreements on Central Bari Doab canal was about to expire and sought a response. Nevertheless, it expired. On 1 April 1948, east Punjab suddenly stopped irrigation delivery from Upper Bari Doab canal to Central Bari Doab canal of West Punjab. As explained at the time, the stoppage intended to establish 'ownership' on Upper Bari Doab canal and to deny any legal right to West Punjab on Upper Bari Doab canal. The action possibly was in keeping with the preceding tumultuous events. Predictably, West Punjab retaliated with economic sanctions against its own religious groups. A conference of the two dominion successors of Punjab was held to resolve the issue on 15 April 1948. Two agreements were concluded to be ratified in the proposed 3 May meeting. Under first a Status Quo Ante was accorded to Central Bari Doab canal until 30 September 1948. Under the second, supply to Dipalpur canal was restored until October 1948. The agreements were ratified but the mention of a termination date was excluded. The Punjab Partition Committee took note of these developments on 26 May 1948. The episode served a notice of the storm and heralded a formal beginning of the 12-year-long Indus Water Dispute between India and Pakistan. The event spurred unprecedented activity in Pakistan in planning and implementation of replacement works. Figure 7.5 indicates the Indus system in 1960, with links in Pakistan and dams under construction.

After partition, India, faced with a problem of providing irrigation to its unserved vast areas so far, took up enlarging the capacity of Sirhind canal, Upper Bari Doab canal system, and new Bist Doab canal. For this purpose, Ropar Headworks and Madhopur headworks were remodelled. A new barrage at Harike, to feed existing Sutlej valley canals of India and to feed the Indira Gandhi canal system was taken up. The design of Bhakra concrete gravity dam of India (226 m high), Nangal Barrage and its canal system was started. The major part of the canal system was operational before 1960. Figure 7.6 shows the basin, Rim Stations, locations of dams and barrages.

The two successor countries thus seemingly overcame anger and despair, and initiated massive rehabilitation of affected people besides the Indus irrigation system. They further took up reintegration of headworks and canal systems and extension of irrigation badly needed in their respective areas. Disagreements had already surfaced about supplies to two irrigation systems from three Eastern rivers, viz., Sutlej, Beas and Ravi. Pakistan wanted continuity in supply of water to its area, India wanted to develop its own area to sustain its pre-partition population and to develop new areas for new settlers and refugees. Pakistan proposed adjudication by International Court in June 1949 stating that the then '*modus vivendi*' of the two agreements of May 1948 was unsatisfactory. On 3 January 1951, former Chairman TVA Lilianthal after a visit to India noted that as the Tennessee Valley Authority (TVA) dream was quite appealing in the Indian sub-continent, and the current situation provided a ‘great opportunity’ for US to mediate (and possibly take on Communism?). He wrote a proposal in June 1951 seeking the involvement of the World Bank. Eugene Black, then President of Bank, liked the proposal. The Bank made a formal proposal in September 1951. In November 1951, both countries accepted it. The first action of the process was to accept the two agreements (without extending the termination date.) From 1951, Pakistan started talking only through the mediator. Lengthy negotiations followed. Roller-coaster events took their toll, but the IWT ultimately materialized in 1960.

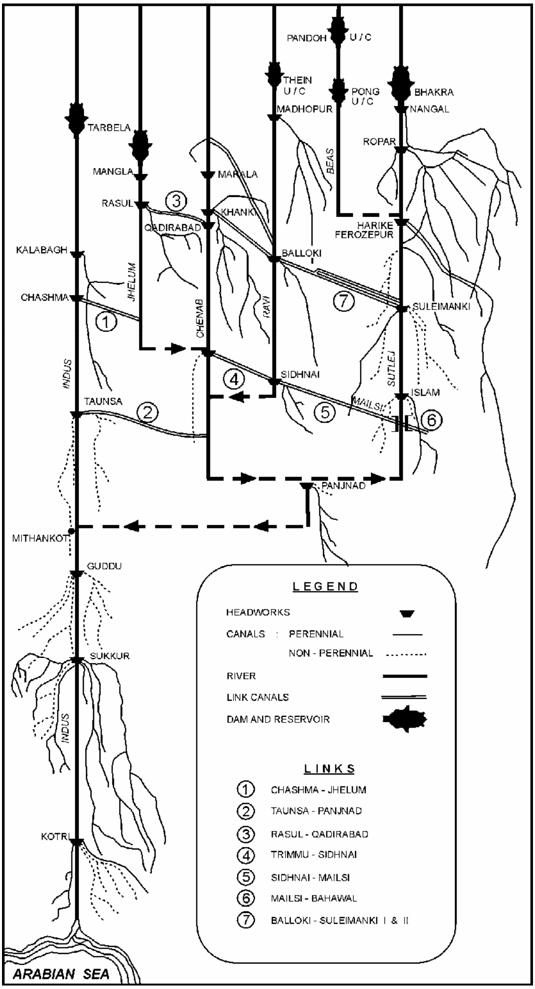

Fig. 7.5. Indus system, Pak links, dams under construction, 1960

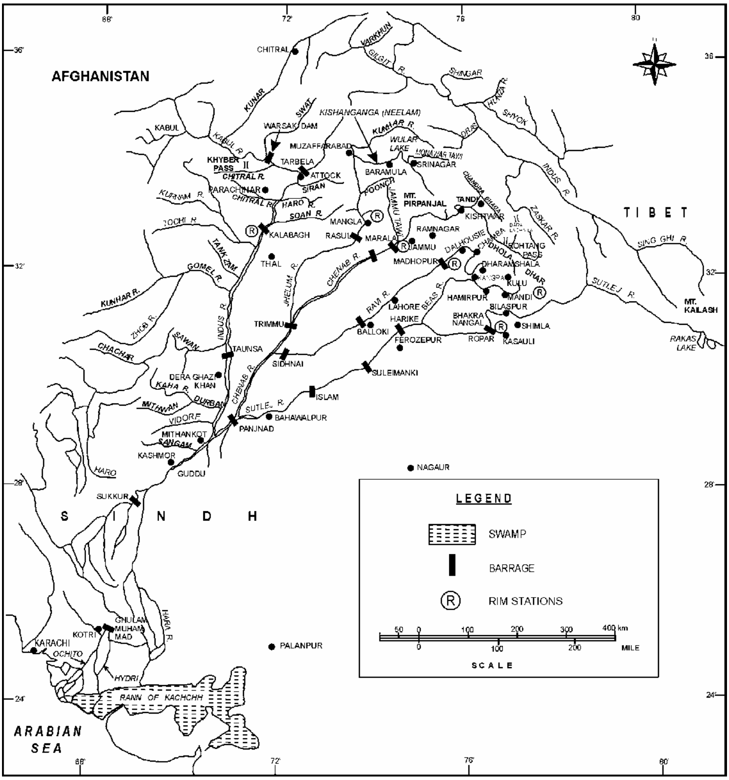

Fig. 7.6. Indus rivers, rim, dams, barrages

7.5 Indus Basin Development from 1947 to 1960

7.5.1 Development in Pakistan

In view of a likely shortage of water in canals fed from headworks located in India, plans were drawn to make it up by transferring water from Western rivers towards east through link canals. In addition, several new projects were taken up. In a short span of 13 years, four new barrages were constructed and several new canals were added, besides extending the existing network. Construction of Taunsa weir to augment the inundation system in Dera Ghazi Khan and Muzaffargarh districts of Punjab was taken up. Kalabagh Barrage on Indus and Thal canal became operational in the fifties, serving area of about 4.3 Mha waste sandy desert.

Similarly, Kotri Barrage with four canals was constructed in 1955 to provide irrigation in Lower Sindh for an area of 1.21 Mha. Akram-wah canal (122 km) taking off on the left of headworks was started in 1951 and became operational in 1958. The Samatri canal with another colonization scheme was launched in the Nawabshah district (Sindh) in the late fifties.

7.5.2 Developments in India

Post-independence, India adopted the ‘Five Year Plan’ model and launched a massive first plan. Bhakra-Nangal, Hirakud, Damodar Valley Corporation modelled on lines of Tennessee Valley Authority, Sindri fertiliser factory, Chittaranjan locomotive works and community development programmes were the main thrusts of the plan. In the Indus Basin, India took up Harike Barrage 3 km downstream of confluence of Sutlej and Beas. With the Ferozepur Feeder and head regulator of Rajasthan Feeder, it was completed during 1947 to 1960. Remodelling of the Madhopur-Beas link was also completed. The Bhakra Nangal project was taken up in 1948. Nangal Dam, Hydel canal and two power houses, Bhakra canals, remodelling of Ropar headworks and Sirhind canal system were completed by 1955. Bhakra Dam was completed in 1963 and limited use of its storage started in 1958. By 1954, India had decided on its own use of eastern waters (41 BCM) bet Jammu and Kashmir, Punjab, Patiala and East Punjab States Union, Rajasthan. The work of Rajasthan canal (Indira Gandhi Nahar) was taken up in 1958. Need for improvement of Ferozepur headworks was by then keenly felt. Harike Barrage was completed in 1952. It was 636 m long with nine under-sluices and 22 weir bays with a discharge capacity of 18,400 m^3/s. Steel gates 31 nos. of 18.28 × 7.79 m were provided. Three canals, the Makhu canal, Ferozepur Feeder and Rajasthan Feeder, took off from the left side of barrage. The Ferozepur Feeder had a full design capacity of 312 m^3/s. The canal bifurcated at its 18th km into Sirhind and Ferozepur Feeders. The former had a capacity of 135 m^3/s and a length of about 140 km providing irrigation to Punjab and the Bhakra area of Rajasthan. After traversing a distance of about 34 km, it joined Bikaner canal and eastern Punjab canal which were earlier off-taking from Ferozepur weir. These canals thus were later fed from Harike Barrage.

7.5.3 Need for Storages and Bhakra Nangal Project

Under the run-of-river system, on the one hand, it was necessary to plan supply to meet the growing demands of food and fibre. On the other hand, there was no spare water in the Sutlej River in winters as all free flow at Ropar was allocated to the Sirhind canal. There were inundation canals of ‘Grey canal system’, taking off from the left of Sutlej for irrigating Ferozepur and Ludhiana districts during the monsoon. While river supplies were insufficient to meet existing demands during winter, Sutlej had a large surplus during the monsoon. It could be captured in a reservoir for irrigation and generation of hydropower. An idea for a dam at Bhakra was mooted for the first time in 1908, but actual construction commenced only in 1948. The dam and ancillary irrigation works were completed in 1963. Hydropower station was commissioned in 1969. About 13,000 workers, 300 engineers and 30 foreign experts worked for the project. It provided new irrigation facilities for an area of 2.6 Mha, while improvements in the then existing irrigation facilities were extended to an area of 0.9 Mha. Besides, generation of hydropower through the installed capacity of 1127 MW power resulted in electrification of 128 towns and 13,000 villages in the area, besides providing water lifting energy for tube-wells. Fine-tuning of generation to irrigation needs and availing of all allotted waters has remained a difficult task for the management board. Sizeable quantum of water does flow downstream to Pakistan ex-Harike as seen even in severe droughts. Figure 7.7 shows the Bhakra–Beas system.

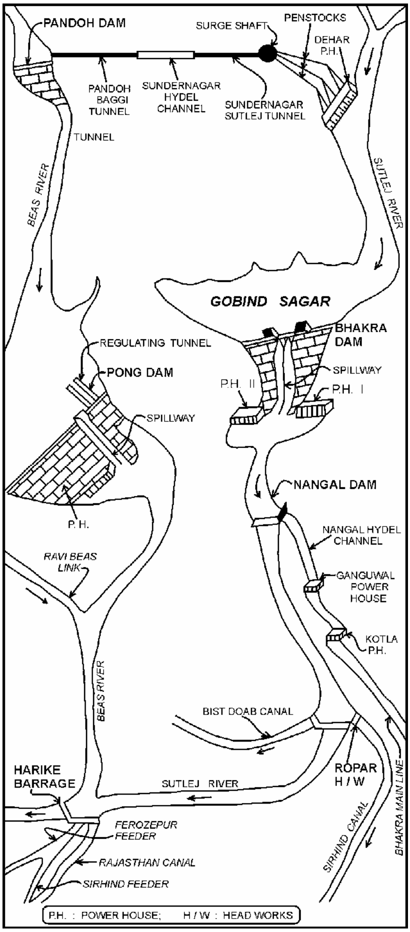

Fig. 7.7. Bhakra Beas system in India

7.5.4 Other Systems

Owing to excessive irrigation from wells in the past, the groundwater level in Jalandhar district had gone down alarmingly. It was therefore decided to build Bist Doab canal from the right bank of Sutlej at Ropar. The canal with a capacity of 45.3 m^3/s was completed in May 1954, extending irrigation to a gross area of 0.26 Mha. By recharging groundwater, agriculture through wells was restored. The capacity of Sirhind canal was increased from 256 m^3/s to about 351 m^3/s. Later with Sirhind Feeder and Bhakra Main Line in 1957 and 1954, part of the area served by Sirhind canal was transferred.

7.5.5 Madhopur Headworks

After protracted deliberations, an Inter-State Conference was held in January 1955 at New Delhi to review the shares of states from the Indus system as a whole. It was decided at the meeting to increase the capacity of the 20 km long Madhopur Beas Link to 283 m^3/s. It was designed to divert about 2.71 BCM of Ravi waters in a mean year to Beas for utilization ex-Harike Barrage. Madhopur Beas Link required remodelling of Madhopur headworks. Also it was decided that a new barrage and embankment should be constructed to regain proper control on all diversions, rather than resorting to repairs.

7.5.6 Review of Developments

In spite of partition trauma, the momentum generated for irrigation before independence was accelerated by both countries. Their perceptions about likely changes due to ongoing talks on final sharing of Indus Waters guided their actions. During this period, Pakistan was about to complete the 101 km long Marala-Ravi Link, 163 km long Bombanwala-Ravi-Bedian-Dipalpur Link, and the Balloki-Suleimanki Link. In addition to the Warsak Dam on Kabul River and Rasul hydroelectric scheme, four new barrages viz., Kalabagh, Taunsa, Guddu and Kotri were completed. These works helped Pakistan to augment withdrawals from 80 BCM in 1947 to 98 BCM by 1987. In India, the scope of the Sirhind canal and Bhakra Nangal project was enhanced. The principal works comprised the following: enlarging the capacity and addition of new channels from Upper Bari Doab canal, construction of a barrage at Harike as headworks for Rajasthan canal and the Ferozepur Feeder, Bhakra canals, dams and power houses. An agreement about distribution of waters of Sutlej had been arrived at earlier amongst the concerned states stipulating that water of Sutlej would be entirely used by the Sirhind-Bhakra-Nangal complex. The Madhopur Beas Link and Sirhind Feeder were completed by 1960. Work on the Rajasthan canal continued. India's area irrigated from Eastern rivers between 1948 and 1960, increased from about 0.3 to 2.5 Mha.

7.6 The Indus Water Treaty, 1960 and After

7.6.1 Main Features

Clear indicators were available, post-partition, on several issues. Stands by Punjab, Sindh, Bahwalpur, Bikaner and others had been well articulated. Their positions underwent subtle modification dependent on the successor country to which the irrigated area went. Even though the 12 years after the partition and before the IWT were a period of uncertainty and caused problems with water resources use, the resolution of these issues was not easy. Discussions through mediation by the World Bank which started in May 1952, were intensively participated and fought on the basis of an in-depth understanding of ground realities, by very eminent irrigation engineers from both sides. They got inexorably lengthened but eventually concluded into the IWT in 1960, which was signed by the President of Pakistan, the Indian Prime Minister, and Sir Illif of the World Bank on 19 September 1960. It came into force on 11 January 1961 after the exchange of ratifications by both governments and took effect retrospectively from 1 April 1960. The waters of the Eastern rivers Ravi, Sutlej and Beas were allocated to India, while Pakistan was allowed the use of the Western rivers Indus, Jhelum and Chenab except for use by India for domestic, non-consumptive and some agriculture use (as specified in Annex C of the IWT); generation of hydroelectric power as set out in Annex 'D' and storages of water as provided in Annex 'D' and 'E' of the IWT.

The water of the Western rivers for consumptive use allowed to India (Art. III), was insignificant compared with Western rivers. The flow of Eastern rivers at Rim Stations had an annual average of 41 BCM, whereas the Western rivers had 166 BCM making a total of 207 BCM. Average annual flow at Rim Stations for the flow series from 1921–1922 to 1945–1946 was: Indus at Kalabagh 110 BCM, Jhelum at Mangla 28 BCM, Chenab at Marala 29 BCM, Ravi at Madhopur 8 BCM, Beas at Mandi plain 16 BCM and Sutlej at Ropar 17 BCM. Initial claims of India and Pakistan were for 36–64% and 19–81% of distribution. What they got was about 20–80%, which was closer to the Pakistani claim. The IWT allowed a transit period to Pakistan for making replacement arrangements to ensure supplies to the then existing canal systems, fed from the Eastern rivers.

India was entitled to irrigate areas from Western rivers, as on 1 April 1960 and to expand the area within the limits indicated. Thus over and above an area of 0.26 Mha irrigated in India, along with permissible withdrawals through Ranbir and Pratap canals, India was entitled to irrigate another 0.28 Mha; 28,340 ha from Indus, 161,943 ha from Jhelum and 93,522 ha from Chenab. The respective areas irrigated on 1 April 1960 from these rivers stood at 17,076 ha, 209,680 ha and 33,559 ha or a total of 260,315 ha. At the same time, India was restricted to expand irrigation up to 28,340 ha from Indus; 60,728 ha from Jhelum and 12,390 ha from Chenab or a total of 109,310 ha until India was in a position to release water from the conservation storage as per the IWT. These areas lie in Jammu and

Kashmir, except for some small area that lies in Himachal Pradesh in the Upper Chenab. India maintained that it would require a release of 0.61 MCM to utilize all of the 109,300 ha area. The release of this much water was possible only if and when, Jammu and Kashmir could create storages. No conservation storage on Western rivers had been created up until 2001. Area irrigated in India including Jammu and Kashmir stood at 21,316; 258,000 and 46,963 ha totaling to 326,279 ha from Indus, Jhelum and Chenab rivers respectively.

7.6.2 Contents of the Indus Water Treaty

The Indus Water Treaty (IWT) has a preamble by the governments of India and Pakistan agreeing to 12 Articles and eight Annexures. In all, IWT's 12 Articles spread over 22 pages with Annexures make up a total of 117 pages. Article I defines terms used in the IWT as they were prevalent then.

Articles II and III respectively lay down nine and four provisions. Article II has one Annex B, dealing with use by Pakistan of Ravi waters. In contrast, Art. III for use of Western Rivers by India has three Annexures detailing severe restrictions. These articles happen to be the main cause for differences between the two countries.

Article IV has 14 provisions and is for use of both eastern and Western rivers and has no Annexures. It stipulates that Pakistan will endeavour to construct a system of works to accomplish replacement of irrigation water supply to the Pakistan area dependent on Eastern rivers until August 1947, from Western rivers. Article V has seven Financial Provisions stipulating that India will contribute a certain agreed sum towards cost of replacement works as per Art. IV to the Bank to credit of the proposed 'Indus Basin Development Fund'. Article VI has 1st provision specifying data to be supplied and 2nd provision for supply to the extent available: other data about rivers, canals and reservoirs connected with the IWT. Article VII has two provisions for future cooperation. The second provision includes supply of data about proposed works of either party to the other. To that extent Art. VI was expanded.

Article VIII has 10 provisions about composition, purpose and functions, frequency of meetings, privileges, immunities accorded to representatives of Member States as related in UN Convention, allowing for two advisors/assistants, appropriate facilities, submission of yearly report for period end March, by 1 June to the Government of India and Government of Pakistan, in addition to other desired reports, bearing of expenditure, and determining own procedures. Article IX has six provisions regarding settlement of differences and disputes, as dealt with separately below. Article X has an enabling emergency provision to modify mutually agreed provisions of the IWT in case of break-out of large-scale international hostility, which will affect procurement of material, equipment for completion of replacement element {Art. IV (1)} by 31.3.1973. Article XI has three general provisions regarding rights/obligations of the parties of the IWT, stating recognition or a waiver of any rights/obligations for parties and general principles of laws/precedents that Indus Basin Development Fund provisions remain unaffected by the IWT. Article XII has four final provisions: contents, ratification, modification (by a duly ratified treaty for modification) and continuation of IWT in force until terminated by a duly ratified treaty.

The eight Annexures 'A' to 'H' deal with the following subjects explained in relevant Articles. 'A' reproduces notes exchanged by two governments agreeing to the cessation of the Inter-Dominion Agreement of 4th May 1948 and cited rights and obligations of each on canal Water Dispute on ratification of the IWT. 'B' Art. II (3) lays down prescribed agriculture uses by Pakistan from Ravi. 'C' under Art. III (2)(c) similarly does it for India from Western Rivers. 'D' under Art. III (2)(d) prescribes hydropower generation by India on Western Rivers. 'E' under Art. III (4) prescribes allowed storages by India on Western Rivers. 'F' under Art. IX (2) provides for Neutral Expert; 'G' under Art. IX (5) for Court of Arbitration and 'H' lays down Transitional Arrangements. Annexures A to H: eight with appendices cover 95 pages of IWT.

Annexure B has provisions for Ravi water use by Pakistan covering only one page. Annexures C, D, E on the contrary deal with use by India of Western Rivers and are very detailed running into 34 pages. No wonder the size of these Annexures has bred complexity and hence differences.

7.6.3 Some Important Provisions

Annexure D

Provision for design of any new Run-of-River HE Plant of India has to conform to criteria laid down in Paragraph 8 of Annexure D and specified information regarding the Plant has to be communicated to Pakistan, at least 6 months in advance of the beginning of construction of river works connected with the HE Plant.

Article IX

Settlement of Differences and Disputes: Under Art. IX (1), any 'question' which arises between the Parties concerning the interpretation or application of the IWT or the existence of any fact which, if established, might constitute a breach of IWT is first to be examined by the Permanent Indus Commission, to resolve the 'question' by agreement. Article IX(2)(a) provides that if the Permanent Indus Commission does not reach agreement on any 'question/s', a 'difference' is deemed to arise. Such 'difference' if in opinion of either Commissioner, falls within 23 specific provisions of Part 1 of Annexure F can be decided by a Neutral Expert who is to be appointed and who is to follow procedure as per provisions of its Part 2. If the Neutral Expert cannot decide the answer to a question, the Permanent Indus Commission can treat a part or the whole question/difference as a 'dispute'.

As the Neutral Expert ceases to work, and once a 'dispute' arises, the two governments can enlist the services of one or more negotiators to initiate negotiations. If this step does not work out, a Court of Arbitration of seven members comprising two members appointed by each party, plus one member each as Chairman, a highly qualified engineer, and a person well versed in international law, can be established (Annexure G). A difference/dispute can be alternatively referred to negotiators/ Court of Arbitration (under paragraphs 3, 4, 5 of Art. IX), right in the beginning. But, when it is with the Neutral Expert, alternative routes are not available. The parties have to maintain a four-member panel of umpires for drawing upon as members on the Court of Arbitration. The IWT serves as 'Law' for the Court of Arbitration in addition to a recognized (by parties) international convention or customary international law. The Court of Arbitration has to render its written Award with costs. It can reassemble and clarify or interpret its Award if requested within 3 months.

Annexure F

An Neutral Expert is to be a highly qualified engineer appointed jointly by the two governments, or if no appointment is made within 1 month after request, then by a person or a body agreed in advance, or in absence of agreement, by the World Bank, provided that such appointment shall be made after consultation with each party. The decision of the Neutral Expert within competence is final and binding, in respect of the particular matter on which the decision is made, upon Parties and upon any Court of Arbitration established under the provisions of IWT. The Neutral Expert may also, at the request of the Permanent Indus Commission, suggest for consideration of the Parties, measures as are appropriate to compose a difference or to implement his decision. He can also recommend that the difference has to be treated as a dispute for referring it to negotiators or the Court of Arbitration.

Provisions for Ratification of IWT

Under Art. XII (3), IWT provides for modification of provisions by a ratified treaty for that purpose between the two governments. Article XII (4) provides that provisions modified under Art. XII(3) will continue in force until terminated by a ratified treaty concluded for that purpose between the two governments. Thus there is no 'exit' option in IWT.

Utilization by India of the Western River Waters under Annexures C, D, E for Different Purposes

Gross storage of 4.5 BCM comprising 1.56 for general purposes, 2.0 for hydropower and 0.94 BCM for flood conservation is permitted. Over and above India's 0.256 Mha irrigated area on 1.4.1960, and the permissible withdrawals from Ranbir and Pratap canals, about 0.28 Mha additional irrigation is permitted from Indus, Jhelum and Chenab rivers. But such an area can be irrigated only if storages are built. India has not constructed any storage so far. About 0.2 BCM storage is contemplated on Kishanganga, a tributary of Jhelum. Another 1.3 BCM storage is under planning for the Bursar project on Marusudar, a Chenab tributary. As storages had not been built, India was able to irrigate only about 0.3 Mha during

2003–2004. About 43 irrigation schemes are under consideration. Against HE potential of about 8800 MW, only 1425 MW capacity is installed so far. Construction of another 1290 MW capacity is under progress. Information about proposed 27 HE projects is sent to Pakistan by India.

7.6.4 Permanent Indus Commission

Article VIII provided for constitution of a Permanent Indus Commission of one commissioner each, which was soon done by both countries. Unless either government decides to take up any particular ‘question’ directly with the other, each Commissioner acts as his government’s representative for all matters and serves as their channel of communication. The Permanent Indus Commission is to meet regularly at least once a year, alternately in India and Pakistan in November or as agreed and can inspect works in the Indus Basin. The Commission also meets when requested by either Commissioner. It has met regularly for the past 45 years 93 times. Its functions, inter-alia comprise: (a) to establish and maintain cooperative arrangements for implementation of IWT, to promote cooperation in development of waters of the rivers on specified aspects; (b) furnish a report of its work for the year ended on preceding 31 March to both governments before 1 June on its work, and such other specified reports; (c) undertake once in every 5 years, a general tour of inspection of rivers to ascertain facts connected with various developments/works on the rivers; (d) make every effort to settle differences and disputes promptly in accordance with Art. IX of IWT.

7.6.5 Role of IWT in Both Countries

The IWT was a landmark in the history of the two countries. So also in the history of irrigation, as Indus had served and continues to serve the largest physically contiguous irrigated area in the world’s river basins. Table 7.5 indicates growth of irrigation in the Indus Basin from 1947 to 2000. Figure 7.8 shows how irrigation picked up as a proportion of sown area. It not only displayed a statesman-like approach of engineers/leadership of the two countries, it also enabled a profound change in development of irrigation in both countries. In hindsight, one can only imagine the herculean efforts that went into collating the studies and analyses that demanded a lot of patience and goodwill, aided by the mediation. IWT undoubtedly resulted in a giant upsurge in irrigation and agricultural activity in the two countries enabling the basin to serve as the bread-basket for both.

The IWT enabled both countries to harness unutilized water potential. During the last four decades, the irrigated basin on both sides of the border became their granary, bestowing self-sufficiency and independence of thought and action. Hydropower proved another major beneficial output of IWT helping the countries run their industry and irrigation pumps. The irrigated area of the basin leads the *per capita* contribution to GDP in both countries, is an adequate testimony about the beneficial effect of Indus waters. The primary, secondary and the tertiary benefits due to IWT, however, remain to be completely quantified.

Table 7.5. Growth of irrigated area in Indus Basin in million ha

Year	India	Pakistan	Remarks
1947	22.00 (70)	10.75 (68)	1. All the area irrigated in Pakistan lies in the Indus Basin.
1950	22.00 (70)	10.75 (68)	2. In case of India, Punjab Himachal Pradesh, Jammu and Kashmir, and Rajasthan lie in Indus Basin which is also server by Indus waters.
1955	22.00 (70)	9.45 (68)	3. Figures in parenthesis show the percentage of population in agriculture for the country.
1960	23.45 (70)	10.60 (68)	4. Jammu and Kashmir is also served by the Indus Waters.
1965	26.52 (70)	12.04 (67)	
1970	31.25 (70)	12.95 (56)	
1975	32.30 (70)	14.30 (56)	
1980	39.35 (69.7)	13.83 (54)	
1985	41.77 (68.1)	15.76 (52)	
1990	43.05 (65)	16.30 (69.7)	
1995	53.00 (61.9)	17.20 (49.4)	
2000	55.00 (60)	18.00 (47)	

Source: Food and Agriculture Organization (2001)

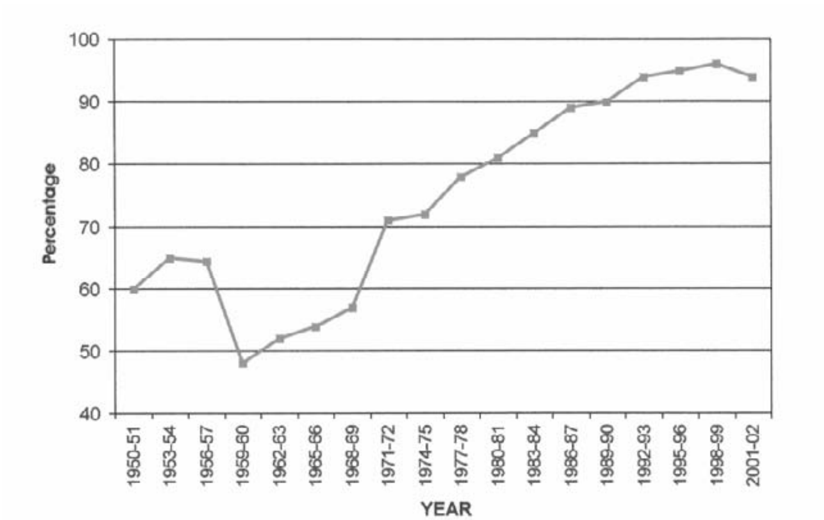

Fig. 7.8. Punjab net area irrigated as percentage of net sown area

Developments in Pakistan

The Indus Basin Development Fund Agreement between supporting party countries, the World Bank and Pakistan had envisaged two dams, eight large capacity inter-river link canals, six barrages, remodelling of three of the existing inter-river link canals and irrigation systems as listed below.

