Knowledge is essential in an increasingly complex world. In order to contribute to a better understanding of global development and an increased effectiveness of development co-operation, the EGDI secretariat of the Swedish Ministry for Foreign Affairs, manages the Global Development Studies series. The studies in this series are initiated by the Ministry, but written by independent researchers.

Another task of the secretariat is to serve the EGDI (Expert Group on Development Issues) in its efforts to channel research findings into the heart of policymaking. The EGDI consists of internationally renowned researchers and policymakers with extensive networks in their respective field. The group initiates and produces policy relevant studies on global development.

For futhur information please contact:
The EGDI Secretariat
Ministry for Foreign Affaris
Department for Global Development
SE-103 39 Stockholm, Sweden

Phone +46 8-405 10 00
Fax +46 8-723 11 76

egdi.secretariat@foreign.ministry.se
www.egdi.gov.se

The present study attends to the emerging field of benefit sharing among states sharing a transboundary watercourse. Some of the key questions addressed in this comprehensive overview and analysis are:

- How can transboundary water co-operation be utilised as a means for confidence building and conflict prevention?
- How the concept of benefit sharing in a transboundary river basin can be assessed and used by donors and development partners.
- How 'positive-sum outcomes' (as opposed to zero-sum outcomes) can be generated and used in conflict ridden river basins.
- How external actors can act in a more harmonised way in the pursuit of economic development and co-operation promotion in transboundary settings.
- How support of riparians at different levels of development and relative power in a river basin can be made in a coherent and useful manner.

The study makes recommendations for how Sweden and other donors, including international organisations as well as development banks, can improve their strategies for addressing the challenges inherent in supporting riparians sharing an international river basin.

It emphasises the need for long-term commitment by international organisations and bilateral donors engaged in the promotion of transboundary water co-operation. The study proposes a model, including environment, economics and security parameters, for the analysis of benefit sharing.

REGERINGSKANSLIET
Ministry for Foreign Affairs
Sweden

SE-103 39 Stockholm, Sweden
Telefon +46 8-405 10 00 Fax +46 8-723 11 76
www.egdi.gov.se

Global Development Studies No. 4

Trans-boundary Water Co-operation as a Tool for Conflict Prevention and Broader Benefit Sharing

Trans-boundary Water Co-operation as a Tool for Conflict Prevention and Broader Benefit Sharing

David Phillips, Marwa Daoudy, Stephen McCaffrey, Joakim Öjendal and Anthony Turton

REGERINGSKANSLIET
Ministry for Foreign Affairs
Sweden

David Phillips is a British international consultant on water-related and environmental issues. In the last six years, Dr. Phillips has been a key player in developing preferred approaches to the sharing of water in the Jordan River basin.

Marwa Daoudy is a Research Fellow at the Centre for International Studies and Research (CERI) in Paris. She is a political scientist with extensive experience on water resources within the Middle East in particular.

Stephen McCaffrey is a professor at the McGeorge School of Law in the University of the Pacific in California. Professor McCaffrey was a Special Rapporteur for the work of the UN International Law Commission on the Law of the Non-navigational Uses of International Watercourses.

Joakim Öjendal is associate professor at PADRIGU (the Department of Peace and Development Research, Gothenburg University). Dr. Öjendal's Ph.D. dissertation from the year 2000 was concerned with the allocation of the water resources in the Mekong River basin.

Anthony Turton is a political scientist from University of Pretoria, South Africa, who is widely published on matters relating to trans-boundary water resources and has particular experience of those in Sub-Saharan Africa. He is also Head of the African Water Issues Research Unit (AWIRU).

Trans-boundary Water Cooperation as a Tool for Conflict Prevention and for Broader Benefit-sharing

Prepared for the Ministry for Foreign Affairs, Sweden

David Phillips, Marwa Daoudy, Stephen McCaffrey,
Joakim Öjendal and Anthony Turton

Phillips Robinson and Associates, Windhoek, Namibia
Cover photo by David Phillips

Edita Stockholm 2006

Table of Contents

Figures

Tables

Foreword

Today, more than forty-five percent of the world's popula¬tion live in internationally shared river basins. Furthermore, over fifty percent of the world's available water resources are located in internationally shared basins. The increasing pressure on the limited freshwater resources in places such as the Middle East and Southern Africa makes greater and deeper knowledge of how to manage transboundary waters essential. History shows that shared waters could and would be a source of conflict and even war. More recently it has been demonstrated that they can serve as a factor that draws states into a more co-operative mode. Taking stock of the fact that states tend to co-operate over their shared water sources the present study, commissioned by the Secretariat of the Expert Group on Development Issues (EGDI) at the Swedish Ministry for Foreign Affairs, analyses whether transboundary water co-operation can be a tool for conflict prevention and also broader benefit sharing.

The study outlines a number of policy lessons, among others that there is an urgent need for increased and a more co-ordinated support of transboudary water management; that co-operative 'spill-over effects' stemming from transboundary water co-operation can be sought and materialised but are more likely to be achived in circumstances that are not highly 'securitised'; that donors and international financing institutions shall take note of the need to support weaker states in transboudary setting since these are often at a disadvantage for example economically and capacity wise in relation to the dominant state(s) in the basin.

The proposals and policy recommendations of the present study are issues we believe will contribute to the international discussion on how transboundary water management could evolve over the next years to come. Not least we hope there are key lessons for the international community to be learned, which would contribute to a more coherent approach in our support of natural resources management, peace and development in shared river basins.

Annika Söder
State Secretary for International Development Cooperation

Acknowledgements

This document benefited from reviews provided by a number of individuals, during Reference Group meetings held in Stockholm in the course of its preparation, and also in less formal situations organized by the team leader. We are grateful to all of these individuals for their time, insights, and input.

We wish to specifically acknowledge the input and assistance of Mr. Torgny Holmgren and Dr. Anders Jägerskog of the Swedish Ministry for Foreign Affairs. Mr. Holmgren kept a 'steady hand on the tiller' throughout the work, and was always of assistance when this was requested. Dr. Jägerskog conceptualized the study for the most part, and also acted as the day-to-day contact for the Client, during its completion. Every assistance was given to the study team, and we appreciate the thoughtfulness and active input of these individuals and of the Swedish Ministry for Foreign Affairs as a whole. Further valuable input was received from staff members of SIWI and from those of various other organizations in Sweden and elsewhere, and this is also acknowledged gratefully.

We note that it is rare for financing organizations to provide a 'clean sheet of paper' for tasks such as these, and to react positively even when the authors criticize aspects of past performance, or suggest that there is room for improvement. The Client for the present study has done just that, reflecting their deep overall maturity as an agency for the provision of international assistance, and their desire to make real improvements to future financing in this most important sector – including a specific impact on poverty alleviation in developing nations. We hope that the output from the project will benefit not just the Swedish authorities in the future, but also all those providing finance in matters relating to trans-boundary water resources and their utilization. We emphasize that this is already important today, but will be much more important tomorrow as populations grow and shared water resources come under ever greater pressure.

Acronyms

ADB	Asian Development Bank
ADB-GMS	Asian Development Bank, Greater Mekong Sub-region program
AMBDC	ASEAN's Mekong Basin Development Cooperation
ASEAN	Association of Southeast Asian Nations
BDP	Basin Development Plan (Mekong)
CIA	Central Intelligence Agency (USA)
CNRS	Center for International Studies and Research, Paris
CoMWANBS	Council of Ministers for Water Affairs of the Nile Basin States
CSIR	Council for Scientific and Industrial Research (South Africa)
DWT	Dead Weight Tonnes
ECAFE	Economic Commission for Asia and the Far East (United Nations)
EGDI	Expert Group on Development Issues (SMFA, Stockholm)
EIPD	Ethiopian Institute for Peace and Development
ENSAP	Eastern Nile Subsidiary Action Program
EP	Environment Program (Mekong)
ESCAP	Economic and Social Commission for Asia and the Pacific (United Nations)
FAO	Food and Agriculture Organization
GAP	The Southeastern Anatolian Project in Turkey
GDP	Gross Domestic Product
GWh	GigaWatt-hours
ICCON	International Consortium for Cooperation On the Nile
IFI	International Financial Institution
ILA	International Law Association
IMC	Interim Mekong Committee
IUCN	International Union for the Conservation of Nature
IWRM	Integrated Water Resource Management
KBO	Kagera Basin Organization
kg	Kilogrammes
km	Kilometres
kWh	KiloWatt-hours
LAM	Legal Assessment Model, Dundee, Scotland
LVEMP	Lake Victoria Environmental Management Project
MCM	Million Cubic Meters
MDG	Millennium Development Goal
M/F	Male/Female
mm	millimetres

MRC	Mekong River Commission
MW	MegaWatts
NBI	Nile Basin Initiative
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
NGO	Non-Governmental Organization
NRBAP	Nile River Basin Action Plan
ODI	Overseas Development Institute
OED	Operations Evaluation Department, New York
PADRIGU	Department of Peace and Development Research
PCE	Parliamentary Committee of Enquiry on the Israeli Water Sector
PNA	Parallel National Action
PPP	Purchasing Power Parity
PRA	Phillips Robinson and Associates Pty. Ltd., Windhoek, Namibia
PSO	Positive-Sum Outcome
PSRP	Poverty Sector Reduction Program (Mekong)
PWA	Palestinian Water Authority
RBO	River Basin Organization
SADC	Southern African Development Community
SAP	Subsidiary Action Program (Nile)
SIWI	Stockholm International Water Institute
SKVD	Swedish Committee for Water and Dam Issues
SMFA	Swedish Ministry for Foreign Affairs, Stockholm
SVP	Shared Vision Program (Nile)
TECCONILE	Technical Co-operation for the Promotion of the Development and Environmental Protection of the Nile Basin
TVA	Tennessee Valley Authority
UN ESCWA	United Nations Economic & Social Commission for Western Asia
UNCESCR	United Nations Committee on Economic, Social and Cultural Rights
UNDP	United Nations Development Programme
UNDUGU	'Brotherhood' in Swahili, denoting an early collaborative effort on the Nile involving Burundi, the Central African Republic (now the DRC), Egypt, Rwanda, Sudan, Uganda, and Zaire
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNGA	United Nations General Assembly
USA	United States of America
US$	United States Dollars
WCD	World Commission on Dams
WUP	Water Utilization Program (Mekong)
WWW	World Water Week (Stockholm)

Executive summary

This report is the primary output from a Global Development Study produced for the Expert Group on Development Issues (EGDI) within the Ministry for Foreign Affairs in Sweden. The views expressed in this report are those of the authors, and do not necessarily reflect the views of the Swedish Ministry for Foreign Affairs.

The report concerns trans-boundary (international) waters, and provides an analysis on whether cooperation concerning such waters may constitute a tool for the prevention of broader conflict and/or the sharing of benefits. It was produced by a small group of multi-disciplinary experts working under the company *Phillips Robinson and Associates*, based in Windhoek, Namibia. [a] In addition to the more general matters addressed herein, the report considers three river basins in detail as Case Studies: the Jordan River; the Kagera River (an upper tributary of the White Nile); and the Mekong River in Southeast Asia. Other trans-boundary river systems (and groundwaters) are also discussed, where relevant.

A number of conclusions have been drawn from the analysis presented in this report. These are discussed below in categories which relate to specific questions raised in the Terms of Reference for the current study. We believe all of the conclusions cited below to be important, and the order in which they are shown does not imply any relative priority.

[1] Critical characteristics of trans-boundary waters

Certain of the characteristics of trans-boundary waters are of particular importance in determining the preferred approaches of the riparians for future development. A comprehensive review of the Case Studies and other selected trans-boundary waters has shown that:

- Generic solutions to trans-boundary water management are not available: There are no viable generic solutions to the problems faced by co-riparians in relation to shared watercourses. Thus, in each basin taken as a Case Study, the scenarios available for economic improvement (and for other forms of advancement) rely on a unique mix of interventions.

[a] The team was led by Dr. David Phillips (<djhphillips@hotmail.com>) of Phillips Robinson and Associates, and included Dr. Marwa Daoudy of the Center for International Studies and Research (Sciences-Po, CNRS) in Paris; Dr. Joakim Öjendal of PADRIGU in Gothenburg University; Dr. Anthony Turton of Arcus Gibb Pty Ltd. and CSIR in Pretoria; and Professor Stephen McCaffrey of the University of the Pacific in Sacramento, California.

Examples from other parts of the world are cited to show that this is the case elsewhere also, and that 'one size does not fit all' in relation to preferred options for managing trans-boundary waters to optimize economic benefits. This implies that the precise situation faced in each trans-boundary basin must be 'unpacked' if any coherent understanding is to be available of the preferred route for future development. We propose the use of a range of indicators to assist in this process.

- **Preferred approaches to future improvements can be determined:** To provide insights into the best approach to each trans-boundary resource, we have developed an analytical model which we have named the Inter-SEDE model. This consists essentially of a matrix with three broad categories of issues: security; economic development; and the environment. The indicators referred to above are used to populate the matrix, and to generate comparative estimates of the importance of specific types of drivers in each basin. This represents an extension of the previous work of Sadoff and Grey (2002), in particular. The analysis of the three Case Studies using this theoretical model serves to highlight the unique characteristics of each trans-boundary basin, and also to reveal distinctions between co-riparians within each basin. This will be of considerable utility to the co-riparians themselves, and also to external financing institutions and agencies wishing to assist in improvements in future water management and economic development.

- **Security-related issues are of great importance, but each case is unique:** We believe the processes of securitization and desecuritization as described by Buzan *et al.* (1998) and by Turton (2003a) to be of fundamental importance in defining the preferred approach to water management (and hence, to economic development) in trans-boundary basins. The security element of the triad in the Inter-SEDE model discussed here may sometimes dominate over all other issues, and this is the case in the Jordan River basin in particular amongst the three Case Studies we have addressed. In such instances, the sharing of benefits is most unlikely to be countenanced by the co-riparians (or to be successful, if proposed by third parties). The primary interest of the co-riparians under these circumstances is to attain their rightful volumetric allocations (at the least) from the shared water resource. In other trans-boundary basins, a greater degree of desecuritization exists, and the riparians will be more open to a discussion of benefit-sharing and to the consideration of issues other than security. In the Mekong River basin, for example, the requirement to maintain the flood pulse is widely considered to be essential for the protection of the livelihoods of the large subsistence-level populations of the downstream co-riparians. This has critical implications for the maintenance of the natural

hydrological characteristics of the system and the possibilities for developing further hydropower, which in turn influence the basket of options available in relation to benefit-sharing.

- **The *status quo* may not be an appropriate starting point:** A tendency exists amongst many parties to consider the *status quo* the most reliable and acceptable starting point for negotiations between co-riparians seeking to formalize their shares of trans-boundary waters, either through volumetric allocations or benefit-sharing. This is not always appropriate, however. In two of the three Case Studies addressed here, basin hegemons or dominant parties have already succeeded in accessing more than an equitable share of the available water resources. In one case (Egypt), this has eventuated by virtue of colonial-era agreements which are now strongly disputed by the upstream co-riparians. In the other case (Israel), it has occurred largely through military means, including the occupation of parts of the territories of other basin States. The selection of an appropriate starting point for negotiations on either volumetric allocations or the sharing of benefits is crucial, and greatly affects the chances of success of any negotiations between co-riparians intent on optimizing their economic development.

[2] Particularly powerful types of approaches

In attempts to optimize the future development of a trans-boundary basin, certain types of approaches should be sought preferentially, both by external agencies and by the riparians themselves.