Reservoirs

- Mangla Dam (Jhelum): Gross/Live Capacity 7.25/6.59 BCM, height of dam 116 m.
- Tarbela Dam (Indus): Gross/Live Capacity 13.69/11.47 BCM, height of dam 148 m.
- A small storage on Indus at Chashma with gross storage of about 0.9 BCM.

Link Canals

- Trimmu-Sidhnai : Chenab and Ravi rivers;
- Sidhnai–Mailsi: Ravi and Sutlej rivers crossing the latter through a siphon; Mailsi-Bahawal Link-up with the existing canal system;
- Rasul–Qadirabad: Jhelum and Chenab rivers;
- Qadirabad-Balloki: Jhelum, Chenab and Ravi rivers;
- Balloki-Suleimanki II: Ravi and Sutlej rivers;
- Chashma-Jhelum: Indus and Jhelum rivers;
- Taunsa-Panjnad: Indus and Panjnad rivers.

Barrages

- New Sidhnai Barrage on Ravi;
- Mailsi (Gated) syphon on Sutlej;
- Marala Barrage on Chenab;
- Qadirabad Barrage on Chenab;
- Rasul Barrage on Jhelum;
- Chashma Barrage on Indus.

Remodelling of 12 Existing Links, Barrages and Canal Systems

The total cost of the gigantic project was unprecedented. Still, all the components were completed by 1971, except the Tarbela Dam, which was completed in 1976.

Developments in India

India had significantly relied for its requirements of food grains, fibre and oil seeds on the irrigated areas in the Indus Basin before partition. As a major part of the irrigated area producing food grains went to Pakistan, India faced serious shortage necessitating imports. The setting up of an alternative became a priority task. During the post partition period for the first time in the basin's history, several diversion works supported by storages in the hills were undertaken on a fast track. As development of water resources is a state subject in India, an agreement is required between riparian states for development of inter-state waters. While negotiations with Pakistan were in progress, an agreement was reached amongst India's Indus Basin states on areas to be irrigated and locations of off-takes from the Bhakra Nangal Project. The use of surplus waters of Ravi and Beas, excluding pre-partition use was separately planned. An agreement on sharing of surplus waters of the system was signed amongst states in 1955. Subsequently on availability of further data, a revised agreement was signed in 1981. The proportion of shares fixed was: Punjab 5,205 MCM, Haryana 4,317 MCM, Rajasthan 10,608 MCM, Jammu and Kashmir 802 MCM, and Delhi water supply 247 MCM. Total 21,179 MCM.

The main thrust of the project was irrigation, flood control and hydropower generation. It was achieved by building storage dams: Thein Dam on Ravi, Pong/Pandoh dams on Beas and Bhakra/Nangal on Sutlej, and by inter-linking Ravi, Beas and Sutlej rivers under a Master Plan. The linking of Ravi and Beas in 1955 and Beas with Sutlej in 1977 were undoubtedly historic events. Following important milestones in the history of development of irrigation in the Indus Basin can be identified:

- 1963: A 225.3 m high Bhakra Dam and appurtenant works;
- 1964: A 346 km long Rajasthan Feeder canal that feeds the 650 km long Rajasthan Main canal;
- 1974: A 132.7 m high earth-cum-rockfill dam at Pong (Beas II) and appurtenant works;
- 1977: Beas I comprising 74.4 m high earth-cum-rockfill diversion dam at Pandoh, the 37 km long water conductor/diversion system and two tunnels of 8.5 m diameter in a length of 25.5 km, and the 11.8 km long difficult Hydel canal for enroute hydropower generation and irrigation;
- 1985: Lift Irrigation Schemes in Haryana;
- 1999: Indira Gandhi Nahar Pariyojana Phase I;
- 2001: Thein Dam (Ranjit Sagar Dam);
- 2005–2006: The nearly complete IGNP II.

Table 7.6 shows structures built on the Indus system until IWT and beyond.

Table 7.6. Structures across the Indus and its tributaries

River	Basin	Type of structure	Distance from origin	Capacity		Period of construction
				Live in billion m^3	Spilling in m^3/s	
Indus	**Pakistan**					
	Tarbela	Dam	1,280	11.6[1]	42,469	1976
	Kalabagh (Jinnah)	Barrage	1,440	NA	26,897	Pre–1947
	Chashma	Barrage	1,496	0.5	26,897	1967–1971
	Taunsa	Barrage	1,680	NA	31,144	1959
	Guddha	Barrage	2,000	NA	33,975	1955–1963
	Sukkur	Barrage	2,105	NA	42,469	1922–1930
	Kotri Ghulam (Md.)	Barrage	2,520	NA	24,774	1947–1955
Chenab	**Pakistan**					
	Marala	Barrage	510	NA	31,144	1956–1968
	Qadirabad	Barrage	550	NA	22,848	1956–1968
	Khanki	Barrage	580	NA	22,650	1892
	Trimmu	Barrage	795	NA	18,450	1939

Table 7.6. (Continued)

Jhelum	**Pakistan**					
	Mangla	Dam	250	5.8	34,663	1968
	Rasul	Barrage	325	NA	24,318	April 1967*
Ravi	**Pakistan**					
	Balloki	Barrage	600	NA	NA	1913 (old) 1962 (new)
	Sidhnai	Barrage	878	NA	42,857	1886 (old) 1964 (new)
	Syphon	1 no.	NA	NA	NA	1965 (new)
	Bridges	7 nos.	NA	NA	NA	NA
	India					
	Thein	Earthfill Dam	334	2.34	19,329	2002
	Madhopur	Barrage	360	NA	17,750	Pre-1947 remd. 1955/1959
Sutlej	**Pakistan**					
	Suleimanki	Barrage	1,040	NA	9,296	Pre-1947
	Islam	Barrage	1,224	NA	8,580	Pre-1947
	Mailisi Syphon	Syphon	1,264	NA	149	May 1965
	Panjnad	Barrage	1,440	NA	25,700	Pre-1947
	India					
	Bhakra	Dam	450	9.87	300,000	1958
	Nangal	Barrage	463	0.029	11,327	1952
	Ropar	Barrage	523	NA	9,911	1954
	Harike	Barrage	912	NA	18,400	1954
Beas	**India**					
	Pandoh	Diversion Dam	NA	0.03	9,939	1977
	Beas (Pong)	Dam	NA	7.29	12,374	1974

Source: Ahmad and Chaudhury (1988), PANCID (2003).
Note: *Rebuilt and replaced with barrage in 1967 as Indus Basin Plan Work; [1]=Original; NA=Not Available

7.7 Implementation of the IWT

During the implementation of the IWT for the last 45 years, several 'issues' cropped up between the two Parties. Procedural issues were resolved with comparative ease. The Salal issue was resolved at the Foreign Ministers' level and the Project with installed capacity of 690 MW is completed. Presently, Tulbul (navigation), Baglihar (hydropower) and Kishanganga (hydropower) issues are at various stages of discussion/negotiation.

7.7.1 Bilateral Interactions

So far, 93 meetings of Permanent Indus Commission are held. General issues considered by the Commission are as follows:

1. Measures for recovery and restoration of timber floating down into Pakistan.
2. Reimbursement of cost of transmission of data by telegram, telephone or wireless.
3. Agreement on exchange of data of four drainages: Hudiara, Kasur, Salimshah, Fazilka.
4. Agriculture use by India from the Western rivers as on Effective Date.
5. Initial filling below dead storage level of Salal HE Project.
6. Arrangement for broadcasting met/flood data from 1 July to 10 October.
7. Resolution of dispute concerning Art. IX(1) of the IWT .

The following specific issues were discussed.

8. Sumbal, Chinani, Ganderbal, Mahora, Salal, Lower Jhelum, Dul-Hasti, Uri, Tulbul, Baglihar, Kishenganga projects. These projects are completed except for a) Dul-Hasti (nearing completion) and b) Baglihar, c) Tulbul (under construction).
9. Baglihar issues are under active consideration. Tulbul is stand-still as a precondition for government-level talks which are not making headway. Kishenganga issues are presently pushed into the background due to the priority to Baglihar.

7.7.2 Constraints Felt in India in Implementing the IWT

As explained earlier, the main constraint for India has been the rather one-sided elaborate restrictions IWT places on use of waters of Western rivers in upstream. As an upstream riparian, some restrictions are expected, but such feeling has grown due to the stand adopted by Pakistan over the years. Other issues are listed below.

Unfavourable Definition of Maximum Irrigated Cropped Area

Provision (ii) paragraph 5 of Annexure C includes cropped areas irrigated from an open well, a tube well, a spring, a lake or a tank in excess of the areas so irrigated as on the Effective Date. This provision, as it is concerned with surface waters, limits India's need to use the basin's full groundwater potential.

Difficulties in Implementation of Projects

The IWT provides for either country to seek data of projects of the other, likely to adversely affect its interests. As India is the upstream riparian, every project of India can be deemed to affect downstream riparian. No Pakistani project is likely to adversely affect India. The provision gives an unfair advantage to the lower riparian. Though no formal clearance is required from Pakistan for such projects, India's IWT obligations make them a subject of long debate putting hurdles in implementation. India has provided data about 27 such upstream projects to Pakistan. A first response of Pakistan is to say that the project is not in accordance with IWT pointing out one or the other perceived deficiency. The objections are usually marked by neglecting engineering economics, current practices and insisting on costly alternatives based on old Science and Technology, while asking more data often beyond the IWT resulting in stalling the project.

a) Salal HEP – Resolution of differences regarding design came through at government level when an agreement with six articles was reached on 14 April 1978. In Art. 1, newly agreed Salient Features covering pond levels, storage, numbers and size of gates, elevation of power intakes, numbers, size, elevations and concrete plug arrangement are given. Other articles provide requisite clarifications.
b) Tulbal navigation project – Pakistan termed it as a storage project disallowed under IWT. India claimed that it only restored a natural storage, depletion of which was planned to meet navigation needs. Also, it will be beneficial to Pakistan in firming hydro-power at Mangla Dam on Jhelum.
c) Baglihar HEP – Pakistan demanded additional data and proposed alternative to India's proposal which violated IWT. India denied violation, and affirmed that it no way harmed Pakistan's interests. An alternative proposed by Pakistan had outdated engineering practices. The claims were discussed in PIC (84th to 91st meetings) and at Secretary to Government of India level in June, 2004 and January 2005. On January 15, 2005, Pakistan requested the World Bank to appoint a Neutral Expert for a decision. Further details are given under Utilization by India of Western Rivers Waters under Annexures C, D, E for different purposes.
d) Kishen-Ganga – Pakistan claimed that it had proposed water use for storage/diversion in this project. India sought substantiation of the Pakistan claim. The claim was extensively discussed in 91st, 92nd and 93rd meetings of the Permanent Indus Commission. During the 93rd meeting of February 05, Pakistan gave six questions to be resolved under Art. IX of IWT. The Indian side felt that the stage for invoking Art. IX had not been reached.

Limitations of the Irrigated Crop Area, Resources Crunch of India's Jammu and Kashmir State

In India, irrigation is a state subject. The Jammu and Kashmir state Government had not been able to rapidly undertake irrigation projects on Western rivers due to a resources crunch. Also, the maximum irrigated crop area from run-of-river irrigation projects was limited to 0.365 Mha, compared to the maximum irrigated crop area permitted of 5.37 Mha permitted under IWT, which called for storage schemes. To that extent, India was constrained to harness waters of Western rivers.

Restrictions on Use of Waters Transferred Inter-Basin

According to Art. III (2), India cannot cause interference with Western rivers except for certain restricted uses, including agricultural use as per Annexure C, to build storages to avail permitted waters for specified irrigated crop area. In case it is not feasible to build requisite storages, inter-basin transfer of water to build storages in other tributaries' river basins is necessary (except for a restricted scope in the case of Chenab to an irrigated crop area of 6,000 acres outside its drainage basin level permitted on any of the river basins of the Western rivers).

Supply of Data to Pakistan Asked under Arts VI(2) and VII(2)

Under IWT, Annexures C, D and E respectively deal with agricultural use, generation of hydro-electric power and storage of waters by India on the Western rivers. They also specify the data that India must supply regarding these uses. Annexure C envisages the annual supply of data of the irrigated crop area, Tehsil-wise, district-wise and basin-wise. India claims to fulfill this obligation meticulously. Under Art. VI(2) and VII(2) initially, both India and Pakistan supplied data requested by each other for run-of-river irrigation schemes. However, Annexure C does not envisage supply of such data of run-of-river irrigation schemes dealing with Agricultural Use, which Pakistan asks for. The view taken by India was that under the general rule of International Law, neither party can invoke general provisions of Art. VI(2) and VII(2) for seeking information for uses envisaged under special Annexures C, D and E. Supply of data by India on irrigation schemes was accordingly stopped. As the Permanent Indus Commission could not resolve the issue, the Government of India desired Govt-to-Govt-level talks in this connection under Art. VIII(1) in 1987. No response from Pakistan was received. Meanwhile, Pakistan stopped asking for such information. India also is not seeking information regarding certain projects of Pakistan. The matter is still under 'talks' stage and calls for early resolution.

7.8 Baglihar Hydroelectric Project

7.8.1 The Project, the 'Question', and Surfacing of 'Differences'

Baglihar is a Run-of-the-River HE Plant on the Chenab Main, under construction by Jammu and Kashmir state since 1999. It was about 70% complete by the end of January 2005. The dam is 144.5 m high and 317 m long with a gated spillway to pass design flood of 16,500 m^3/s. An underground power-house has an IC of 450 MW in the first stage with a provision for similar IC in the second stage. Specified information was first communicated to Pakistan in May 1992. Pakistan viewed in August 1992 that the plant design did not conform with IWT. At the 84th PIC meeting, the project was discussed when Pakistan requested additional data. The project was discussed in successive meetings. Pakistan acknowledged in the 87th meeting during May and June 2002 at New Delhi that data in accordance with provisions of IWT was supplied. Some changes in project design were sent earlier to Pakistan in May 2002. Pakistan, however, maintained its objections. It then sought additional data, which India considered as beyond the IWT. Pakistan then sought to resort to Art. IX provisions of IWT about "Settlement of Difference and Disputes".

7.8.2 Positions of India and Pakistan on the Project and Subsequent Developments

India considers that the project design conforms with IWT and does not contravene criteria (a), (c), (e) and (f) of Paragraph 8 of Annexure D in light of the following: (i) There being no breast walls in the spillways and top of chute spillway gates being flush with full pondage level, there is no scope of artificial raising of water level above the full pondage level. (ii) Pondage is based on minimum mean discharge of river at site (125.89 m^3/s) in order to meet daily and weekly load fluctuations within limitations as stipulated in IWT. (iii) Ungated spillway is not techno-economically viable from considerations of topography, submergence, energy dissipation, reservoir sedimentation, etc. Deep-seated sluice spillway which serves dual function of flood discharge charged with silt rather than allowing silt to settle down and cause loss of valuable space which could be used for generating more hydropower, are in line with prevailing practice the world over in rivers with high silt load. Crest of sluice spillway has been fixed from considerations of effective silt routing based on prevalent practices and model studies. Model studies have indicated still deeper seating of the spillways. (iv) Sill of high-level intake has been located below dead storage level to ensure uninterrupted flow without formation of vortices and ingress of air into the tunnel. The water seal has been based on various established national and international practices/formulae. Hydraulic model studies indicate for further increasing the water seal.

Pakistan claimed that as questions raised in August 1992 were not resolved, "differences" had arisen in terms of Art. IX and that the matter should be referred to an Neutral Expert. In the history of IWT, this was the first time that Pakistan resorted to invoke this provision. India asked Pakistan to provide the basis for the conclusion that project design did not conform with the IWT based on information supplied. India could then provide clarifications in technical discussions between experts of both sides to satisfy Pakistan about its views. As such a process under the cooperative framework of Art. VIII was bypassed, invoking Art. IX(2)(a) for Neutral Expert was incorrect. In the next meeting of PIC: (i) Pakistan and India reiterated their stands. (ii) India explained the technical basis of design and offered to modify design, if Pakistan technically and quantitatively substantiated its need. In fact there was perceptible congruence of views. (iii) During May 2004, Pakistan offered to resolve the differences bilaterally if India stopped construction. In July 2004, additional data under 17 items was sought by Pakistan to quantify objections. (iv) India provided them in December 2004.

7.8.3 Subsequent Meetings

Given the recent détente in relations, Pakistan and India decided to review 'objections' in a specified time-frame. For supply of additional data/information for substantiating technical objections, a visit to Project model and the Project site, besides detailed technical discussions was planned. Pakistan, however, insisted on suspension of construction work. Since IWT did not provide it, India did not agree. Meanwhile, Pakistan sent, on 31 December 2004, its observations on India's information. A final meeting at Secretary level was held from 3 to 7 January, 2005. During the meeting, India's response was presented. India offered to narrow differences through technical discussion if Pakistan provided a quantitative basis for their view that the design was not in accordance with IWT. Pakistan then brought up five major issues comprising: (1) Why not weir at low-level of a low height? Why sluiced spillway? (2) Calculations of pondage of firm power. (3) Calculations for fixing level of intake. (4) Why not provide an ungated spillway, as a gated spillway could be used by India to cause flood or drought in the downstream? If gates were necessary, provide them at the highest level. (5) Calculations and justification of Free Board. India welcomed the step. Discussions by technical experts followed afterwards. Pakistan, however, again insisted on suspension of work before continuing further discussion.

7.8.4 India's Response

The issues covered concern about height of dam vis-à-vis concept of small height for run-of-the-river schemes; maximization of pondage for generating 450 MW at selected periods of the week against assumption that only Firm Power at 130 MW was to be generated; freeboard over full pondage level was considered excessive which, in Pakistan's view could be manipulated to store more water, etc. India responded to these issues as follows.

a. There was no restriction on dam height. Annexure D provided for a 'dam' as a part of 'run-of-river' plant, criteria laid down as well as Appendix requires communication of details viz. 'dam', spillway, intake, outlet works, etc.
b. Maximum pondage was restricted to twice the pondage required for firm power, corresponding to minimum mean discharge at plant. There was no stipulation that only firm power was to be generated. Also pondage (live storage) sufficient to meet fluctuations in daily and weekly loads was to be provided, by way of surcharge storage and secondary power, which constitutes power other than 'firm power', available during certain periods of a year.
c. IWT required that volume of water received in the river upstream of the plant during any period of seven consecutive days shall be delivered into downstream during the same seven days period and that the volume of water to be delivered downstream in any one period of 24 hours shall not be less than 50% and not be more than 130% of volume received above the plant during same period of 24 hours.

d. IWT did not constrain plant to generate only firm power on a continuous basis.
e. Pondage of more water by exploiting free board was a misplaced apprehension. All codes required a minimum free board for safety of structure, but no maximum limit was prescribed. Considerations like serviceability determine free board.

7.8.5 Further Developments

On 15 January 2005, Pakistan requested the World Bank for the appointment of a Neutral Expert to decide on five main questions. On 25 January 2005, the World Bank sought documentary evidence. Pakistan provided it on 28 January 2005. On 9 February 2005, the World Bank sought India's response. India informed that the appointment of a Neutral Expert was not warranted. On 25 February 2005, the World Bank informed the proposed procedure for appointment of a Neutral Expert. After consulting both governments, the Neutral Expert was appointed. He convened a meeting of representatives of two governments at Paris in the first week of June 2005 to chalk out the process. The work of the Neutral Expert is proceeding accordingly. After hearing the parties, he may or may not provide his decision on the questions/differences raised by Pakistan. He can also deem the question/difference as a 'dispute' and refer it to negotiators/ Court of Arbitration as prescribed in paragraphs 3, 4, 5 of Art. IX. A lot will depend on how the parties approach the matter that has been referred to the Neutral Expert for a decision. The Neutral Expert reported his determinations on the points of differences referred by the Government of Pakistan on 12 February 2007.

7.9 Summing-up

7.9.1 Problems Raised and Their Resolution

Besides usual procedural issues and other minor matters such as supply of stipulated data, the Permanent Indus Commission addressed several specific issues raised by Pakistan, about schemes planned by India on Jhelum and Chenab rivers for which IWT provided elaborate restrictions as indicated in Art. III and Annexures C, D, E. India on the contrary did not raise a single issue about any of the schemes in Pakistan on Eastern rivers.

Both the Western tributaries pass through the Indian state of Jammu and Kashmir before they cross into Pakistan. The Jammu and Kashmir state' territory has been the main reason for the confrontation between the two countries ever since the partition. Given its geographical location in the divided basin, downstream of the Jammu and Kashmir state territory, Pakistan has continuously taken a sceptical and opposing stand on almost every upstream plan, whether it served India beyond its allotted share or not and, more importantly, how it affected Pakistan. It is not clear how such an approach helps its territorial claims on Jammu and Kashmir territory, which it would want to benefit. On the contrary, it seems to alienate the Jammu and Kashmir people, as they remain deprived of the benefits they can get, if the proposed scheme in Jammu and Kashmir is implemented.

Issues raised by Pakistan were not about a breach of any basic issue such as water shares. They related to specific articles, provisions, and instrumentalities in Annexures to IWT, obviously included in accordance with science and technology deployed then, to enable implementation of allocation of waters from different rivers. Seemingly innocuous provisions in IWT, seem to form a basis for Pakistan's 'objections'. Professionals can understand that scope of terms like: run-of-the-river plant, dead and live storage, suspended and bed load sediment, sediment routing/management in reservoirs, gated and ungated crest and sluice spillways, pondage, surcharge storage, free-board, and definitions of acronyms such as MDDL, FSL, MWL, conveyed a specific context in design at the time of IWT.

However, science and technology has not remained frozen and static over a period of 45 years. Its application and context for realizing the IWT goals has changed beyond recognition in this long period. The same terms have acquired a new significance and application by now. More sound, focussed and economic design procedures using optimized and simulated studies have evolved by now and made it more cost-effective than ever before. Imponderables had become practicable due to new ways of analysis such as FEM, mathematical modelling and vast computational power that was simply not on the horizon until then. The quest for optimization and cost-effectiveness has yielded precise outputs in 45 years.

A treaty obviously cannot take into account such possible developments. Its provisions however, have to be accommodative of likely changes in technology and their influence on safety, productivity, and cost-efficacy of infrastructure required for installing its basic architecture. But those who implement it have to recognize the need to provide a modern wherewithal to such provisions, while considering application of formal terms/definitions used in past, which if literally interpreted can perceive 'violation', whether it affected the basic agreement or not. In reality it does not, but provides freedom/flexibility from the tyranny of technicalities.

Another approach manifested in the case of Wullar Barrage of India on Jhelum. Pakistan sought stoppage of the ongoing plan, until resolution of the specific objections through dialogue. Although IWT did not provide such contingency, once India wearily accepted the suggestion, the sense of urgency in resolution of the issue was forgotten and got relegated to the background. In the Wullar case, meetings of the Permanent Indus Commission are ritually being held over the last 15 years but as construction is stopped, negotiations tend to be long drawn, perfunctory and ultimately sterile in resolution of the issues.

7.9.2 Extent to Which the Solutions Have Satisfied the Parties

Invariably, a procedure laid down for resolution of issues raised by one party can potentially cause long delays, if the procedure is not objectively deployed by the other. The brief to the negotiating team for resolving the issue comes from respective government and the space for accommodation of views of the other party, depends upon the political climate, the urgency, the options, the capacity to absorb ill-effect/harm if any, etc. If a party perceives a question/issue as not in consonance with specific articles of a treaty such as IWT, the course for resolution can be as lengthy as one wants. If keen, both parties have to attempt resolution of the issues through bilateral dialogue/negotiations. If one wants, even seemingly innocuous provisions in IWT can be used to support objections.

It is difficult to say whether resolution of IWT issues in the past has been satisfactory or not for the two parties, because as mentioned earlier, most times, issues were raised by one party and not by both. No wonder that a party that receives all objections can feel aggrieved and unhappy with the process. Nevertheless the process indeed must attempt attainment of the ultimate objective and not aim at mere blocking through mere technicalities legitimate aspirations for development of a party allowed by the treaty. As explained earlier, although meetings of the Permanent Indus Commission were regularly held, the onus of replying to objections remained with only one party all the way through. In spite of the unequal geographical status, honest efforts were seemingly made by India to reply to the series of objections, resolve the issues as best, and as soon as possible. Unfortunately, delays in resolution have only affected the needy people of India’s Jammu and Kashmir state for whom Pakistan is seriously concerned.

Some time back, a student of Mid-East waters through the Johnston Plan attributed success in breaking the logjam mainly to: (1) shifting debate from water rights to needs, (2) reaching resolution before water predicament became too tight, (3) fortuitous shift in political climate. Maybe the time is now ripe for resolution of all outstanding issues about the IWT through the adoption of an appropriate plan on such lines.

7.9.3 Type of Desirable Changes in IWT

As explained in earlier sections, complexities of issues in the case of the Indus Waters that have grown for over more than a century of ‘changes’ and were waiting to be resolved by an agreement, were immense. Aspects such as the persistent mismatch between demand and supply, the history of irrigation and colonization in waste land, upstream–downstream issues, size of the basin, large populations involved were already complex. The addition of a political partition of an otherwise integrated agrarian society awkwardly and hastily conducted based on religion proved extremely violent in terms of loss of life and property. It broke up hundreds of families, caused forced transfer of colonized farmers and people, raised property issues and generally compounded all the issues. Vehemently fought, polarized and long-drawn negotiations resulted into the IWT, after a lapse of a full

13 years after independence. The agreed sharing of waters as in IWT possibly is not in tune with the principles for planning of water use of shared rivers as presently advocated. Had the sub-continent not been partitioned into two countries, the sharing would have been significantly different than what was prescribed in IWT. But the partition of India cannot be undone and so also the division of this important river basin.

Within India, sharing of waters between states has been agreed. A Tribunal set up under the law of the land will modify it further where called for. But already opinions have been expressed that IWT, which decided India's share from the two rivers Jhelum and Chenab, ignored interests of the constituent Jammu and Kashmir state. The Government of India should therefore open the IWT and/or look into allocations between different states of India once more and correct the injustice. Nothing much has been heard about resolution of historical issues about sharing of waters between Sindh and Punjab. There may be a need if not now, later for Pakistan to resolve such internal issues. How concerns of within-country sharing of allocated waters for both can be met with by a new treaty has not been studied, nor voiced so far.

The third aspect pertains to clamour in certain quarters to abrogate IWT and go in for a new one with changes necessary in view of inequity in allocation and in face of continuous confrontation on each scheme of India. As explained earlier, there is no exit option in IWT, so it cannot be abrogated. It can only be replaced by a mutually agreed new Treaty. No studies are probably available to quantify the so-called inequities, nor has any government yet mooted the idea.

The fourth aspect relates to the need for a pragmatic approach by both countries in the Permanent Indus Commission and the governments. There is a lot of merit in this approach as recent developments indicate. Given the mutual goodwill and broad co-operative framework, irritants could be removed and plans examined dispassionately on the basis of adoption of science and technology based framework only. As the interest of the Jammu and Kashmir people is at the heart of the issue of the water use of Western rivers, both countries ought to adopt a liberal approach in their development. Finally it is said that what is needed is 'political subordination to engineering' for resolution of the differences and not 'engineering subordination to politics' as is generally followed.

7.9.4 Life of the Treaty, and Future

The IWT 1960 has no exit option, nor any fixed time frame for operation, unlike most of the tribunal awards in the case of other Indian shared rivers. It cannot be amended unless there is agreement of both parties. It can also be replaced only by another mutually agreed Treaty which seemingly is impossible given the distrust and suspicions of the past. IWT came into force after ratification by both countries and has been operated without a serious crisis for the last 45 years, although there have been some hiccups, once in a while. It is for the first time that an issue on a particular scheme has been referred to a neutral expert. So far, no issue has been taken to an International Arbitrator. Given the present goodwill between the two countries, it is likely that the views provided by the expert will be carried through and implemented. But meanwhile, the following issues that have arisen need to be deliberated, debated and considered by the two countries and by water sector professionals as well.

1. Life, exit, replacement provisions are in order.
2. A Treaty such as IWT should really have agreement in two parts: one that divides the natural water resource between the parties; and another one that lays down procedures which should be subject to review in light of new innovations on science and technology and/or facts that enable agreement to improved mechanisms to implement it.
3. Basically the second part should enable an improved management of the water resource that is more productive, less expensive and at the same time safe and sound. It should lead the parties to a 'win-win' situation from a stalemate condition.

In 2002, Ashutosh Mishra, Programme Consultant at the Malaviya Centre for Peace Research in India, studied the background of IWT before reaching the negotiation stage. He identified the following basic elements contributing to IWT. These could be invoked again to break the impasse towards which the two countries could unwillingly proceed if the present détente does not last. (i) Desire to solve the problems. (ii) Involvement of a non-political, pragmatic experienced expert. (iii) Trust in the expert. (iv) Stability of the two governments. (v) Mutual trust and rapport amongst the governments. (vi) Reliance on human considerations rather than on codified law, independent of political issues and pressures.