- **Positive-sum outcomes and water allocation:** Positive-sum outcomes provide an exceptionally powerful basis for future economic development in trans-boundary basins, and in some instances will be critical to the attainment of successful development programmes. Several distinct types of positive-sum outcome can be sought, depending on the circumstances. The importance of a capacity to increase the volume of the overall water resource is emphasized by the Jordan River Case Study, with desalination being a highly viable option for several of the co-riparians. Within this scenario, a further potential positive-sum outcome exists between Israel and Palestine, involving the transition to equitable water allocations and the instigation of a more coherent trade regime involving low-cost agricultural products traded from Palestine to Israel.

- **Positive-sum outcomes and benefit-sharing:** In the Kagera/Nile River basin, positive-sum volumetric outcomes are possible by adjusting the flow dynamics and taking account of evaporative losses within the

system, as well as the potential introduction of desalination in certain locations. However, the basket of options is also very considerable relating to benefit-sharing in the Kagera and the broader Nile systems. This can be utilized to defuse the present controversy regarding the historical agreements on volumetric allocations, which are not accepted by upstream co-riparians on either the White Nile or the Blue Nile (and do not conform to the principles of customary international water law). Broadly similar types of benefit-sharing scenarios exist for the Mekong River system as for the Kagera River basin and the Nile system as a whole, although both the securitization-desecuritization dynamic and the available options are unique in the case of the Mekong. The effective absence of both China and Myanmar from the present institutional arrangements and the latest agreement (the so-called MRC Agreement of 1995) constitutes an ongoing threat to successful development within this basin, especially in view of the plans for further major dams upstream in China, and elsewhere. We believe that an initiative is needed in the Mekong system to bring the missing co-riparians into the planning process, and this would best be coupled to much broader changes in the philosophy and approach to the regional trade in a range of commodities.

- **Determining benefit-sharing more closely:** We consider most of the international literature generated to date on the sharing of benefits to be of a 'soft' nature, and there is a need for much greater specificity. Certain types of benefits (such as the generation of hydroelectric power) have an obvious link to the utilization of water resources, but others are much more subtly linked. Trade-related scenarios are of particular importance here, and deserve far greater attention. It will be necessary to develop benefit-sharing as a concept in much greater detail (and to quantify benefit-sharing in relation to water allocations and to economic factors) if this is to be a successful component of future agreements between riparians in trans-boundary basins. This remains a major challenge for practitioners working in trans-boundary basins, and must be faced if the concept of benefit-sharing is to become of significant utility in the future.

- **Addressing benefit-sharing wisely:** Even though the concept of benefit-sharing is relatively new, some parties (mainly basin hegemons) are already seeking to mis-use it and to impose their will on other co-riparians in the guise of generating an equitable share of (unquantified) benefits. This represents a major disadvantage of the approach as a whole, and we consider that it will be likely to create greater controversy and unease amongst co-riparians, rather than defusing conflict. Additionally, if the sharing of benefits is to be a major pillar of the future

economic growth of basin States in trans-boundary watercourses, all parties should recognize that this is necessarily multi-directional in nature. Thus, for example, the downstream co-riparians should generate benefits for the upstream States, if the latter release flows which could otherwise be utilized upstream. Similarly, the generation of hydroelectric power by upstream co-riparians may be the best option in relation to efficiencies of water use in particular basins, but downstream Basin States should also benefit. As noted above, the precise *quantification* of benefits (and preferably also their relationship to volumetric allocations of water) is highly important, and most co-riparians are unlikely to accept international agreements unless such matters are addressed transparently and coherently. In addition, the perception of benefits (and their usefulness) will alter over time, and any international agreements based on benefit-sharing scenarios will need to take account of this.

[3] Factors to be considered

A consideration of the Case Studies and other trans-boundary water resources has shown that several factors with potential contributions to the optimal future development of trans-boundary basins are of frequent importance, but have received insufficient attention from most riparians (and at least some funding agencies) to date.

- **Intra-sectoral allocative efficiencies:** Many countries utilize water exceptionally inefficiently in the 'thirstiest' sector – agriculture – even though they are located in arid regions and/or are water-stressed. The reasons for this extend from a simple lack of education or reliable information, through a paucity of available (often minimal) front-end investment, to a misplaced reliance on historical methods of agriculture. Very considerable improvements in intra-sectoral water use efficiency can be achieved, as has been demonstrated by Israel in particular over the last three decades. This involves a number of activities, including the use of improved methods of irrigation; the selection of more appropriate crops; and the development and use of crops with higher yield. [The latter statement should not be taken to refer to Genetically Modified Organisms, the use of which is outside the scope of the present report]. All of these should be pursued with vigour by the countries experiencing water stress (and indeed, others), and we consider that international financing agencies should assist in this, as a high priority.

- **Inter-sectoral allocative efficiencies:** Where basin States are water-stressed but rely heavily on the agricultural sector for their foreign

earnings, inter-sectoral water allocations should be considered in detail. In general terms, industrial applications may generate much greater added value for a given unit volume of water, and a reliance on agricultural production is commonly linked to the continuation of poverty in developing nations. This is particularly the case where international agencies have continued to fail to solve the problem of agricultural subsidies world-wide, and where no 'level playing field' exists for the trade in agricultural produce, as a result.

- **Virtual water:** While virtual water should not be deemed a panacea, it is clear that a deeper consideration of virtual water flows would be of utility to several of the basin States included in the Case Studies addressed here (and others, elsewhere). Previous debates on this topic have suffered from a lack of coherence, and virtual water has been effectively side-lined by many as an element of consequence in the future debate. We consider that this is most unfortunate, as there can be little doubt that a diligent consideration of virtual water flows amongst basin States (especially those in water-stressed situations) would lead to measurable improvements. It is important also to note that political rhetoric involving so-called 'food security' at a national level should be accorded only the importance it may deserve.

- **Joint water management and trans-boundary institutions:** Joint water management is a desirable objective in trans-boundary basins. However, the precise form that this should take varies considerably, according to a number of factors which are basin-specific. This issue is closely tied to the securitization-desecuritization scenario, which tends to prescribe the form of interface preferred by the basin States. For example, the co-riparians of the Jordan River basin have a primary interest in volumetric allocations rather than benefit-sharing, and any joint management agency established in that geography would be likely to be limited to the monitoring of hydrological characteristics, abstraction rates, and other such technical matters. By contrast, the Kagera Basin Organization established previously was given a very broad mandate extending well beyond the water resources *per se*, and this appears to be likely to be repeated shortly in reinvigorated efforts in that basin (which are to be applauded). The Mekong River Commission falls between these two extremes, and suffers primarily from the absence of two of the six co-riparians in the basin. We believe that international financing organizations would do well to consider this issue especially carefully. This is because an appropriate decision on the form and function of a joint management institution is of great importance, being linked also to matters of sovereignty and jurisdictional competence.

- **Sovereignty-related issues:** Following from the above, much of the political rhetoric attached to trans-boundary watercourses is embedded in notions of State sovereignty. The Harmon Doctrine is perhaps partly to blame for this, but it is notable that customary international water law has moved very considerably beyond that concept in the intervening 110 years. Nevertheless, issues relating to sovereignty are of clear relevance to determining the allocation of trans-boundary water resources, and also in any benefit-sharing scenario to be developed amongst basin States. This report discusses an approach utilizing a form of Parallel National Action, and we consider that there is merit in the further development of this concept as it pertains to trans-boundary natural resources – including water, and other types of resources.

[4] Implications for financing organizations

One rationale for the present study derived from a desire of the Swedish authorities to optimize their future assistance relating to trans-boundary waters and the economic development of riparians, reflecting trends towards globalization and a stated policy to specifically direct funds towards rights-based approaches and to reduce poverty. We applaud this initiative and suggest several conclusions in this regard, which we consider relevant to all international financing in the sector.

- **The issues must be addressed as a matter of urgency:** Trans-boundary waters are a vitally important component of the fresh water resources of the world. Analyses of various types all show that water stress is increasing globally, and some believe this to be the most critical problem faced by humans (perhaps, coupled to global climate change). The populations of virtually all developing countries are expanding, and in some nations the numbers are doubling within every two decades. This creates sequentially greater water demands for domestic use, effectively 'squeezing' the volumes available to the industrial and (especially) agricultural sectors. It is no coincidence that several of the Millennium Development Goals are tied intimately to the supply of fresh water. If the present problems relating to the allocation and utilization of trans-boundary waters and the benefits from these resources are not solved, further conflict appears to be inevitable – both within States, and between them. This does not amount to a confirmation of the oft-cited inevitability of 'water wars', as this concept is simplistic and clearly does not reflect reality. However, it is self-evident that parties will 'fight however they' may to gain access to fresh water, as one of the most vital resources to sustain human existence. This raises the importance of understanding the political processes involved in negotiations concerning either water allocations, or benefit-sharing.

- **The further development of specific policies is needed:** We believe that there is an urgent need for international financing and donor organizations to reconsider their policies pertaining to trans-boundary waters in the specific, and also to the water sector as it relates to other issues. Policy development amongst most international financing institutions and donor agencies is inadequate to date, in at least three major respects: (a) trans-boundary issues relating to water are given generally insufficient attention and funding; (b) assistance provided in the water sector is often de-linked from that in other sectors, and this is inappropriate; and (c) most aid organizations fail to focus specifically on the alleviation of poverty, even though this is a stated aim for many such agencies.

- **A holistic vision is vital:** Rivers are defined not only by their annual flows, but by their flow regimes. The drive to construct dams and other major infrastructure which affect flow regimes has been controversial for many years, different proponents arguing all sides of the case with vigour. It is suggested here that decisions on such major infrastructure development – and on water management practices as a whole – should take account of matters in a holistic fashion which extends well beyond Integrated Water Resources Management (IWRM), which some parties believe to be outdated. Certainly, Integrated Natural Resource Management should be preferred, but even this alone cannot do justice to the breadth of vision required in decisions on such matters as the preferred location for major dams in trans-boundary watercourses. If such decisions are to be made appropriately (and the mistakes of the past are to be avoided in the future), we believe that many variables should be considered in combination. These include not only the basin-wide affects of such structures on water availability over time (volumes, rates, stocks and flows), but also the ability to maintain critical ecosystem components (wetlands; lakes; deltas) and their wildlife; the impacts on regional primary and secondary production and trade patterns; the differential effects on various sectors of the population (with an emphasis especially on the marginalized and poorer sectors); and other factors. In particular, it is notable that decisions based on the preference of a basin hegemon may give rise in the longer term to an increased likelihood of conflict in the basin. This is also the case for any decision that serves to broaden the differential between the poor and the wealthy.

- **Funding entities may also have to assume the role of a 'referee':** In at least some circumstances, riparians are tempted to enter international agreements which are not aligned with customary international water law, and/or are inequitable for other reasons. This usually occurs where

a basin hegemon utilizes coercive powers to either achieve or perpetuate dominance over other basin States, reserving inequitable water volumes (or benefits) for its own use. In such circumstances, external funding entities should be prepared to offer impartial advice in an attempt to maximize the likelihood of an equitable outcome.

- **'Spill-over' can be sought and realized, but all solutions are unique:** One of the basic reasons for the commissioning of this study was to investigate the extent to which 'spill-over' from cooperation on trans-boundary water management might have positive effects on broader international cooperation. We conclude that this is in fact a 'two-way street', with the potential for 'spill-over' in either direction. However, all solutions are unique to each given trans-boundary basin, and each set of co-riparians. We consider that the Inter-SEDE model presented here – informed by the indicators utilized for each of the Case Studies as examples of the approach – can have broader application elsewhere, and can assist in realizing more appropriate solutions in most or all trans-boundary basins. In this manner, the 'ingenuity gap' (Homer-Dixon, 1994b, 1996) may hopefully be bridged, and trans-boundary water resources and the benefits arising from these may be more equitably allocated amongst basin States, recognizing the needs of the poor in particular.

The Authors:
Dr. David Phillips, Phillips Robinson and Associates, Windhoek, Namibia <djhphillips@hotmail.com>

Dr. Marwa Daoudy, Center for International Studies and Research (CNRS), Paris, France <daoudy@hei.unige.ch>

Dr. Joakim Öjendal, PADRIGU, Gothenburg University, Sweden <joakim.ojendal@padrigu.gu.se>

Dr. Anthony Turton, Arcus Gibb Pty Ltd. and CSIR, Pretoria, South Africa <aturton@csir.co.za>

Professor Stephen McCaffrey, McGeorge School of Law, University of the Pacific, Sacramento, CA, USA <smccaffrey@pacific.edu>

Citation:
Phillips, D.J.H., M. Daoudy, J. Öjendal, A. Turton and S. McCaffrey (2006). *Trans-boundary Water Cooperation as a Tool for Conflict Prevention and for Broader Benefit-sharing.* Ministry for Foreign Affairs, Stockholm, Sweden.

Chapter 1: Introduction

This report represents the output from a Global Development Study produced for the Expert Group on Development Issues (EGDI) within the Ministry for Foreign Affairs in Sweden. It relates to trans-boundary waters, and includes an analysis on whether cooperation concerning such waters provides a tool for the prevention of conflict and/or the sharing of benefits. The study was completed in the second half of 2005 and early 2006, by a small group of inter-disciplinary experts contracted by the Swedish Ministry for Foreign Affairs.[1]

The views expressed in this report are those of the authors, and do not necessarily reflect the views of the Swedish Ministry for Foreign Affairs.

For the purpose of this study, trans-boundary waters are taken as "international watercourses", which have been defined recently in Article 2 of the Convention on the Law of the Non-navigational Uses of International Watercourses (United Nations, 1997) as follows:

> *"Watercourse" means a system of surface waters and groundwaters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus.*
>
> *"International watercourse" means a watercourse, parts of which are situated in different States.*

'Water scarcity' is used in this report as a benchmark for the availability of water to various States and communities. In volumetric terms, 1,000 m^3 *per capita*/year is taken as the threshold for water scarcity, and 500 m^3 *per capita*/year is used as the threshold for 'absolute water scarcity'. This essentially follows the proposals of Falkenmark and Widstrand (1992), commented upon and to some degree extended by Gleick (1993a, 1993b) and Lawrence et al. (2002).

The Terms of Reference for the production of this report made note of a number of matters of importance. Thus, the Terms of Reference dictated that:

[1] The work was undertaken by the consulting company *Phillips Robinson and Associates Pty. Ltd.* (PRA) based in Windhoek, Namibia. The team was led by Dr. David Phillips (<djhphillips@hotmail.com>), of PRA and included Dr. Marwa Daoudy of the Center for International Studies and Research (Sciences-Po, CNRS) in Paris; Dr. Joakim Öjendal of PADRIGU in Gothenburg University; Dr. Anthony Turton of Arcus Gibb Pty Ltd. and CSIR in Pretoria; and Professor Stephen McCaffrey of the University of the Pacific in Sacramento, California.

- The study should focus primarily on how cooperation on trans-boundary water resources may reduce conflict and contribute to the development of poorer countries in particular. The possible 'spill-over' from cooperation on trans-boundary waters to broader political arenas is of particular relevance within this overall theme.

- The 'multi-purpose uses' of water should be considered, with potential benefits of various types being addressed (environmental; economic; regional integration; increased trade; reduced military expenditure). This implies the need for a holistic analysis of the utilization of trans-boundary waters.

- The joint management of trans-boundary waters should also be considered, and the relationship of this to both volumetric water allocations and the sharing of benefits should be discussed.

- Scenarios for future development should be generated, based in part on the sharing of trans-boundary water resources but also being cognisant of links to other sectors. Three Case Studies should be described and interrogated in this regard, these involving the basins of the Jordan River in the Middle East; the Kagera River at the head of the White Nile; and the Mekong River in south-east Asia. Similarities and differences between the three Case Studies should be highlighted and discussed, and comments should be provided on the applicability of any conclusions to other international river basins.

- A theoretical model should be generated to analyse the benefits to be derived from water resource management and development in trans-boundary river basins. The model should be applied to each of the three Case Studies, and used to suggest policy steps of importance for the co-riparians involved and also for development partners.

- The output from the project as a whole is envisaged to be of relevance to Sweden's future policy for global development and assistance, as stated in Bill 2002/03:122 entitled *Shared Responsibility: Sweden's policy for global development*.

The following sections of this report speak to the Terms of Reference in full. Chapter 2.0 presents comments on the context for the project, clarifying the approach taken in completing the investigation on which this report is based and also commenting on the relevance of international water law. Chapter 3.0 discusses the links between cooperation, conflicts and benefits in general terms, and provides an overall theoretical framework for analysing benefits. The three Case Studies are discussed in detail in Chapters 4.0 to

6.0, and indicators are developed in each instance for analysing benefits and development options. The Case Studies are interrogated in Chapter 7.0, the indicators being used in a new anaytical model to reveal the key drivers pertaining to future development in each basin. Thereafter, proposed approaches for improvements are provided for each basin. Similarities and distinctions between the three Case Studies are highlighted, and this provides insight into approaches of potential utility in other trans-boundary basins. Chapter 8.0 addresses specific questions included in the Terms of Reference, amplifying comments provided elsewhere in the report. Concluding remarks are provided at Chapter 9.0, and a full list of references is included thereafter.

Chapter 2: The context for the study

This study emanates from a policy initiative of the EGDI and is intended to contribute to a global policy debate on the management of trans-boundary waters, and connected issues concerning conflict and the sharing of benefits. The rationale for the study is rooted in wider trends in Swedish foreign policy, which is undergoing ambitious and far-reaching changes. Important theoretical considerations and policy developments are underway in relation to international aid programmes, in which previous Swedish inputs have been considerable (especially in a catalytic sense). The study is contextualized below, in relation to the particular expectations of the EGDI; the policy changes within Sweden and elsewhere; and technical matters pertaining to trans-boundary waters and their utilization.

2.1. 'Shared responsibility' – The policy context

In December 2003, the Swedish parliament adopted a new overarching foreign policy that is intended to permeate all aspects of the country's future development aid.[2] The basic theme of that policy involves 'shared responsibility' for 'global development', and reflects a step away from a nationalist stand with its primarily bilateral commitments, towards a position where 'global' and 'common' issues are to be highlighted. The fundamental underlying concept of this change is that populations are increasingly interdependent on a world-wide scale, and that global problems must be solved jointly. While seemingly idealistic and altruistic, there can be little doubt that international assistance programmes should reflect the process of globalization, and decisions are needed as to how international cooperation and aid programmes should be designed in this new era. In Sweden, it is suggested that four core values should guide foreign policy in the future, these being *peace*, *democracy*, *human rights* and *development*. The ambition is to link these objectives with each other in a coherent future foreign policy.

A key focus in the preparation of the Swedish policy was the discussion of 'global public goods' which are of common concern (benefiting all), but where no single body has the clear responsibility for upholding these goods. A major study completed by the United Nations Development Programme (partly commissioned by the Swedish Ministry for Foreign Affairs) to iden-

[2] The Government Bill 2002/03: 122. *Shared Responsibility: Sweden's Policy for Global Development* was presented to the Swedish Parliament in May 2003, and adopted in December 2003. It claims to be the first coherent foreign policy in the world explicitly adapted to a globalized condition and modelled to fit to the UNDP Millennium Development Goals. See <http://www.regeringen.se/content/1/c6/04/10/63/9a6ca06f.pdf>.

tify these public goods and the manner of their protection argued as follows (Kaul et al., 1999; Sachs and Cook, 1999):

> *Nation states will witness continuing erosion of their capacities to implement national policy objectives unless they take further steps to cooperate in addressing international spillovers and systemic risks. But that cooperation must be of a new type. Not just cooperation that keeps global public bads at bay (until they reach crisis proportions) but cooperation that centers on creating global public goods and internalizing externalities. And not just cooperation that mistakenly assumes that the sphere of "public" ends at national borders, but cooperation that recognizes that an efficient system of global public policy is a necessary ingredient of an efficient global economy.*

It is notable that water-related issues – which many consider the greatest imminent crisis faced by humans on a global scale (Clarke, 2004; Gleick, 2004) – were generally neglected in this inventory and analysis of global public goods. However, the subsequent discussion placed increasing emphasis on 'regional public goods' (Sachs and Cook, 1999), with the involvement of the EGDI again occurring (Stålgren, 2000). At this point, trans-boundary water management was introduced as an issue of relevance. Referring to the work of Sachs and Cook (1999), Stålgren (2000: 10) stated that *"[t]he increased awareness of the volatility of external effects of what originally is national or sub-national activities has encouraged attention to regional CPR [common pool resources] such as transboundary watersheds."*

As a natural continuation of the interest of the Swedish Ministry of Foreign Affairs in the sector, a study on 'Transboundary Water Management as an International Public Good' was commissioned by the EGDI in 2000 (ODI and Arcadis, 2001). These authors addressed the concept of benefit-sharing and concluded that:

> *The public good argument can form the basis on which to develop a consensus on this benefit sharing idea, and indicates a possible way forward for operationalising the concept regionally. The basic ideas of non-rival and non-excludable consumption and political consensus around the provision of benefits assist in grounding some of the ideas of 'water security' and effective 'water governance'.*

ODI and Arcadis (2001) also promoted the establishment of an 'International Shared Water Facility'. Although theoretically the concept of 'regional public good' is not explicitly carried over into the present study (see the discussion in Chapter 3), the matter of 'benefit-sharing' is at its core, and the

management of trans-boundary waters is also addressed herein.

The emerging ambition of the Swedish Ministry of Foreign Affairs to link various foreign policy areas serves to increase the incentive for linking issues of security with those of development (both of these being key concepts in the new policy). These processes converge in relation to trans-boundary conflict management in developing regions (Öjendal, 2000a), as poverty alleviation and development issues are distinctly linked with conflict prevention and security in such geographies.

The present study also represents a continuation of the long-term engagement of the Swedish Ministry for Foreign Affairs in environmental and water-related issues. The first major input of this type involved the hosting of the first United Nations Conference on the Human Environment in Stockholm in 1972. Such attention to the environment was a novel concept at the time, and one which proved to be a milestone in raising awareness in environmental issues globally. In the water sector, Sweden has further engaged through the Global Water Partnership, the Stockholm International Water Institute, the annual World Water Week in Stockholm, and via support for policy development globally in several multilateral forums.

2.2. The task – a policy in search of realization

The current study is nested coherently within Sweden's official foreign policy for global development. The Swedish policy dictates that the main objective for development cooperation is to help create conditions to enable poor people to improve their lives, through the protection of livelihoods. Two perspectives – the rights perspective and the perspective of the poor – are considered to be of central importance to this global development policy. Given the fundamental human requirement for water, the appropriate sharing of trans-boundary watercourses is implicitly tied to the attainment of human rights (UNCESCR, 2002). The potential for an improved allocation of benefits between populations sharing trans-boundary watercourses also speaks directly to the alleviation of poverty in many cases, especially as one of the most important benefits in the developing world involves the ability to increase food production through the use of irrigated agricultural techniques.

In discussion with the EGDI, three Case Studies were selected for consideration here, due to their complementary nature. The first of these involves the Jordan River basin, where five co-riparians compete for the limited available water resources and little international cooperation is evident, with the threat of conflict being ever-present. The second Case Study involves the Kagera River basin, an upper tributary of the White Nile shared by four States. In this instance, the sharing of benefits amongst the co-riparians is at a nascent stage, and the relationship between the preferences within the

sub-basin and the events connected to the Nile Basin Initiative needs to be considered as an additional dimension. The third Case Study concerns the Mekong River basin, where at least some of the six co-riparians are beginning to develop a coherent system for sharing benefits.

In line with the Terms of Reference for the work, principles derived from these Case Studies (and other selected examples) are distilled in later sections of this report in discussions relating to four specific research and policy-oriented questions:

- What conclusions arise from the available international literature on conflict and cooperation on water resources, and what role does the sharing of benefits play in this?

- Can cooperation on the sharing of international watercourses be utilized as a broader conflict prevention tool – i.e. is there potential for 'spill-over' in this regard?

- What are the key areas for development partners in integrating trans-boundary water management more closely into their overall development agendas?

- What scenarios exist for future development in the Case Study basins, and how critical is joint water management as an element of these future scenarios?

Given that many of the available water resources are of a trans-boundary nature in the developing world, the process by which States share such waters is of clear importance to poverty reduction in a global sense. However, much of the development cooperation to date has tended to address this area in isolation, rather than integrating the water resource aspects into other areas of concern, such as the preferred agricultural uses of water or the availability of sanitation.[3] This is most important, as a trend appears to be emerging globally in which the general concept of Integrated Water Resource Management (IWRM) will be reassessed, and a drive is emerging for Integrated *Natural Resource* Management (with water resources 'nested within', this). This trend is discussed by this study, as it is intimately linked to the potential for the sharing of benefits attached to trans-boundary watercourses. The most obvious example of this relates to the common profligate use of water for agriculture in almost all developing nations (and

[3] Other issues of broader relevance are also to be considered. These include international trade (e.g. in agricultural produce), which is of particular significance in the Jordan River basin.

some developed countries, also). This not only constrains the future economic development of certain nations in particular fashions, but also tends to lead to the destruction of forests, wetlands, and other forms of natural ecosystems, reducing biodiversity and affecting carbon sinks, whilst creating negative externalities such as greenhouse gas emissions and global warming. However, several other more subtle linkages also exist, and these are discussed against the background of the three Case Studies.

2.3. The empirical background and general policy development

The preferred utilization of trans-boundary watercourses is an issue with truly global dimensions and importance. To take the African continent as an example, shared river basins account for:

- 61% of the total area of the continent (see Figures 1 and 2);
- 77% of the population on the continent; and
- an astonishing 93% of the total available water in Africa.[4]

This pattern of reliance on trans-boundary water resources is repeated elsewhere. For example, Palestine in the Jordan River basin is almost completely dependent on shared watercourses (involving four main aquifer systems and the Jordan River itself), as endogenous water supplies in Palestine are minor and are ephemeral in nature only. The two downstream co-riparians in the Jordan River system are exceptionally water-stressed, with *per capita* fresh water availability of only 70 m^3/year for Palestine and about 160 m^3/year for Jordan (Phillips *et al.*, 2006b in press). The dominating position of Israel in the basin has generated either actual conflict or the threat of conflict on several occasions in the relatively recent past, linked directly to access to water resources.

Several authors have debated the link between access to water resources and conflict, with different parties arguing all facets of the case. In reality, it is clear that inequitable access to water resources has caused conflict in the past, although there are also examples of States in various stages of conflict cooperating over water resources (e.g. Jägerskog, 2003; see also the more detailed discussion below). Most recently, the latter includes the experience of the Nile Basin Initiative involving ten co-riparians of the Nile River, several of which were engaged in open hostilities with each other at one time or another during the negotiations (and four of which are co-riparians of the Kagera River, addressed directly in the present work). A second example

[4] Data from Peter Ashton; cited by Turton (2005a).

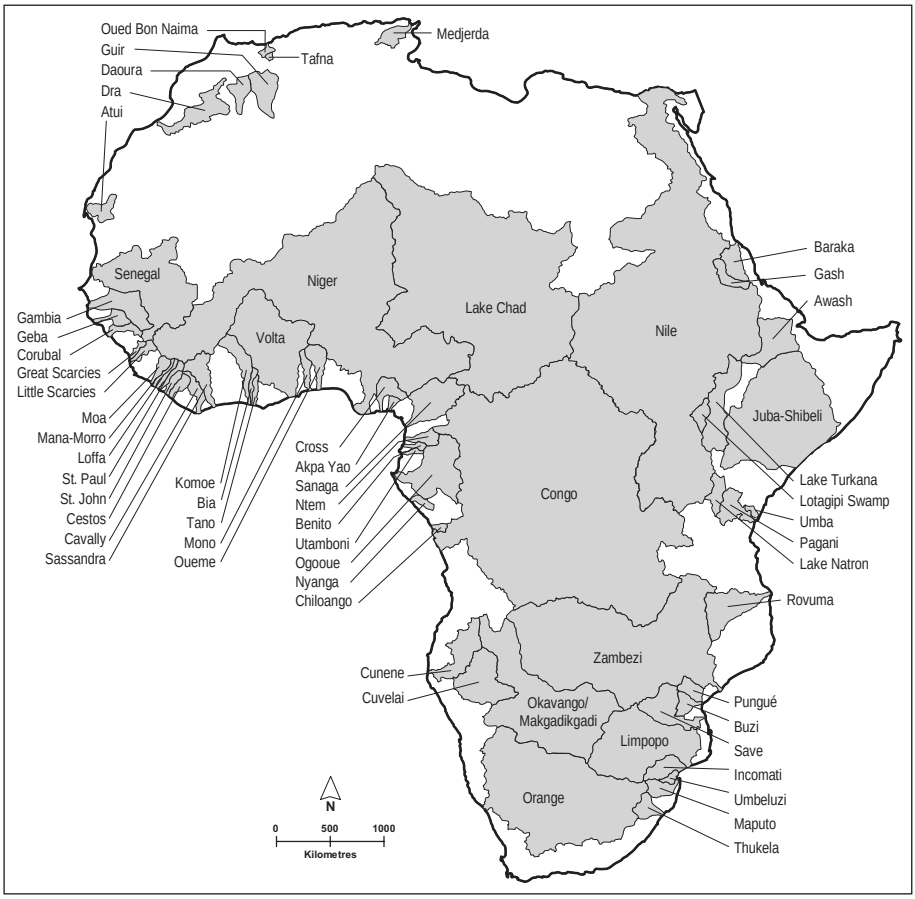

Figure 1. Map of Africa showing the locations and names of the continent's 61 international river basins. After Ashton and Turton, in press; original modified and redrawn from UNEP, 2002: 27.

concerns the Mekong, where cooperation by at least some of the six co-riparians has survived decades of violent conflicts in the region.