7.9.5 IWT and the UN Convention

The UN Convention on Non-navigable Uses of International Water-Courses was adopted in 1997 after 20 years of negotiations. Burundi, China and Turkey voted against. Several countries including India and Pakistan abstained. The Convention did not enter into force due to lack of requisite ratifications. It is almost 8 years since the Convention was adopted. It would be instructive to probe why it has not entered into force though adopted by the UN and how the IWT fits the Convention framework. 'Indus' constitutes a different 'water-course' than one envisioned in the Convention. Its authors and negotiators no doubt considered the Indus experience. How? The author of the present chapter has not yet directed his inquiry to this aspect.

The main principles of the UN Convention comprise equity in sharing and reasonable use without significant harm. A special effort is called for to study how far, where and why IWT differs from these principles. Circumstances and facts on the ground for the IWT viz. complexities of a vast checkered history of an established irrigation system, high population density and artificial political division of irrigated territory; no doubt are unique to Indus waters. An across-the-board 'international water course' may not be good enough for such comparison. In the absence of a serious effort, one can only make guess-estimates about the success or failure of both:

IWT and/or the Convention. Also, it will be purely speculative whether, shorn of political overtones, the Indus water division would be the same or not.

Or in an ultimate analysis, could the two countries open the IWT once more and go for maximization of fruition in light of the changed circumstances? In fact, the Jammu and Kashmir has on record in 1998, that I asked Union Government to review the IWT, as it does not serve the interests of the state. Another unattended aspect of the present inquiry relates to principles of international law such as 'rebus sic stantibus' conveying that treaties are to be observed (only) if conditions remain the same. Their applicability to treaties such as the IWT over long periods of more than four decades, while a lot of things changed in the domain of science and technology, development and management of waters, administration, political boundaries, etc.

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8 The Mekong: IWRM and Institutions

Katri Mehtonen, Marko Keskinen and Olli Varis

8.1 Introduction

During recent years, numerous events and documents in the water sector have endorsed integrated water resources management (IWRM) and a basin-wide approach to river management. The Mekong River is a good example of an international river basin that involves multiple sectors and actors and thus needs integrated management. The Mekong River Commission (MRC) has partly adopted this task, but faces many constraints such as the absence of the two upstream countries.

In addition to the MRC, there are several other international institutions in the Mekong basin that have water-related issues in their agenda. These institutions include among others the Greater Mekong Subregion (GMS) Programme and the Association of Southeast Asian Nations (ASEAN) Working Group on Water Resources Management. The major financial institutions, the World Bank and the Asian Development Bank (ADB), are also involved with water through financing different projects. The World Trade Organisation (WTO) can be seen as one of the relevant institutions with all of the Mekong countries either as its members or in the process of applying for membership. The national governments and various NGOs operating in the region are also important players in the game.

This chapter analyses the institutional setting and the possibilities for feasible IWRM in the Mekong basin. Owing to the multidisciplinary nature of IWRM, cooperation between different organizations and institutions at different levels is an absolute prerequisite for its successful implementation. Yet, the institutional and governance aspects are usually not well addressed in commitments and recommendations, and subsequently in policy analyses related to river basin management.

The internal interests of the riparian countries as such are not much addressed in this chapter but are discussed elsewhere (Keskinen et al. 2008). The focus in this chapter is in the linkages and interrelations between the institutions. The first section discusses the challenges of IWRM particularly in international river basins. Thereafter, a brief introduction to the regional institutions in the Mekong basin is given, followed by an analysis of the current cooperation between the institutions. The analysis is finished with discussions and conclusions emphasizing the importance of institutional cooperation.

8.2 IWRM, Rivers and Institutions

The concept of IWRM is based on the so-called 3E principle: waters should be used to provide Economic wellbeing to the people, without compromising social Equity and Environmental sustainability. Waters should be managed in a basin-wide context, with stakeholder participation, and under the prevalence of good governance. Today, it appears that IWRM is supposed to be a framework for any water planning and management. Nevertheless, despite the fine principles of IWRM, the feasibility of the concept in the real world has been questioned. Some scholars suggest that the actual use of the IWRM has been minimal, or even indiscernible in the field (Biswas 2005). According to these views, the concept is too broad and theoretical to be successfully implemented in the field. One of the main problems is that the IWRM concept tries to simultaneously cover all water-related activities under one system. In most cases, the real challenge is to orchestrate a system that is formulated from small units – or “bits and pieces” as Mohile (2005) articulates – that are focused on a certain category of water use. The IWRM process should therefore be seen as a means to an end, rather than as an end as such. It is clearly more an ideological and philosophical framework than an operational concept, and more an approach than a goal as such.

A practical sign of the difficulties with the IWRM concept is the failure in preparing the IWRM and water efficiency plans for major watersheds by 2005, as was planned in the Johannesburg Summit for Sustainable Development of 2002. When considering the myriad challenges that the river basins of the world are subjected to, the aim can be seen to be extremely ambitious. The competition of water between different users including industries, agriculture, fishing, domestic use, navigation and recreation is harsh in many river basins. In many cases, water availability is critical in supporting local livelihoods and local cultures. Moreover, it is necessary to consider environmental aspects and, among other things, secure an adequate flow and water quality in the river to sustain the ecosystems. In international river basins, integrated management becomes even more challenging as the differing interests of the riparian countries are added to the picture.

Preparing IWRM plans is, of course, a good and desirable aim. However, this aim would make more sense if it was also ensured that the plans will also be implemented. Integrating such wide plans covering many sectors and actors requires appropriate institutions and understanding of broader political context where the water management takes place. Institutional set-up is thus the fundament of the IWRM process in any river basin. In international basins, the task of implementing IWRM is often assigned to a basin organization, which is supposed to coordinate the various activities by riparian countries. If properly established and managed, such organization supports solid cooperation between the riparian countries, which is a prerequisite for practising IWRM in an international river basin. However, as indicated by the Mekong example, even a functioning basin organization does not guarantee comprehensive cooperation between the riparian countries.

8.3 Mekong River and Its Development

The Mekong is the ninth largest river in the world if measured according to runoff. With its 500 km^3 of water that it carries each year, it is 10 times of the size of the Nile. The total length of the Mekong is estimated to be over 4,800 km, which brings it among the 12 longest rivers in the world (Hori 2001). The river's catchment area is 795,000 km^2 and it ranks first in the Southeast Asia in terms of total volume (MRC 2003). The Mekong also supports an exceptionally diverse and productive freshwater ecosystem and is the source of livelihood for almost 70 million people living within the basin. There are six riparians sharing the river, namely China, Myanmar, Laos, Thailand, Cambodia and Vietnam (Figure 8.1).

Fig. 8.1. The Mekong River Basin

The basin can be divided into the Upper and Lower Basin. China and Myanmar form the Upper basin, which constitutes approximately 24% of the total catchment area (MRC 2003). The Mekong originates from an altitude of around 5,000 metres in the Himalayan mountain ranges of Tibet. It then flows through the Yunnan Province of China before forming the border between Myanmar and China, and later between Myanmar and Laos. The Upper basin changes into the Lower Mekong basin in the so-called Golden Triangle region where the borders of Myanmar, Laos and Thailand meet. From there, the river flows across northern Laos and then turns southwards towards Cambodia, forming on its way the border between Laos and Thailand. In the Cambodian capital, Phnom Penh, the Tonle Sap River connects the Mekong River to the Tonle Sap Lake, the largest lake in Southeast Asia. Shortly after, the Mekong splits into two: the larger mainstream Mekong called Tien River and the smaller Bassac River. These two rivers then enter Vietnam and the Mekong Delta, where the river splits into several smaller rivers and is known as the River of Nine Dragons.

The Mekong and its tributaries provide freshwater resources, fishing, irrigation, navigation routes, a source of hydropower production and many other possibilities. Consequently, there are multiple plans to develop the river, including dam building particularly in China and Laos, navigation improvement in the upstream, and irrigation to increase availability of water for agriculture. In the following sections, some of these plans are discussed.

In China, the ongoing economic liberalization has resulted in economic growth that demands larger inputs of water and electricity. Additionally, increasing power interconnections between Chinese provinces via regional power grids facilitate power trade within the country and make the Mekong hydropower potential available not only in the riparian regions but also in the neighbouring provinces and in the fast growing east coast. Consequently, China is implementing a cascade of seven or eight large dams on the Upper Mekong, with a total installed capacity of about 15,000 MW. Currently, two of the dams, the Manwan and the Dachaoshan, have been completed and the Jinhong and Xiaowan dams are under construction. In addition to the Chinese provinces, some of the electricity will be exported across the borders to the other Mekong countries (Mehtonen 2007). However, there are serious concerns about the environmental and social impacts of the dams due to altering the natural regime of the river (Dore and Yu 2004). No environmental or social impacts assessments covering the whole river basin were made before the implementation of the cascade. In fact, China did not negotiate with the other riparians over the project (Makkonen 2005). The proponents of the cascade emphasize that it will help with the flooding and drought problems downstream (e.g. Plinston and He 1999). Nevertheless, according to a general understanding, there will be changes in the natural flow pattern due to increasing dry-season flows and decreasing wet-season flows. These changes may be critical to the ecosystems and the livelihoods in the downstream. However, the most serious problem is the lack of open discussion on these issues between the countries, and the local residents.

The Mekong offers China an access to the Southeast Asian markets. In order to improve the navigability of the rocky and narrow river, China has initiated an improvement project of the Upper Mekong together with Thailand, Laos and Myanmar. The plan includes removal of several rapids and reefs from the Upper Mekong River by dredging and blasting (Finlayson 2002). The aim is to clear the way for cargo ships up to 300 tonnes in the first phase and up to 500 tonnes later on, although the project was later put on hold after the first phase. The project has been criticized for not addressing sufficiently the potential fisheries and food supply impacts. Additionally, Cambodia and Vietnam claim that they were never asked or even properly informed on this project, despite their vital dependence on the river (Makkonen 2005). Once again, China argues that the impacts will not be severe, and that navigation is the only feasible way to transport goods in the area.

Besides China, Laos has ambitious plans for building hydropower dams in the Mekong, but mainly to its tributaries. The country aims for much-needed economic revenue by selling power to the neighbouring countries. To facilitate cross-border electricity trade, a regional power grid has been planned to cover the whole Mekong Region. Both the World Bank and the ADB have supported the idea. The development of hydropower in the Mekong basin has, however, faced severe criticism and suffered several setbacks owing to its significant environmental and social impacts that remain poorly analysed and recognized (IRN 2004). Various actors have criticized particularly China's dams on the Upper Mekong and accused China of developing hydropower without negotiating with the other riparian countries. However, the downstream countries are also hungry for electricity, and considerable investments to Chinese hydropower are expected particularly from Thailand.

One remarkable development plan relates to improvement of irrigation systems in the basin. So far, Thailand and Vietnam are the countries with clearly the most developed irrigation systems, while in Cambodia and Laos the irrigated areas are considerably smaller. Thus, the potential for irrigation development is rather remarkable in the latter countries, at least in theory – there are also concerns that the feasibility (related to financial feasibility as well as other problems, for example, in the suitability of soil for irrigation) of proposed irrigation schemes have not been properly studied. At the same time many of the development scenarios for the basin combine construction of hydropower dams with the plans for large-scale irrigation development despite the fact that the planning and construction of the two are not implemented hand in hand, and that their modelled combined impact to Mekong's flow regime may therefore not occur as predicted.

Another big unknown in the Mekong development is the gross impact of all these plans on water quality. The intensifying agriculture, land cover changes, growth of the urban or semi-urban population that have no appropriate wastewater management, and expansion of industry and traffic are among the major factors that will increase the nutrient and pollutant concentrations in the river. The sediment concentrations are also exposed to major changes. The local erosion problems witness a growing tendency but on the contrary the new dams are expected to trap considerable quantities of suspended solids. For example, Kummu and Varis (2007) have estimated that the Manwan Dam traps around 68–75% of the Mekong's sediment at that point, and the whole cascade of eight dams may trap up to 94% of sediments when fully operational. However, some claim that the river will replace the trapped sediments soon after the dams by erosion from the downstream river bottom and strands (He 2005).

The diverse aspirations for the exploitation of the Mekong River give rise to different and often opposing development objectives that are a potential source of tension and conflict between the riparian countries (Campbell 2005). Accordingly, the resolution of these conflicts will require some painful trade-offs. Cambodia wishes to maintain the seasonality of the river – including the flood pulse system – in order to protect the exceptional ecosystem of the Tonle Sap Lake. Owing to its downstream position, sensitive ecosystems and flat terrain, upstream development creates the biggest worries in Cambodia. For Vietnam, sufficient dry-season flow in the Mekong Delta is one of the most significant issues particularly for rice cultivation and aquatic production. Thailand, by contrast, aspires to draw water from the river and its tributaries for irrigation and has even planned to divert some of the Mekong's water to its own rivers (Elhance 1999). As discussed above, China and Laos are most interested in developing hydropower in the Mekong basin. There are many different opinions on how the planned developments would change the conditions in the basin. Moreover, as a result of the scarcity of information and research, myths and one-eyed views are easily borne. This is one reason why appropriate institutions are needed and why cooperation between them is so important.

8.4 Regional Institutions in the Mekong Basin

There are several institutions in the Mekong Region that involve water-related issues. The most important of these institutions are the MRC, the GMS Programme, the ASEAN and the financing institutions – most notably the World Bank and the ADB (Figure 8.2). The institutions have different agendas and they function differently. For example, the MRC focuses directly on water resources management, while the GMS aims more broadly at economic development of the region and the ASEAN promotes economic integration and trade between its member countries. The World Bank and the ADB focus on financing suitable projects. Furthermore, the ASEAN consists basically of its member countries, without external donors within the organization. In the GMS, the member countries are directly involved but additionally, many countries are involved through their membership in the ADB, which is the major supporter of the GMS. The MRC is a cooperation organization between the four downstream countries. However, the donors have a significantly strong role in the Commission. It can be regarded as a problem that many of the Mekong institutions are so much directed by the donors and the local ownership is very low. However, as a result of the past hostilities and the fact that the Mekong countries are both economically and politically at very different levels, external institutions are needed to facilitate the cooperation.

In addition to the institutions mentioned earlier, there are other arrangements that are either smaller in scale or those that are only now increasing their influence in the region. The World Bank, for example, has recently showed increasing interest in the Mekong Region. The most visible sign of this is World Bank's strategy for the region, called the Mekong Water Resources Assistance Strategy (MWRAS). It is meant for years 2005–2010 and it aims to assist Mekong countries and the MRC in identification, preparation, and optimal operation of priority sustainable investments (World Bank 2005). More recently, the ADB has also joined the World Bank in the planning and implementation of the MWRAS.

Naturally, the governments of the Mekong countries are also involved in bilateral and multilateral cooperation forms among each other and outside the institutions. These arrangements include, for example, the Upper Mekong navigation improvement project, Thai-initiated Ayeyawady-Chao Phraya-Mekong Economic Cooperation Strategy and the World Conservation Union's (IUCN) and its partners' initiatives on the Mekong Region water governance (IUCN et al. 2007; Dore 2007). Moreover, The Global Water Partnership (GWP) has been active in promoting integrated water resources management in the region, for example with the help of the South East Asia Water Forums in 2003 and 2005. It is also important to note that the historical political connections and disconnections of the past few decades are a significant factor for successes and failures in economic and political cooperation in the region. Moreover, many trade arrangements, for instance the energy export of Laos to Thailand, and related investments and ownership arrangements are crucial factors in the regional arena.

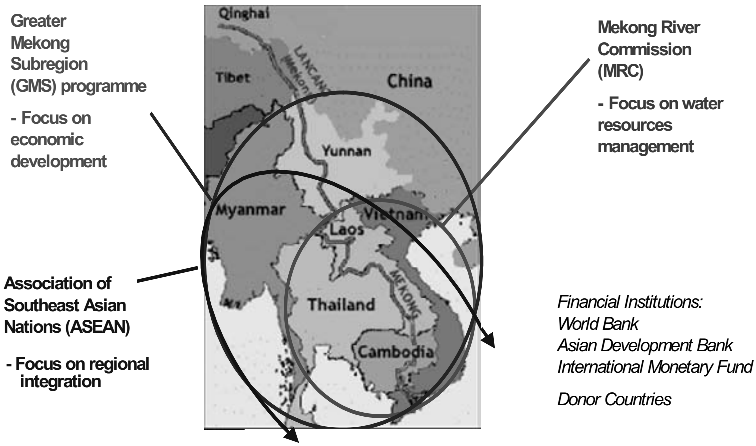

Fig. 8.2. Different cooperation settings and agreements in the Mekong Region

8.4.1 Mekong River Commission

Regional cooperation efforts over the Mekong River started in 1957, when Cambodia, Laos, Thailand and South Vietnam established the Mekong Committee (MC) with the support of the UN. Its successor, the Interim Mekong Committee functioned from 1978 to 1993, but faced serious challenges owing to the mixed situation in the riparian countries. The MRC was established in 1995 to further intensify cooperation in river management in the Lower Mekong Basin. Owing first to political and later also economic reasons, these Mekong organizations were limited in the four downstream countries, while China and Burma (Myanmar) stayed outside.

The Mekong Agreement of 1995 started a new era in the Mekong cooperation. Instead of the former emphasis on planning and construction, the Mekong Agreement focuses on sustainable and comprehensive management of the Mekong River. Owing to its prominence on joint development, ecological protection and water allocation, the agreement has been praised as a milestone in international water resources management treaties (Radosevich and Olson 1999). However, as a result of its limited power, the MRC appears to be more of a coordinator, rather than a controller, of the use of water resources (Browder and Ortolano 2000). In addition, although environmental and social aspects are high on the MRC's agenda, the practical level implementation still remains far from the fine principles stated in the agreement.

It is important to note that both the Mekong Agreement and the internationally agreed principle of IWRM call for plausible compromises between environmental sustainability, social equity and economic wellbeing in river basin management. The vision of the MRC is to have an economically prosperous, socially just and environmentally sound Mekong River Basin. The Commission's mission is to promote and coordinate sustainable management and development of water and related resources for the countries' mutual benefit and the people's well being. Tools for this include implementing strategic programmes and activities and providing scientific information and policy advice. At the core of all this is the so-called Basin Development Plan.

The Basin Development Plan can actually be seen as the third wave of basin development plans. The contemporary one is in many ways different from the previous ones. This is obvious due to the more long-term, strategic type of approach that the MRC has in comparison to its predecessors. Besides addressing different sectors such as agriculture, fisheries, hydropower and so forth, it has a strong focus on "cross-cutting themes", including environmental protection, human resources development, poverty reduction, gender equity and public participation.

One of the perennial is the focus and the orientation of the MRC. In order to deepen the cooperation, China would want the Commission to include more economic issues in its agenda (Makkonen 2005). Recently, a discussion about the Commission's mission has received some new attention due to the vision of the current leadership, according to which the Commission should be more development oriented; the main purpose and focus for the MRC would thus be to harness the economic potential of the river. The benefits that investments in the water sector can bring to the people should be examined (Cogels 2005). Such an approach has, nevertheless, raised some criticism. For example, Jensen (2005) claims the approach lacks the consideration of those conflict issues that the MRC should deal with, including, for example the several controversial dam projects that are going on both in the upstream and the tributaries. Others are worried for the lack of assurance that all stakeholders – particularly non-state actors – would be equally involved (Molle 2005; Sneddon and Fox 2006; Sokhem and Sunada 2006).

One of the current processes within the MRC is building closer cooperation with China. China and Myanmar have been dialogue members of the Commission since 1996 and the two upstream countries are thus not totally outside the cooperation. However, they do not need to follow the decision-making of the MRC or to commit themselves to any agreements. Up to now, neither China nor Myanmar have been enthusiastic to sign the Mekong Agreement and thus to become a member of the MRC. Nevertheless, the MRC has lately shown clear signs of deepening the dialogue with China, emphasizing particularly for increasing cooperation in the scientific field (MRC 2002, 2006).

The atmosphere in and orientation of the MRC and its predecessors appears to fluctuate according to the acute issues and the political situation in the member countries. In the 1970s the Committee was much more development-orientated, and planned a series of dams to be built along the Lower Mekong River. By the time the Mekong Committee was planning dams on the Mekong mainstream, China lived through an era of extreme communism in which the focus was on basic agricultural and industrial activities and no large-scale economic development was achieved. In this way, the setting was quite the opposite to what it is today, when China is building dams to the upstream while the MRC and its member countries have expressed concerns over their possible impacts. Later, environmental awareness has become an issue also in China, but the country still appears to prioritize economic development projects before environmental considerations.

8.4.2 Greater Mekong Subregion Programme

The Greater Mekong Subregion (GMS) Programme was initiated in 1992 by the ADB and the UN Economic and Social Commission for Asia and the Pacific (ESCAP). It was established to facilitate sustainable economic growth and to improve the living standards of the 230 million people living in the GMS countries. All the six riparian countries became members of the programme. However, China was represented by the Yunnan Province. Additionally, the Guangxi Zhuang Autonomous Region has been much involved in the programme (Qin 2005).

The GMS Programme covers seven main sectors, including transportation, energy, tourism, trade and investment, telecommunications, human resources development, and environment. The main focus of the programme appears to be on economic and infrastructure development, including particularly transportation and energy sectors. The member counties are also deepening cooperation in border control, which could eventually lead to something similar to the Schengen Agreement in Europe permitting easier international travel (Xinhua 2005).

The most significant projects under the GMS include the East–West and North–South Economic Corridors, Regional Power Interconnection and Power Trade Arrangements, Flood Control and Water Resource Management, and Tourism Development (Qin 2005). Water resources management is gaining more and more attention. When renewing the GMS 10-year framework in 2001, several member countries expressed their will to emphasize water resource management. This will rose particularly from the extensive damages caused by flooding. Furthermore, it was noted that social and environmental implications of infrastructure projects, such as hydropower development, were not always adequately assessed. A more holistic approach would include proper management of shared natural resources with a priority on protection and management of watersheds and wetlands (GMS 2002).

Even though water as such is relatively new on GMS's agenda, water-related issues have been considered already for a long time. Regional energy trade is one of these issues. In 2005, the member countries completed a power trade operating agreement that will create transparent rules and regulatory framework for the trade (ADB 2005). Regional Power Interconnection and Trade is one of the 11 key programmes of the GMS and it is scheduled for completion by 2019. As about 32% of all energy generation in the GMS is based on hydropower, water has an essential role in the energy issues. Already the plans of 1995 included hydropower projects connecting Cambodia, Laos, Vietnam and Myanmar with Thailand. Moreover, the plans mention the transmission line between the Jinghong hydropower plant in Yunnan and Thailand (ADB 1995). At the same time, the Theun-Hinboun Hydropower Project in Laos together with a transmission line to Thailand were being implemented.

8.4.3 Association of Southeast Asian Nations

The ASEAN was established in 1967 by Indonesia, Malaysia, Philippines, Singapore and Thailand. Today, with the exception of China, all the Mekong countries are members of the ASEAN. The member countries' economic performance varies a great deal and the GMS countries are among the poorest ones. The need to bridge the development gap between the members in order to accelerate integration has been recognized within the ASEAN (VNA 2005).

The Association also has close connections with the East Asian countries through cooperation mechanisms, such as the ASEAN+1 between the ASEAN and China, and the ASEAN+3 incorporating also Japan and the Republic of Korea. China was accorded the full Dialogue Partner status of the ASEAN in 1996. In 2003, a Joint Declaration of the ASEAN and China on Strategic Partnership for Peace and Prosperity was adopted. The relationship includes political and security cooperation, economic cooperation, and functional cooperation. The ASEAN+3 cooperation began in 1997 and was later institutionalized in 1999 when the countries issued a Joint Statement on East Asia Cooperation. The emphasis is on cooperation particularly in economic, social, and political fields. The countries hold regular dialogue and consultations on political and security cooperation, as well as cooperation in economic, and monetary and financial fields (ASEAN 2007).

The aim of the ASEAN is to promote economic cooperation and the welfare of the people in its region (ASEAN 2004). Each state is to cooperate under a set of guidelines, including collaboration on utilization of agricultural and industrial resources, and maintenance of close cooperation with existing international and regional organizations with similar aims and purposes. The ASEAN follows a set of key principles, also referred to as the ASEAN way. The members have formally adopted four basic principles, found in article 2 of the Association's Treaty of Amity and Cooperation. The actions of the ASEAN members should be guided with the principles of respect for the sovereignty and territorial integrity of all nations, non-interference in the internal affairs of one another, settlement of disputes by peaceful means, and renunciation of the threat or use of force. The ASEAN Way also includes not using collective defence to serve the interests of any among the big powers and the principle of consultation as the basis for settling differences among members. Moreover, the members have agreed upon a set of procedural norms, which set out the procedure by which conflicts would be managed by the ASEAN. The norms include the principle of seeking agreement and harmony, the principle of sensitivity, politeness, non-confrontation and agreeability, the principle of quiet, private and elitist diplomacy versus public washing of dirty linen, and the principle of being non-Cartesian, non-legalistic. Goh (2003) emphasizes that these norms do not identify specific goals of policy, but instead they prescribe the manner in which the member states should manage their affairs and interact with one another within the context of ASEAN.

The ASEAN Mekong Basin Development Cooperation initiative is one of the sub-regional frameworks of cooperation that the ASEAN is involved with. The initiative was established in 1996 and its objectives are to enhance economically sound and sustainable development of the Mekong basin, to encourage a process of dialogue and common project identification, and to strengthen the interconnections and economic linkages between the Mekong riparian countries and the other ASEAN member countries (ASEAN 2003).

In the future, ASEAN will most probably become increasingly important also in regional water management. The Association aims to promote regional peace and stability among the member countries. Noting the significance of the Mekong for the riparian countries and the sensitive transboundary questions related to water management, regional stability necessarily requires considering Mekong issues. The ASEAN Working Group on Water Resources Management was established in 2002 (SEATAC 2007). The group operates in the following areas: networking and collaborative action on IWRM, exchange of relevant information, expertise, technology and know-how on water management as well as training, education and awareness-raising campaigns on IWRM. The ASEAN also deals with energy issues. Increasing energy cooperation has been discussed and joint investment in building hydropower is seen beneficial to the region (Lao News Agency 2005). According to this view, hydropower would not only supply cheaper energy than oil but would also enhance closer relations within the ASEAN, and help narrow the economic disparities between the member states.

8.5 Institutional Cooperation

Many of the institutions discussed above have considerable overlaps in their mandates as well as their member country base, and therefore cooperation between them would be expected. However, the different regional institutes cooperate only to a limited extent and some are even seen more as rivals than partners (Hirsch et al. 2006). It also appears that cooperation is largely concentrated on economic matters other than water resources management. For example, the MRC is mentioned as one of the extended economic cooperation initiatives of the GMS.

Probably the biggest difference between the institutions appears in China's participation; the country is member-only in the GMS Programme. The GMS Programme seems to be easier for China to participate than especially the MRC, as no serious disagreements exist about the aims and functions of the programme. In addition, absence from the ASEAN is natural as China is not a part of Southeast Asia.

However, some think China participates in the GMS Programme basically to enhance the relationship with the ASEAN and to maintain peace and stability in Southeast Asia (Qin 2005). The GMS Programme has been defined as one of the five key areas of economic cooperation between China and ASEAN. Moreover, ASEAN+3 collaboration involving the ASEAN, China, Japan and South Korea is one of the regional trends identified within the GMS. This collaboration could have important implications for the GMS particularly in the form of free trade expansion (GMS 2002). The GMS Programme sees the setting even broader and considers itself as a bridge linking China, Southeast Asia, and South Asia (GMS 2002).

Furthermore, the GMS Programme initiatives play an important role in narrowing the development gap between the original and new members of the ASEAN. The ASEAN considers also the cooperation with the MRC fruitful, and the issue was highlighted in the ASEAN Ministerial Meeting of 2005 (Lao News Agency 2005). However, in the meeting communiqué, MRC cooperation was listed under the topic of Environment which can be seen to reflect the image of the MRC within the ASEAN.

It is also important to understand and take into account the role of the donors for the different institutions. Although the majority of the donors come from outside the region, they should still be regarded as one important family of institutions having a remarkable impact on the development and cooperation in the Mekong Region. Different donors have naturally different objectives and interests – evident and not so evident – in funding Mekong cooperation. Despite serious attempts for donor coordination and coherence and for ensuring independent planning of countries and different institutions that donors support, there is still a lot to improve on this front. After all, donors still decide through their financing decisions to a greater extent if a certain scheme or programme is going to be implemented or not.

Out of the different institutions, the MRC has the strongest connection with donors as currently over 90% of its funding comes from external donors and less than 10% from riparian countries (MRC 2005). In 2004, the Commission's biggest agreed donors included The Netherlands, Sweden, Germany and Finland, while, for example, Denmark, Belgium, France, and the ADB had pledged considerable amounts as well. The GMS Programme is strongly influenced by the ADB, and consequently, by the ADB's major donors such as Japan.

8.6 Lessons Learned

It is evident that there is a need for more cooperation and coordination between the different Mekong institutions and actors. In the Lower Mekong basin, cooperation has existed for decades with a remarkable support from the UN, development banks and several western countries. Still, the MRC and its predecessors have not been too successful in the comprehensive development and management of the Mekong basin.