The link between trans-boundary water systems and benefits to populations (especially those living in poverty) is also intimate. Recent updates by the United Nations on progress towards attaining the Millennium Development Goals (MDGs) show that the target of halving the proportion of the population without sustainable access to safe drinking water and sanitation (MDG 7, target 10) is unlikely to be met, at least unless a rapid improvement is seen before 2015. This is particularly the case in rural areas of developing nations – especially those in sub-Saharan Africa. Because most of the available water in that area is trans-boundary in nature as noted previously, it is clear that the benefit of access to safe drinking water is unlikely to be attained where an equitable distribution of those waters does not eventuate. The same case can be made for food security in the developing nations,

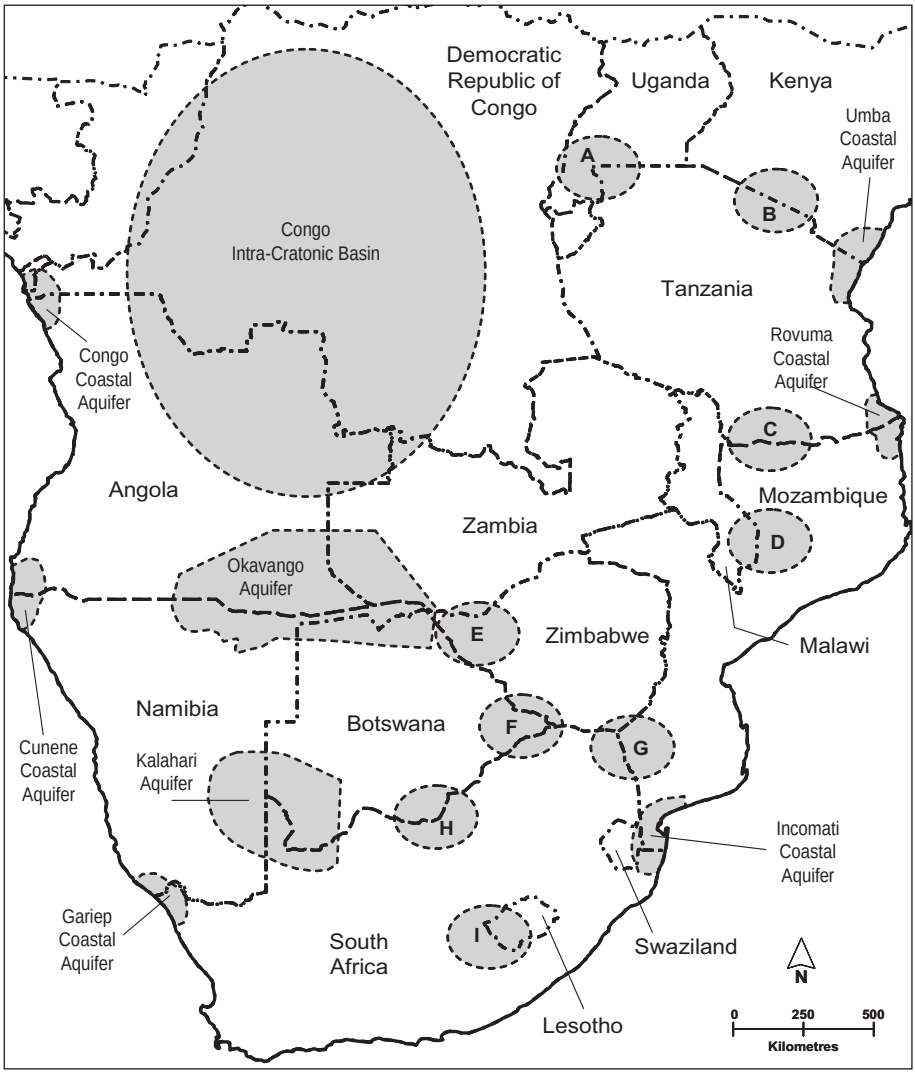

Figure 2. Map of southern Africa, showing the international (shared) aquifer systems used by the SADC States. (A = Kagera Aquifer; B = Kilimanjaro Aquifer; C = Upper Rovuma Aquifer; D = Shire Valley Alluvial Aquifer; E = Nata-Gwaai Aquifer; F = Tuli-Shashe Aquifer; G = Pafuri Alluvial Aquifer; H = Ramotswa Dolomite Aquifer; I = Karoo Sedimentary Aquifer. After Ashton and Turton, in press; drawn from data in UNESCO-ISARM, 2004: 7).

which is intimately dependent on the availability of water, and also on access to global markets supported by the capacity to finance the trade in virtual water in a sustainable manner.

The 'zero action option' (involving the maintenance of the existing financing systems internationally) will clearly lead to further erosion of the livelihoods of marginalized populations in the poorer developing nations. This is to be considered inappropriate in isolation, but will inevitably be ac-

companied by an increased divergence of the rich and poor, with significant potential for increased (intra-State and inter-State) conflict. Recent years have seen an emergence of activism amongst sections of western societies aimed at addressing the plight of the world's poor. It is widely acknowledged that international assistance programmes should attempt to drive globalization in a direction intended to reduce the divergence in income between communities and populations. The critical nature of water resources implies that international assistance programmes in this arena are of particular importance in this regard.

2.4 International water law

International water law is arguably coming of age. The Helsinki Rules of 1966 are generally considered to be the first coherent codification of customary international water law (ILA, 1966). These were extended two decades later to a consideration of groundwaters by the Seoul Rules, also promulgated by the International Law Association (ILA, 1986), and the Bellagio Draft Treaty on Transboundary Groundwater (Hayton and Utton, 1989). More than ten years then passed before the publication in 1997 of the United Nations Convention on the Law of the Non-navigational Use of International Watercourses (United Nations, 1997), which is now widely considered to be the most authoritative legislative instrument relating to international water law. The Berlin Rules which have been recently published by the International Law Association seek to extend the customary water law framework yet further (ILA, 2004).

The three key principles of international water law concern equitable and reasonable use; the avoidance of significant harm; and the prior notification of works which may affect co-riparians in trans-boundary watercourses. In relation to the first of these, it is notable that Article 5 [1] of the most recent codification of international water law (United Nations, 1997) states the following:

> *Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits therefrom, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.*

The reference to both 'utilization' and 'benefits' here is important, as it is clear that customary international law anticipates the possibility that co-riparians may either allocate trans-boundary water resources volumetrically,

or agree on the sharing of benefits arising from shared watercourses (or possibly, both of these in concert). Where volumetric allocation is contemplated, several factors are offered for consideration, and those laid down in the Helsinki Rules of 1966 and the more recent United Nations Convention are shown in Table 1. It is notable that while this body of law provides general guidance on equitable and reasonable use of trans-boundary water resources, no simple formula exists for co-riparians to derive volumetric allocations. Thus, all cases are considered to be unique and the riparians involved should negotiate their respective shares of each of the trans-boundary resources, depending on their particular circumstances. In some instances, the riparians involved have preferred to negotiate over benefits arising from the waters themselves rather than attempting to derive volumetric allocations, and this matter is addressed at greater length in subsequent chapters of the present report.

Table 1. The factors to be considered when allocating international watercourses, as included in the Helsinki Rules and the 1997 United Nations Convention.

The Helsinki Rules	The 1997 UN Convention
CHAPTER 2. EQUITABLE UTILIZATION OF THE WATERS OF AN INTERNATIONAL DRAINAGE BASIN.	**Article 6 – Factors relevant to equitable and reasonable utilization.**
Article V. I. What is a reasonable and equitable share within the meaning of article IV to be determined in the light of all the relevant factors in each particular case.	1. Utilization of an international watercourse in an equitable and reasonable manner within the meaning of article 5 requires taking into account all relevant factors and circumstances, including:
II. Relevant factors which are to be considered include, but are not limited to:	
1. The geography of the basin, including in particular the extent of the drainage area in the territory of each basin State;	(a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
2. The hydrology of the basin, including in particular the contribution of water by each basin State;	(b) The social and economic needs of the watercourse States concerned;
3. The climate affecting the basin;	(c) The population dependent on the watercourse in each watercourse State;
4. The past utilization of the waters of the basin, including in particular existing utilization;	(d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
5. The economic and social needs of each basin State;	(e) Existing and potential uses of the watercourse;

6. The population dependent on the waters of the basin in each basin State;	(f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
7. The comparative costs of alternative means of satisfying the economic and social needs of each basin State;	(g) The availability of alternatives, of comparable value, to a particular planned or existing use.
8. The availability of other resources;	
9. The avoidance of unnecessary waste in the utilization of waters of the basin;	
10. The practicability of compensation to one or more of the co-basin States as a means of adjusting conflicts among uses; and	
11. The degree to which the needs of a basin State may be satisfied, without causing substantial injury to a co-basin State.	
	2. In the application of article 5 or paragraph 1 of this article, watercourse States concerned shall, when the need arises, enter into consultations in a spirit of cooperation.
III. The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is reasonable and equitable share, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.	3. The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is a reasonable and equitable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.

The other two key principles of customary international water law generally pose less problems for co-riparians. The avoidance of significant harm was included in the Helsinki Rules in Articles V and X, being termed 'substantial injury' or 'substantial damage' therein. The Bellagio Draft Treaty referred to the need to 'avoid appreciable harm' to the groundwaters of other States. The United Nations Convention of 1997 strengthened the provisions relating to the obligation not to cause significant harm (see Article 7 of that Convention), and several other international legal instruments also contain such a provision. Many international agreements on trans-boundary waters reflect this requirement, and most also include the need for prior notification.

However, even here differences exist between distinct basins. For example, some riparians continue to resist the requirement for prior notification (e.g. Ethiopia in the Nile River basin; see Chapter 5 of this report). This reflects the fact that there is no universal recognition of the principles of international water law, and many States prefer to simply negotiate agreements on

the utilization of trans-boundary waters (or sometimes on the sharing of benefits) using their own methodology. The United Nations Convention acknowledges this in Article 3, and also notes that the Convention will not have retrospective effect relating to previous agreements. Under such circumstances, international water law may be considered a blunt instrument, especially by basin hegemons (or politically dominant States) intent on reserving trans-boundary waters for their own use. As will be seen in Chapters 4 to 6 of this report, international water law is by no means universally respected by co-riparians sharing trans-boundary waters.

Chapter 3: The framework for the approach

3.1 Water, conflict, cooperation and 'spill-over': The debate

Water is a fugitive resource, moving in both time and space (Frederick, 1996; Ashton, 2000). While many think of water as a stock, it is in fact a flow (Shaw, 2005: 5), otherwise known as a flux. By virtue of crossing national boundaries, water forces riparian States into a situation of inter-dependence. The difficulties encountered with managing and sharing a common resource such as water are well-known. Conflicts over water evolve in complex environments. In the case of the Middle East, for example, the potential for conflict is increased because the region has one of the highest demographic growth rates in the world at 3–4%.[5] Water-intensive agricultural irrigation policies are motivated by the pursuit of water and food security, mostly in countries with high demographic growth rates and very limited economic diversification. Some of the highest demographic concentrations in the world are found in two of the three Case Studies addressed by this report – the Jordan and Kagera River basins. More significantly, however, the linkage between high demographic growth rates and the degree of economic diversification is a key factor in the context of benefit-sharing.

Water-related issues have been analyzed from many distinct perspectives by different authorities. However, the perception of water as a global common good has triggered a debate on the need for collective action, some of which has a theoretical underpinning. In order to avoid a 'tragedy of the commons' (Hardin, 1968) or unilateral abuse of this finite resource, some have appealed for common forms of resource management (Ostrom, 1990). Other approaches, inspired by game theory, attempt to identify property rights for water (Luterbacher *et al.*, 2000). Water is in fact a potential source of conflict *and/or* cooperation. This is particularly significant in the context of the current study, because the trajectory of inter-State relationships is largely dependent on factors other than those found in the water sector *per se*. Thus, water is seldom an independent variable, as discussed in greater detail in later sections of this report.

The sharing of water resources has hydrological, economic, foreign policy, and domestic dimensions (Le Marquand, 1977). Neo-Functionalists predict that cooperation in low politics (i.e. technical issues such as water sharing) will 'spill over' into high politics (Mitrany, 1975). However, a lack of cooperation in high politics can also lead to a similar deadlock in low politics

[5] UN ESCWA: Members, General and Social Indicators (<http://www.escwa.org.lb>).

(Lowi, 1993). Under regime theory, regional institutions act as efficient tools to manage cooperative regimes for natural resources (Young, 1989; Jägerskog, 2003). While international governance implies an agent-based resolution of collective problems at local, national and international levels (Medzini and Wolf, 2001), there is no deep understanding of the dynamics of governance, and the theoretical underpinnings of this therefore remain scanty (Turton and Earle, 2005). The concept of Integrated Water Resources Management has been promoted by international institutions to attempt to engender economically viable and environmentally sustainable utilization of the common water resources (Claasen, 2005). However, some States refuse to be 'integrated' in any fashion, although their water resources should nevertheless be equitably and reasonably allocated and utilized.

From a 'virtual water' perspective, we also know that water is, in effect, imported through food. Food imports indirectly contribute to easing internal and external water conflict by erasing political costs (Allan, 2000). Water footprints, or the volume of water needed for the production of the goods and services consumed by the inhabitants of a country, are evaluated in various chapters of the present document. Significantly, this analysis reveals the role played by the absence of economic diversification. It also merits mention that some emphasize that 'virtual water' fails to grasp the symbolic dimension related to water rights, while potentially delaying the need to manage reform, and regulate demand. This is particularly significant for the long-term resolution of an asymmetric conflict such as the dispute over water in the Jordan River basin. Most virtual water analysts also ignore the important issue of possible economic dependency that such trade can induce in a given country. For a virtual water solution to be viable, the importing country must have the capacity to pay for the imported food (and other goods), and this in turn implies a diversified economy capable of generating foreign currency with which to finance this trade. Economists and engineers also warn about the confusion between the grain trade and the water trade, as 'virtual water' does not appear in a country's water balance. However, attempts have been made to call for a more sophisticated modelling approach that is capable of understanding these nuances (Turton *et al.*, 2003), and this is an important issue deserving much greater attention. Alarmist appeals are dismissed in favour of 'cornucopian' approaches which emphasize the need to put an economic value on water, since the problem is often one of mismanagement, not scarcity (Gledditsch, 1998: 381). Hence, many economic approaches advocate cooperation through demand management, pricing or water markets (Allan, 1995; Dinar, Rosegrant and Meinzen-Dick, 1997; Fisher, 2001), because they are driven by the developed countries in the industrialized northern hemisphere (Turton *et al.*, 2005). This means that they often do not resonate with the actual needs in many of the developing countries of the world.

Water can also be a source of conflict as riparian States strive to gain a maximum share of a finite (albeit fugitive) resource. This often occurs specifically where water issues are embedded in larger conflicts of a high-politics nature, or where limited economic diversification limits the range of policy options open to Governments. In such cases, potential solutions tend to involve agreements on volumetric allocations rather than the sharing of benefits, and the Jordan River basin provides an excellent example of such a scenario.

3.2 Characterizing conflict

As noted by several authors, conflicts between States over water resources can range greatly in intensity (e.g. see Frey, 1993; Zeitoun, 2005a). Yoffe and Larson (2001) provided a scale of intensity for conflicts, as shown in Table 2. Zeitoun (2005b) has recently adapted elements from this to conflicts pertaining to water, resulting in the examples shown in Table 3.

Table 2. The scale of conflict intensity. Adapted from Yoffe and Larson (2001).

	Scale	Example of Event
Conflict ↑	-7	Formal declaration of war.
	-6	Extensive war-like acts causing deaths, dislocation or high strategic costs.
	-5	Small-scale military hostilities.
	-4	Political-military hostile actions.
	-3	Diplomatic-economic hostile actions.
	-2	Strong verbal expressions displaying hostility in interaction,
	-1	Mild verbal expressions displaying discord in interaction.
	0	Neutral or non-significant acts for the inter-nation situation.
Cooperation ↓	1	Minor official exchanges, talks or policy expressions; mild verbal support.
	2	Official verbal support of goals, values, or regime.
	3	Officially sanctioned cultural or scientific support (non-strategic).
	4	Non-military economic, technological or industrial agreements.
	5	Military, economic or strategic support.
	6	Major strategic alliances (e.g. an International Agreement).
	7	Voluntary unification into one nation.

Two important matters arise from this type of categorization:

- While many parties have debated whether 'water wars' occur from a narrow perspective of outright armed hostilities between States (or at least discrete political entities; see below), this ignores lower-intensity conflicts which may nevertheless be of significant importance in determining the geopolitical attitudes of parties to each other. At least two of the three Case Studies addressed in the present report involve a cycle of ongoing conflict amongst the co-riparians, sometimes becoming hostile and being underpinned by armed violence.

- Conflict between States is only one aspect of the overall concern, as conflict *within* States may be at least as destabilizing a force in regional terms, and is probably considerably more common than inter-State conflict over natural resources such as fresh water. It may be anticipated that intra-State conflicts will become increasingly important as access to water is further restricted, and trans-boundary river basins and aquifer systems are obvious trigger points for such future problems.

It is also notable that Table 2 remains underdeveloped conceptually, as in many circumstances both conflict and cooperation between basin States may occur concurrently. Thus, the relationships between States are complex, with cooperation in one arena often being accompanied by conflict (especially 'cold conflict') in other areas.

Table 3. Classification criteria for conflicts on water. After Zeitoun (2005b).

Base of Conflict (Gleick)[6]	**Suggested Criteria**	**Example** (Gleick)[6]
Development Disputes – where water resources or water systems are a source of contention and dispute in the context of economic and social development.	Conflicting interests are neither fought over militarily, nor resolved peacefully.	Ethiopia-Somalia 1963; Bangladesh 1999; Pakistan 2001; Turkey-Syria-Iraq 1990.
Control of Water Resources – where water supplies or access to water are at the root of the tensions.	A changed outcome in physical or effective control of the resource following the end of the conflict.	Egypt-Sudan 1958; Israel-Syria 1958; Brazil-Paraguay 1979.
Water as a Political Tool – where water resources, or water systems themselves, are used by a nation, State or non-State actor for a political goal.	Coercion – the use of an advantageous hydraulic (or security) position to advance interests in non-water domains.	Iraq-Syria 1974; Turkey-Syria-Iraq 1990; Malaysia-Singapore 1997.

Water as a Military Target – where water resource systems are targets of military actions by nations or States.	The deliberate destruction of wells, reservoirs, treatment or distribution facilities.	Zambia-Rhodesia 1965; Israel-Syria 1967; Israel-Jordan 1969; South Africa-Angola 1988; US-Afghanistan 2001.
Water as a Military Tool – where water resources or systems are used by a nation or State as a weapon during a military action.	The use of flooding, moats, poisoning.	Ethiopia-Somalia 1948; Israel-Lebanon 1982; Bosnia 1992; Kosovo 1999.

3.3 Water, conflict and security: Securitization processes

The previous section of this report identifies different categories of conflict intensity and their impact on water management. Conflict arises over water resources when riparian States feel constrained in their ability to realize their national goals and objectives, generally as a result of one or more co-riparians unilaterally using the resource. A key element in understanding the dynamics of water conflict is the presence of a prevailing threat perception that acts as an interceding variable, informing decision-making and thereby linking perceptions to reality (Turton, 2003a: 73; 2003b: 89).

Conflicts can be conceptualized as a 'distribution' or 'collaboration' problem between different parties with competing and incompatible demands (Zartman and Rubin, 2000: 2). Commonly in such a situation, one party (intentionally or otherwise) frustrates another actor's objectives (Frey, 1993: 57). Conflict can also be perceived as a contest that parties try to win through various strategies (Schelling, 1960: 3). Inequality can also be a decisive influencing variable that determines the level of conflict (Dutta and Mishra, 2005), and it is important to understand that this extends to both inter-State and intra-State scenarios (e.g. compare the Jordan River basin to the Kagera sub-basin).

Hegemonic Stability Theory proposed by Neo-Realists involves an account of how a hegemon, i.e. the most powerful riparian in the basin, manages to impose its own water policies on the other Basin States. Under such a circumstance, open conflict will usually occur only when this is in the hegemon's interest (Lowi, 1993). However, in general terms no military conflict over water is likely to occur, even in a troubled region such as the Middle East (Waterbury, 1994). An emerging new theoretical development is that known as hydro-hegemony, which seeks to clarify hydro-politics from the perspective of the hegemonized (Zeitoun, 2005b). This concept seeks to

[6] Gleick, P. Water conflict chronology – Introduction. Pacific Institute, California, USA. (<www.worldwater.org/>).

capture the essence of what has been noted above – that power asymmetry is a fundamental aspect of hydro-politics – even to the point where the concepts used and literature cited can be traced back to the political interests of key actors. Just as history books are mostly written by the victors of an armed struggle, so the hydro-political literature tends to be written by the hegemon seeking to retain a specific power relationship. While this can be regarded as a fact of life in contemporary hydro-political analyses, recent research has shown that weaker States in a given political configuration can (and do) leverage benefits in excess of their initial expectation, provided that certain pre-conditions exist (Turton, 2003c; Daoudy, 2005; Turton and Earle, 2005: 165). This is important in the context of the current study, because in order for a third party such as a donor organization to develop a benefit-sharing policy strategy that is viable, it will be necessary to determine from specific Case Studies, what potential exists for leveraging a positive-sum outcome – and then concentrate the diplomatic efforts accordingly.

After several decades of outcries from a few specialists in the water sector, the early 1990s saw the emerging global water shortage and its major consequences being placed gradually on the global policy agenda. Having awaited recognition for many years, the urgency of the matter finally struck with full force, causing alarmist responses and at times an unbalanced debate in terms of the implications for a peaceful resolution to the problem. Water management thus became associated with security concerns, and international river basins came increasingly into political focus. This has been termed the 'securitization of water resource management', which links water issues to national security concerns, thereby taking them out of the normal domain of technical management (involving so-called Technocrats) and placing them in the secret and closed domain of security officials (so-called Securocrats; see Buzan *et al.*, 1998; Turton, 2003a: 74).

Increasing water stress, the notion of an emerging threat to national resources and the inequitable distribution of water emphasize two dimensions of the theoretical debate: the link between environmental problems and the emergence of conflict; i.e. water as a security issue. Central to this is the role played by threat perception as an interceding variable, because it is through this mechanism that environmental issues such as water scarcity become perceived as national security threats, therefore driving the securitization dynamic (Turton, 2003a, 2003b). Actors are often not merely concerned over the enforcement of an optimal distribution of water, but ultimately seek to achieve enforceable security arrangements. The link between security and the control and distribution of natural resources lies at the heart of most water conflicts, with threat perceptions being 'the glue that binds these different variables together'. Security can be simply defined as a protection from threat (whether real or perceived), although the concept is far more nuanced than this in reality (Brauch, 2005a, 2005b). Security studies originally addressed concerns from the perspective of military and economic

threats to a State's territory, its autonomy and its borders. This concept is at the core of Realist and Neo-Realist interpretations of security – what would later be defined as 'traditional security studies' (Buzan *et al.*, 1998: 203).

In the 1990s, critical or non-traditional security studies have introduced a new perspective on threats to national security, broadening the agenda from traditional threats (military, economic) to new security threats which, for example, can be linked to the environment or to energy (Krause and Williams, 1997; Romm, 1993: 6; Spector and Wolf, 2000: 410). Other threats relate to national development policies, and establish a relationship between water and territory (Dalby, 1997: 3). For example, water scarcity and food-related scarcity often appear to constitute serious threats to the national security of developing countries (Korany *et al.*, 1993: 15–17).

The concept of *environmental security* – touted by the 'Toronto Group' (Homer-Dixon, 1993, 1994a) – has made its mark on the pre-existing debate on resource-oriented conflicts (Westing, 1986; Mathews, 1989: 162). This development was associated with an important underlying driver in the form of national intelligence services, many of which were re-defining a role for themselves in a post-Cold War world (Rodal, 1996). *Environmental scarcity* is linked to very high risks of violent conflict because of acute change or stress in resources (such as water scarcity and extreme pollution), often accompanied by high population growth and a socially inequitable distribution of resources (Homer-Dixon, 1994a: 6–8). Environmental security can also be interpreted as the need to preserve local biospheres because of their established impact on a whole range of human activities, initiating a process of the securitization of environmental problems (Buzan *et al.*, 1998: 76). Perceived as the protection of national resources, environmental security can be divided into categories, one of these involving trans-national environmental problems, such as global climate change and resource-based problems which traditionally affect territorial integrity and political stability (Romm, 1993: 15).

Recent research findings on the part of the International Peace Research Institute of Oslo have confirmed the link made between scarcity and conflict (Toset *et al.*, 2000). However, probabilities for increased military conflict seem to increase when rivers cross borders rather than forming borders, as this creates an upstream/downstream dynamic (Toset *et al.*, 2000: 971). It is particularly interesting in this context that the Palestinian-Israeli conflict involves five main trans-boundary water resources, with Palestine in an upstream position in three of these, and Israel upstream in the other two cases. Phillips *et al.* (2006b, in press) have intimated that this may represent an important key to unlocking the solution to equitable and reasonable allocation of the shared resources in that instance.

Some would warn about the establishment of a paradigm in which all global threats are systematically linked to national security issues, making environmental security a loose concept (Ayoob, 1997; Deudney, 1990: 461).

A further key issue is the role of securitizing agents, often in the form of well-meaning commentators who seek to draw attention to the perceived plight of natural resource management by couching their communications in an alarmist manner (Turton, 2001, 2002a: 13–15). This reveals that 'security is in the eye of the beholder' – a question of how threats are perceived and used, rather than whether they are real. States are also keen to protect themselves from threats coming from within their societies, which can be perceived as identity or secessionist threats. 'Societal insecurity' is reflected by the perception of some communities that inadequate water resource development will affect their very survival, creating so-called 'vertical identity' conflicts between central States and peripheral communities (Buzan *et al.*, 1998 : 132). It is for this reason that Brauch (2005a; 2005b) calls for greater rigour in the use of security as a concept. The securitization of threats helps to legitimize exceptional measures in the guise of defending national survival by taking the threat out of the normal domain of politics, and placing it in the security domain where it receives greater attention, but is also alienated from the general public. The debate on environmental security has, for example, triggered a controversial Neo-Malthusian concept according to which population growth in poor countries and pressure on natural resources leads to a weakening of environmental and security regimes (Ohlsson, 1999). Appeals have therefore been made for greater population control in poor areas of the world, without making the connection between poverty and choice.

For some years to date, predictions have been broadcast relating to imminent water wars (e.g. Irani, 1991; Starr, 1991). However, these theories have proven to be inaccurate, as no armed conflicts have erupted based simply on water-related issues, even in highly water-scarce regions such as the Middle East. Others consider the link between environmental degradation and/or change in water resource allocation as a threat to State security, without establishing this as a prime reason for armed conflicts (Lowi and Shaw, 2000: 149; Wolf and Hamner, 2000: 123), and these analysts again fail to recognize the role of threat perception as an interceding variable. The Jordan River basin Case Study (Chapter 4 below) clearly suggests that water is not the principal factor behind the 1967 Arab-Israeli conflict. Sections 3.2 and 8.1.1 of this report also establish that water is seldom an independent variable, but rather operates in combination with other existing sources of conflict, reflecting these underlying tensions, and sometimes also magnifying them.

3.4 From 'water wars' to the sharing of benefits

Over the last decade, the debate has matured and begun to swing in the opposite direction, emphasizing options for cooperation and the amicable sharing of benefits resulting from professionally managed watersheds. This process has been cited as the 'desecuritization of water resource management'

(Turton, 2003a: 96), and opens the way to negotiated agreements between States and the consequent sharing of benefits. The concept of benefit-sharing is a central focus of the present work, and can only be understood in the context of the securitization and desecuritization dynamics noted here. Below, we trace this debate and contextualize the concept of benefit-sharing within the wider global discussion on water-related topics.

3.4.1 The emergence of water on the global policy agenda

As noted briefly in Chapter 2 above, the emerging focus on water-related issues can be traced back to the United Nations Conference on the Human Environment of 1972, in Stockholm. At that time, water-related matters were hardly discernible as an issue of importance among many other environmental issues brought forward. However, a breakthrough was achieved in Mar del Plata in 1977 where participants from all over the world gathered. The Mar del Plata meeting focused entirely on water and had a high policy profile – a combination never achieved before. The conference placed water-related concerns securely onto the international political agenda (Biswas, 1997: 127; Najlis and Kuylenstierna, 1997: 23). In essence, the need was argued for better informed and more flexible national water plans; viable institutions for the implementation of such plans; comprehensive and updated water laws to create an adequate enabling environment; and participation by all stakeholders. The bottleneck to improved water governance was seen to be inadequate management at the national level.

Although the awareness of the looming global water shortage increased gradually during the 1980s, the situation in material terms showed no sign of improving. For instance, during the "water decade" announced by the UNDP in 1980, the global ratio for people with access to safe water remained essentially unaltered.

In a pre-meeting designed to prepare for the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, water specialists and policy-makers met in Dublin early in the same year. Whereas the later conference in Rio de Janeiro – a success in relation to many other environmental issues – was largely seen as a failure by the water specialists, the Dublin meeting in itself produced four policy pillars that solidly placed water on the global development agenda. These became known as the Dublin Principles, and are as follows:

- The effective management of water resources requires a holistic approach, linking social and economic development to environmental and land use concerns, including inter-watershed issues.

- The participation of stakeholders, planners and policymakers at all levels is absolutely necessary.

- In global terms, women play a central part in providing, managing, and safe-guarding water resources.

- Water has an economic value and should be regarded as an economic good (*cf.* Lundqvist and Jønch-Clausen, 1994).

These recommendations came to dominate part of the following decade, and 'modernized' the thinking in attempting to deal with the emerging global water shortage. Even more importantly, the four recommendations laid the foundation for the possible desecuritization of water resource management, at least in basins that were not embedded in larger, more intractable sets of national security concerns.

However, by the 1990s the predictions of water shortage and water stress were so alarming – particularly in some semi-arid regions – that a virtual 'scramble' for water resources set in, driven by the desires of many Governments to establish security of supply at all cost, in a world of apparently hostile adversaries. Significantly, attempts by various well-meaning water resource professionals to raise the profile of water by framing it in the language of crisis, simply served to drive securitization dynamics (Turton, 2001). This had a number of unintended consequences. The situation appeared particularly alarming in certain international watersheds that had either no or inadequate water-related agreements in place.

At the same time, it became increasingly obvious that the major share of the 'still available' global water resources was to be found in international watersheds. For example, Conca (2006: 73–91) notes that more than 50% of the continental surface area lies in international river basins. In Africa, this figure is around two thirds of the total land surface area of the continent, containing more than 90% of the water and home to about three quarters of the entire human population (Ashton and Turton, in press). Water came in this context to be a key dimension in security discussions, or even regarded as the potential trigger for armed struggles (Irani, 1991; Starr, 1991; Ramana, 1992; Bulloch and Darwish, 1993; Gleick, 1994; Rake, 1997; Wolf, 1997; de Villiers, 1999; Turton, 2000). Regions such as the Middle East, the Nile Basin, the Indus, and the Ganges-Bramaputra basins were seen as prone to water-derived conflicts, some of which seemingly had the potential to become armed military confrontations. Moreover, the extrapolation of figures led in certain 'hot-spots' to entirely untenable predictions, and few options to future conflicts were envisaged.

Several commentators published doomsday-style predictions during this period, citing competition for water in trans-boundary basins as a source of armed conflict. Egypt threatened to go to war against upstream countries if what it perceived as its share of the Nile water was tampered with. Thus by the mid 1990s, the idea of 'water wars' reached the popular, academic and policy-making circles with considerable force, indirectly creating a discourse

that heavy-handed politicians picked up and used as leverage for their own vested interests. These fed into the securitization discourse, and slowly water resource management was elevated to the lofty realm of national security, inhabited exclusively by Securocrats and therefore inaccessible to the general public.

3.4.2 Where are the water wars? Where is the cooperation?

It is rare that findings within social science produce instant paradigm shifts. However, with the surprising result from a database study at the Oregon University led by Aaron Wolf, disclosing that there have hardly been *any* 'water wars' in human history (Wolf, 1997, 1998b; see also Turton, 2000, 2002b, 2005a, 2005a; Jägerskog, 2003), the tables were turned almost overnight. An analysis based on a total of 1,831 events connected to trans-boundary 'basins at risk' has shown that the riparians in fact tend to cooperate, rather than entering into conflicts (Figure 3; see Yoffe, 2001; Giordano and Wolf, 2003). Other empirical studies soon followed, with at least four distinct schools currently known to be in existence – in Oregon, Oslo, Maryland and Tshwane (Turton, 2005b).