The MRC has already for years promoted programmes that aim to an integrated approach in the management of the river. For example, the Commission's Basin Development Plan, currently entering into its second phase, can be regarded as an IWRM process. However, as China and Myanmar are absent from the MRC, they are not included in the BDP either. Without involving the two upstream countries and their river basin activities, it is hard to talk about any comprehensive management. Furthermore, even the member countries still seem to lack the political will to carry out comprehensive development of the Lower Mekong basin (Keskinen et al. 2008). The complex political relations, substantial economic and political differences as well as the fairly weak institutional capacities of the member countries can partly explain the lack of more cooperative policies. Various internal governance problems together with the lack of political stability in the region have also played their parts. It must also be realised that the basin is geographically an extremely vast area and therefore already challenging to manage and govern.

The institutional set up for the Mekong basin should cover all the key aspects of IWRM: economic, environmental and social issues (Figure 8.3). A set up that fulfils the requirements of IWRM can be arranged in several ways. Basically, either all the institutions should cover all three aspects, or they should focus on their main mandates and responsibilities, and by cooperation ensure that all the other aspects are considered. In addition to the institutions themselves, the donors should take care that environmental, social and economic issues are equivalently considered in one way or another. As of 2007, the MRC seems to be moving towards the economic apex of the IWRM triangle. Consequently, as the ASEAN and the GMS Programme already mostly focus on economic issues, environmental and social aspects risk being given less attention.

One additional point is that the priority setting of the institutions is in continuous evolution. For example, the ongoing deepening of the regional integration has an impact on priorities of the institutions.

One basic principle of cooperation is that it must be motivating for all participants. Surprisingly, this basic rule seems not always to be taken into consideration.

For instance, in the claims for China to cooperate with the downstream when planning river development it is often forgotten that China needs to gain something in response to modifying its plans. China seems to have more to lose than gain for instance from the MRC membership. Currently neither economic, political nor water management-related benefits of the Mekong cooperation seem to be strong enough to persuade China to join the MRC as joining would simultaneously limit its plans for the Upper Mekong.

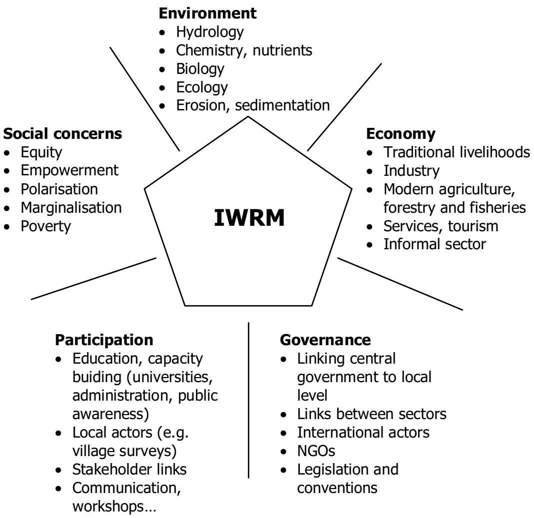

Fig. 8.3. The facets of IWRM (Varis et al. 2006)

However, the rapidly proceeding regional cooperation through the ASEAN and the GMS Programme, and China's membership in the WTO hopefully also make cooperation on water more attractive. Promising signs of China's increasing cooperation and willingness have gradually become obvious. China's interests in cooperation are mainly economic and the country seems to prefer bilateral arrangements before multilateral ones. With its increasing economic power, China could partly replace western donors and development banks active in the Mekong Region. One issue to consider is whether bilateral arrangements with the regional superpower would hinder multilateral cooperation.

Mutual benefits have their implications to IWRM, because integration is fundamentally about cooperation between different needs and interest groups. In order to balance economic, environmental and social needs, the outcome must adequately satisfy all stakeholders.

When talking about regional cooperation, it is also important to note that emphasis should be on both horizontal and vertical cooperation. While horizontal cooperation between the states usually functions rather well, vertical cooperation with lower governance levels is far more challenging. In the Mekong Region, most countries still have serious challenges in their stakeholder participation, which makes local level participation in planning and decision-making weak. Cooperation between the different governmental levels is also scarce, and the actual decision-making remains centralised. Therefore, a well functioning cooperation between the national governments does not alone guarantee equal decision-making. In some cases, it can even lead to a situation where local level concerns and potential transboundary impacts are neglected in regional discussions (Keskinen et al. 2008).

Fortunately, there already exist promising initiatives to increase dialogue and vertical linkages between local, national, and regional actors, and in this way also to make regional institutions better linked with the actual issues and concerns in the local level. One of the most interesting initiatives is the Mekong Region Water Dialogue Events that are promoted by the IUCN and its partners (IUCN et al. 2007).

8.7 Conclusions: IWRM as an Approach, Not as a Goal

This chapter analysed institutional cooperation in the Mekong River Basin. A particular focus was in the implementation of IWRM as has been recommended in innumerable recent documents. The IWRM concept is a great approach to water management in that it aims at balancing different needs, including economic, environmental and social aspects of water. But it is only great if it is actually being implemented and improving matters.

Let us recall the IWRM plans that the Johannesburg Summit required by the year 2005 for all major river basins in the world. By 2007, still not that many serious plans have been implemented. For example, the GWP has made good efforts for IWRM plans all over the world. However, it has not been able to implement the plans, since it lacks an appropriate institutional structure to allow implementation of such comprehensive plans. It should be remembered that the plans as such are not important unless they are followed by concrete actions.

The flair that IWRM gets from most international recommendations is that IWRM is a one-shot plan. This flair is not only theory, but many large international and donor agencies finance comprehensive plans over and over again without knowing that such plans have been done already many times but what is missing is implementation (cf. Varis et al. 2006). IWRM is thus rather a philosophy, ideology, and a process than a distinct plan. Means and ends get mixed: from the Johannesburg plan of implementation, it is easy to get the somewhat blurred view that the IWRM and water efficiency plans are the goal *per se*. Can a plan be the end…? Evidently not – it is a means to an end. Water resources management and development is exposed to very demanding and important pressures and challenges in many parts of the world. There are burning problems that await solutions.

Coordinating the functions of different actions and institutions and increasing mutual cooperation is the reality regarding most large river basins, instead of having a centralized agency. In the Mekong Region, IWRM could be at best used as a tool for sustainable development and as a framework for the cooperation between different institutions.

The major failures of the Johannesburg-type of plans in the Mekong case include the following:

- River basins are the cradles of mankind and consequently each major basin has its own ages-old as well as recent history. The former one is a potpourri of cultural, ethnic, political and other issues. The recent history includes the institutional arrangements and governance characteristics internationally, nationally and locally. All these factors set the foundation to the implementation of IWRM. The Mekong basin has been subjected to severe serious international efforts in terms of basin-wide planning over the past several decades. These efforts have indeed been costly in many ways but have not yielded very much to the water sector itself, but obviously more to the overall stability of the region. Reasons are many, and many of them are beyond the water sector. They can be comprehended only against the historical, cultural and political context of the basin. The water sector should build its own efforts on these realities.
- Water sector is seen as too disconnected from other sectors. The water sector itself is a many-dimensional mosaic of activities, with no clear disciplinary boundaries (cf. Mohile 2005). Energy, agriculture, forestry, environment, health and several other sectors are part of the water sector in the Mekong basin, but at the same time they are themselves sectors by their own right, and even parts of still other sectors. We should naturally make attempts to bring these all together in the water sector plans, but recognize at the same time that many other sectors are suffering with similar challenges in integrating their own sectors – in some of them water being an important component. The water sector is very alone in advocating, for instance, "… all waters should be managed in the basin-wide context". How can one sector so totally ignore jurisdictional boundaries, trade, transport, cultural and ethnic issues and so forth?
- A typical caveat of water professionals is to be far too hardware-oriented in water resources management. This means that, dominantly, the resources and their development are the starting point, but too seldom the institutional and human capacity dimension is reflected (Varis and Pres 2008). The "people out there" are amazingly often ignored and forgotten. Governance, institutions, human skills and education are typical bottlenecks of implementation of IWRM, and the tendency seems to be that they are inadequately addressed. As a dynamic concept, IWRM takes its time to evolve. If the dissemination of a demanding concept is too swift, too widespread, too open and in too large a scale, the implementation will definitely face problems. One institutional cornerstone of the implementation of IWRM is legislation – a very scarcely elaborated theme in the Mekong discourse.
- In real-life in river basins such as the Mekong, the institutional set-up is a complicated issue and mix of various international, national, governmental and non-governmental, commercial or subsistence-related, and many other agencies and other stakeholders. A single-agency approach is to some extent valid – in many river basins, a river basin organization has been successful – but nowhere does

it have the privilege to ignore other agencies and stakeholders. So is the case with the MRC: it competes and complements in many ways with the ASEAN, ADB, GMS Programme and other organizations, not to talk about the situation of the national Mekong Committees in the member countries of the MRC. None of the institutions has the undisputable leading role within the water sector.

- The stakes and ambitions within a river basin do not originate alone from the basin itself. The Mekong case shows clearly how diverse and massive the involvement of external powers has been in the past many decades. The international agencies referred in this analysis are all to certain extent driven from external actors. The donors and other actors have their own stakes, which further complicate the integrated approach to river basin management.

It would seem problematic to establish a strong, basin-wide institution to coordinate water issues when there are serious challenges with national-level institutional cooperation in all of the Mekong countries (Sokhem and Sunada 2006). In many countries, the national institutions are still weak and lack democratic participation mechanisms. Moreover, the rivalries between the institutions may effectively hinder cooperation and coordination (Keskinen et al. 2008). Additionally, the requirement of IWRM to simultaneously coordinate all water-related sectors seems to be rather ideological than practically feasible.

An integrated approach would mean close cooperation and coordination among the various institutions and stakeholders and the creation of a common view for the river management. However, in the case of the Mekong River, the different institutions appear to work rather separately and there is not sufficient coordination between them.

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Acronyms

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
GMS	Greater Mekong Subregion
IWRM	Integrated Water Resources Management
MRC	Mekong River Commission
WTO	World Trade Organization

IUCN	The World Conservation Union
GWP	Global Water Partnership
MC	Mekong Committee

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9 The Upstream Superpower: China's International Rivers

James E. Nickum

9.1 Introduction

At first glance, shared basins should rank high on China's agenda. Just over one-third of the country's land area, 3,200,000 km^2, lies in 19 international river basins (Gleick 2000: 249).[1] Only Russia (8 million km^2), the US (6 million km^2) and Brazil (5 million km^2) have a greater basin area. With the notable exception of its long and arid interface with Mongolia, China shares a river basin along most of its 22,000 km land border with 14 countries and two special administrative regions (Hong Kong and Macau) (Fig. 9.1).

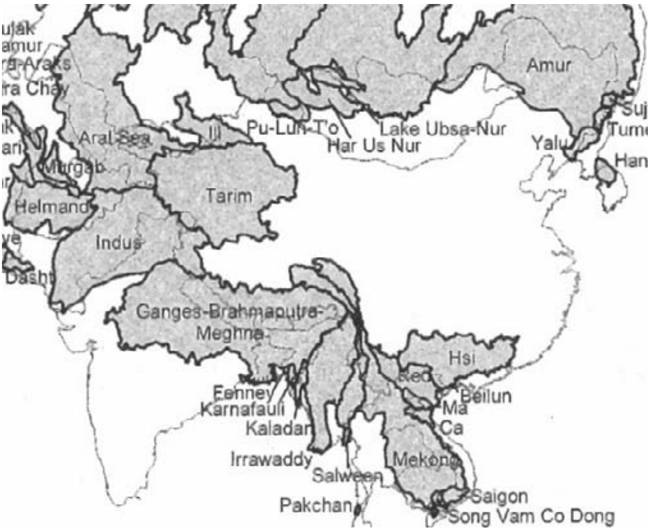

Fig. 9.1. A shared basin at (nearly) every land border. Source: Wolf et al. 1999

[1] In the Northeast, these are the Heilong (Amur), Yalu, Suifun and Tumen; in the Northwest, the Aral Sea, Har Us Nur, Ili, Irtysh (Ob), Pu Lun To, and Tarim; in the Southwest, the Beilun, Ganges-Brahmaputra-Megna, Indus, Irrawady, Lancang (Mekong), Nu (Salween), Pearl (Xi and Bei), and Yuan (Red) (He et al. 1999, which provides the regionalization; Gleick 2000:249).

Yet international rivers would not appear to be of major concern to China’s water policy makers. The comprehensive reports, strategy papers, water encyclopaedias and almanacs published by the China Water and Power Press, the outlet for the Ministry of Water Resources, are virtually silent on the international dimensions of China’s river basins, much less that there might be some controversy over their development. Casual inquiries in Beijing of a small number of leading Chinese researchers on water resources and the environment in summer 2005 elicited little knowledge or concern over international waters, aside from the Mekong. Even Ma Jun, a severe critic of China’s river basin mismanagement, gives no attention to flows leaving the country in his comprehensive survey of water woes (Ma 1999).

On the academic side, He Daming and his colleagues at the Asian International Rivers Centre in Kunming are nearly unique in their concern with international rivers, and even then, mostly on the Mekong (e.g. He and Feng 2006). Some of this chapter draws upon one of his papers that was published by the Chinese Academy of Sciences (He et al. 1999, Liu 2004). Yet this exception highlights the rule. The geographical marginality of the Centre and the apparent lack of spread effects of Professor He’s work in the national water policy literature after nearly a decade indicates, to invert a slogan common during the Cultural Revolution, that a single spark has yet to set ablaze the prairie.

It is not surprising, then, that Nakayama (2005) notes that the Chinese Government “has issued few clear statements regarding its policy on international river basins”. As Makkonen (2005: 277) delicately puts it, “integrated management…does not appear to be an attractive point of view to China, particularly in the case of transboundary rivers”.

When China has taken a stance, it has not always been accommodating. Most notoriously, China was one of only three countries (with Turkey and Burundi) to vote against the Convention of the Law of Non-Navigational Uses of International Watercourses (“Watercourse Convention”) when it was adopted in May 1997 by the United Nations General Assembly. It has also been criticized widely for declining to become a full member of the Mekong River Commission, although it is a dialogue member and the existing members have not always been enthusiastic about having China join.

This chapter explores some of the reasons why, in general, the international dimensions of China’s shared river basins have appeared to be of so little concern to China’s policy makers. It focuses on some of the less well-known basins to provide a perspective on China’s approach to the more salient Lancang (Mekong) and Nujiang (Salween) cases that are already covered by Mehtonen, Keskinen and Varis in this volume and in the excellent overview by Makkonen (2005) of all of China’s major southern border flows (also including the Brahmaputra, Irrawaddy, and Red rivers).

A number of interrelated reasons may explain the relative lack of salience of international river basins in China’s decision making, and China’s refusal to sign the Watercourse Convention as well as its apparent reluctance to participate as a formal member in cooperative basin management regimes such as the Mekong River Commission. These include geography, history, and the minority ethnicity of most of China's borderlands. At the same time, it should be noted that China has acted actively in recent years to improve cooperative relationships with its neighbours.

9.2 Geography

9.2.1 Question Authoritative Statistics

First of all, the international character of most of China's international basins can be much overrated. The facts on the ground in China indicate the limitations of relying on statistics of the area of shared river basins as a measure of the misalignment of hydrological systems with the tightly bordered modern nation state. The largest of the "international" basins inside China's territory is the Tarim, which at 1,000,000 km^2 covers more than one-tenth of China's land area, second only in size to the entirely domestic Chang Jiang (Yangzi) Basin (1,800,000 km^2). Yet the Tarim lies almost entirely (95%) within the internationally recognized borders of China. About half of the small remainder is in territory that is disputed with India but under the control of China. Almost all of the remaining 2–3% is in the remote mountains of eastern Kyrgystan, itself a relatively water-rich "upstream hegemon" in the Aral Sea system that has even threatened to sell water to China (presumably from more accessible flows) if downstream Uzbekistan did not pay for it (Karaev 2005). The Tarim is not governed by an international treaty (Herrfahrdt et al. 2006: 66), but at this point, there is no need for it to be. Because of its importance to Xinjiang Province and its centrality in resource use conflicts between migrant Han and indigenous oasis-based Muslim minorities (especially the collection of Turkic peoples grouped together as "Uyghur") (Gladney 2004: 162), the Tarim is a basin of concern to China's policy makers, but as an inland domestic flow.

In another twist of the numbers, the Tarim is not the largest international basin with some part in China. That honour goes to the nearby Ob. Yet only 14,000 km^2 of headlands of the Ob's Irtysh tributary lie in the northwestern corner of China. In this case, however, even though this is less than one half of 1% of the total basin, and the portion in China is towards the bottom of the list of international basins, it is quickly becoming a factor in China–Kazakhstan relations, as will be discussed below.

Hence, China's largest international basins, measured by land area, lie almost entirely within China, or only fractionally within China. In either case, their international character is usually quite minimal. Furthermore, despite the great flows out of the Tibetan plateau into South Asia, the predominant share of water originating in China stays there. Nearly three-quarters of China's runoff (2000 out of 2700 km^3) crosses no international borders.

9.2.2 Upstream Superpower

Another salient fact of geography is that China is upstream on nearly all international flows except some border rivers (the Yalu, Tumen, and Amur), where it is neither upstream nor downstream. Less than 1% of China's water (17 out of 2711 km^3/ann) flows in from other countries (Table 9.1). China's outflows (606 km^3/ann across borders, 126 km^3/ann into boundary rivers) are over 40 times as great as its inflows (Department of Hydrology 1992: 106, 131, 129, 130).[2] China, and in particular the Tibetan plateau, is the "water tower" of Asia (He et al. 1999).

The significance of this is that Chinese water users have little intrinsic interest in considering the effect of their use on their counterparts in neighbouring countries. In the absence of clear benefits for doing so, restraint on behalf of unseen co-riparians across downstream borders would be an extremely unusual act of altruism. The attention of China's river managers to cross-border issues is adequately consumed by interprovincial disputes.

Table 9.1. Dependency ratio of China and its neighbours

	Dependency ratio (%)
China	0.6
Mongolia	0
North Korea	13.1
Kazakhstan	31.2
Kyrgyzstan	0
Tajikistan	16.8
Afghanistan	15.4
Pakistan	76.5
India	33.9
Nepal	5.7
Bhutan	0
Myanmar	15.8
Laos	42.9
Vietnam	58.9
for reference:	
US	3.4
Russia	4.3
UK	1.4

Source: FAO, 2003: 78–72. Dependency ratio: The ratio incoming water to total renewable water resources.

9.2.3 Borderlands

A third point is that with a few exceptions (Korea, Vietnam), most border areas within China are relatively unpopulated. They tend to be too dry or too high for

[2] Figures are mean (P=50%) runoff for the years 1956–1979.

dense populations or extensive irrigated agriculture. Hence, except for some hydropower and navigation projects, little developmental attention has been devoted to them. Their resource, tourist and environmental potentials are bringing them increasingly into the limelight, however. It should also be noted that major population concentrations and political centres in neighbouring countries (e.g., Bangladesh, Kazakhstan, Nepal, Pakistan and Vietnam) are often relatively close to the border.[3]

At the same time, and perhaps even more importantly, those who live there tend to be poor and mostly non-Han minorities, often with cross-border ethnic affinities. This theme will be taken up in a later section.

9.3 History and Sovereignty

9.3.1 Why did China Vote against the Watercourse Convention?

China's vote against the Watercourse Convention was not as out of step with international praxis as it might seem at first glance. The convention, which took 27 years to draft, was "an effort to codify customary principles of international law … and to set out procedural requirements for notification and consultation among nations regarding the use of international watercourses" (Gleick 1998: 210). The end result was a text that reflected the various conflicts of interests and doctrines more than it resolved them. Its Article 5 sets "equitable and reasonable utilization" as the fundamental legal principle to be applied in international waters, yet the criteria for determining such utilization, laid out in Article 6, are quite broad and Article 8 reaffirms the principles of "sovereign equality, territorial integrity and mutual benefit". Article 33 provides for a mandatory "fact-finding" commission for unresolved disputes, but only obligates the parties concerned to "consider in good faith" the recommendations of the commission.

China was one of three (together with Turkey and Burundi) to cast an outright negative vote, citing the lack of broad consensus over key provisions, the "indisputable sovereignty over a watercourse which flows through [a state's] territory," the asymmetry of "rights and obligations of upstream and downstream states," and the mandatory provisions of Article 33 (United Nations General Assembly 1997). These same objections were also lodged for the record by some of the 27 countries who abstained. Few of the 103 countries voting in favour appear to have had a deep commitment to the document in the end. Only 16 countries actually signed the Convention while it was open for signature (to 21 May 2000), and five between then and August 2002, leaving it 14 short of the relatively modest 35 necessary for it to come into force (http://www.europeangreens.org/info/resolutions/lux4.pdf, viewed 23 March 2006).

[3] Thanks to Olli Varis for this insight.

The significance of the Convention, even if ratified, is subject to different interpretations. Since the Convention is intended to be a codification of evolving practice, provides “little concrete guidance,” and is not binding (Gleick 1998: 210), it may be said that it adds nothing new to actual decision making. Others (e.g. Nakayama 2005: 70) say actual international conduct now follows the principles of the Convention, even though it is not ratified – which could be saying the same thing, only in reverse. Yet others have noted that shared rivers are so site-specific that general principles are of little use (Ministry of Foreign Affairs of Sweden 2001: 9).

9.3.2 The Apparent Weight of History

For present purposes, the critical question is why China’s vote was made in the face of certain passage, and when abstention was an alternative chosen by many who shared China’s concerns, including India, Pakistan and France. Of course, no definitive answer can be provided in the absence of access to the parties involved. Nonetheless, some plausible reasons may be considered here. One of these may be a particular sensitivity to protecting national sovereignty that arises from historical reasons, in particular, the erosion of China’s national rights of self-determination, including treaty ports, extraterritoriality, and outright invasion, from 1840 to 1949. The “five principles of peaceful co-existence,” initially proposed by Premier Zhou Enlai in 1954 and adopted by the non-aligned movement in Bandung in 1955, continue to be cited as the basis of China’s foreign policy. These principles are: mutual respect for each other’s territorial integrity and sovereignty; mutual non-aggression; non-interference in each others internal affairs; respect for mutual equality and working for mutual benefit. Shared waters expose problems of incongruities between these principles, however, especially sovereignty and non-interference with established users.

These conflicts have only grown in salience recently, however, because of the peripheral nature of China’s international flows and due to a long period of relative economic and political isolation during the Cold War, especially after the breakup with the Soviet Union in the late 1950s and before the reform policies initiated at the end of 1979. The Cultural Revolution era, from 1966 to 1976, when China could only claim North Korea and Albania as allies, served only to reinforce a strong realist view of national sovereignty.

In practice, China’s government has cited the non-interference provision of “peaceful co-existence” as an argument against compulsory multilateralism. Most likely, it was simply important for China to reaffirm its position of the primacy of national sovereignty over resources in its boundaries, which is not surprising given its upstream position, and growing pressure to develop water resources near some of its borders.

9.3.3 The Short Arm of the Law

Only one article of the 2002 Water Law[4] (#78 of 82 total) deals with international waters, declaring that in case of a conflict between domestic law and international treaties or agreements, the latter should prevail except where China has declared a reservation. Especially since China has very little capacity in international water law, this provision is likely to have the unintended consequence of inhibiting its formal assent to international conventions and agreements.

9.3.4 Apparent Contrast with Grand Strategy

An apparent irony of China's negative vote on international waters is that 1997 was precisely at the beginning of a more multilateralist approach to neighbourly relations in other arenas. On closer examination, this again might not be surprising.

Beginning with the end of the Cold War, China had moved to resolve disputes with bordering states and to demonstrate an interest in playing a constructive role in international organizations. By 1996, a grand strategy had evolved reflecting a realization that, especially in security matters, bilateralism was not effective in providing China an advantage when its smaller neighbours had recourse to multilateral responses and security cooperation with a hegemonic United States. A good example of the multilateral initiatives was the Association of Southeast Asian Nations (ASEAN) formed in 1967 in part due to a desire for solidarity among the diverse countries of Southeast Asia in response to a perceived threat from China.[5] This concern intensified with their larger neighbour's 1992 forceful claim to disputed islands and seas in the South China Sea. It quickly became apparent to China that it needed to adopt a more reassuring, accommodating strategy (Goldstein 2005: 110, 120, 203).

China's growing relationships with ASEAN and the implications for the rivers they share are covered in Mehtonen et al. (2008) China moved towards multilateralism along much of the remainder of its border, especially in the area of security, as a principal founder in April 1996 of the group that evolved into the Shanghai Cooperation Organization (SCO). The six member states of the SCO (China, Kazakhstan, Kyrgyzstan, Russia, Tajikistan and Uzbekistan) cover over two-thirds the land area of Asia. Together with three of the four observer states (India, Mongolia and Pakistan but not Iran), SCO spans by far most of China's borders, excepting only Afghanistan, Bhutan, Nepal, North Korea, Myanmar (Burma), Laos and Vietnam. Once the institutional framework for cooperation was in place,

[4] Zhonghua Renmin Gongheguo Shuifa, 29th Session of the Standing Committee of the Ninth People's Congress, People's Republic of China (29 August 2002). Available in Shuilibu (2003) pp 177–183.

[5] Ironically, the much-vaunted "ASEAN Way" that provides the ideological basis for cooperation is itself grounded in a principle of non-interference that has attenuated the organization's ability to go beyond being a talking shop, especially as its membership has grown (Conde 2007).

SCO has quickly expanded its activities beyond security to cultural and economic cooperation, especially in the areas of energy, information technology and transportation (http://www.sectsco.org/html/00030.html).

Perhaps even more than ASEAN, the SCO remains a talking shop dominated by the world's second-tier hegemons, but even that is a strong indicator of a desire to develop a multilateral foundation for addressing cross-border disputes, despite the greater negotiating costs that might entail. At the same time, the initial focus on security, notably countering terrorism *and* separatism, indicates that one purpose of the SCO is to counter cross-border ethnic affinities with a cooperative framework based on nation states, i.e., between dominant non-border ethnic groups (see next section). Ironically, as Goldstein (2005: 125) points out in a more conventional security context,

> …an expanding role in regional multilateralism provided Beijing with forums within which it expected to find support for its 'hard' view of sovereignty that emphasizes the absolute right of each state to decide how best to manage its own internal affairs.

Thus, as is the case with the United Nations, multilateral approaches based on the nation-state can serve as a mechanism for hardening soft national boundaries. There is, then, no contradiction between China's hard line on the Watercourse Convention and its growing regional multilaterism.

9.4 Borders as Buffer Zones

One factor that is rarely documented, but that necessarily comes into play in the interpersonal relations involved in crossborder flows, is ethnicity. One-half of the territory of the People's Republic of China is occupied primarily by the 9% of the population that falls into one of the 55 official minority categories (Gladney 2004: 7). These ethnicities tend to be located on the margins of the country (Fig. 9.2).

> The fair and rational use and management of the allocation of these international flows affects the sustainable development of one-third of China's territory and international regional cooperation and stability of China in Southeast Asia, South Asia, West Asia and Northeast Asia. In particular, it affects friendly relations between China and its 15 neighbouring countries.[6] It also impacts the reform policies of opening up to the outside and affects cross-border economic cooperation and stability in a border region that stretches over 22,000 km and includes 30 national minorities that span the borders (He et al. 1999: 528).

[6] Until 2003, China claimed Sikkim as one of 15 sovereign neighbours. In that year, China recognized its status as a state of India, while India recognized Tibet as part of China. Since then all agree that China borders 14 countries.

We may expect the possibilities of cross-border interactions, especially in the immediate border region, to be strongly informed by the nature of relations between the dominant but geographically central Han majority and the border minorities who are often majorities in neighbouring states. The way these ethnic relations play out in practice can be very complex in practice, however. Sometimes they are conflicting, and sometimes facilitating.

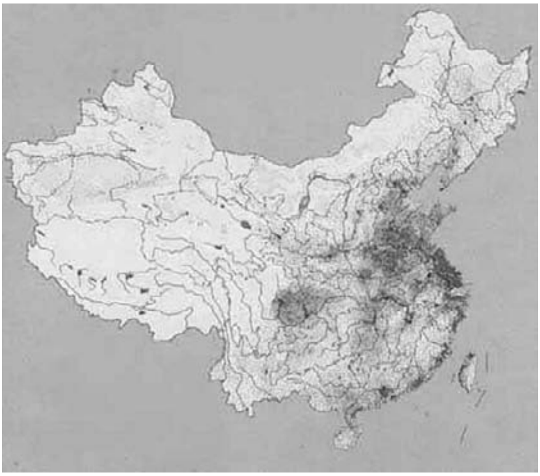

Fig. 9.2. China's population distribution. Source: http://depts.washington.edu/chinaciv/geo/people.htm

The southeast basins (Lancang/Mekong and Nujiang/Salween) have been well covered by others, but usually without explicit reference to ethnic dimensions. For example, Makkonen (2005: 290) notes a strong desire of local parties in Yunnan to be more considerate of their downstream neighbours, but it is not clear the degree to which ethnicity plays a role in this feeling of consanguinity. Here I will just note that there is a strong affinity between many of the Dai peoples in Yunnan and the majority Thai in Thailand and Lao in Laos that may operate together with (or in opposition to) commercial relations between the Han majority in China and the economically powerful overseas Chinese communities in Southeast Asia.

The role of the overseas Chinese (huaqiao) communities complicates an analysis of cross-border relations, especially in Southeast Asia, where they are economically dominant. *The Economist* claimed that the liquid assets of overseas Chinese are roughly equivalent to "all of the bank deposits in Japan" (18 July 2002: 21–24). Their presence in Southeast Asia is one factor in determining a widespread distrust of China in majority populations and their governments in the region (Chua 2002). This distrust was no doubt aggravated from 1909 to 1980, when successive Chinese governments (Imperial Ching, Republican, and Communist alike) granted citizenship to anyone with a Chinese father, no matter where they were born (Stuart-Fox 2003: 124, 172–173). At the same time, overseas Chinese have comprised a major source of social and economic capital, both within the region and in China itself. The globalization of China's economy, exemplified by its entry into the WTO, is likely to benefit overseas Chinese more than proportionally within their countries, making it even more imperative that Chinese foreign policy be accommodating to its neighbours, lest long-standing ethnic rivalries with majority populations rekindle throughout southeast Asia (Chua 2002).

Here, I would like to turn to some of the other borders, however, even though information on them is often quite limited. The treatment accorded these cases here must therefore be brief and conclusions drawn more than usually tentative.

9.5 China's Other Border Rivers

9.5.1 Heilong (Amur) River

Russia and China occupy comparable shares (48% and 43% respectively) of the 2,000,000 km^2 Heilong (Amur) River Basin, and most of the 4,300 km long border between the two countries, in China's northeast, is comprised of rivers in the basin. A well-publicized benzene spill on the Songhua (Sungari) tributary in Jilin, China in November 2005 temporarily endangered the water supply of the Russian city of Khabarovsk and brought the international nature of the basin to world attention. In 1969, during the Cultural Revolution, Chinese and (then) Soviet armies clashed, allegedly over the issue of sovereignty over a few islands in the border Heilong River. Nonetheless, the joint use of this basin (including Lake Xingkai/Khanka [Jin and Zhai, 2005]) has been largely unproblematic, due to the low population density, high latitude and abundant water in the area. The two countries formally delimited their borders in agreements negotiated over 40 years and concluded in 2004 (http://www.chinaembassy.org.in/eng/fyrth/fyrth/t166213.htm, viewed 14 January 2007). Both countries have been discussing developing hydropower stations along the mainstream of the Heilong, primarily to supply China's growing energy needs (Dong et al. 2004: 294).

In August 2006, China and Russia established the first free-trade zone at the border of the nearby Suifen River. The infrastructure is expected to be in place by 2010 (Furuya 2007).

In a rare exception, cross-border ethnicity is not a significant factor along the eastern borders of China and Russia. Each side tends to be dominated by immigrant populations from core areas (Russia and Han Chinese respectively) and their descendants.

On the contrary, the northeastern border with Mongolia adjoins China's Inner Mongolia Autonomous Region (equivalent to a province) and contains a number of shared rivers and lakes in the upper reaches of the Amur Basin. The two countries signed an agreement on the protection and utilization of transboundary waters in 1994 (in force in 1995) (http://ocid.nacse.org/cgi-bin/qml/tfdd/treaties.qml?qml_screen=full&TN=187), but there is little information on activity carried out under this agreement. The two countries also have common groundwater basins in the arid Gobi regions along the southern border of Mongolia (United Nations 2006: 496).

9.5.2 Cooperative: Korean

Cross-border ethnicity is more likely to be a significant factor in the area of Jilin Province in the Northeast along the Korean border. This area is subject to inevitable history wars between nationalist partisans on both sides, centering on the nature of the ancient (b.c.e. 37 to c.e. 688) Kingdom of Koguryo/Gaogouli and the setting of the current border along the Tumen and Yalu rivers in 1909 by agreement between the Chinese Government and the Japanese Resident General in Korea, Ito Hirbumi (Ahn 2006). Included in the deal was a division of Mt. Changbai (Baekdu in Korean), a sacred site to Koreans whose crater lake provides the source for both border rivers and the northward-flowing Songhua as well. Nonetheless, relations between China and Korea have been relatively harmonious over time, and in particular over the joint development of the two border rivers in recent decades.

Yalu River

One of China's most apparent successes in the use of a shared river may be the Yalu, with North Korea, especially in the area of hydropower. Ironically, the cooperation began with the inheritance of a facility, the large Shuifeng (Sup'ung) Hydropower Station (780 MW capacity), that was constructed from 1937 to 1944, at the very end of the period of Japanese occupation. According to Chinese sources, four of the six sets of power generators were removed by the Soviet army during its brief occupation in 1945–1946, leaving one each for China and Korea. The facility was then restored with design assistance from the Soviets, and recommissioned in 1955. At that time, China and North Korea signed an agreement specifying that the power station was jointly owned by the two countries and operated by the newly established China–Korea Hydropower Corporation. Production management was left to the Korean side, with the understanding that power was to be delivered equally to the two countries (Dong et al. 2004: 378–379).

Three power stations followed on the Yalu, the 400 MW Yunfeng (1959–1967), the 390 MW Weiyuan (1978–1988) and the 160 MW Taipingwan, with plans for two more. They all appear to have followed the model for the Shuifeng, with joint ownership under nominal management of the joint corporation, and generated power equally shared, but under the operational management of the Korean side (Dong et al. 2004: 294, 335–337, 379–380). These provided power for "one of the most developed electricity networks in Asia in 1980", but at least on the Korean side the poor maintenance and inefficiencies of that system have contributed to North Korea's energy crisis (http://www.globalsecurity.org/wmd/world/dprk/energy.htm, viewed 28 January 2007).

Tumen River

The Tumen River Basin is small, less than 30,000 km^2, mostly in China, but strategically located at the conjunction of Russia, China and North Korea. The river itself forms the boundary first between China and North Korea, and then, for its final 16 km before entering the sea, between North Korea and Russia. Ethnic Koreans are present in large numbers throughout the basin, constituting nearly half of the 2 million people in China's adjoining Yanbian Prefecture (the Russian portion is virtually unpopulated). This area has been the site for one of China's most significant multilateral cooperative activities. In the early 1990s the United Nations Development Programme (UNDP) provided the catalysis for the intergovernmental Tumen River Area Development Programme (TRADP), involving the basin countries plus Mongolia and South Korea. Included in this programme was TumenNeT, a multi-stakeholder "regional partnership program" supported by the Global Environment Facility (GEF) and the UNDP that aimed at preparing a Strategic Action Program (SAP) "to protect transboundary biodiversity and international waters and to attract green investment." (http://www.tumennet.org, viewed 10 Aug. 2005). TumenNeT, which ran from June 2000 to November 2002, identified a number of environmental problems that were exacerbated by national and international fragmentation of management, including "declining populations of key species, compromised water quality and loss of watershed functions, unsustainable agriculture and forestry … increasing residential and industrial pollution, worsening desertification and dust storms, habitat destruction and alternation, and loss of biotic integrity." (http://www.undp.org/gef/05/portfolio/writeups/iw/tumennet.html, viewed 14 January 2007). The TRADP received support from numerous other international organizations, including the Finnish Government, the East–West Center, the Asian Development Bank, the UN Industrial Development Organisation and the World Tourism Organization. Cooperative economic development appears to have continued in the area, with focus on providing port access to landlocked Chinese enterprises (Furuya 2006). From limited reports available, it does not appear that the SAP has been successful in improving water quality in the river, however (Onishi 2006).

Cooperation between China and North Korea has consistently been linked to shifting geopolitical considerations. For the most part, these considerations have reinforced cooperation: the Korean War, rivalry between China and the Soviet Union and, more recently, the growing economic and strategic importance to China of South Korea and China's desire to gain access to a port via the Tumen River. Recent frictions between China and North Korea over the latter's nuclear programme, and the rise of irredentist claims to a greater Korea, including the ethnic Korean parts of China, may make issue linkages less useful in supporting joint river development between the two countries. Barring a catastrophe, however, economic fundamentals favour deepening cooperation, although with uncertain effects on the environment.

9.5.3 Less Cooperative: Western Turkic Minorities

The problems involving shared river basins along the northwest border of China (Xinjiang) are in many ways similar to the better known southeast rivers, and arguably more complex hydrologically, ethnically and economically. In particular, growing economic and security interdependence have so far done little to mitigate criticism of China for non-cooperative upstream development of waters that may be affecting downstream neighbours who are themselves more actively engaged in developing regional cooperative arrangements over shared waters with the assistance of third-party (mostly European) actors (Weinthal 2002).

Since 1999, China has been engaged in a programme to develop its inland western areas, allegedly to redress a growing income gap with the coastal east that has been in a better position to reap the benefits from the rapid economic growth that has accompanied reform and greater openness to foreign investment and trade. Since many of these areas are populated by ethnic minorities, the programme has a clear secondary objective of cooptation and nation-building. Largely Muslim Xinjiang, like the central Asian countries to its west, has enormous energy reserves that are being tapped to fuel China's rapid economic growth, and has become the country's leading cotton producer.

The SCO began in large part as a government-to-government forum to counter rather than promote cross-border ethnic affinities, especially of the Moslem Turkic peoples of Central Asia. The lure of well-paying jobs has become a magnet for Han migration, possibly intensifying rather than moderating ethnic tensions. Environmentalists and even some political leaders have expressed concern that the unthinking import of the development model of the eastern part of the country, especially if accompanied by further Han migration, will have serious unintended consequences in the fragile ecologies and ethnic settlements of the west.

Two river basins, the Ili and the Itrysh, are of particular concern, both most immediately with neighbouring Kazakhstan. The Ili flows past the former capital of Almaty into Lake Balkhash, one of the largest freshwater lakes in Kazakhstan, and it is said to be one of the largest lake ecosystems in the world (Yessekin 2006: 12). The 14.6% of the basin (60,000 out of 413,000 km^2) in China generated nearly two-thirds of the runoff in 2004 (13.36 out of 20.6 km^3) (http://www.carec.kz/English/news/12.03.2007/Sheme_IMIBB.pdf). China has built 15 reservoirs on the tributaries of the Ili (Kash, Kunes and Tekes), with numerous more small impoundments in the planning stage (United Nations Economic and Social Council 2006). An International Conference on Implementation of Integrated Management in the Ili-Balkhash Basin, convened in February 2007 with support from the European Commission, did not succeed in eliciting a commitment from Chinese negotiators to scale back their appropriations of the Ili, although "they… were listening" (Greenberg 2007).

Until recently at least, the Irtysh, a branch of the Ob, was of much greater concern to Kazakhstan, primarily because of China's construction of a 22-meter wide, 300-kilometer long canal to divert an estimated 1 km^3 of the river's water annually to the oil fields of the Tarim Basin by the year 2020. At the same time, Kazakhstan has looked to the river as a source of water to support the development of the area around its new capital at Astana. China and Kazakhstan have held negotiations on joint use of the Irtysh since 1999, and signed an agreement on the joint use of 23 transborder rivers including the Irtysh and Ili in 2002 wherein they agreed to share information on the river and to establish a Joint Committee on Transboundary Rivers (Pannier and Magauin 1999; Burke 2001; http://www.fmprc.gov.cn/eng/wjb/zzjg/tyfls/tyfl/2626/t22920.htm). The committee has met and exchanged data, but it is unclear whether there has been much progress beyond that. One of the biggest controversies, at least initially, was over the annual flow of the river, which China estimated as being much greater than did Kazakhstan (12 km^3 cf. 9 km^3) (Burke 2001).

Despite the existence of the SCO, and the presence of Russia as a downstream user of the Irtysh beyond Kazakhstan, negotiations have been bilateral and on the basis of voluntary dispute resolution, principles that very much favour an upstream hegemon. Critics have accused China of dragging out negotiations and being less than forthcoming with data (e.g. Yermukanov 2006). Cross-linkages with China's eagerness to secure Kazakhstan's oil and gas do not appear to provide a major countervailing weight.

9.6 Current Issues: A Chinese Checklist

As noted at the outset, He Daming and his colleagues constitute a nearly solitary awareness-raising voice within China on international river basins. Recent analyses (He and Feng 2006) are devoted primarily to providing an overview of issues and options in the world outside, limiting itself to the Lancang–Mekong case in discussing basins of direct relevance to China and its neighbours. This indicates that many of the factors listed by He et al. nearly a decade ago (1999: 531–532) continue to impede cooperation between China and its co-riparians. These factors comprise the following.

1. Research is lacking on the basins, especially on their social, economic or environmental aspects, resulting in unclear baselines.
2. International boundaries have been contested (especially with India) and have shifted because of sedimentation, bank collapses and course shifts. The latter is particularly a problem in the northeast flows that are shared with Russia and North Korea. In 1995, a flood resulted in over 1000 dike collapses and changes in the course of the Yalu River in five places, moving 13 km^2 of land from Jilin Province over to Korea and with it timber resources valued at over 100 million yuan (US $13,000,000). Erosion losses are also serious in the transboundary rivers in Yunnan Province.
3. There is little awareness of the international dimensions of river flows when they are developed and managed. Few Chinese have studied international water law beyond translations of the documents.
4. China lacks an overall operational plan or management organization for international basins, and has not joined with neighbouring countries to establish international basin development and management organizations.

5. Cross-border cooperation focuses on economics, not resources or sustainable development. Widespread poverty on both sides of the border places constraints on funds, technology, skilled labour and information.
6. Inadequate attention is given to the fair and equitable use of waters or the allocation of rights over resources shared with other countries.
7. Different parts of the country face different cross-border problems. In the northeast, it is control of water pollution and ecosystem preservation. In the northwest, it is the fair and equitable distribution and use of water with bordering countries. The southwest is particularly complex, involving the delineation of boundaries, biodiversity protection, the distribution of water resources and the protection of water source areas.

In their recent book, He and Feng (2006: 147) offer four slightly different sets of reasons for China's reluctance to join the Mekong River Commission (MRC):

1. Little research has been carried out in China on the Mekong (Lancang) as an international river, leaving significant gaps or incongruities in basic data, such as for basin area and average quantity and quality of flow as it leaves China. In addition, the number of different agencies and voices involved domestically make it impossible for diplomats to engage in material discussions with other countries.
2. The potential constraints on domestic development of the river are unclear if China were to join the MRC.
3. China's regulations on state secrets do not allow the direct exchange of data between scientific research organizations and the MRC without the agreement of foreign affairs departments. They also block official exchanges with the MRC.
4. The breakdown of the economic planning system means that the development plans from the planning era are no longer implemented, making it difficult to resolve conflicts between development objectives or protect the national interest through diplomatic negotiations.

9.7 Implications and Lessons for the Future

Professor He's observations for the most part reinforce the points made elsewhere in this chapter. Many of his arguments are hardly unique to China. Water is seen as primarily a resource to be captured and used by nearly all its neighbours. Data relevant to cross-border flows is frequently uncollected, unreliable, or inaccessible. Diplomacy requires two-level negotiations, domestic as well as international, which may be beyond the technical or political capacity of foreign affairs offices. Even the heavy hand of China's state security regulations is not unique, either to the country or to its political system. None of China's neighbours are paragons of transparency. Critical hydrological data has been sequestered by the military in electoral democracies such as India and Israel, and may be universally characteristic of hegemonic behaviour in asymmetric dyadic relationships.

Thus if other things are equal, it is not surprising that China would be unwilling to be cooperative with its numerous co-riparians, given its upstream location in most cases. The possibilities of international cooperation may be strongly affected by Han-minority relationships and the involvement of overseas Chinese agents, but the ways in which these elements are playing out and are likely to do so in the future, especially over shared waters, are very complex. Nonetheless, the trend is for China to adopt a more cooperative stance with its neighbours, both as part of its grand strategy and out of economic necessity. As long as the bases for cooperation are more strategic and economic than environmental, however, the fate of shared river basins may remain an afterthought.

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10 Management of the North American Great Lakes

Marcia Valiante

10.1 Introduction

Management of the shared waters of the Great Lakes has been a matter of concern in relations between Canada and the United States for more than 100 years. How the two countries have addressed water management conflicts reflects many factors, including their history, commonalities and differences in their legal and political systems, evolution of the larger binational relationship, economic integration, each country's domestic political priorities and environmental agendas, among others.

In this comparatively water-rich region, allocation issues were worked out relatively early through the establishment of joint institutions, so that over the past 40 years, most of the legal and institutional developments that have been introduced respond to problems of water quality. A history of dramatic abuse and indifference spawned a complex array of norms, organizations, initiatives and programmes devoted to ameliorating past harm and facilitating ecosystem restoration. Through hard work, undertaken by a wide variety of organizations, and targeted on specific goals, Great Lakes water quality has improved in the last 30 years. However, many problems remain, and new ones are continually identified, requiring ongoing attention.

The way in which these problems have been and are being addressed transcends the classical international relations model of governance, where states are the primary actors. It is a good example of what has been called "post-sovereign governance" in an international context (Karkkainen 2004). Development and implementation of norms shaping the behaviour toward the Great Lakes involve a complex web of largely cooperative relationships among multiple participants, including supranational organizations, national governments, First Nations, subnational and local governments, non-governmental organizations, experts and individuals. This is consistent with a transnational model of governance, characterized by partnerships between governmental and non-governmental entities (Piilola 2003), and centred on the goal of the ecosystemic integrity of the Great Lakes Basin. "What emerges from this multi-institutional system is something other than a neat, unified approach to the basin, but one that increasingly appears to embody some core principles of ecosystem management" (Rabe 1997).

This chapter explores the evolution of this governance system, reviews its strengths and weaknesses, and considers ways to make the system more effective in the future.

10.1.1 Characteristics of the Great Lakes System

The Great Lakes – St Lawrence River system is the world's largest freshwater ecosystem, accounting for almost 20% of the world's available surface water. The system contains about 23,000 km^3 of water and covers an area of 244,000 km^2 (Government of Canada 1995). The size of the basin, or the land drainage area, is approximately 521,830 km^2. There are five lakes of differing sizes and characteristics,[1] with five "connecting channels"[2] and associated tributaries that empty into the St Lawrence River and from there into the Atlantic Ocean 3,200 km from the headwaters.

Almost 40 million people call the Great Lakes Basin home, 10% of the population of the US and 1/3 of the population of Canada. The Great Lakes provide a foundation for the economic, social and cultural life of the region. However, the pressures on the waters of this ecosystem are enormous. Exploitation of its natural resources, starting with furs, fish and logs, helped ensure early settlement of the region by Europeans. Mining and smelting, steel making and heavy manufacturing were established by the late 19th century, and continue to this day, accompanied by urbanization, agricultural development, pulp and paper and chemical manufacturing, commercial fishing, transportation, drinking water supply needs, hydropower development, and recreation.

Despite their size, the Great Lakes are vulnerable to toxic contamination. Retention times are long, ranging from 191 years for Lake Superior to 2.6 years for Lake Erie[3] (Government of Canada), so only 1% of the water in the system is cycled through the system annually. This allows contaminants to become more concentrated, often moving through food chains. Their large surface areas make the Lakes vulnerable to accumulations of pollutants through atmospheric deposition. In addition, soil erosion rates are high in some areas, contributing fertilizer,

[1] Lake Superior is the largest and deepest, containing 12,100 km^3 of water, or more than half of the system's total volume. The climate is cold and the land surrounding the lake is comprised of granite outcrops, with poor soils. It is largely forested, with conifers dominating. Lake Michigan is the second largest lake, with a volume of 4,920 km^3 of water. Its basin is sparsely populated in the northern, colder areas, and is very heavily populated in the south. Lake Huron is the third largest lake, with a volume of 3,540 km^3 of water. Land use in its basin is quite varied, comprising many cottages, but also intensive agriculture and some locally significant industrial development. Lake Erie is the most southerly lake. It is the smallest lake by volume and the shallowest. Its basin is heavily agricultural interspersed with heavy urbanization. It is the most productive of the lakes. Lake Ontario is smaller in surface area than Lake Erie but deeper. Major urban areas line the Canadian shore of the lake, with significant local industrial development across the basin.

[2] The St. Mary's River connects Lake Superior to Lake Huron, the St Clair River, Lake St Clair and the Detroit River connect lakes Huron and Erie, and the Niagara River connects lakes Erie and Ontario.

[3] Retention times for the other lakes are: Lake Michigan, 99 years, Lake Huron, 22 years, Lake Ontario, six years.

wastes, and pesticides from agricultural operations[4] (Colborn et al. 1990). Current environmental problems stem from historic contamination, continuing inputs of known and newly identified toxic substances, increasing numbers of alien invasive species, increased demand for water, increased run-off and natural heritage destruction owing to urban development, changes in agricultural production, energy production, and waste disposal.

10.1.2 Participants in Great Lakes Governance

Responsibility for the water management of the Great Lakes is divided between a large number of organizations, both domestic and international. Domestically, both the US and Canada have a federal system of government, dividing jurisdiction between a "federal", that is, national, government, and states and provinces. Eight US states share at least some part of their coast on the Great Lakes.[5] In Canada, the Great Lakes are exclusively within the province of Ontario but the St Lawrence River cuts through the province of Quebec. Being riparians gives each of these governments authority over some aspects of the waters of the Great Lakes.

Within these governments, responsibility for the Great Lakes and environmental protection is divided between different agencies and different programmes.[6] In both countries, the lead federal agencies are the environmental departments, the US Environmental Protection Agency and Environment Canada. A similar pattern occurs at the state and provincial level.

In the US, the states have primary authority over water resources, but the federal government plays the lead role on water quality standards. Coordination between governments is pursued through the US Policy Committee, with representatives of federal, state and tribal agencies. Because of significant differences between the states in terms of their water management programmes, the federal government has also attempted to bring greater consistency to state water quality programmes and standards.[7]

[4] In southern Lake Michigan, erosion occurs at the rate of 3.1–4 tons per acre per year, and in some part of the Lake Erie Basin, erosion occurs at the rate of 2.1–3.0 tons per acre per year.

[5] These are Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania and New York.

[6] For example, in Canada, shipping is the jurisdiction of the Department of Transport, fisheries that of the Department of Fisheries and Oceans, wildlife that of Natural Resources Canada, etc. In the US, the National Oceanic and Atmospheric Administration, US Geological Survey, Fish and Wildlife Service, Army Corps of Engineers, are all involved through some 148 different programmes.

[7] The most concerted effort is the Final Water Quality Guidance for the Great Lakes System, popularly known as the Great Lakes Initiative, adopted pursuant to the Great Lakes Critical Programs Act of 1990. The Great Lakes Initiative established uniform minimum water quality standards that the states are expected to implement through their point source discharge permit systems.

In Canada, provinces have primary authority over natural resource development and environmental protection, but the federal government has authority over navigation, fisheries, and international relations. This overlapping authority led the federal and Ontario governments to coordinate their activities through an intergovernmental agreement, known as the "Canada–Ontario Agreement", last updated in 2002. This agreement sets out detailed principles and strategies for Great Lakes clean-up that the two governments will pursue.

In both countries, there are also aboriginal communities scattered throughout the basin with some governing authority over the issues of the Great Lakes. First Nations in Canada have constitutionally protected rights. They must be consulted, and their interests accommodated, whenever government action may interfere with those rights (Supreme Court of Canada 2004). Tribes in the US have been recognized as having authority equivalent to that of states for purposes of environmental regulation, so are directly involved in water quality regulation.

Beyond these governments, there are hundreds of municipalities within the basin that have authority over decisions affecting land use, waste management, sewage treatment and stormwater management. In Canada, this level of government includes both local and regional governments, which operate with provincial oversight. Mayors from many Great Lakes cities have formed a binational coalition known as the "Great Lakes and St Lawrence Cities Initiative" to coordinate their activities and ensure local interests are represented in discussions with other levels of government.

The two countries have also created a number of binational organizations with significant roles in restoring and protecting the Great Lakes. The most well-known and most important is the International Joint Commission (IJC), created by treaty in 1909 (United States 1909) with responsibility over all waters shared between the two countries, of which the Great Lakes are a part. The IJC was given several new roles exclusively focused on the Great Lakes, starting in 1972. The IJC is a six-member commission with equal representation from each country. Members are appointed by the President of the US and by the Governor in Council in Canada. The IJC has offices in Ottawa and Washington, and a Great Lakes Regional Office in Windsor, Ontario. Regarding the issues of the Great Lakes, the IJC operates through several standing boards, plus *ad hoc* task forces and working groups, composed of staff from federal, state and provincial agencies and other experts on Great Lakes issues, with secretariat support by the Regional Office staff.[8] Its role is discussed more fully below.

The other major binational organization is the Great Lakes Fishery Commission (GLFC), established by treaty in 1954 (Canada 1954). After several failed attempts at binational cooperation on fisheries management, it was the devastation to shared fisheries caused by sea lamprey introduction that propelled the parties to negotiate an agreement to facilitate joint management of Great Lakes fisheries.

[8] These include the Great Lakes Water Quality Board, the Great Lakes Science Advisory Board, the Council of Great Lakes Research Managers and the International Air Quality Advisory Board.

The GLFC has eight members (four from each country) and a secretariat staff in Ann Arbor, Michigan, and relies on outside expert advisors for assistance. Its mandate relates to the coordination of fisheries research, recommendation of measures to ensure a sustainable fishery, sea lamprey control and implementation of joint fisheries management plans.

The Great Lakes state governments work cooperatively on environmental management issues through the Great Lakes Commission (GLC), created under US law in 1955 as an "interstate compact". It is formally comprised of representatives of the eight Great Lakes states. Ontario and Quebec were initially "observers", but have been "associate" members of the GLC since 1999, allowing them limited participation. The mandate of the GLC is to advance the common interests of the sub-national governments on issues relating to economic development and environmental quality. The GLC operates through a large number of advisory committees and task forces on a wide range of issues, including invasive species, land use impacts, brownfields re-development, wetlands, dredging, and others. The GLC also collects data from the states, on air emissions for example, and runs the Great Lakes Information Network, a web-based source of information on Great Lakes concerns.

Also at the state-provincial level is the Council of Great Lakes Governors, made up of the 10 Governors and Premiers. It was established in 1983 to coordinate efforts on regional economic development and environmental protection. One of its main concerns has been the issue of water diversion and export, on which it has developed agreements on how proposals for diversion or export will be handled. The Council has also adopted an agreement on the control of toxic substances. Most recently, it has negotiated an agreement establishing a common standard for all jurisdictions to apply in water management decisions and a regional process for reviewing significant water diversion and consumptive use projects.

Looking at governments alone does not give a true picture of the nature of governance in the Great Lakes. One of the most important elements in shaping the values and policies and in achieving progress on regional water issues has been the rich diversity of civil society participation (Wapner 1997). This has included hundreds of domestic public interest groups, from the national to the local level, scientists and other university researchers, policy experts, active participants from industry and labour unions, health professionals, recreational users, and many others. There are also multiple networks that bring together each of these categories of groups from both sides of the border. Some of the most influential are Great Lakes United, the International Association of Great Lakes Research, and the Council of Great Lakes Industries. Many public and private foundations based in the region have supported the work of non-governmental organizations and researchers (Valiante et al. 1997).

10.2 Evolution of Great Lakes Governance

Management of the Great Lakes forms a part of the legal and institutional framework governing Canada-US water management. In the 19th century, navigation and fishing rights were the most important bi-national issues with respect to the Great Lakes. By the turn of the 20th century, the region was intensively developed, and other conflicts emerged. Two of the most divisive for bilateral relations were the diversion of water out of Lake Michigan at Chicago and plans to use water at Niagara Falls for electricity generation. At the same time, water issues relating to allocation for irrigation and power development were also arising along the international border in other parts of the continent (LeMarquand 1993). The two countries soon accepted that a permanent forum for resolution of problems over the use of shared waters was needed, and they negotiated a treaty to establish the "rules of the game" for all boundary waters, including the Great Lakes.[9]

The Boundary Waters Treaty established a number of principles that were to govern relations over all shared waterways.[10] With respect to allocation, the governing principle is that each party has an equal right to use boundary waters. With respect to quality, Article IV of the Treaty provided that boundary waters and waters flowing across the boundary "shall not be polluted on either side to the injury of health or property on the other" – a progressive principle for the time.

The Boundary Waters Treaty also established the International Joint Commission (IJC). The powers of the IJC under the Treaty are:

- to review and decide upon all proposals for "uses or obstructions or diversions" of boundary waters (or of waters flowing into or from boundary waters) on one side of the border that could affect the natural levels or flows on the other side;
- to manage levels in two specific river systems;
- to study and report on "other questions or matters of difference" between the parties "involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along the common frontier" when referred to it by the parties; and,
- if asked by the parties, to give binding decisions on disputes referred to it.[11]

9 At this time, Canada, although created as a self-governing dominion in 1867, did not have responsibility for its foreign relations. This authority was held by Britain until 1930, so it was formally with Britain that the United States negotiated the Boundary Waters Treaty.

10 These principles include: free navigation of boundary waters and Lake Michigan for residents of both countries (Article I); exclusive national jurisdiction over use of waters within each country, subject to rights of redress should any injury occur in the other country (Article II); equal and similar rights to use of boundary waters (Article VIII); in case of conflict, priority of uses shall be, first, domestic and sanitary purposes, second, navigation, third, power generation and irrigation (Article VIII). Shared waters were classified as "boundary waters", that is, those forming the boundary; waters flowing across the boundary; or tributary waters.

11 The power to give binding decisions has never been used, so the work of the IJC has focused on its other roles.

With regard to the Great Lakes, the IJC has been involved in regulating dams and diversions for hydropower and navigation, controlling water levels[12] and, through several "references", it has played an important role in studying water quality, levels, diversions, water exports, and transboundary air quality.

10.2.1 Water Quality

Since its first reference from the national governments in 1912, the IJC has been concerned about the water quality of the Great Lakes. It reported on its study in 1918 to the effect that water quality in the lakes themselves was pristine, but that in the Niagara, Detroit, St Clair and St Mary's rivers, the water was "unsightly, malodorous and absolutely unfit for domestic purposes." Thousands of deaths occurred every year owing to cholera and typhoid until drinking water treatment began as a result of this reference. Unfortunately, pollution was not curtailed.