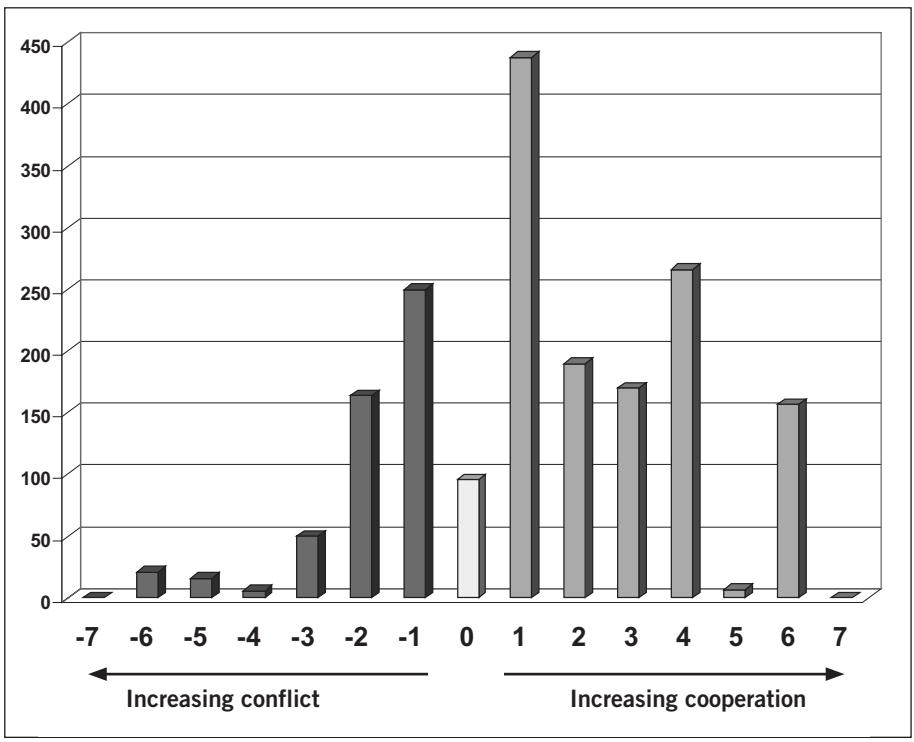

Figure 3. The numbers of recorded events relating to conflict or cooperation on trans-boundary water resources. Redrawn, after Yoffe (2001); Giordano and Wolf (2003).

This opened up a 'discourse of cooperation' (Nicol, 2002: 167) that was related to the potential for collaborative attitudes over water-related issues and the possibility to initiate rising spirals of benevolent relations, rather than the opposite (see also Jägerskog 2003). There is no single interpretation of the concept of 'cooperation', which has been addressed by a distinct literature in the field of international relations (e.g. see Axelrod, 1984; Keohane, 1984; Oye, 1985). This literature has also shown that cooperative outcomes can arise among self-interested actors, thus generating positive-sum games. Closely connected to the existence of a conflict, cooperation would only prevail in mixed situations of 'conflicting and complementary interests' (Axelrod and Keohane, 1985: 226). The degree of cooperation also depends on the capability of the actors to accommodate conflicting interests. In addition, the concept of cooperation is sharply differentiated from other concepts such as 'harmony' and 'discord', as under conditions of cooperation, actors have an incentive to change their behaviour in an act of reciprocity (Keohane, 1994: 44–57). The institutionalization of cooperation has been conceptualized by constructivists as a learning process in which actors 'reconstruct their interests in terms of shared commitments to social norms' (Wendt, 1994: 77–94). Others have also analyzed the institutionalization of cooperation on water in specific examples such as the Jordan River basin (Jägerskog, 2003).

Recognition of the cooperative side of shared water resources became a mantra in the subsequent debate (e.g. Conley and van Niekerk, 2000; Huisman *et al.*, 2000; van der Zaag and Savenije, 2000; Kliot *et al.*, 2001; Sadoff and Grey, 2002, Nicol, 2003). Some of these authors cautioned, however, that while States often cooperate in the field of water resource management, this should not be an excuse for complacency in the face of complex and often rapidly increasing demands for strategic access to water by certain co-riparian States (see Nicol, 2002: 168). Others noted that international agreements on water were commonly either abrogated, or were not implemented in full (Swain, 2004).

While the new empirical evidence of Wolf (1998b) and his co-workers was enthusiastically accepted by a world hungry for such information, he also pointed out that inadequate water access and management is a destabilizing factor, and that this should become the new focus in policy circles. In juxtaposition to the emerging discourse, Gleick (2004) and others argued that although wars are not necessarily triggered by competition over water resources, other forms of conflict are driven by increased competition over such scarce resources (including social instability, ethnic clashes, low-intensive international conflict, and border disputes; see Homer-Dixon, 1994a; du Plessis, 2000: 28; Swain, 2004).

Moreover, the fact that 'water wars' have not occurred does not imply that cooperation exists, or that water resources are shared equitably and reasonably by co-riparians on the basis of the principles of customary international

water law. The debate which emerged from the argument by Wolf (1998b) has tended to obscure the fact that from a developmental point of view, equitable access to water resources remains hampered by antagonism and distrust among riparians in international watersheds, producing sub-optimal results (Öjendal, 2000a). It is in this context that threat perceptions become relevant, because they perpetrate a culture of mistrust. When internal conflict is also accounted for, there can be no doubt that tensions and lower level conflicts exist, and these reflect increasing global, regional and local water scarcity (Sneddon *et al.*, 2002; Miller and Hirsch, 2003). However, cooperation at the regional or local levels may be far more successful than that between States, and 'spill-over' effects can still be sought at the lower geographic scales (*cf.* Jägerskog, 2003: 161).

Other authors found a different interpretation of 'water wars', arguing that these exist already, but have not been recognized. Shiva (2002) suggested that the privatization and pollution of water resources effectively constitute a 'war against the poor'. Boesen and Ravenborg (2003) considered that social unrest is the more likely problem, and cautioned that without improved handling of international watersheds we may see a move 'from water wars to water riots', and a similar point was made by du Plessis (2000). Postel and Wolf (2001) concluded that *"[l]ost amidst this perennial debate over whether there will be water wars has been a serious effort to understand precisely how and why tensions develop, beyond the simplistic cause-and-effect equation that water shortages lead to wars"*. The debate has thus turned full-circle and the key issue remains the utilization of trans-boundary waters in a sustainable manner, while at the same time reducing poverty and ensuring that violent conflicts do not occur.

While attention in policy circles seems largely to be devoted to conflict prevention in terms of international diplomacy under a 'Westphalian' system (giving priority to political negotiations and international agreements between sovereign States), an equally important task may now be to find ways of utilizing water resources in an optimal way for sustained economic development and therefore the alleviation of poverty. The unequivocal establishment of the link between good watershed management and successful development policies is therefore a key contemporary policy challenge (Nicol, 2003).

However, several basic dilemmas exist in international watershed management. From a theoretical point of view, trans-boundary water resources constitute a special (and a particularly complex) case of the utilization of common pool resources. This 'common pool' is, however, compromised by the fact that States are sovereign in nature and operate in a largely anarchic international system with no central authority, zealously guarding their 'space' and perceived 'national interest' within that contested terrain. As noted previously in Section 2.4, international law is still relatively underdeveloped and inadequately recognized in relation to trans-boundary water-

courses, providing no certainty of a viable solution (Conca, 2006: 169). In this situation, some States prefer a non-cooperative situation to one where dominance, hegemony and super/subordination takes over. Although not heading for 'water wars', this lack of cooperation results in sub-optimal water management, with adverse consequences for development (and usually also for the environment). There is thus a 'power and security dilemma' to overcome in order to mitigate conflict (Buzan, 1991), while also delivering economic development (Frey, 1993; Öjendal, 2000b). This dilemma is further aggravated by the fact that in many international river basins, power is asymmetrically distributed (e.g. Daoudy, 2005).

An additional basic dilemma in international river basins is that optimal solutions may not be congruent with the principle of equitable utilization (e.g. see Grey, 2001). Thus, with spiralling water shortages, the optimal solution *should* be sought, but this usually compromises the desire to achieve equity at the same time, thereby pushing the issue into the direction of securitization as the result of threat perceptions based on historic circumstances occurring outside the water sector. For example, from a purely technical point of view, it may be more efficient to locate dams in the headwaters of a basin (e.g. the Euphrates, Tigris, and Nile basins). Against this, no guarantee may exist for the equitable distribution of benefits from such dams, which renders the optimal technical solution questionable in a political sense – unless such guarantees can be constructed and the nature of the regional politics supports such arrangements. However, such constructs are of necessity embedded in the psyche of the decision-making elite, constantly being reinforced and re-defined through the filter of threat perception. Optimal solutions from an engineering perspective are therefore usually affected by more pervasive and dominant national security concerns, trapping the paradigm in the securitization domain.

A third basic dilemma with developing water resources in an international watershed relates to global public goods and ecological sustainability. It is well established that unregulated access to common pool resources creates over-utilization and unsustainable use, to the final disadvantage of all (Hardin, 1968; Ostrom, 1990). This is a particular problem with trans-boundary waters, as upstream parties may over-utilize the resource and downstream States may be powerless to stop this, or to extract compensation. All international watersheds constantly run the risk of lacking coherent regulation – either through the 'prisoner's dilemma' rationale where all parties wish to be a 'free rider' and hope that others restrain (or are forced to restrain) their abstraction rates, or simply through the lack of legal harmonization and coordinated policies. The inevitable consequence is the over-exploitation of the resource, damaging the ecosystems and the services they provide (and ultimately the resource-base itself in some cases, especially where groundwater is involved). Furthermore, most of the available literature overlooks the cumulative effect of adverse ecological impacts, many of which accrue

across international borders (Conca, 2006: 8).

To solve these 'basic dilemmas' of international watershed management may be where the major benefits are to be found. The establishment of river basin authorities with clear legal and organizational structures is commonly recommended, geographically covering the entire river basin, and functionally dealing with the multiple uses of water (e.g. Kliot *et al.*, 2001: 252; Swain, 2004: 172). However, this idealist assertion conflicts with notions of sovereignty, and some States prefer a 'free-rider' situation outside institutionalized river basin authorities, without firm commitments on water allocation. Three other keys for best practice in international watershed management were cited by van der Zaag and Zavenije (2000: 58), these being integrated supply and demand management; public participation; and enhanced regional and economic integration. While these factors may form elements of a well-founded process, the incentives for cooperation may remain too small for many States to be induced into multilateral water management arrangements. Indeed, the approach taken by Sadoff and Grey (2002) is compellingly simple: if there are sufficient incentives to cooperate, States will do so. Yet we also know that while the 'silver bullet approach' has been seductively logical, in most cases such a solution remains elusive. This circumstance triggers the questions of *what benefits exist* in joint watershed management, and *how such benefits may best be shared*.

3.4.3 Is 'benefit-sharing' a solution?

The concept of 'benefit-sharing' has been pursued as a policy tool especially at international conferences and workshops, where it appears to be more frequently cited than within academia. As examples, the sharing of benefits was actively debated at the International Conference on Freshwater in Bonn in 2001; the 3rd World Water Forum and Ministerial Conference of 2003; and at the Stockholm World Water Symposium of 2005. It is striking when reading the literature that although references to benefit-sharing (or the like) are numerous, little substance is discernible beyond the catch-phrase level. In fact, most of what is termed 'benefit-sharing' falls into one of two traps: either it resembles the previously utilized concept of Integrated Water Resource Management; or it consists of idealistic appeals for what should be done, without entering into a discussion on the real-world viability of such visions.

The authors of the present report therefore believe that the concept of benefit-sharing needs to be significantly developed, if it is to become of real utility in the debate on trans-boundary water resource management. Sadoff and Grey (2002) have provided the simplest and most useful general framework to date, arguing that benefits from cooperation over a shared river basin may be divided into four different categories: 'environmental', 'economic', 'political', and 'catalytic'. From there, they argue that conflict/cooperation is

largely determined by the incentives for co-riparians to cooperate. The possible incentives are listed in turn, and in principle this could be applied to any international watershed (Sadoff and Grey, 2002). Savenije and van der Zaag (2000: 14) have partially operationalized the concept, noting that one option for sharing the resources in a basin would be to identify development strategies that can thrive under an equitable division of water and other resources.[7] They also address benefit-sharing more concretely, referring to it as 'exploiting interdependencies', and making a reference to the gradual growth of a political situation such as that in the European Union, where countries dare to trust that advantages and disadvantages will balance themselves out in the long term. In a further paper, van der Zaag *et al.* (2002) present a more detailed (if still somewhat generic) suggestion on how water in an international river basin could be equitably shared. Axiomatically accepting the concept of equitable use, they propose a formula for the division of the available water resources according to [assumed] local use, population sizes, the green/blue water composition, and other factors. While simple, yet clear and quite sophisticated, the entire work presumes the full acceptance by all stakeholders of the equitable use concept. It overlooks 'past or existing utilization' and 'existing and potential uses' (which also have legal standing, in the Helsinki Rules and the 1997 United Nations Convention respectively), and also fails to deal adequately with the need to avoid significant harm to the interests of other co-riparians. More importantly, it fails to take account of relative power in the international sphere, and this usually determines the rationale for States to agree to such allocations.

Similarly, the Legal Assessment Model (LAM) under development by the International Water Law Research Institute at the University of Dundee seeks to audit water agreements by testing elements against specific principles of international water law (Wouters, 2003). The LAM approach is an important development in our understanding of benefit-sharing, but it also ignores the real-world situation of power asymmetries on a planet dominated by sovereign States, each seeking to maximize its own comparative advantage by pursuing narrowly-defined national interests.

Facilitated by a 'neutral tool' such as the ECO^2 approach (Claasen, 2005), meaningful issue-linkage starts to emerge. This methodology offers possibilities for quantifying trade-offs that could lead to a realistic form of benefit-sharing (Claassen, 2005). However, it is clear that any attempts to identify quantifiable and empirically verifiable trade-offs (that could eventually be negotiated) may become extremely complex, and hence vulnerable to political disruption and/or misinterpretation. This work is still in an experimental stage, and is being tested on ever more complex cases at the sub-national level in South Africa.

[7] This concept is important, and we return to it in several of the Case Studies discussed later in the present report.

A further attempt to substantiate benefit-sharing is made by Klaphake (2005). Using eleven African case studies including the Kagera Basin Organization (KBO; see Chapter 5 of this report), this analysis attempts to define economic benefits arising from the management of river basins. However, the study lacks credibility due to pervasive factual errors and a questionable methodology. An attempt to assess the phenomenon from an aid point of view by Scheumann and Neubert (2005) is of interest, but the narrow focus of that work reduces its utility somewhat. There is also a risk that the use of a benefit-sharing approach may allow regional hegemons to exploit common resources under a quasi-sharing formula that they themselves have defined, solely for their own benefit. This is central to the rationale of the emerging concept of hydro-hegemony (Zeitoun, 2005a, 2005b).

In the Case Studies addressed in later chapters of this report, we follow the framework of Sadoff and Grey (2002) in part, although their fourth category ('catalytic') is not used here. This is because we consider that development within the other three categories could very well be catalytic also, and we prefer the notion of 'spill-over' to the use of this fourth category. Hence, the assumption is followed that a well-managed watershed will provide enhanced values in terms of *Security*, *Economic Development*, and the *Environment*, each of which can become catalytic in its own right

3.5 Analyzing benefits

Any critical study of benefit-sharing as a concept needs to address three specific questions in order to disentangle the complex inter-connectivity of cause and effect linkages. These three questions are as follows:

- Is water resource management an independent variable?
- What role does (or can) water resource management play in regional integration?
- Given the issue of multi-causality, what are the categories in which benefit-sharing is most likely to be manifest and therefore measurable?