Through the 1940s and 1950s, following significant industrialization and urbanization of the basin, the IJC was given further references by the parties. Although some recommendations from these studies were adopted, the system continued to decline until, by the late 1960s, an IJC study demonstrated that the Lakes had become "seriously polluted on both sides of the boundary to the detriment of both countries and to an extent which is causing injury to health and property on the other side of the boundary… [P]olluted waters are lakewide in extent [and] the two principal causes are wastes discharged by municipalities and industries…," with agricultural wastes also a factor (IJC 1970). This report came out in 1970, at a time of nascent environmental awareness and activism. Its findings were reinforced by news reporting of several dramatic incidents, including oil spills, the Cuyahoga River on fire and the "death of Lake Erie" from eutrophication. Public sentiment was galvanized and governments were convinced to act, apparently finally convinced that the benefits of cooperative action outweighed the costs of inaction. The action they took was to negotiate an agreement between the two national governments, known as the "Great Lakes Water Quality Agreement" (GLWQA), signed in 1972 (Canada 1972).

The 1972 GLWQA set the stage for the present management system. The two governments agreed to focus on all waters of the drainage basin of "the Great Lakes System", including Lake Michigan. The parties agreed on general water quality objectives for the Lakes as well as specific joint objectives for phosphorus and several other forms of pollution. Implementation of the specific objectives was left to each country and their different legal and political systems, but the Agreement provided the direction that implementation was to include programmes for controlling discharges of municipal sewage, controls on industrial pollution and from other activities.

Institutionally, the parties turned to the well-established IJC "to assist in the implementation" of the agreement. The IJC was given responsibility for:

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[12] The IJC continues to operate "boards of control" that determine the amount of water levels and flows in the St Mary's River, the Niagara River, and the St Lawrence River.

- “collation, analysis and dissemination of data and information supplied by the Parties and State and Provincial Governments” relating to water quality;
- collection, analysis and dissemination of data and information concerning water quality objectives and the operation and effectiveness of the programmes and other measures established pursuant to the Agreement”;
- “tendering of advice and recommendations to the Parties and to the State and Provincial Governments,” including, with respect to “water quality objectives, legislation, standards and other regulatory requirements, programmes and other measures, and intergovernmental agreements relating to” water quality;
- assistance in the coordination of joint activities;
- assistance in the coordination and dissemination of water quality research; and
- investigations and reporting regarding other subjects referred to it. (Initially, this included the status of the Upper Great Lakes (Huron and Superior) and on the contributions of land use activities to contamination of the Lakes).

The IJC was required to make an annual report to the parties on progress toward meeting the Agreement objectives, including an assessment of the effectiveness of the parties’ programmes. It was given the discretion to publish “any report, statement or other document” it prepared and the authority to verify independently the data submitted to it. A comprehensive review of the Agreement’s effectiveness was to be done in its fifth year.

In order to help it carry out its new responsibilities, the IJC was mandated to establish new joint institutions: a Great Lakes Water Quality Board (made up of representatives of the parties and state and provincial governments), a Research Advisory Board (made up of government representatives plus others involved in Great Lakes research activities), and a Regional Office.

Pursuant to this Agreement, the parties adopted different domestic approaches to implement the specific objectives but, by 1977, when the Agreement was reviewed, they had largely succeeded in meeting the phosphorus objective. Progress was tracked closely by the Water Quality Board and reported to the governments and the public through IJC annual reports.

Scientific researchers in universities and governments began to focus more and more during this period on evidence of the presence of persistent, bioaccumulative toxic substances, including PCBs, Mirex and DDT and 100 others, in the waters, sediments, fish and wildlife of the Great Lakes Basin and on deposition of such substances from the air and land-based activities as well as from direct discharges to water. These research findings as well as “the expanding involvement of environmental organizations and the absence of a strong lobby against… helped create a favourable political climate” (Botts and Muldoon 2005) that heavily influenced the review and led to re-negotiation of the Agreement.

A significantly revised Agreement was adopted in 1978 (Canada 1978). The 1978 Agreement shifts from an emphasis on phosphorus control to an emphasis on controlling the impacts of toxic substances (although phosphorus control was continued and new objectives set). A new purpose and policies were added. Perhaps “the most profound new feature of the 1978 Agreement was the call for an ecosystem approach to management, making ecological integrity rather than only water chemistry the accepted goal…" (Botts and Muldoon 2005). In addition, the parties agreed that "the discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated…".[13] A significantly expanded list of specific objectives and a number of new Annexes were included to address issues identified by the IJC and the parties, including non-point source pollution.

Some changes to the role of the IJC were made in the new Agreement, although its role continued largely unchanged. The IJC was to continue to monitor progress but was to report to the parties every two years, rather than annually. It was given added responsibilities regarding the collection and dissemination of research and the provision of advice to the parties. The IJC was to carry out its responsibilities principally using the Water Quality Board (WQB) and the renamed Science Advisory Board. The Water Quality Board's mandate shifted from assisting the IJC to now being its "principal advisor". This created somewhat of a conflict of interest because the WQB was composed entirely of senior agency officials and the Board's responsibility was to assess the effectiveness (or lack thereof) of these agencies' programmes. The IJC was also to ensure "liaison and coordination" among Agreement institutions and other institutions carrying out work on the issues of the Great Lakes. A further review was to be undertaken following the third biennial report.

Following the adoption of the 1978 Agreement, the parties took steps to implement its objectives through domestic action. Starting in 1980, however, the US federal government began to pull back from strong environmental protection domestically, which spilled over into programmes affecting the Great Lakes. In the meantime, scientific evidence was growing that toxic substances in the Great Lakes were having adverse effects on human health. Environmental organizations were growing in size, number and sophistication and calling ever more loudly for greater governmental attention to this evidence and for action in response. In the early 1980s, a binational citizens' coalition, Great Lakes United, was formed. The IJC had adopted a formal policy on public participation in 1980, in pursuit of which it began deliberately to link more directly with public interest groups, disseminating information and opening its meetings to broader involvement. The states became more and more concerned and involved in the Great Lakes issues, increasing the environmentally focused activities of the Great Lakes Commission, and forming the Council of Great Lakes Governors in the early 1980s, through which they took leadership on the issue of water diversion. In 1985, a major joint independent scientific assessment of the GLWQA was concluded. Much of the research and public participation activities were supported by private foundations located in the region. The major concerns of all those involved were the growing impacts of toxic substances and the gap between Agreement objectives and government actions.

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[13] Annex 12 added that "regulatory strategies for controlling or preventing the input of persistent toxic substances" were to be aimed at protecting the health of humans and aquatic life and "the philosophy adopted for control of inputs of persistent toxic substances shall be zero discharge."

All of this influenced the parties when they sat down to review the Agreement, as required in 1987. The IJC's Third Biennial Report, the 1985 independent scientific review and the report of extensive public consultations conducted by Great Lakes United all identified a lack of progress toward Agreement objectives. The negotiations included, for the first time, representatives from regional environmental organizations (officially, as observers) who participated actively in the discussions. A Protocol was adopted, amending the 1978 Agreement. The 1987 Protocol strengthened the existing objectives and programmes. New Annexes were added to address issues such as non-point source pollution, contaminated sediment, airborne toxic substances, and pollution from contaminated groundwater. Two new processes were devised, one for the development, implementation and review of "remedial action plans" (RAP) to clean up 43 local "areas of concern," and the other for development and implementation of "lakewide management plans" (LaMPs). Annex 11 was amended to require that the parties develop and implement a joint surveillance and monitoring programme to track progress under the Agreement. Finally, some changes in the roles of the parties and the IJC were made. In particular, the parties agreed in Article X that they would "meet twice a year to coordinate their respective work plans with regard to the implementation of this Agreement and to evaluate progress made."

This latter, seemingly minor, provision meant that the parties would directly, not via the IJC, evaluate progress toward meeting the goals of the Agreement. This, combined with some internal changes in IJC operations, has led to some shift by the parties away from previous levels of participation in IJC activities (Botts and Muldoon 2005). The parties formed the Binational Executive Committee (BEC) to set priorities, coordinate binational programmes and evaluate progress under the Agreement. It was through the BEC that the parties adopted and began to implement a joint strategy for achieving "virtual elimination" of priority persistent organic pollutants, after numerous IJC reports calling for urgent action (Binational Executive Committee 1997). The parties also began to host their own biennial meetings, known as the State of the Lakes Ecosystem Conferences, or "SOLEC".[14]

The Water Quality Board's role was changed from principal evaluator of programmes to "policy advisor", in an attempt to eliminate a perceived conflict of interest. However, this eventually left the IJC with very limited resources to carry out the task of evaluating programmes intended to implement Agreement objectives.

Since adoption of the 1987 Protocol, there have been changes in all aspects of the Great Lakes regime other than in the formal agreement structure. Changes since 1987 include:

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[14] The major task of SOLEC has been to develop a set of indicators by which to measure progress toward the goals of the GLWQA.

- changes in the internal workings of the IJC and the Boards;
- significant cutbacks in the budgets of environmental departments at the federal, state and provincial level, particularly for monitoring and enforcement activities, followed recently by renewed interest in clean-up;
- expansion of the work of SOLEC;
- growing First Nations and Tribal involvement in Great Lakes issues;
- increasing interest in Great Lakes issues by mayors and local officials;
- increased participation by industry in basin-level policy issues;
- a decline in funding and basin-scale activities of environmental NGOs;
- increased action on local and lakewide issues through RAPs and LaMPs;
- growing public concern with water supply issues and the impact of trade agreements on future availability of Great Lakes water for regional purposes;
- state and provincial priority on negotiating water management agreements to control, in particular, the issue of water export and diversion;
- emerging evidence about new contaminants in the environment not addressed in the GLWQA, including bromiated fire retardants, pharmaceuticals and hormone-disrupting substances;
- a broadening of concerns beyond toxic water pollution to include habitat degradation, alien invasive species, urbanization impacts, agricultural run-off, atmospheric deposition, and climate change;
- Within governments, the approach to environmental regulation has shifted away from traditional "command and control" approaches to "smart regulation", that is, greater reliance on cooperative, negotiated requirements, economic instruments and information-based approaches.

All of these changes help frame the debate about the future of the GLWQA and Great Lakes governance more generally.

After 1987, formal reviews by the parties suggested some changes should be made to the Agreement, but none were made. It is only with the review commencing in 2006 that the governments appear ready to re-open the agreement to make significant changes for the first time since 1987.

10.2.2 Water Quantity

Under the Boundary Waters Treaty, two principles guide the right to use Great Lakes Basin water. First, for waters classified as "boundary waters", which includes the lakes themselves and the connecting channels, each country has an equal right to their use. Second, for waters that exist on one side of the boundary but will flow across, each country has the exclusive right to their use, subject to an obligation to provide access to legal remedies if injury occurs in the other country. Ongoing decisions about flows are made through Boards of Control operated under the International Joint Commission for the St Mary's River, the Niagara River and the St Lawrence River, for purposes of power and navigation. Otherwise, decisions about allocation are made under domestic law, in both countries at the state or provincial level.

The Great Lakes Basin is a comparatively water-rich region. Over time, this sense of the Lakes as containing an endless bounty of water led to very wasteful practices and left legal rules underdeveloped. As a result, today residents of this region have the highest *per capita* water use in the world. Recently, however, there has been a major shift in popular understanding about this bounty. Even though the lakes contain almost 20% of the world's freshwater, annual renewal is only at the rate of 1%. With many claims on this water for local uses, many stresses on water quality, and many uncertainties about the impacts of climate change, recent threats of diversion and export of Great Lakes water have met with stiff resistance from the public and their politicians.

In the 1980s, a number of proposals to divert large amounts of water from the Great Lakes to other parts of the US were actively studied and debated (Donahue et al. 1986). The response from governments in the region was that they wanted to control any diversion. In 1985, the governors of the eight Great Lakes states and the premiers of Ontario and Quebec adopted a non-binding agreement known as the "Great Lakes Charter" (Council of Great Lakes Governors 1985). While recognizing that the Great Lakes constitute a single hydrological system, the Charter required that each of the 10 governments be notified and consulted about any proposal for a major diversion of water from the lakes. Diversions were not prohibited by the Charter, but politically this was the stance of all of the leaders. The Charter also committed the leaders to developing a "cooperative water resources management programme" for the basin, which was not done.

To reinforce the governors' ability to control the destiny of Great Lakes water, the US Congress adopted a mechanism in the 1986 Water Resources Development Act (WRDA) which requires the approval of all of the eight governors for any diversion of water from the US side of the international boundary out of the basin[15] (WRDA 1986). Importantly, both the Charter and the WRDA focused on the basin as the boundary, not the political jurisdictions. This meant that, for states that are only partly within the basin, a diversion from one part of their territory to another would trigger the Charter and WRDA.

Thereafter, the proposals for large-scale, continent-wide diversions disappeared. The only proposals that did come forward were more local. Several proposals to divert water from the lakes to other parts of the states that straddle the basin were reviewed –some were approved and some denied. In 1998, a proposal by a small Ontario company to put water from Lake Superior into tankers and ship it to Asia was initially approved by the Ontario government without any consultation under the Charter. A wave of controversy erupted and eventually led to changes in the laws of both countries, a reference to the IJC, and negotiation of a new state-provincial arrangement, known as "Annex 2001" (Valiante 2004).

Annex 2001 is in fact two agreements, now in the final stages of negotiation. One, the Great Lakes Basin Sustainable Water Resources Agreement, is an agreement between the eight states and two provinces. The other is the Great Lakes Basin Water Resources Compact, an agreement among the states alone, which is

[15] This federal law was considered necessary because the state arrangement was considered vulnerable to challenge under the US Constitution's Commerce Clause.

considered necessary to make the arrangement binding under US law.[16] The states and provinces agreed to prohibit diversions out of the basin, with limited exceptions for communities that straddle the basin, to deal with that politically difficult issue. In addition, they agreed to adopt minimum standards to apply to major withdrawals of water for use within the basin. This is important because a number of the jurisdictions have little or no regulation in place; it will force them to develop water management to at least a minimum level and apply conditions such as conservation. In addition, very large consumptive uses will require "regional review", that is, review by representatives of all of the 10 signatory governments.

These agreements are important for the purposes of this chapter because, firstly, they reflect a long-overdue, but concerted effort to develop standards for water allocation and use that are likely to become increasingly important in the future as conflicts increase. Secondly, they demonstrate the leadership of the states and provinces on this issue and their commitment to control what happens to Great Lakes water, without interference from the federal governments.

10.3 Strengths and Weaknesses of the Great Lakes Governance Regime

To what extent has this governance system proved effective in meeting its goals?[17] With respect to Great Lakes water quality, one can point to a number of successes. Pursuant to the 1972 GLWQA, improved sewage treatment helped reduce phosphorus loadings to agreed-upon levels, resulting in dramatic improvement in water quality, in Lake Erie in particular, and fewer beach closings. After the 1978 Agreement, toxic discharges were significantly reduced,[18] resulting in declining levels of toxic contaminants in water and biota. Heavily degraded "areas of concern" are being cleaned up through the combined efforts of governments at all levels and local interests, with two fully "de-listed" and two "in recovery". Decimated wildlife species such as bald eagles are recovering. Lake trout are at self-sustaining levels in Lake Superior and are successfully reproducing in Lake Ontario. Scientific research funded for GLWQA purposes has been used as the foundation for international efforts to reduce the use of persistent organic pollutants

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[16] The final Annex Implementing Agreements were signed by all Great Lakes Governors and Premiers on December 13, 2005. The Agreement will come into force in stages, as each jurisdiction adopts the provisions into its law; the Compact will require approval by the US Congress in order to create legally binding obligations."

[17] It is difficult to demonstrate that a particular approach to governance is "effective" owing to the difficulty of tracing and isolating the effects of something so ill-defined as a Great Lakes governance system. An in-depth discussion of the general problems with proving "effective" governance is found in Young (1999).

[18] Environment Canada estimates that there has been an overall reduction of 71% in the use, generation and release of seven priority toxic chemicals; an 82% reduction in discharges of chlorinated toxic substances and virtual elimination of water discharges of dioxins and furans from pulp and paper mills.

and to control long-range transport of air pollutants. The concept of an ecosystem approach to environmental management has spread to many other regions.

For water quantity, major conflicts over projects affecting levels or flows have been successfully managed by the IJC, through its approval jurisdiction and its ongoing Boards of Control. The states and provinces have developed a system for controlling diversions and export that is untested, but that has managed, politically, to forestall major proposals from coming forward.

A number of factors have contributed to these successes.

1. Equality – The IJC, governmental agencies at all levels, and many other Great Lakes organizations have followed the principle of equality of the parties, despite the differences in population and economic and political power between the two countries. This has meant that most Great Lakes bodies have equal representation of the two parties. This has been especially important to Canadian participants, who have thereby been able to exercise considerable influence over decisions.
2. Common vision and common objectives – In the GLWQA, the parties, encouraged by the scientific community, agreed on a common vision and set of principles, and they established common standards, specifically focused on the Great Lakes Basin as an interdependent ecosystem, and equally applicable to both countries, despite differences in their contributions to Great Lakes pollution. Although the Agreement is implemented through domestic programmes, this common vision, which has been referred to as the "North Star" of Great Lakes governance, set the direction for all governments and organizations as they went about designing and implementing their programmes. The particular common vision adopted was a progressive one, including concepts such as the ecosystem approach and zero discharge for persistent toxic pollutants, which has challenged decision-makers and influenced subsequent regulation beyond the Great Lakes region. Likewise, in the Great Lakes Charter and the Annex 2001 agreements, the states and provinces have adopted a common vision around water quantity management, centred on the basin as an interconnected system.
3. Different scales of action – While the overall principles and objectives have been agreed to by the two national governments, detailed management plans and actions to implement the objectives take place at different scales: basin-wide, lake-wide, state/provincial, regional, and local. As concerns addressed by the GLWQA became more complex, the parties found it increasingly difficult to "manage" at the system-wide scale. Combined efforts with state, provincial, and local governments and organizations became necessary, as evidenced for example by the addition of RAPs and LaMPs in the 1987 Protocol. A shifting yet overlapping constellation of organizations is involved at each level and on each issue, but to the extent that actions at different levels reinforce each other, they contribute to the success of the whole regime.
4. Strong scientific foundation – Scientists were the ones who initially pushed for action to address the issue of the contamination of the Great Lakes. Through the early references, the parties and the IJC fostered a strong research culture

around Great Lakes issues and this has continued. Scientists from agencies and universities have always played a central role in IJC organizations and these served as the fora for debates about the research findings that flowed to them. This joint and scientifically grounded approach to reaching consensus on the nature and extent of the problems facing the Great Lakes has also been extremely important to the convergence of views on solutions. It has been the source of the IJC's credibility and the strength of its influence with the parties.[19] This approach spawned leading scholarship and innovative concepts, including the ecosystem approach, understanding of persistent organic pollutants and endocrine-disrupting substances, among others.

5. Active community participation – Certainly one of the most influential features of an effective Great Lakes regime has been the development of a strong network of NGOs and other civil society groups focused on relevant issues. Parts of the network already existed but its development into a coordinated network was facilitated by deliberate efforts and resources supplied by the IJC, several foundations and governments. The Great Lakes are a powerful symbol around which to frame the debate and organize public support for clean-up. Using the Great Lakes as a symbol reinforces a regional identity, deepening the public's support for progressive action. Many existing national or regionally prominent groups formed Great Lakes programmes and joined together with local groups to do many things, including shaping the agenda, lobbying governments, providing expert advice, monitoring, evaluating progress, disseminating information to the public, and helping implement programmes. The creation of Great Lakes United in the early 1980s "led to coordinated binational activism for the Great Lakes and expansion of the Great Lakes environmental community in both countries" (Botts and Muldoon 2005). GLU is also an important player because it brings together NGOs and others with many different interests in the Great Lakes, including First Nations, labour unions, recreational groups, conservation groups and wildlife protection organizations. This coordinated community successfully sparked public demands for action on toxic contamination, and helped to sustain government support for Great Lakes programmes when government interest was flagging.
6. Good governance mechanisms: accountability and adaptability – The GLWQA is built around the concept of independent evaluation of the parties' progress toward its objectives. Under the Agreement, it is the parties and the states and provinces that implement domestic programmes to meet the common objectives and it is the role of the IJC to assess their success in doing so and make recommendations for improving their success. Information is the currency of this system of accountability. The parties are obligated to supply information to the IJC and the IJC disseminates that information, along with research findings and a

[19] The IJC has been referred to as an "arbiter of fact", a "means of obtaining agreed upon and trusted technical and social data… The IJC studies give each side the confidence to deal with the other's proposals without being side-tracked by endless debates about facts, effects, and opportunities. It establishes a common factual and technical base between the governments, the essential first step in successful negotiations" (LeMarquand 1993).

wide array of reports, to the public. This ensures transparency and facilitates accountability, so long as the parties fulfil their obligations. In addition to the IJC's role, governments themselves collect and make publicly available considerable amounts of data through domestic legal requirements. A lot of NGO activity, directed toward ensuring accountability, is contingent on this information being provided. Accountability is also ensured by the work of the governmental auditing bodies in both countries who carry out periodic audits of the parties' success in meeting their obligations regarding the Great Lakes. The system also allows for adaptive management, in that there is ongoing review of the "state of the Lakes" and mandatory periodic review of the GLWQA. The IJC's Boards review their priorities in every two-year reporting cycle and modify their programmes as needs change. The Agreement, in both its objectives and methods, has evolved as understanding of the problems in the Great Lakes has evolved.

7. Partnerships – at all levels, action is taken by a complex web of formal and informal, permanent and *ad hoc* networks, with governmental, intergovernmental and non-governmental organizations, and private firms working in partnership. At times, the federal governments have played a leadership role, for example, in pushing states to adopt uniform standards, but leadership has not been exclusively "top-down". It has shifted over time and across issues, with different actors coming forward as others retreat.
8. "Binationalism" – The formal structure and operating procedures of the IJC and its Boards has always been based upon the principle of independence, so that commissioners and officials sitting on the Boards serve in their personal and professional capacities, rather than as representatives of their governments. This has created a climate of trust and cooperation within the IJC and has allowed them to take a unified stand on most issues, increasing their credibility.

Despite these successes and undoubted strengths, it is clear that the Great Lakes Basin remains subject to significant stresses, that the purpose of the GLWQA "to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem" has not been achieved. The most recent "State of the Lakes" assessment concluded that the status of the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem is "mixed", with signs of both recovery and degradation (US EPA 2004). Given the serious and complex problems facing the Lakes, this is probably not surprising. However, while there is clear evidence of progress toward that goal, there is also clear evidence of both an "unfinished agenda" and emerging threats.

Here are some examples. A recent study on the state of the ecosystem found that 70% of the indicators studied relating to health of the lakes were "mixed", "mixed-deteriorating", or "poor". Levels of toxic substances are still high enough to generate fish consumption advisories throughout the basin. Studies have shown that adverse health effects, at levels higher than the provincial average, are associated with living in Ontario's Areas of Concern. Beach closings have become more common owing to combined sewer overflows, inadequate sewage treatment and run-off from agricultural operations. A deoxygenated summertime "dead zone" in Lake Erie has recently re-emerged. Uncontrolled introductions of alien invasive species have allowed them to spread through the system, dramatically modifying natural systems, threatening native species, and causing billions of dollars in associated economic losses[20] (Great Lakes Regional Collaboration 2005). A legacy of contaminated sediments and habitat destruction requires immediate attention. Emerging threats include newly identified chemicals of concern, proposals to divert or export water, rapid urbanization, and climate change.

Both political and structural problems have hampered the effectiveness of the Great Lakes regime. Because the governments retain control over implementation, progress depends on domestic action, which is influenced by domestic politics. Not surprisingly, government commitments have gone up and down with changing political ideologies and shifting economic priorities. Public support in both countries has been generally strong, helping to push governments to meet their commitments, but it also has not been sustained at a consistent level. Other concerns have emerged within each country and at the international level that compete for the attention of governments, NGOs and the public. Industry, which did not play a major role in Great Lakes institutions until the 1990s, has become a more dominant influence. Environmental groups are still active, but have lost some funding and many have turned to other issues. However, they are reinvigorated when individual issues come to the fore, as was most recently seen in the debates around water diversion and the Annex 2001 agreements.

What should be clear from the earlier discussion is that the governance structure in the Great Lakes Basin is complex, with a great many organizations at all levels pursuing different mandates, participating in hundreds of programmes and initiatives, held together by the tenuous thread of a few core principles. This approach has been described as a "cluttered mess" because it was developed in a disjointed fashion and operates with limited coordination of the disparate pieces. There is no central control of the system, but only a weak organizational structure. Without some coordination mechanism for all the programmes, there is a significant risk of both duplications of effort and gaps in coverage, and considerable potential for confusion about who is in charge.

Although many levels of government and NGOs are active in carrying out the objectives of this regime, the federal governments do play a pivotal role. Yet, as their commitments changed, local and regional initiatives proliferated to fill at least some of the gaps. The IJC, while centrally placed, has neither the authority nor the resources to play a central coordinating role, even with respect to its strength in science assessment. This lack of central control is not necessarily a problem, as long as there is coherence in policies, priorities and programmes and no major gaps exist. The Great Lakes system may be too large and complex for central control to be realistic, and it is politically unrealistic to expect the parties to yield sovereignty to an international organization such as the IJC. Nevertheless,

[20] It has been estimated that at least 162 non-native aquatic species have become established in the Great Lakes, with one new species identified every eight months.

coordination remains a high priority and failure of the parties to achieve it will fuel the argument for centralization of control in a binational organization.[21]

Many specific (and similar) problems have been identified with the efforts of both parties. The Canadian federal government has been criticized by its environmental auditor, the Commissioner for the Environment and Sustainable Development, for failing to have

> some of the basic information it needs to develop priorities and action plans. For example, it has no overall picture of the many contaminants in the basin or the contribution of groundwater to the basin. Consequently, it is involved in many remedial actions with no way to determine which are the most important and what they will contribute. (Government of Canada 2001)

In addition, the Commissioner concluded that the federal government's commitments and priorities lack transparency and clarity and many are outdated, that it has been inconsistent in its approach, that its monitoring programmes are inadequate, that funding cuts have hampered programme implementation and weakened its scientific capacity, that many key commitments have not been met, that it has failed to meet its obligations to provide information to the IJC, and that the pace of progress is slow. Instead of a federal strategy that comprises "constant vigilance, a long-term view, sustained actions, research and monitoring, and stable funding in line with commitments", the federal approach is characterized by short-term, incremental steps, insufficient data collection, inadequate support for scientific research and inadequate funding. "But diminished funding is not the only reason why the government is not meeting key commitments. The limited use of federal powers, weaknesses in basic management and accountability, and the politics of federal-provincial relations have all played a part."

The United States Government has been criticized by its auditing branch, the Government Accountability Office, for failing to develop a comprehensive strategic plan for restoration of the Great Lakes (US GAO 2003) and for failing to develop a comprehensive monitoring programme that would provide the "information needed to monitor restoration progress and assess the degree to which the parties are complying with the requirements and objectives of the agreement" (US GAO 2004). Other problems identified with the US programme include a lack of clearly defined organizational leadership structure, failure to coordinate the different programmes and agencies involved in the issue, failure to coordinate its restoration goals and monitoring activities with Canada's goals, and lack of an "an accurate, complete and centralized source of existing monitoring information for coordinating activities."

It is clear that demonstrable progress on Great Lakes restoration depends both on a sustained commitment of resources from all players to monitoring, research,

[21] The US Government recognizes the problem and is taking steps to improve coordination of programmes (*albeit* only on its side of the international boundary). A federal Interagency Task Force was established in May 2004 by Executive Order of the President, with the task of convening a "regional collaboration" of federal, state, tribal and local government officials, NGOs, and citizens to develop a strategy for restoration of the Great Lakes. The strategy was finalized in December 2005.

communications and management programmes and on significant improvements in coordination of the vast array of activities around water management and clean-up. The scope and complexity of the task means that securing the necessary resources over the decades it will take to restore and maintain the system and finding effective coordination mechanisms are the major challenges ahead.

10.4 Looking to the Future

On the issue of water quality, Canada and the US have commenced a formal review of the GLWQA, which will take place over the next year. The review will include extensive consultation between federal, state and provincial governments, First Nations and Tribes, the IJC, other stakeholders and the public. In the past, the purpose of the review has been to update the Agreement and, if necessary, codify changes that have occurred, and to set the stage for the future.

One of the leading issues in the current review is whether the Agreement should move away from its primary emphasis on water pollution issues and formally become an ecosystem restoration or sustainable development agreement. While the 1978 Agreement did introduce the ecosystem concept and establish an ecosystem restoration purpose, the then controversial nature of the concept and its unknown implications led the parties to put the bulk of their efforts into water pollution reduction.

Some principles in the Agreement are out of date. In practice, the parties and other stakeholders have long since moved beyond water pollution issues toward ecosystem concerns. Programmes in both countries address biodiversity, invasive species, land use, air deposition, climate change, groundwater contamination, water supply, etc.[22] The IJC has long been studying and making recommendations on such issues (IJC 2004). During the review, some have proposed expanding the GLWQA beyond a focus on water quality to become an ecosystem restoration agreement. This proposal has prompted some to question whether such a shift would undermine the Agreement's strengths in achieving reductions in water pollution. Others argue that including the issues of air pollution and climate change requires actions that are beyond the Great Lakes ecosystem and thus risks losing the unique ecosystem focus.

Even if it is decided to continue to address only water quality, the principles and annexes of the Agreement should be updated to reflect more recent scientific understanding of the interrelationships between environmental issues. For it has been repeatedly demonstrated that protecting water quality can only be accomplished through concerted efforts to reduce air pollution, control land-use activities and adopt pollution prevention measures.

[22] These are reflected in the approach of the 2002 Canada–Ontario Agreement and the US Great Lakes Strategy, for example. The parties also now include the St Lawrence River and involve the government of Quebec in the system.

An additional question is whether the Agreement should continue as a "passive" instrument, with the international aspects focused on monitoring and reporting of domestic progress, or whether it should become an action-oriented "management" agreement (Pollution Probe 2004). Even with a broader set of principles, it is less likely that the parties will agree to a more action-oriented agreement. This would require them to cede greater authority over implementation, perhaps to the IJC, and thereby lose some control over the direction and pace of action. The recent efforts at coordination within the US point in the opposite direction, indicating a greater reliance on domestic rather than binational implementation.

Employing a broader lens will demand tools for even greater coordination. Not only are more stakeholders involved but current governments resist using taxpayers' money to take up the slack. This raises questions about who should be responsible for coordination, and what mechanisms should be used. Many people look to the IJC, the obvious bilateral institution, to play that role. However, it is unlikely that the parties will be willing to use the IJC in this way, as they have shown great reluctance to expanding the powers of the Commission in recent years. If they did, the IJC's organizational structures and operations would have to be changed. Even without major new powers, the IJC's structures should be reviewed and updated.

One of the most pressing demands of the Great Lakes governance system is for better information collection and management. This science-driven system has suffered from inadequate monitoring; as the concerns addressed in the Agreement broaden, the problem expands. It is crucial in a loose governance system such as the Great Lakes to ensure that comprehensive information is collected and made available to all stakeholders, allowing them to play their different roles and foster accountability. However, this is an area of chronic underfunding by national governments, for which they are repeatedly criticized.

On the issue of water quantity, the Annex 2001 agreements have been finalized and the hard work of implementation has begun. For some jurisdictions, including Ontario and Minnesota, there will be relatively little administrative reform needed to implement the agreements. For others, however, new laws and regulatory machinery will need to be put in place. For all, the new region-wide agency will have to get up and running, and detailed rules of operation instituted. In the US, concerted effort will be needed to convince Congress to approve the compact. In Ontario and Quebec, the terms of the agreement will have to be implemented by legislation.

10.5 Conclusion

The North American Great Lakes, shared by Canada and the United States, as with all international basins, have unique characteristics and a unique history that make it difficult to identify portable lessons, suitable for adoption elsewhere. What appears at first glance to be a superficially simple system, implicating only two countries, both industrialized, with democratic traditions and highly integrated economies, is in fact a complex system of transnational governance directed towards an expanding range of seemingly intractable problems. Serious challenges face the participants, particularly with respect to coordination of effort, ongoing commitment of resources, updating the goals, and adapting to new problems.

In this case, whatever success there has been has come from a consistent emphasis on the basin as an integrated ecosystem. Even though actions are taken at different levels, the common thread is the benefit to the system as a whole. Unlike some cases of transboundary pollution in an upstream/downstream context, the parties accept that action is necessary on both sides if either country is to make gains. This creates a strong incentive for cooperation. Emphasis on the basin has also helped create a regional identity, beyond national affiliation, that grounds public support for concerted action.

The existence of a permanent binational organization has been crucial to ensuring a convergence of views on the nature of the problems to be confronted and the range of solutions available. The IJC has also been important in ongoing monitoring and review of progress toward common goals, in the face of inconstant commitments by governments. The public availability of information has promoted transparency and reduced the ability of the national governments to avoid their obligations. A key factor in accountability has been the active engagement of diverse networks of domestic and binational scientists, NGOs, and others.

Within a permanent institutional structure, governance has been adaptive, responding to changing scientific understanding and priorities. The arrangements were in certain ways deliberately planned to be reflexive, for example, through requirements for regular review and evaluation. Planning for change allows a governance system to learn and adapt to unexpected challenges.

Perhaps the most important lesson from the Great Lakes experience is the lesson of prevention. In this region, economic development proceeded without regard for the long-term environmental consequences. Only at the point of severe environmental degradation did the two countries accept that cooperative action was needed. Clawing back to even a reasonably sustainable ecosystem will mean many generations of concerted effort, fuelled by billions of dollars in public and private funds. Sustaining the commitment necessary for this effort will continue to be difficult and will demand ongoing vigilance.

Acronyms

BEC	Binational Executive Committee
GLFC	Great Lakes Fishery Commission
GLWQA	Great Lakes Water Quality Agreement
IJC	International Joint Commission
LaMPs	Lakewide Management Plans
RAP	Remedial Action Plans
WRDA	Water Resources Development Ac

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11 The Rio de la Plata River Basin: The Path Towards Basin Institutions

Lilian del Castillo Laborde

11.1 Introduction

The Río de la Plata drainage basin is one of the five greatest drainage basins in the world with special particularities to be recognized and admired. It is formed by the discharge of waters from five countries – Argentina, Brazil, Uruguay, Bolivia and Paraguay – extending over some 3,100,000 km^2.[1] The basin as a whole has a mean annual precipitation of 1,100 mm ranging from desert zones in the Upper Bermejo river basin to sub-tropical regions in the Upper Paraguay river. Such a diversity derives from the interconnection of a number of sub-basins. Each sub-basin – the Tieté, Paranapanema, Paraná, Iguazú, Uruguay, Paraguay, Bermejo, Pilcomayo, Iguazú, Salado del Norte, and Río de la Plata rivers – has its own rich characteristics and their confluence extends geographically until reaching the common terminus of the Río de la Plata.[2] These sub-basins spread over extensive territories of some of the basin countries, and their features will be briefly described to provide the physical characteristics that will introduce the institutional and legal framework.[3]

Indeed, it is well established that a basin comprehends surface and groundwater resources constituting, by virtue of their physical relationship, a unitary whole and normally flowing into a common terminus.[4] Therefore, it encompasses the main stream of an international river and its tributaries, as well as international lakes and groundwater which are connected with other parts of an international watercourse. Groundwaters should be considered as parts of the basin, and their links with surface waters should also be fully taken into consideration even though they

1 Argentina 790,000 km^2, Bolivia 205,000 km^2, Brazil 1,415,000 km^2, Paraguay 410,000 km^2, Uruguay 150,000 km^2, Totalling 3,100,000 km^2. Source: http://www.ina.gov.ar.

2 Technical data from the La Plata Basin Case Study, Second World Water Assessment Report (WWAR), with the most updated information currently available.

3 Del Castillo Laborde, L (1999) The Plata Basin Institutional Framework. In: Management of Latin American river basins: Amazon, Plata, and São Francisco, AK Biswas, NV Cordeiro, BPF Braga, and C Tortajada. United Nations University Press, Tokyo, 175–204.

4 Article II of The Helsinki Rules on the Uses of the Waters of International Rivers, adopted by the International Law Association at the fifty-second conference, held at Helsinki in August 1966. Report of the Committee on the Uses of the Waters of International Rivers (London, International Law Association, 1967).

may present distinct features as compared to surface waters. A broader conception, however, includes all waters and also the territory that the basin spans.

Fig. 11.1. South America and the Río de la Plata Basin

The Río de la Plata Basin is a rich array of wildlife and extensive ecosystems, and environment balancing is necessary for population growth, the expansion of industrial, agricultural and mining activities and large-scale hydraulic engineering.

The Río de la Plata River, the common terminus of the drainage basin, has a length of 250 km from its inner limit with the Uruguay River and the outer limit with the Atlantic Ocean. The river is short but extremely wide at its mouth, 224 km long, with a water surface of 35,000 km². Its sources are the Paraná River and the Uruguay River, each comprising several sub-basins, the Paraná River Basin being the larger one (Paraná River Basin: 2,660,000 km² and Uruguay River Basin: 440,000 km²).The mean discharge into the Atlantic Ocean amounts to 23,000 m^3/s. It has a number of tributaries along its banks, the main stream on the Argentinean bank is the Salado River and on the Uruguayan bank it is the Santa Lucía River.[5]

The Tieté River originates in Brazilian territory, at the Serra do Mar, in the vicinity of the Atlantic Ocean. It is the most important river of the São Paolo state, Brazil. It flows 1,150 km in Brazilian territory until it reaches the Paraná River.

[5] Del Castillo Laborde, L (2005) The Río de la Plata and its Maritime Front Legal Regime. Argentine Council for Foreign Relations (CARI), Buenos Aires (In Spanish). Published in English in 2007 by Martinus Nijhoff Publishers, Leiden and Boston, MA.

Another important tributary of the Paraná River is the Paranapanema River, 929 km in length, a Brazilian river which runs across the States of São Paolo and Paraná, Brazil.

The Paraná River is a Brazilian river at its sources which, after flowing in Brazilian territory, forms the boundary between Brazil and Paraguay, and continues its flow to form the boundary between Argentina and Paraguay. After receiving the waters of the Paraguay River at Confluencia, it turns its east–west direction into north–south and it is an Argentinean river in its lower stretch until it debouches in a large delta into the Río de la Plata. It has a length of 2,570 km, which could be enhanced to 3,740 km if taking the Paranaiba River into account. Its high mean flow of 17,700 m^3/s makes the Paraná River the most relevant regarding the total basin flow.

The Paraguay River, a tributary of the Paraná River, is a boundary river between Bolivia and Brazil, Paraguay and Brazil, and Paraguay and Argentina. Its length is 2,621 km. It has a basin of 363,592 km^2 which has different zones and forms the large Pantanal of Xarayes wetland, of 147,629 km^2. It receives a number of tributaries, the Apa River, the Verde River, the Negro River, and other main tributaries, the Pilcomayo and Bermejo rivers. The mean annual flow, including the Pilcomayo and Bermejo rivers, is 2,700 m^3/s.

The Bermejo River, a tributary of the Paraguay River which has its sources in Bolivian territory, is part of the boundary between Argentina and Bolivia and then flows into Argentinean territory. The river flows from east to west and forms swamps in the plain region. It divides into two branches, the Teuco River in the north and the old bed of the Bermejo River in the south and both branches finally form the Lower Bermejo until it debouches into the Paraguay River. Its length is 1,060 km and its basin surface reaches 123,000 km^2. The annual flow is irregular and varies between 20 and 14,000 m^3/s. The solids suspended in the river waters are 7 kg/m^3 in some areas.

The Pilcomayo River Basin in the territories of Argentina and Paraguay has a surface of 270,000 km^2. The sources of this tributary of the Paraguay River are in the Andean Cordillera in Bolivia, and the total length is 1,100 km. However, it is not a single watercourse, because its course silts up and divides into two main branches, North and South, which meet again and form the Lower Pilcomayo. It has a mean annual flow of 200 m^3/s. It flows east–west from Bolivia to Argentina, and forms the boundary between Argentina and Paraguay.

The Iguazú River is a tributary of the Paraná River, which originates at the Serra do Mar in Brazilian territory. Its total length is 1,320 km, flowing 1,205 km in Brazilian territory until the confluence with the San Antonio River, where it becomes an international river and forms the boundary between Argentina and Brazil. In the international stretch lie the impressive Iguazú Falls, formed by 275 magnificent waterfalls about 70 m high and distributed over an extension of 2,700 m. After the falls, the river flows a short distance until it debouches into the Paraná River. The basin surface is 62,000 km^2.

The Salado del Norte River, a tributary of the Paraná River, has its sources in Argentinean territory and flows 1,150 km until it debouches in the Paraná River at the Santa Fé City, running across the country from its northern part in the Puna, across the Chaco and finally in the Santa Fe Province.

The Uruguay River is a Brazilian river at its sources, which then becomes a boundary river between Argentina and Brazil and, in the last stretch, it is a boundary river between Argentina and Uruguay. The basin spans an area of 365,000 km^2, which represents 11.8% of the total basin surface. It is located 42% in Brazil, 41.1% in Uruguay and 16.4% in Argentina. It has a length of 1,600 km and a mean annual flow of 5,500 m^3/s. The Uruguay River has two main tributaries, the Negro and the Cuareim rivers, both on the left bank spreading over the Brazilian and Uruguayan territories.

11.2 Building a Basin Institutional Framework

The object of an international structure for the water resources of the basin is to make cooperation work between the riparian countries and to elaborate the guidelines for the basin policies. These guidelines were agreed by riparian countries at the basin organization and they mirror their interests. Basin policies should be implemented by the riparian States national institutions and for that reason a constant interaction between the regional and the national institutions is required. The basin organization constitutes a bridge between the basin guidelines elaborated at the regional level with a comprehensive perspective and the national policies focused on their specific and local demands. An international basin requires a basin organization and, once established, a basin organization needs the capacity to elaborate basin policies. The absence of a basin organization or the existence of an organization without planning purposes will produce similar results, segmented policies and divided uses. This is the state of affairs for a great majority of international basins, with the consequence of different regimes for one interdependent resource.

International basin institutions should be efficient, and riparian countries should vest the basin organization with the functions and the capacity to enhance cooperation between them. Cooperation at the regional level is the path towards comprehensive basin management, at the same time proclaimed and rejected by riparian countries of international basins, international lakes, and international aquifers.

11.2.1 The Río de la Plata Basin Treaty

The fact that a basin is a geographical unit does not mean that it should have a single riparian, a unified policy or a coordinated institutional management. On the contrary, political boundaries, whether international or interstate ones, in most cases run across the basin's territory and waters. The Río de la Plata Basin is not an exception, with five riparian countries, two of them with a federal political organization. Accordingly, a legal and institutional framework should have both an international organization and a national reception of the international rules for its implementation. Both legal regimes are in place but their description would only be a simplified overview of compacts and statutes. For a comprehensive picture, it is worth looking into the aim behind those legal instruments and the intention of the parties mirrored by the organizations thereby established. International regimes gather political relationships and institutional structures, different scenarios with their own languages and communication mechanisms. Both levels are intertwined in the legal design of international affairs – including those of water – to build the reality of international law.

The need to favour cooperation with regard to the uses of watercourses running through the territory of two or more countries has frequently been stressed in meetings of the American States. Precedents emerge from the instruments following regional conferences which, among the matters considered, included topics related to the uses of watercourses. The Protocolo de Paz entered into in Buenos Aires on 12 June 1935, which brought the Chaco War between Bolivia and Paraguay to an end, established that a traffic, commerce and navigation regime would be adopted bringing in facilities to foster the development of these countries.[6] Subsequently, the Meeting of the Foreign Ministers of the American Republics held in Panamá, from September 23 to October 3, 1939 recommended in its Final Act 'To promote the negotiation of bilateral or multilateral agreements for the organization and maintenance of regular and connected streamship services between the countries of the Continent in order to facilitate the direct traffic of passengers and cargoes.'

Soon afterwards, the Regional Conference of the Countries of the Río de la Plata Basin was held in Montevideo, Uruguay, from January 27 to February 6, 1941. The Regional Conference focused on navigation and on the industrial and agricultural uses of the watercourses of the basin. The Declaration issued by the Conference stated that the undersigning riparian countries, Argentina, Bolivia, Brazil, Paraguay and Uruguay, recognized freedom of navigation to the ships of all flags on the rivers of the basin and, based on such circumstance, it was recommended to set up joint technical commissions 'in order to study ways and means of improving the navigability of those rivers, forming part of the hydrographic system of the Río de la Plata, which flows between or through two or more of the countries concerned.'[7] The Declaration added that these joint commissions were to undertake special studies concerning: (a) Prediction of rises in water levels; (b) Placement of marking buoys and beacons; and, (c) Any factors liable to affect navigation conditions. Additionally, it recommended that the riparian States should conclude 'agreements amongst themselves regarding the use of the said rivers for industrial and agricultural purposes,' consistently with what had been

[6] Peace Protocol, Buenos Aires, 12 June 1935, Republic of Paraguay, National Publisher, Asunción, pp 6–11.

[7] Resolution concerning the establishment of joint technical commissions to study the hydrographic system of the river Plate, Regional Conference of the Countries of the Río de la Plata, 6 February 1941, Document A/5409, p. 212–213.

stated in the Declaration of Montevideo concerning the industrial and agricultural uses of international rivers of 1933.[8]

The genesis of the current institutional organization of the Río de la Plata Basin took place when a combination of national and international convergent factors facilitated the necessary sequence of negotiating rounds. The institutional organization of the Americas was conveniently developed in the 1960s. Thus, there was a regional organization, the Organization of American States (OAS), which could support the initiatives of member States regarding joint development programmes; a regional branch of the Economic and Social Council of the United Nations for Latin America (ECLAC), to foster regional technical cooperation, and a regional financial institution, the Inter-American Development Bank (IDB), to assist regional infrastructure development with other international financial institutions.

The drafting of a future convention on the rights and duties of States on the utilization of international rivers was, at that time, the concurrent interest of Argentina and Brazil, the two major South American rivers' riparian States. For that purpose, in 1963, Brazil suggested at the OAS that a conference should be convened on the subject,[9] a proposal that started a two-year drafting task by the OAS Juridical Committee of a draft Convention on the Industrial and agricultural utilization of international rivers and lakes, which was approved by the Committee on September 1, 1965.[10] Notwithstanding the fact that the draft convention gathered the point of view of each riparian State and that it was extensively discussed by the Committee, the diplomatic conference formally convened to approve the outline was never held, and the preliminary version failed to become a legal instrument.[11]

In 1966, the Argentinean Government, on its part, interested the IDB to undertake the study of the water resources of the Río de la Plata Basin, which is also called in a shorter denomination La Plata Basin, and for that purpose convened a meeting of the riparian countries to discuss the initiative. The meeting, which took place in Buenos Aires on 27 February 1967, became the first meeting of the Río de la Plata Basin countries. It was agreed to organize a regional project for the basin water resources system and the Coordinating Intergovernmental Committee of the Río de la Plata Basin Countries (CIC) was established. The CIC was launched as a permanent entity with the functions of assisting the countries in the joint and comprehensive study of the La Plata Basin and of outlining a programme of

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[8] Declaration of Montevideo concerning the Industrial and Agricultural Use of International Rivers, Seventh Inter-American Conference, 24 December 1933, United Nations, Document A/5409, p. 212.

[9] Letter dated March 27, 1963, of the Brazilian representative at the OAS addressed to the Secretary General suggesting calling a Panamerican Conference referred to the utilization of international rivers and explaining the benefits that would derive from the adoption of a set of rules stating and regulating the rights and duties of riparian States, Doc.OEA/ser.G/VI.C/INF.

[10] OAS Official Documents/OEA Documentos Oficiales, OEA/Ser,I/VI.CIJ.75Rev., pp 140-156; Doc. OEA/ser.I/VI.2, CIJ-79.

[11] Interamerican Juridical Committee, IJC-CJI, Resolution X of November 30, 1965, Rio de Janeiro, ibidem, n.8, p.5.

multinational, bi-national and national works that would be conducive to the regional development. The works would include infrastructural development, some of which would be water-related. The IDB was eager to sponsor the La Plata Basin project and together with other organizations, i.e., the OAS, the UNDP, the ECLAC, the INTAL (IDB-Institute for the Integration of Latin America and the Caribbean), among others, organized the Consultative and Coordinating Board for the La Plata Basin Development Programme (Inter-Institutional Agreement of 10 November 1967). The INTAL was appointed as the Secretariat of the Board and its President as Secretary of the Board.

The first report prepared by the OAS in 1968 addressed the institutional and legal issues for the future programme (OAS, General Secretariat, Legal Department, Programme for the Development of the La Plata Basin: Institutional and Legal Aspects, December 1968), which was not foreseen exclusively for the development of the water resources system of the basin but as a regional physical infrastructure programme. The priority was regional development through infrastructure development, desired in the southern part of South America. On 18–20 May 1968 the second meeting of the La Plata Basin countries took place in Santa Cruz de la Sierra, Bolivia, and the most important infrastructure projects were listed even though the comprehensive study of the basin water resources was in its first stages. The CIC was entrusted to draw up a treaty in order to enforce the institutionalization of the basin. In 1969, the sponsor organizations' institutional Board was dissolved when the riparian countries adopted the Río de la Plata Basin Treaty on 23 April 1969 on occasion of the third La Plata Basin meeting at Brasilia, Brazil. The institutional organization created by this agreement embedded the already established CIC as its operating organ, and transformed the Meeting of the Foreign Affairs Ministers of the La Plata Basin Countries into the highest political decision body. The new organization was furnished with a permanent General Secretariat with its seat at Buenos Aires, Argentina.

The La Plata Basin Treaty also provides the necessary institutional mechanisms to pursue its goal. The treaty structures three basic organs, which remain part of the personified actors obliged to comply with the coordination and execution of the Treaty provisions. The organs are the Conference of Foreign Affairs Ministers, representing the riparian states' highest interests; the CIC, analysing in depth the technical coordination; and the General Secretariat, which provides a common centre for administrative and informative action.

The decision-making mechanism established for the CIC and the Foreign Affairs Ministers Meeting was the rule of unanimity, which is a convenient rule with regard to the consistency of the decisions with each Party's opinion but very difficult to overcome in the decision process. The 250 resolutions adopted in 20 meetings by the Foreign Affairs Ministers were usually too general and, accordingly, with limited implementation at the national level. Another limitation of the La Plata Basin institutional system arises from the absence of information duties between the regional organization and the riparian countries with regard to the basin-related works and water uses. The outcome of a basin organization with general goals but deprived of implementing tools, is a policy-oriented institution without compliance functions. It is neither more, nor less, than a legal framework with an accompanying institutional framework.

The Río de la Plata Basin Treaty[12] provided the basis for further bilateral and multilateral agreements concerning works for hydropower generation, navigation and management aspects. According to its Article 1, the Parties have the main objective of promoting "the harmonious development and physical integration of the Río de la Plata Basin and its areas of direct and measurable influence". With the purpose of complying with this goal, it was necessary, as a preliminary task, to identify areas of mutual interests in which the policies of the riparian States converged and this was one of the first tasks of the CIC. The Treaty also included the Parties' aim to promote "the rational utilization of water resources, especially by the regulation of watercourses and their multiple and equitable exploitation". This was inserted in the Treaty not only as a matter of legal principles for water uses, but also on practical grounds. Achieving a substantive coordination of projects and programmes was the common intention of the Parties, the basic consensus stated in the agreement. In another perspective, the preservation of natural resources, of animal and plant life, and the promotion of inventory assessments derives from the idea of reasonable and equitable utilization.

One of the main issues the Treaty implicitly dealt with is the concept of "basin". The Treaty provisions are geared towards the unity of the basin and the interrelation of its components, especially when they foster the comprehensive knowledge of de La Plata Basin as a whole and when they establish the equal representation of the five riparian countries in the Treaty organization.

Navigation is a very important use in the basin watercourses and it also requires the cooperation of the riparian states in the different stretches. The amelioration of the river basin conditions to improve navigation so as to cope with increasing traffic demands should be jointly carried out. In fact, partial improvements are of no use in waterways crossing the territories of different countries and special agreements for that purpose were concluded.

Water quality and environmental standards are referred to in the objectives of the Treaty. One of them is the conservation and development of animal and plant life and the other the surveying, assessment and development of the natural resources of the basin. These goals involved a number of issues for natural resources utilization and a number of decisions by the Plata Basin organization, dealing with the duty to protect the water resources of the basin. To implement the Treaty objectives on the matter, the exchange of information was proposed at several meetings as well as the elements and parameters to be monitored and controlled (Resolutions No. 67 (VIII) of 9 December 9th, 1976, requesting the exchange of information on water quality between riparian States, reiterated in Resolution No. 123 (X) of 6 December 1978; followed by Resolutions No. 192 (XV), No. 196 (XVI) and No. 2 (E-II) and Resolution No. 140 (XI) of 4 December 1980, adopted by the Foreign Affairs Ministers of the Río de la Plata Basin Countries).[13]

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[12] U.N.T.S. 875 (1973), p. 11–13.

[13] Resolutions of the Foreign Affairs Ministers of the Río de la Plata Basin, CIC, General Secretariat, Buenos Aires, Argentina.

11.2.2 New Organs of the Treaty System

The original structure of the Treaty established in 1969 has been modified with the addition of new organs and the amendment of the existing ones. The two organs added were the financial fund (Constitutive Agreement of the Plata Basin Financial Development Fund, FONPLATA) and the Programme for the Navigation of the Paraguay-Paraná Waterway (Hidrovía). Together with these incorporations, the CIC was amended not in terms of the functions vested in it by the Treaty but with regard to the representation of member States. In fact, technical delegates were included together with the diplomatic representatives in each member State delegation. Moreover, meetings of the diplomatic agents of member States at the CIC venue in Buenos Aires, Argentina, were included in its Statute in order to facilitate the preparatory work for the CIC meetings. The CIC Secretariat was also transformed into a General Secretariat with new capacities to foster the participation of the Treaty system in national and international events.

From the first steps of the basin's institutional foundation (Santa Cruz de la Sierra Minutes, 1968) the basin States realized that it would be necessary to have a financial branch to support the future programmes and projects. In 1971, the IV Foreign Affairs Ministers Meeting held in Asunción, Paraguay, created the financial body of the Plata Basin (Resolution No. 5 (IV) of 6 June 1971). The functions and capacity of the new entity were outlined in the next meeting (Resolution No. 44 (V) of 7 December 1972). The FONPLATA was agreed upon on 12 June 1974, in the VI Meeting of Foreign Affairs Ministers, as an international institution and it was also decided that its headquarters would be in Bolivia. The seat was located in the city of Sucre (Resolution 56 (VII)), where it began its operation in 1977. In December 2002, the permanent seat was moved to Santa Cruz de la Sierra, Bolivia (CIC, Session 529, December 2002).

The entity would be funded by larger contributions of the basin countries with stronger economies, Argentina and Brazil, and would give priority to finance works in the three countries with smaller economies, Bolivia, Paraguay and Uruguay, according to its Constitutive Agreement (Article 13). However, the five countries would contribute to the common fund.

From its creation to the end of 2006, the FONPLATA provided financial support to 72 activities of member States amounting to US 919.1 million and sponsored 18 activities for technical cooperation amounting to US 4.9 million. The financial policy was geared mostly towards infrastructure development, agriculture, health, manufacturing and exports promotion. The trend to support especially the member countries with smaller economies was reversed and, out of the 12 loans approved between 2003 and 2006, five were awarded to Argentina, five to Brazil, one to Bolivia and one to Uruguay. Financial assistance was granted to initiatives for regional development, addressing the basin as a region. FONPLATA is currently associated with other regional financial institutions, the Andean Financial Corporation (CAF) and the IDB, to support the South American Initiative for Infrastructure Integration (IIRSA). The IIRSA was launched in August 2000 in the Millennium Meeting of South American Heads of State convened in Brasilia, Brazil aimed at developing the transport, energy and telecommunication infrastructure of the 12 South American States. The project included in IIRSA that links this Initiative with the Plata Basin is the Paraguay-Paraná Waterway, a programme of the Plata Basin countries.

The Hidrovia Paraguay-Paraná (Paraguay-Paraná Waterway) is a programme for the development of navigation from Puerto Cáceres (Brazil) to Nueva Palmira (Uruguay). The Intergovernmental Waterway Committee (CIH) was established to develop the programme which was incorporated into the La Plata Basin system as a new organ in 1991. The Paraguay and Paraná rivers' stretches between Puerto Cáceres (Brazil) and Nueva Palmira (Uruguay) reach 3,400 km long (2,100 miles), and the programme ends at the starting line of the Río de la Plata River. The CIH was entrusted to carry on with the feasibility studies from the economic, social, technical and environmental points of view, as well as with the drafting of the legal instruments.

The programme for the improvement of navigation in the Paraguay-Paraná stretches foresees dredging to improve the depth of the navigation channels, which has been executed in the most frequently sailed zones, and rocks removal to eliminate obstacles in certain difficult zones. These works would have a negative impact on the Pantanal, qualified as the largest tropical wetland in the world. The Pantanal is formed by the floods of the Paraguay River during the wet season, which spans a large area of Bolivia, Brazil and Paraguay territories, in the heart of South America. Critical studies have been concluded on the issue of improved navigation with regard to the harm that the envisaged river works would cause to this unique and rich ecosystem. However, the most important works have not been carried out yet. The Hidrovía programme has begun the improvement of the buoying system to facilitate 24 hours of navigation, partially executed, and it has also encouraged the building of new port facilities in cooperation with the private sector, which has contributed to these works.

At the same time as the watercourse works, the legal aspects of the Paraguay-Paraná Waterway were also developed. In 1992, the Fluvial Transport Agreement for the Paraguay-Paraná Waterway was approved, and the five riparian countries have a single legal framework to regulate navigation. Several Protocols dealing with different aspects of navigation, insurance, safety, and technical requirements, among others, were later added to the Agreement, which came into force in 1995. There is an institutional link between the CIH and the CIC, and the interaction between the two Plata Basin organs could be improved for a fruitful cooperation.

11.3 The Río de la Plata Basin Satellite Understandings

Article VI of the Plata Basin Treaty specifies that the Treaty 'shall not prevent the Contracting Parties from concluding specific or partial bilateral or multilateral agreements' which is an almost redundant provision since States are independent in their international relations. However, what the provision lacks is the duty to inform of those partial arrangements to the Treaty organs, especially the CIC. Article V adopts a similar solution with respect to national works, which affirms that the riparian countries are able to execute projects and works in their respective countries within the respect for international law and the fair practice among neighbouring nations. This provision also lacks the duty of information to the Treaty organs of national projects influencing the water resources of the basin. It seems that the gaps in both Treaty provisions are intentional, to avoid a duty of information that could be assimilated to a duty of consultation.