3.5.1 Question 1: Is water resource management an independent variable?

The immediate answer to this question is that water resource management is seldom, if ever, an independent variable. The reason for this is that water is a classical cross-cutting issue, with linkages to so many different aspects of biological and socio-economic life that it is almost impossible to unravel the cause-effect relationships in a meaningful way. Water means different

things at different places in both space and time. More specifically, water resource management has a different set of linkages, dependent on where the action takes place, what the historic factors are, and how much of the resource is available in the first place. At best we can say that water resource management gives rise to multi-causality. By this we mean that any given effect – say poverty, environmental degradation or a decline in household security – is predicated on more than one specific root cause, of which water resource management is but one.

This gives rise to a specific property of water resource management, however. Given this multi-causality aspect, the underlying tensions or dynamics of society often tend to be magnified by, or reflected in, the way water resources are managed in a given society. For example, a society in which endemic poverty is rife, will tend to have a poor water resource management infrastructure and governance system. Because of this, human health indicators will tend to be of low quality, with some form of correlation between the degree of poor health and the level of poverty. The poorest of the poor will be marginalized, and as such will only have access to the worst infrastructural facilities; and this will be reflected in a number of critical indicators such as health and risk. The converse also holds true. In societies where there is a high level of group fragmentation, based on some form of discrimination, the political elites will tend to favour a specific power-base and start to act as a gate-keeper through which patronage will be awarded. This patronage, often in the form of access to water and the downstream benefits such as health, livelihood security and potential economic wealth, becomes translated into political power. This process has been termed 'resource capture', which is defined as a social effect of environmental scarcity where more powerful groups manage to monopolize access to a critical resource like water, leading to the ecological marginalization of weaker groups (Homer-Dixon, 1994a: 10; Percival and Homer-Dixon, 1998: 286; Ohlsson, 1995, 1998, 1999: 38). Nowhere is this more evident than in South Africa, where resource capture played a fundamental role in the perpetuation of white minority rule during the years of Apartheid (Percival and Homer-Dixon, 1998, 2001; Turton, 2000a, 2000b).

As a direct result of this factor, water resource management reflects political power in a country and a region, making it possible to understand (and perhaps even impact on the process) by isolating linkages between low and high politics, and power asymmetries. This can be thought of as a form of 'spill-over', but given the multi-causality noted above, the potential role of 'spill-over' as a classical vehicle for enmeshment as envisaged by Functionalists and Neo-Functionalists (Haas, 1958, 1964, 1970, 1980; Mitrany, 1966) has certain limitations. For example, where high politics is heavily dominant, such as the case of the Jordan River Basin, this has a profound impact on low-politic issues (such as water resource management). Conversely, any attempt to generate political 'spill-over' from cooperation on water resources

in this environment will meet opposition in the high-politic arena, which will be challenging to overcome. The same may hold true in the Nile River case, where the underlying political dynamics of the entire basin are predicated on the Egyptian fears of loss of viability for their economic and social stability, and thus all efforts by upstream States to develop the resource are translated into a potential zero-sum threat perception. Again this illustrates the impact and pervasiveness of threat perceptions on water resource management in the context of benefit-sharing.

For these reasons, it is important to emphasize at this stage in the analysis that water resource management is seldom – if ever – an independent variable. It is equally important to note that the multi-causality aspect of water resource management means that 'spill-over' has specific potential, but is also constrained by very real parameters. Similarly, it is vital to understand that issue-linkage between high and low politics encourages the securitization of water resource management, posing specific limitations on the potential benefits of 'spill-over'.

3.5.2 Question 2: What role can water management play in regional integration?

Water resource management can be considered as the very foundation of any modern economy. Wittfogel (1957) highlighted the role of irrigation in the formation of centralized bureaucracies in 'despotic Oriental States'. Reisner (1993) documented the role of water resource management in the opening of the American West, and used the concept of the hydraulic mission of society to describe this. Postel (1999: 5) made it clear that the role of irrigation (as a specific element of water resource management in semi-arid regions) is closely associated with the historic rise and fall of many great civilizations. The capturing of the monsoon as a foundation for the ancient civilization of modern Sri Lanka has been documented by Mendis (1999). The 'hydraulic mission' of great cities of the world has been documented, specifically with respect to the control of disease by the construction of water-borne sanitation systems (Graham-Leigh, 2000; Juuti and Katko, 2005). One of the classics of the hydro-political literature involving the very first use of the concept 'hydro-politics' documents the harnessing of the Nile by the modern state of Egypt (Waterbury, 1979).[8] Thus, it is clear that water plays a major role in laying the foundation for economic growth, specifically by increasing the assurance of supply to a level that is consummate with the needs of a modern economy, but also by improving water quality and therefore human health.

[8] The perceived critical importance of water to Egypt is evident from the fact that the Egyptians have monitored the flow of the Nile River for several thousand years. See *The Nilometer in Cairo* at <http://www.waterhistory.org/histories/cairo/cairo.pdf>.

But what of water as a driver of regional integration? The best example of this is afforded by consideration of the Southern African Development Community (SADC). Being characterized by great spatial variations in the distribution of rainfall and therefore river flows, the SADC region provides a glimpse of the potential for water resource management to act as a driver of regional integration. Having been a theatre in which 'the Cold War got hot' as various localized wars of liberation became embroiled in the global balance of power (Turton, 2004: 265; 2005a; 2005b; Ashton and Turton, in press), the very existence of SADC as an entity can be traced back to the so-called 'struggle' against three evils of the day – colonialism, capitalism and racism (Turton, 2004: 259; Turton and Earle, 2005). Overlain onto this political history is a hydrological reality in which the four most economically developed states in the region – South Africa, Botswana, Namibia and Zimbabwe – are all reaching the limits of their readily available water resources (Ashton and Turton, in press). This implies that water scarcity will become a potentially limiting factor to the future economic growth of these countries, and therefore to the region as a whole (Turton, 2003c; 2004; Turton and Earle, 2005). This has the potential to securitize water resource management, as the high politics of national security become linked to the low politics of strategic water resource management (Turton, 2003a: 74). This outcome is sub-optimal, because threat perception starts to drive decision-making, which tends to translate into a zero-sum outcome.

In order to avoid such a zero-sum outcome, the SADC region has embarked on specific de-securitization processes. The most notable of these is the decision to establish a regional integrative framework, much like the European Union, using Neo-Functional approaches to the problem of national sovereignty. The logic is that the European Union has grown over time from an initial series of technical agreements on coal, steel and energy, into the complex supra-national structure it is today. Central to this is the logic of 'spill-over', as cooperation over one narrowly-defined area establishes a normative foundation for cooperation in another. This process is described in Neo-Functional literature as involving enmeshment, build-up and engagement.

The SADC arrangement is based on a regional treaty known as the *SADC Founding Protocol* which is supported by a range of other treaties, one of which is the *SADC Protocol on Shared Watercourses* (see Turton, 2005b). This established the enabling environment in which water resource management can be developed to the point that a range of complex water transfers can be constructed over time (see Figure 4). These are designed to cascade water from the relatively wet north of the region, to the very arid south-west. It appears probable that the future economic viability of the four most water-scarce States in the SADC Region is closely associated with this process. Plans have been registered with SADC and are receiving varying degrees of attention by the respective Governments in the region

(Heyns, 1995a, 1995b, 1995c, 1997, 2002, 2003). Given that a high degree of political stability is needed before these complex schemes can be successfully implemented (Turton, 2005b), there is a strong vested interest to negotiate positive-sum outcomes (Gleditsch *et al.*, 2005). This makes water resource management a powerful driver of regional integration, at least under the conditions found in contemporary southern Africa. Seen in this light, regional integration can be described either as being a product of security concerns (best defined by Buzan, 1991: 210; and Buzan *et al.*, 1998: 170), or alternatively as a Hydropolitical Complex, described by Turton (2003a) and also by Ashton and Turton (2006, in press). The former approach views regional integration through the lens of securitization and threat perception, whereas the latter methodology considers integration through the lens of desecuritization, using the high level of shared dependence on trans-boundary rivers as a key national interest and consequently as a driver of peaceful negotiation and cooperation.

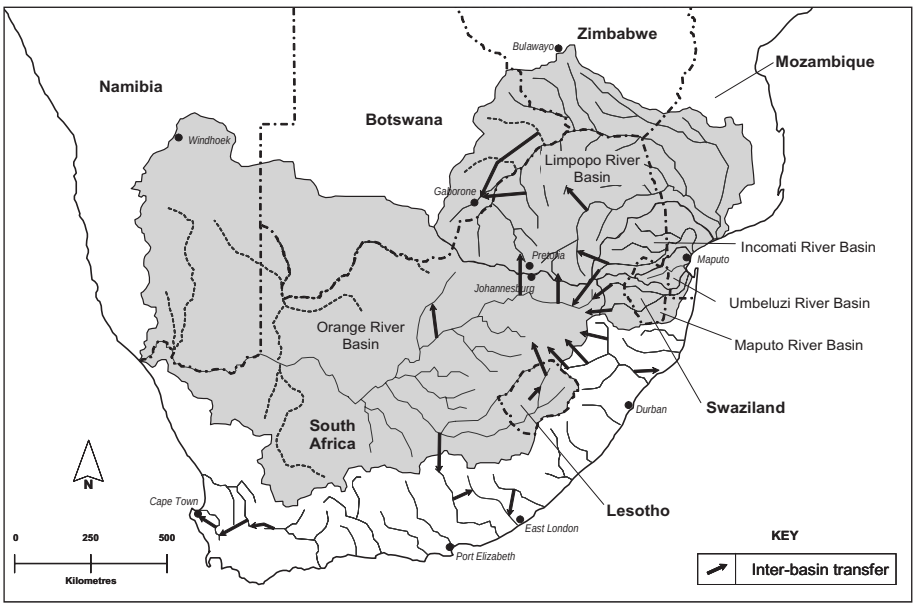

Figure 4. Map of the Southern African Hydropolitical Complex, showing the positions of major inter-basin water transfer schemes. After Ashton and Turton (2006, in press).

This raises another strategically important question that is relevant to the current study. If water resource management can play a role in regional integration, then what other aspects needs to be understood in order to use this fact as a vehicle for the attainment of specific policy objectives? A tentative answer to this challenging question is provided in the argument that links environmental scarcity to social ingenuity (Barbier and Homer-Dixon,

1996; Homer-Dixon, 1996, 2000). This argument suggests that a limiting factor in the developing world is the lack of capacity to generate sufficient 'social ingenuity' with which to manage changing levels of natural resource availability. The argument for this is tentative at present, so no definitive conclusion can be drawn.

Significantly, however, the approach used by Wolf *et al.* (2003) in their 'Basins at Risk' research employs a similar logic by emphasising the existence of institutional robustness with which to absorb the shock of sudden changes within trans-boundary river basins. We can therefore be alerted to the fact that water resource management on its own is a necessary (*but insufficient*) condition on which regional integration can be based. Central to the success of the latter is the capacity to link issues into 'bigger baskets' from which a range of potential benefits can be generated, with these then being distributed amongst the negotiating partners in a way that they deem to be acceptably equitable (Tollison and Willett, 1979; McGinnis, 1986: 141). Issue-linkage is said to occur when an upstream-downstream issue is linked to another issue where the downstream State is in control, and the upstream State is the party making a request (Le Marquand, 1977; Haas, 1980; Golub, 1996; Meijerink, 1999; Marty, 2001; Daoudy, 2005; Mostert, 2005: 7).

Issue-linkage can also be understood as arising from negotiated solutions, emerging from institutionalized settings in which sufficient trust has been generated to effectively desecuritize water resource management, to the extent that threat perceptions no longer inform the water resource management process in trans-boundary river basins or aquifer systems and Technocrats again reign supreme. One way that this may be achieved occurs when the problem definition is moved out of the respective watershed, up into the more strategic 'Problemshed' (Earle, 2003), because it is from the latter that a larger basket of benefits can be found. This conceptual distinction lies at the heart of the notion of benefit-sharing.

One possible way of achieving issue-linkage is through the process of Parallel National Action (PNA; see Nielsson, 1990; Turton, 2002b: 527; Braid and Turton, 2004; Turton and Earle, 2004). The PNA approach offers four specific advantages in the field of water resource management:

- The thorny issue of sovereignty is dealt with by agreeing that there will never be any form of sovereign erosion. This is specifically relevant where recent wars of liberation have bought sovereign control at a very high 'blood price'. Under these circumstances, fears of the possible erosion of sovereign control could act against regional cooperation, thereby undermining the potential benefit arising from water resource management as a vehicle for regional integration and benefit-sharing.

- Institutional strengthening is a key thrust within any PNA approach. This leads to more robust decision-making and the institutionalization

of processes related to water resource management. In turn, these act as fundamental drivers of desecuritization, and significantly raise the potential for a positive-sum outcome.

- The PNA process fosters redundancy, by encouraging or mandating more than one level of communication between bureaucratic entities. This means that the relative gate-keeping power of each respective contact point is diluted by the number of alternative communication points in existence. This reduces the chance of corruption, and also prevents resource capture by more powerful institutions and gate-keeping elites.

- The natural coordination that starts to occur specifically between different sectors in a given country (water, energy, agriculture, etc.), and also between these sectors across international borders, starts to generate a bigger basket of potential benefits. This is an example of the 'Problemshed' at work, linking issues and providing a wider range of potential remedies at a level which may rise above the river basin.

As a result of the outcomes of the PNA process, issues of scale can be transcended. This is strategically important where historic elements of scale impede closer cooperation (such as a recent history of violence) and/or where there is a need to embrace sub-national issues (such as the genocide in the Kagera basin in the mid-1990s), international issues (e.g. war in the Jordan River Basin) or multi-layered issues (such as those arising from nested hierarchies occurring in the Mekong region). The need for multi-scalar analysis has been noted by a number of authors (Adams, 2000; Moe, 2000; Nicol, 2003; Trottier, 2003; Turton, 2003b: 15; Mostert, 2005: 11), and this is an important aspect that must be factored into the current study.

3.5.3 Question 3: How is benefit-sharing manifest, and therefore measurable?

Having noted that water resource management is seldom an independent variable, and that multi-causality makes the isolation of cause-effect relationships unusually difficult, it becomes informative to unpack the manifestations of possible benefit-sharing. In this attempt it is useful to start with an understanding of risk, because it is in an attempt to mitigate that risk that possible issue-linkage can occur to the extent that benefit-sharing might become feasible. Brauch (2005b: 23) develops the argument that contemporary human security rests on three conceptual pillars. These are as follows:

- freedom from want, which is achieved by reducing societal vulnerability through poverty eradication programs;

- freedom from hazard impact, which is achieved by reducing vulnerability and enhancing the capabilities of societies to confront both natural and human-induced disasters; and

- freedom from fear, which is achieved by reducing the risk that various hazards pose on human survival.

Underlying this is the emerging concept of human security, which differs fundamentally from national security by virtue of the normative elements of 'freedom from want' and 'freedom from fear', both of which are increasingly being regarded as a basic human right. This emerging debate sees human security as being: (a) a level of analysis; (b) a human-centred perspective; and (c) an encompassing concept (Brauch, 2005b: 22). However, individual human beings are seen to be too narrow a focus in which security can be meaningfully understood, so people-centric human security needs to be framed in terms of: (i) development by means of poverty eradication, (ii) freedom in terms of human rights and governance structures, and (iii) equity on the international level, with justice being seen as the sub-national reverse side of the coin (Brauch, 2005b: 22). This means that human security is no longer viewed as merely military security, but rather covers a range of issues including economic development, social justice, environmental protection, democratization and respect for the rule of law.

The logic in this linkage of risk to specific sources of hazard, enmeshed as it is in the broadened concept of human security, can inform the process of identifying possible benefit-sharing scenarios in the field of water resource management:

- In the security arena, regional benefits can accrue from the reduction in tensions that are multi-causal in nature, driven by a myriad of factors, but amplified through specific water resource management paradigms and perspectives. Maslow (1943, 1970), in developing his hierarchy of needs, placed security concerns at the very base of his pyramid, because such issues are of an almost primordial nature. Described as stemming from the 'State of Nature' by founders of classical realism such as Hobbes (MacPherson, 1968), security concerns bring out the worst in humans, being forced to fend for themselves by resort to deadly physical force.