Information and prior consultation, two procedural principles of international law applicable to the utilization of international water resources[14] require a common intention of the contracting Parties to cooperate in the integrated management of their water resources. Basin agreements are an effort to build this cooperation among riparian States, and reciprocal information of projects and undertakings for the utilization of the basin water resources are a substantial stage in this respect. At the moment of the adoption of the Plata Basin Treaty, the riparian States were not eager to communicate their initiatives to the organs established by the Treaty and this was incorporated into the agreement. What Articles V and VI of the Treaty do not state has become an essential element for the development of the Treaty system, taking into account that riparian States maintain the same position of territorial autonomy.

11.3.1 Special Infrastructure Agreements

The water flow of the Río de la Plata tributaries together with the gradient of the slopes where their sources lie, are capable of generating abundant hydropower. The steepest slopes are located in Brazilian territory, which is also the country with the largest extension of basin surface, and as a consequence, 90% of its energy derives from its water resources, not only from the Plata Basin but from other river basins. Notwithstanding this, the most important reservoirs for power generation are currently built in the Plata Basin watercourses, where the most important cities and production activities are located, on the Paraná River and its tributaries.

A very important barrage, the Itaipú Dam, is a bi-national work on the Paraná River in the stretch shared by Brazil and Paraguay (Treaty of 26 April 1973 between Brazil and Paraguay). The bi-national corporation was set up on 17 May 1974 and its operation began on 5 May 1984 when the first two turbines were set up. At present, the enterprise operates with 18 turbines which produced in 2005 about 90 million MWh. It is the largest hydropower generator of the Plata Basin. Itaipú is efficient in its use of the watercourse for power generation but, like every large reservoir, it has to develop the protection of water quality and of the living resources. The Itaipú entity is not associated with the Plata Basin Treaty organs in data exchange or in other programmes. The information about the operation of the dam is made public through the web.

On the Paraná River, there are other bilateral agreements for hydropower generation signed between Argentina and Paraguay. The agreement adopted on

[14] Frederic L. Kirgis (Jr.) Prior Consultation in International Law: A Study of State Practice (Charlottesville: University Press of Virginia) 1983.

16 June 1971 established the Joint Technical Commission for the Paraná River with the purpose of determining the possible location of a dam for power generation. The bi-national entity (COMIP) carried out careful studies with that object, although the different locations selected encountered the opposition of the provincial stakeholders, which were opposed to the construction of new large dams in that zone. The COMIP is entrusted with other functions, especially the monitoring of the water quality of the bi-national stretch of the Paraná River, the implementation of the river fisheries agreement and the observance of the hydrometers level to watch the limits of operation of Itaipú. The water level variation was established by a notable agreement between Argentina, Brazil and Paraguay on 19 October 1979, coinciding with the enclosure of the river and the filling of the Itaipú reservoir on 16 October 1979.

Another bi-national dam on the Paraná River was agreed upon between Argentina and Paraguay on 3 December 1973 – the Yacyretá project. The agreement established the Yacyretá Binational Entity (Yacyretá), which was in charge of the development of the project and the construction of the dam. However, the initiative has its first instrument with the Argentine-Paraguayan Protocol signed in Washington, US, on 1 February 1926 for the utilization of the Saltos de Apipé, where the Yacyretá and Apipé islands were located. On 23 January 1958, a new agreement with the same object was signed and a Joint Technical Commission was established, which negotiated the Yacyretá Agreement. According to the Agreement, the project would include the hydropower generation together with the improvement of navigation through a set of locks. The reservoir would also regulate the water flow in floods and droughts. The locks were inaugurated before the operation of the dam started on 2 September 1994, with the first turbine, and reached its higher production with the beginning of operation of the twentieth on 7 July 1998. There is currently the proposal to raise the level of the reservoir to increase the power generation, although there are environmental concerns regarding this new development.

Another important reservoir and bi-national commission was established between Argentina and Uruguay for the Salto Grande Dam, on the Uruguay River. The agreement for the construction of this hydropower project was signed on 30 December 1946, with the purpose of building a multipurpose reservoir for power generation, irrigation, domestic supply and the improvement of navigation with the corresponding locks. On December 1973, a complementary agreement was concluded to establish the regulations of the 1946 Convention. A Joint Technical Commission was established on 20 October 1972 to carry out the project, and was vested with the capacity to administer the construction and to operate the power generation. The building started in 1974 and the first turbine started operation on 21 June 1979. The dam is efficient in water utilization, for power generation and also for irrigation. The navigation locks had not been built until the end of 2006. The Salto Grande Commission develops the monitoring of the reservoir water quality of the ichthyc resources, which were affected by the barrage, and keeps a net of gauging stations for water levels and other parameters. The road at the top of the dam is an international bridge between Argentina and Uruguay, and its operation and maintenance is also in charge of the bi-national Salto Grande Joint Technical Commission.

The Hidrovía Paraguay-Paraná, the waterway that runs from Puerto Cáceres-Brazil to Nueva Palmira, Uruguay, is a programme for infrastructure works to improve navigation conditions, as has been mentioned. The Hidrovía CIH set up for the implementation of those works is an understanding of the five riparian countries, but limited to the stretches that were included in the programme and to its own goals. For that reason, it is a special infrastructure understanding. The CIH has an Executive Secretariat and its seat is in Buenos Aires, Argentina. Navigation is not a consumptive use of the watercourses, its impact on them is related to pollution from vessels and from point sources for the operation of ports. The infrastructure works could also have an impact on the water flow, especially if there is significant rock removal, and impinge upon the wetlands in the watercourses and on erosion of the banks. For these reasons, the infrastructure works require an environmental impact assessment, which is a component of the programme.

11.3.2 Special Understandings for Watercourse Management

The Plata Basin countries have adopted different understandings for river stretches of some rivers, i.e., the Uruguay River in the stretch between Argentina and Uruguay, and for river basin tributaries, i.e., the Bermejo River and the Pilcomayo River, and the Río de la Plata itself.

The riparian countries have established two international commissions for the Pilcomayo River, a river flowing in the territories of three States, Bolivia, Paraguay and Argentina. One of the commissions is the Tri-National Commission for the Upper Basin which spans mainly the territory of Bolivia, set up by the three riparian countries, and the other is the Bi-National Commission, established by Argentina and Paraguay for the bilateral stretch in which the river is the boundary between both countries. The objectives of both Commissions are connected but differ according to the different features of the river in the upper and lower basins. The upper basin in Bolivian territory has steep slopes with significant erosion, and serious pollution derived from the minerals exploitation in the region, including silver, zinc, lead, tin, arsenic and antimony, which discharge and spill into the Pilcomayo tributaries and flow into its waters. The Tri-National Commission was established on 9 February 1995 and it focuses on water quality programmes and on the assessment of the water resources of the upper basin through a master plan. The commission has its seat in Asunción, Paraguay, and a technical office in Tarija, Bolivia.

The Bi-lateral Commission for the Pilcomayo River, established by Argentina and Paraguay, was launched on 5 August 1994, and it focuses on the works that are necessary to control the sediment load that silts up the river bed and causes the flood of its banks over a wide area, with considerable loss for the regional economy.

With regard to the Bermejo River, by the Oran Treaty signed on 9 June 1995, the riparian countries, Argentina and Bolivia, constituted the Bi-national Commission for the development of the basin of the Upper Bermejo River and its tributary the Grande de Tarija River. The Upper Bermejo River is located in the northern part of the Argentinean territory and in the southern part of the Bolivian territory. The Upper Bermejo Basin spans a territory of 50,191 km^2 while the Lower Bermejo River Basin covers a surface of 72,971 km^2, and of the total surface of 123,162 km^2, 90% (111,266 km^2) spans the territory of Argentina. The Upper Bermejo Basin in the Andean range is the Plata Basin's zone closest to the Pacific Ocean, running north–south, while the Lower Bermejo River flows eastward across the Argentinean territory until it debouches into the Paraguay River.

The Bermejo River has its sources in the Andean and Sub-Andean ridges, with maximum heights of 6,200 m, and after the Juntas de San Antonio, the confluence of the Bermejo and the Grande de Tarija rivers, the Lower Bermejo River spans to the east in the Argentinean Chaco plain. Some of the tributaries of the Upper Bermejo, i.e., the Iruya River, incorporate to the water flow large quantities of sediments derived from constant surface erosion. Silt and clay are the most important sediment load of the Bermejo River, which partially reaches the Río de la Plata River and precipitates at its mouth. The Commission has to deal with the threats of severe soil erosion, desertification process, floods and their social consequences, ecosystems deterioration and water quality degradation.

Two other bi-national commissions were created by the Treaty concerning the Río de la Plata and its corresponding Maritime Front, between Argentina and Uruguay, subscribed on 19 November 1973. The Río de la Plata Administrative Commission (CARP) is one of those commissions which has been entrusted with functions regarding the evaluation, conservation, preservation and rational exploitation of living resources and, to that end, to enact rules regulating fishing activities. Another objective vested in CARP is the prevention and elimination of pollution and other harmful effects which may derive from the use, exploration and exploitation of the waters of the river. Moreover, CARP is in charge of the coordination of navigation aids and buoying and to establish unloading and additional loading areas, among other functions. By agreement on 8 July 1991, the members vested the CARP with the capacity to tender and award the dredging, maintenance and buoying of the Martín García channel, one of the Río de la Plata navigation channels, which is currently under its management. The seat of the Commission is in the Martín García Island, Argentina.

The Joint Technical Commission for the Maritime Front (CTMFM) was also established by the 1973 Treaty, and the member States are Argentina and Uruguay. The Commission has been entrusted with the function to establish the catch volumes of the fisheries in the Common Fishing Zone set up by the Treaty, and to promote the joint conduct of scientific studies and research with special reference to the evaluation, conservation, preservation and rational exploitation of living resources, as well as to establish fishing standards and measures and to elaborate projects and make recommendations for the protection of the ecosystems. The Commission is also in charge of the prevention and elimination of pollution, and to that end the Treaty established a zone of prohibition of discharges from vessels.

The Commission has limited its regulatory functions to some of the species of commercial interest, and strives to agree on the total allowable catch of those species on a yearly basis. It has adopted protection measures for those species when the stocks were threatened with overexploitation, even though the measures of establishing closed areas, interrupting the fishing season, selecting the size of trawling vessels and limiting the size of the mesh holes are generally adopted when fisheries are already diminished. The CTMFM is vested with the capacity to adopt those measures which are applicable in each member State without any other condition than its publication in the official gazettes, although its implementation and control belongs to their national authorities. The seat of the Commission is in Montevideo, Uruguay.

Another bi-national commission was established by Argentina and Uruguay for the bilateral and boundary stretch between both countries, from the Cuareim to the Río de la Plata rivers, to implement the Uruguay River Statute that was approved by the agreement of 26 February 1975. The Administrative Commission for the Uruguay River (CARU)'s functions apply to the Uruguay river stretch where the Salto Grande Dam and Technical Commission are also situated. For this reason, their functions overlap with respect to certain themes, i.e., the protection of the water quality and of the living resources of the watercourse. The coordination of their activities with regard to these concurrent functions is not foreseen in their institutional regulations, and this gap is also noticeable with respect to the Río de la Plata Basin organs, namely with regard to its permanent organ, the CIC.

The River Uruguay Statute vested CARU with comprehensive functions and the commission elaborated a Digest for the different uses, which has been approved in the chapters referring to navigation and works, exploitation of the resources of the bed and subsoil, pilotage, pollution prevention and the application of national jurisdiction on the river. The Statute includes the duty of the Parties to inform CARU of any works or project that could impinge upon the quantity or quality of the waters or the river regime. Moreover, the Statute outlines a dispute settlement mechanism in case differences arise for its interpretation and implementation or for non-compliance of the duties agreed upon. The Statute foresees a period of consultations and direct negotiations between the Parties and, if during this stage the Parties fail to reach a solution, the submission of the case to the International Court of Justice of the United Nations. In 2006, a dispute was submitted to the Court by Argentina and Uruguay, whose resolution was still pending in December 2006, for the lack of information by Uruguay about the installation of pulp mills on the Uruguay River banks.

The abovementioned intergovernmental organizations have a permanent character and their functions are related to some uses of watercourses of the La Plata Basin or to the goal of achieving a joint and integrated management of its water resources.

11.4 International Programmes with International and Regional Organizations

The Río de la Plata Basin organization and the satellite organizations are executing programmes with international and regional organizations which promote cooperation in different areas. Specifically, the basin international programmes encourage the sound utilization and the appropriate management of water resources, the protection of water quality and of ecosystems, measures for the prevention of the harmful effects of floods and droughts, data collection and exchange, and the influence of climate variability, among others.

In 2003, Argentina, Bolivia, Brazil, Paraguay and Uruguay started a programme to monitor and control the effects of climate variability on the basin and to improve the available data on social, economic, environmental and physical aspects. The project is funded by the Global Environmental Facility (GEF), the implementing agency is the United Nations Environment Programme (UNEP) and the regional executing agency is the Office for Sustainable Development and Environment of the OAS. The purpose of the programme is to elaborate A Framework for the Sustainable Management of its Water Resources with Respect to the Hydrological Effects of Climatic Variability and Change once some of the common problems affecting the basin have been identified. The local institution designated to execute the programme was the CIC, the entity established by the Río de la Plata Basin Treaty. The Framework project is also aimed at integrating the other projects in the basin (Bermejo, Pantanal, Pilcomayo, Río de la Plata, Guaraní aquifer), enhancing the ripple effects of those initiatives.

The first phase of the project was aimed at preparing the content of the Framework Programme. It was concluded in December 2005, and the studies that were carried out on technical and institutional aspects amounted to a comprehensive diagnosis of the basin, its hydrological patterns, its social and economic elements, water uses, ecosystems situation, and water quality, among other elements. The proposal for the second phase, consisting of the design of the Río de la Plata Basin Framework, was submitted to the financial institutions for funding and implementation. Its execution will bring a qualitative improvement to the comprehensive and unified approach to the Río de la Plata Basin, shrinking the basin limits by means of technology, information and knowledge. It will facilitate the goal of basin watercourses management and protection, gathering the many components in a systematized database and planning exercise to the benefit of its riparian countries.

The international programme for the basin of the Bermejo River, situated in the territories of Bolivia and Argentina, is developing its second phase. The Strategic Action Programme for the Bi-national Basin of the Bermejo River, a GEF Project implemented by UNEP and executed by the OAS, was launched in 1997 with the purpose of assisting the two countries in the sustainable development of the water resources of the Upper Bermejo and Grande Tarija rivers. These two rivers of the Upper Bermejo Basin are boundary rivers between Argentina and Bolivia and the projects were to be executed jointly. A number projects were elaborated during the implementation process, which was completed in 2000, and about 30 of them were selected to be executed in the second phase. The listed projects were drawn by the professionals of both countries and discussed in workshops with public participation. The second phase, geared towards the implementing stage of the selected projects, requires the contribution of the riparian states as well as the financial support of the international agencies. Another important development of the phase already completed is the draft of an institutional framework with the capacity to carry on the future projects and works. Some of the projects are linked to the construction of several dams for power generation and sediments control, which have not been built yet. However, what it is more important is the existence of these projects, which are ready for its execution when national and international conditions become suitable.

The international environmental programme for the Río de la Plata was approved in 1999 and it is almost completed. The Río de la Plata Treaty Bi-National Commissions between Argentina and Uruguay, the CARP and the CTMFM are the two entities that the Consortium established for the design, implementation and development of the Programme concerning the Environmental Protection of the Río de la Plata and its Maritime Front: Pollution Prevention and Control and Habitat Restoration (FREPLATA). The programme was approved in 1999, with GEF's technical cooperation support, and completed the first stage in 2006. The project makes a diagnosis and proposals to strengthen the legal and institutional frameworks, develops research projects with the universities of the member countries for pollution prevention and control, fosters public participation and environmental awareness through workshops, studies and documents.

An international programme for the Upper Paraguay River Basin was launched in 1998 which focused on the Pantanal wetland. The Integrated Watershed Management Programme for the Pantanal and the Upper Paraguay River Basin is a GEF funded programme, to be implemented by the UNEP and executed by the OAS, with an environmental target. The purpose of the project will be the detection of the causes of ecosystems degradation and the planning and execution of measures for the sustainable development of the region. The programme started in 1998 and it is in an ongoing status.

Another programme already completed was executed in Paraguay for regional aspects of the sustainable management of wetland resources, with the aim of exchanging information and assessing the wetland resources in Paraguay.

Finally, it is worth mentioning the project to gather the experience of the different projects, whether ongoing or completed, in the Río de la Plata Basin in a specific project designed for the Development and Implementation of Mechanisms to disseminate Lessons Learned and Best Practices in Integrated Transboundary Water Resources Management in Latin America and the Caribbean, named the DELTAmerica Project. The experiences analysed in this project of projects, which ended in 2006, are related to land and water resources management and its outcome could be the organization of a network of projects that would benefit water resources management plans in national and transboundary resources.

Under the sponsorship of the European Union, Argentina, Bolivia and Paraguay are developing the Integrated Management and Master Plan for the Pilcomayo River Basin Project, which focuses on water quality issues, pollution and sedimentation process. Restoration measures are envisaged by the project to reverse the degradation of the water quality which deteriorated the ecosystems of the basin. The project was launched in 2000 and began its tasks in 2002. The schedule foresees that the master plan for the basin will be ready on 1 July 2008. It will include dams in the Upper basin to regulate the continuous erosion and sedimentation phenomena, water quality restoration for domestic uses and for the protection of the rivers species.

The groundwater accumulated in different strata is an invisible resource of remarkable importance. It is present everywhere and it is abundant in South America, a continent with ample aquifer resources. One of the larger ones is the Guaraní aquifer, located in the territories of Argentina, Brazil, Paraguay and Uruguay, mostly within the limits of the Río de la Plata Basin. The quality of its water differs as well as its temperature and depth. To increase the knowledge of the resource, to assess the abstraction volumes and its relation with the recharge of the water deposits, a project was approved by the GEF. Its object also aims to draw up an international legal and institutional structure for the aquifer with a view to protecting the quality of its waters and preventing pollution.

In the Río de la Plata Basin but not related to water uses, there is at a preliminary stage a programme, partially funded by GEF, for Sustainable Land Management of the Transboundary Gran Chaco American Ecosystem, which spans the territories of Argentina, Bolivia and Paraguay. Land management is closely related to water management out of the natural interaction between those natural resources, intensified due to the fact that the Chaco region suffers a desertification process.

11.5 A Fresh Approach

The notion of "basin" induces us to adopt a unified approach and, in the case of the Río de la Plata Basin specifically, an international regard because of its transnational geographical distribution. These features of the basin resulted in its subsequent international legal and institutional organization. However, it is not enough to establish an international mechanism; there are other conditions to fulfil for an international framework to be meaningful and efficient. Certain conditions belong to the international sphere while others belong to the municipal institutions of member States.

In the international sphere, organizations are constrained by their functions, their capacities, their budget and by the aims of member States. International institutions are not efficient or inefficient in themselves, but according to those factors that provide their structure and condition their behaviour. The La Plata Basin structure was not intended to be a water management institution or a planning and executing body. It was conceived as a negotiating forum at the international sphere, specifically in the regional basin sphere, with no incidence on the municipal order of member States. Provided that that was the common intention of the Parties, the institutional organization fulfilled its object, a limited but relevant one.

The multilateral forum, however, was never a substitute for direct negotiations of member States at the bilateral level.

It is also necessary to take into account that the basin organization was not constrained to water administration, but its purpose is the economic development of the region. The purpose was to avoid that the opposition of one riparian could block works in the territory of another riparian country and to prevent disputes that could arise for concurrent uses.

Other goals were added to the main purpose, and riparian states of the Río de la Plata Basin built a complex system of general and special bodies formed by conferences, programmes and commissions that keep on considering the basin's equitable utilization, the performance to improve navigation and infrastructure works as common issues of permanent interest. Together, the original basin institutions and the new specific organizations reveal the water-based regional structure, which shifted its focus to the water resources of the basin. Another step was to narrow the focus and to conceive water management at the basin level.

Management requires knowledge of the resource, and the framework project was proposed to improve the knowledge of the basin as a whole. This project has concluded its first phase and the second one will bring new management tools and new possibilities for riparian States through a better knowledge of the interaction of the basin water resources. This approach is highly useful and brings a very positive perspective into account, working on making convergence secure, improving information access, developing river programmes, monitoring water and soils quality. Such efforts are expected to raise concern about the threats the basin water is subjected to and to increase awareness of the benefits of planning joint management at the basin level. Concern and awareness will bring water management a step forward.

It is realistic to consider that the basin notion is territorially conditioned, which makes the coordination of interests and policies, and the harmonization of works and initiatives mandatory. For these reasons, riparian States cannot only consider relevant factors concerning water but social participation, environment protection, infrastructure requirements, because these issues shape the decisions with regard to water management.[15]

The interaction between the international and the municipal levels is a decisive factor for the role the international institutions can play. For that reason, the harmonization of national legislation is a fundamental condition for the development of regional plans. Equally important is the harmonization of common environmental policies in areas such as deforestation, land erosion, the relationship between land and water, pollution of surface and underground waters. The interaction between these elements requires regional planning but it could be executed only at the national level. It is necessary to overcome the deficiencies and gaps in municipal legislation and administration to achieve the goal of basin management.

The Río de la Plata Basin is ripe enough for integrated water management based on political consensus. If the basin approach fails, national policies are incomplete and ineffective, because they are only able to face limited issues with

[15] 4th World Water Forum Ministerial Declaration, Mexico City, March 22, 2006.

limited plans. Basin management requires cooperation and a cooperative approach, as opposed to local competing plans. If cooperation became utopian, water management would be utopian, and water crisis would be much more real. The crisis of water is the crisis of water management.

The fresh approach for the Río de la Plata Basin consists of overcoming the present fragmentation in sectors, matters, countries, bilateral organizations, and to build a fluent interaction between those factors. The challenge is to achieve this objective. Adapting the existing institutional framework to new demands for cooperation between national and international entities would reflect the vitality of the system and its present usefulness.

Acronyms

CAF	Andean Financial Corporation
CARP	Río de la Plata Administrative Commission
CARU	Administrative Commission for the Uruguay River
CIC	Intergovernmental Coordination Committee of the La Plata Basin
CIH	Intergovernmental Waterway Committee
COMIP	Joint Commission for the Paraná River between Argentina and Paraguay
CTMFM	Joint Technical Commission for the Maritime Front
ECLAC	Economic and Social Council of the United Nations for Latin America
FONPLATA	La Plata Basin Financial Development Fund
FREPLATA	Pollution prevention and Control and Habitat Restoration Programme, Argentina and Uruguay
GEF	Global Environmental Facility
IDB	Inter-American Development Bank
IIRSA	South American Initiative for Infrastructure Integration
INTAL-IDB	Institute for the Integration of Latin America and the Caribbean
OAS	Organization of American States
UNEP	United Nations Environment Programme
UNTS	United Nations Treaty Series

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Annex

The Río de la Plata Basin Treaty (La Plata Basin Treaty)

Parties: Argentina, Bolivia, Brazil, Paraguay and Uruguay

Signed: Brasilia, 23 April 1969
In force: 14 August 1970

The Governments of the Republics of Argentina, Bolivia, Brazil, Paraguay and Uruguay, represented at the First Extraordinary meeting of Foreign Ministers of the Río de la Plata Basin Countries, held in Brasilia on 22 and 23 April 1969,

CONVINCED of the need to join forces in order to achieve the fundamental objectives laid down in the Joint Declaration of Buenos Aires of 27 February 1967 and the Act of Santa Cruz de la Sierra of 20 May 1968, and guided by a strong spirit of cooperation and solidarity,

CONFIDENT that joint action shall permit the harmonious and balanced development and optimum utilization of the principal natural resources of the region and shall ensure the conservation of those resources for future generations if they are utilized rationally,

CONSIDERING further that the Foreign Ministers have adopted a Statute for the Intergovernmental Coordinating Committee of the Río de la Plata Basin Countries,

HAVE DECIDED to conclude this Treaty in order to strengthen the institutional arrangements of the Río de la Plata Basin and, to that end, have designated their plenipotentiaries who have agreed as follows:

Article I

The Contracting Parties agree to join forces to promote the harmonious development and physical integration of the Río de la Plata Basin and its areas of direct and measurable influence.

Sole paragraph. To that end, they shall promote, in the Basin area, the identification of areas of mutual interest, the carrying out of studies, programmes and works and such operative arrangements and legal instruments as they may deem necessary to achieve the following objectives:

(a) Facilitation and assistance in navigation;
(b) Rational utilization of water resources, especially by the regulation of watercourses and their multiple and equitable exploitation;
(c) Conservation and development of animal and plant life;
(d) Improvement of road, rail, river, air, electrical and telecommunication interconnections;
(e) Regional complementation, by promoting and establishing industries of interest for the development of the Basin;
(f) Economic complementation of boundary areas;
(g) Mutual cooperation in education, health and fight against disease;

(h) Promotion of other projects of mutual interest, especially those relating to the surveying, assessment and development of the natural resources of the area;
(i) Comprehensive knowledge of the Río de la Plata Basin.

Article II

The Ministers of Foreign Affairs of the Río de la Plata Basin Countries shall meet once a year on a date which the Intergovernmental Coordinating Committee shall suggest in order to lay down basic joint policy guidelines to attain the objectives established in this Treaty; to assess and evaluate the results obtained; to hold consultations on the actions of their respective Governments in the scope of the Intergovernmental Coordinating Committee and, in general, to adopt the provisions necessary to comply with this Treaty through the specific measures called for herein.

Paragraph 1. The Ministers of Foreign affairs may meet in an extraordinary session after being convened by the Intergovernmental Coordinating Committee on request of at least three of the Contracting Parties.

Paragraph 2. In the event that, owing to exceptional circumstances, the Minister of Foreign Affairs of a Contracting Party was unable to attend a regular or extraordinary meeting, he shall be represented by a Special Delegate.

Paragraph 3. Decisions made at meetings held pursuant to this article shall require the unanimous vote of the five countries concerned.

Article III

For the purposes of this Treaty, the Intergovernmental Coordinating Committee is recognized as the permanent organ of the Basin and shall be responsible for promoting, coordinating and following the progress of multinational efforts to ensure the integrated development of the Río de la Plata Basin and for technical and financial assistance which it may coordinate with the support of the international agencies it deems appropriate, and for implementing the decisions adopted by the Ministers of Foreign Affairs.

Paragraph 1. The Intergovernmental Coordinating Committee shall be governed by the Statute adopted at the Second Meeting of Foreign Ministers of the Rio de la Plata Basin Countries held at Santa Cruz de la Sierra, Bolivia, from 18 to 20 May 1968.

Paragraph 2. At an extraordinary meeting especially convened for the purpose, the Ministers of Foreign Affairs may, with the unanimous vote of the five countries concerned, modify the Statute of the Intergovernmental Coordinating Committee.

Article IV

Without prejudice of the domestic legislation of each country, the national Commissions or Secretariats established pursuant to the Joint Declaration of Buenos Aires shall be the organs of cooperation and advice among the Governments concerned. These Commissions or Secretariats may establish bilateral contacts, which shall always be in accordance with the criteria and regulations of the countries concerned, and shall keep the Intergovernmental Coordination Committee informed whenever necessary.

Article V

Any joint activities undertaken by the Contracting Parties shall be carried out without prejudice to such projects and undertakings as they may decide to execute within their respective territories, in accordance with the respect for international law and fair practice among friendly neighbouring nations.

Article VI

The provisions of this Treaty shall not prevent the Contracting Parties from concluding specific or partial, bilateral or multilateral agreements designed to achieve the general development objectives of the Basin.

Article VII

This Treaty shall be identified as the Río de la Plata Basin Treaty and shall remain in force for an unlimited period.

Article VIII

This Treaty shall be ratified by the Contracting Parties, and the instruments of ratification shall be deposited with the Government of the Federative Republic of Brazil.

Paragraph 1. This Treaty shall enter into force 30 days after the instruments of ratification of all the contracting Parties have been deposited.

Paragraph 2. Pending ratification of this Treaty by the Contracting Parties and the deposit of their instruments of ratification, any multinational activities they may undertake to develop the Río de la Plata Basin shall be subject to the provisions agreed to in the Joint Declaration of Buenos Aires and the Act of Santa Cruz de la Sierra.

Paragraph 3. A Contracting Party shall notify the other Contracting Parties of its intention to denounce this Treaty at least 90 days before it formally transmits its Denunciation Document to the Government of the Federative Republic of Brazil. Once the Treaty has been formally denounced, it shall cease to have effect, for the Contracting Party denouncing it, one year after.

IN WITNESS WHEREOF, the undersigned plenipotentiaries, having deposited their full powers, found in good and due form, sign this Treaty.

DONE at the city of Brasilia on 23 April 1969 in only one copy in the Spanish and Portuguese languages to be deposited in the archives of the Ministry of Foreign Affairs of Brazil, which shall transmit certified copies to the signatory countries.

For Argentina:
Nicanor Costa Mendez
For Bolivia:
Victor Hoz De Vila
For Brazil:
Jose De Magalhaes Pinto
For Paraguay:
Raul Sapena Pastor
For Uruguay:
Venancio Flores

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