- In the economic sphere, human development can inform the negotiating positions of respective riparian States, developing a core logic of nested hierarchies arising from individual household security, through group security, provincial security, and eventually up to national security levels. The framing of the logic in the language of economic development also means that common currency can be found *via* trade-offs

that lead to potential benefit-sharing. Economic development also underpins the three conceptual pillars of human security noted above (Brauch, 2005b: 23).

- In the environmental sphere, water is a foundation for all sustainable economic activities, with strong contributing factors to social stability and human well-being. It can certainly be argued that in terms of economic development, those individuals who tend to be marginalized from the mainstream of economic activity are more directly dependent on ecosystem integrity for their livelihood security, and as such need to be factored into any final benefit-sharing arrangement. This will usually translate into some form of environmental flow needed to maintain ecosystem integrity, and the capacity of the ecosystem to function as either a resource or a sink.

It is therefore informative to note that Brauch (2005b: 11) makes a strong case for the expanded concept of security by referring specifically to national security, human security and environmental security, using the original work by Møller (2001, 2003) to inform that logic. It is these three elements that have been selected by the authors to focus the remainder of the present study.

In conclusion here, it can be noted that any serious analysis of potential benefits should be based on a highly nuanced understanding of fundamental processes at work in the field of hydro-politics. These can be summarised as follows:

- Water resource management is seldom (if ever) an independent variable. This means that other factors, specifically interceding variables, need to be isolated and understood if any benefit-sharing approach is to be viable. The whole issue of multi-causality also needs to be understood by policy analysts and decision-makers developing a benefit-sharing approach.

- Water resource management can play an important role in regional integration. The exact nature of this process will be dependent on historic, socio-economic and hydrological factors, making each river basin unique. This implies that the 'one size fits all' approach will certainly fail, as it is too simplistic (see also Section 7.1.2 of this report, in relation specifically to the Case Studies). However, we consider that sophisticated analysis can reveal specific factors that can be managed to the extent that they foster the change in perception away from the possibility of threat (as reflected in a Regional Security Complex and the language of securitization), to the possibility of shared benefits (as reflected in a Hydropolitical Complex and the language of desecuriti-

zation). One specific option in this regard is to foster an approach typified by Parallel National Action, in which institutional strengthening is encouraged, and is designed specifically not to erode State sovereignty, but rather to develop redundancy in institutional contact points and a proliferation in the possibility of 'spill-over'. In such a case, benefit-sharing can be seen to provide a positive-sum outcome which is more powerful than threat perceptions that might be articulated by hawkish elements in a society.

- There are three specific categories in which benefit-sharing can be understood. In the security sphere, human security and well-being can be cascaded to eventually become national security and regional security, in which the global public good of shared security becomes sufficiently powerful an inducement to foster positive-sum approaches. In the economic sphere, issue-linkage can take place to the extent that a common currency is developed, though which benefit-sharing can start to emerge. In the environmental sphere, a strong case can be made for the maintenance of some form of ecosystem integrity, either to sustain essential ecological goods and services on which human livelihoods are dependent, or to enable those ecosystems to function as sinks in a sustainable manner.

The following three chapters address the Case Studies against the background provided above, and we return to analytical issues in Chapters 7 and 8 of this report.

Chapter 4: Case Study 1 The Jordan River basin

This section of the present report addresses the first of the Case Studies, relating to the Jordan River basin in the Middle East. The Jordan River is one of the most frequently studied trans-boundary watercourses in the world, and the allocation of its flow has been the source of conflict over a considerable period of time (El Musa, 1998; Jägerskog, 2003; Phillips *et al.* 2006a, in press).

4.1 The basin geography

The total area of the Jordan River basin is approximately 18,000 km^2, and the river is generally considered to have an average flow of approximately 1,400 million cubic metres (MCM)/year. At present, five co-riparians share the water resources of the basin (Figure 5). These are Lebanon; Syria; Israel; Jordan; and the Occupied Territories of Palestine. For ease of nomenclature, the last of these will be referred to hereafter simply as 'Palestine'. Only parts of the West Bank are located within the Jordan River basin, as Gaza and other areas of the West Bank drain to the Mediterranean Sea.

The Jordan River basin area is the recipient of annual precipitation ranging from less than 50mm to almost 1,000 mm, although the bulk of the basin is very arid in nature, rainfall averaging less than 200mm/year (which is insufficient for most forms of rain-fed agriculture). The river rises as three spring-fed streams in Lebanon (the Hasbani), Syria (the Banias) and Israel (the Dan), as shown in Figure 5. The Banias is the shortest tributary, originating from the southern hills of Jabal El-Sheikh (Mount Hermon) in the Golan Heights (with an average flow of 125–150 million cubic meters [MCM]/year). The Hasbani originates in southern Lebanon, and has a similar average flow (125–160 MCM/year). The Dan (Nahr el-Leddan), which carries the largest flow of the three upper tributaries (240–260 MCM/year) rises from the city of Dan (Tell el-Qadi). The Dan is generally described as lying entirely in Israeli territory, thus justifying Israel's contribution to the Jordan River. This proposition is challenged by some, however, mainly through the identification of the river's main discharge from Jabal El-Sheikh (Mount Hermon; see Bakour, 1991; El-Musa, 1997). These three upper tributaries meet in the Huleh valley in Israel, and flow southwards to empty into Lake Tiberias (also known as Lake Kinneret, or the Sea of Galilee). Since 1964, Israel has diverted significant volumes from the basin at Eshed Kinrot at the north-west of Lake Tiberias, through the National Water Carrier to supply the coastal area and the Negev desert.

The flows entering the lower Jordan River are heavily polluted (due to the upstream withdrawals, and in part also because of the diversion by Is-

rael of saline spring flows to the lower reaches), with significant additional contamination occurring between Lake Tiberias and the Dead Sea. Several tributaries join the main branch of the river in this area: the Yarmouk River (rising in Syria, and forming the border between Syria and Jordan in its lower reaches); Wadi Kafrinje; Wadi Zerka; and others (see Figure 5).

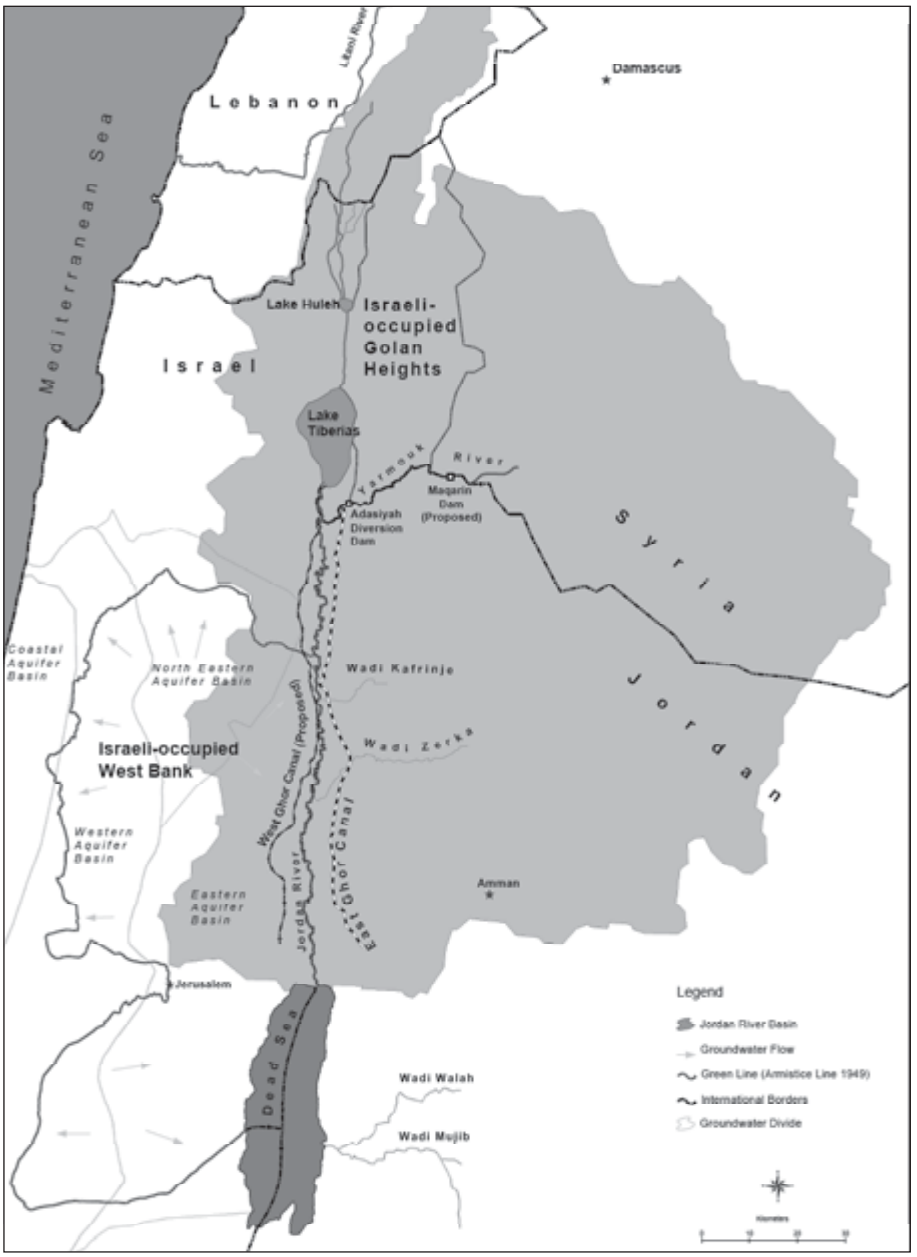

Figure 5. The Jordan River basin.

The Yarmouk River is the largest of the tributaries to the Jordan River, with a sub-basin area of about 7,250 km^2 (80% of this lying within Syria, and the remainder in Jordan). In the last two decades, Syria has created a large number of small impoundments on the Yarmouk system, and these are used to feed irrigated agriculture within the Syrian portion of the basin. Further downstream, Jordan diverts flows from the lower Yarmouk River at the Adasiyah Dam, leading these through the East Ghor Canal (also known as the King Abdullah Canal) for use in agricultural irrigation and also (after treatment) to serve as drinking water supplies in Amman and its surrounds.

The total length of the Jordan River from its three spring sources to the Dead Sea is about 360 km. The lower Jordan River is the principal source of run-off into the Dead Sea, and upstream diversions have considerably reduced the level of the Dead Sea over the last four decades. This is a cause for significant concern, and recent plans to construct a Red Sea-Dead Sea conduit are alleged to be designed (at least in part) to reinstate the former level of the Dead Sea (Benvenisti, 2004).

4.2 Historical agreements on water-related issues

4.2.1 General

Several previous agreements exist on water-related matters between the co-riparians of the Jordan River basin. These include the following:

- three separate agreements from the years from 1920 to 1926 between the British and French Governments in the mandate period, relating to Palestine, Syria and Lebanon;
- the agreements of 1953 and 1987 between Syria and Jordan, concerning the utilization of the waters of the Yarmouk River;
- the agreement of 1994 between Syria and Lebanon concerning the Orontes (Al-Asi) River;
- the 1994 Peace Treaty between Israel and Jordan, containing a specific annex on water;
- the Declaration of Principles from 1993 and the Interim Agreement of 1995 between the Palestine Liberation Organization and Israel; and
- the so-called tripartite agreement of 1996 between representatives of Palestine, Israel and Jordan, relating mainly to the development of new water.

Certain other international agreements are also of tangential relevance, including the *Bahrain Environmental Code of Conduct for the Middle East* of 1994. The agreements discussed above are reviewed in Annex 1 in relation to their content concerning water rights and connected issues, and a very brief general overview is provided below.

4.2.2 Broad overview of the existing agreements

As detailed in Annex 1, most of the agreements concluded to date by co-riparians of the Jordan River basin are of a bilateral nature. Volumetric allocations have been included in several of these, such as the 1994 Peace Treaty between Israel and Jordan; the Interim Agreement of 1995 between Israel and Palestine; and the Syrian-Lebanese Agreement (1994) on the Orontes River. However, such volumetric allocations as have been agreed to specifically by the parties do not appear to be either legally justifiable or equitable, as discussed at greater length in the following sections. This implies that none of the agreements signed to date has fully quantified the water rights of any of the parties. Perhaps even more importantly, there is no basin-wide agreement which establishes the shares of the parties in the regional water resources, in a collective fashion.

4.3 The Johnston Plan and connected documents

In the second half of 1953, President Dwight D. Eisenhower designated Eric Johnston as his personal Ambassador, and instructed him to attempt to generate a regional agreement amongst the (then) co-riparians of the Jordan River basin as to allocations of the available water resources. The principal reason for this was to attempt to derive a solution for the many thousands of Palestinian refugees who had been displaced from historical Palestine by the 1948 war with Israel. This 'Functionalist' approach to water allocations can be considered in the context of the present report to have been largely motivated by the objective of triggering a 'spill-over' effect, commencing with cooperation on water-related issues, but extending later to political matters including the delineation of borders, and the eventual return of Palestinian refugees. The negotiation sequence reveals compromises on both sides (Phillips *et al.*, 2006a, 2006b, in press), as discussed briefly below.

While historical Palestine had already been subject to partition for some years by the early 1950s (see UNGA, 1947), Johnston addressed the co-riparians as only four States: Lebanon; Syria; Israel; and Jordan, which included the present-day West Bank. His initial approach to allocations was based principally on the Main Plan (1953), but this was modified later by the release of both the Cotton Plan (1954) and the Arab Plan (1954). During the period from late 1953 to late 1955, Johnston visited the Middle East region

four times, discussing a wide variety of issues relating to the allocation of the Jordan River basin waters with the Israelis and with Arab League representatives. As noted in detail by Phillips *et al.* (2006a, in press), several matters tended to dominate the discussions:

- The Israelis wished to include the Litani River in the eventual Johnston Plan, claiming it as a regional resource. Johnston refused, however, noting that the Litani River is altogether endogenous to Lebanon. Israeli claims to the contrary date back to Zionist attempts since 1919 to include the lower Litani within their ambit of influence (Amery, 1998). These have continued even to the present (Medzini and Wolf, 2004), but the recent arguments are based on presumed hydrological connections between the Litani and Jordan basins, and do not appear to be credible.

- The Israelis also demanded that any flows allocated to them could be used externally to the Jordan River basin, if they so desired. The reason for this was the stated intention of Israel to divert water to the Negev, to 'make the desert bloom'. Johnston accepted that any of the co-riparians could use their allocations as they so wished, although none of the Arab States requested the consideration of out-of-basin transfer of flows, and this effectively skewed the negotiations in the favour of Israel.

- The Arab States were concerned over the use of Lake Tiberias as the main storage reservoir in the system. This was due to their belief that Israel would continue to dominate the shores of the lake, and that their own access to those waters could be limited by Israel. In part to address this, Johnston proposed a hydrological study in the Hasbani River basin in Lebanon to attempt to design additional local storage, and the construction of the Maqarin Dam on the Yarmouk River (see Figure 5).

The Johnston Plan (1955) was finalized on 30 September 1955, after two years of regional negotiations and shuttle diplomacy. Several parts of the text of the final document are notable, including the following quotations:

- *….the United States believes that the international resources vital to the growth and development of more than one nation should be peacefully and equitably shared.* [Page 2].

- *….the United States insists that the Plan must be equitable in its own judgement. It could not agree to support any project which might, because of basic inequity to one party or another, provoke disputes and possible termination of the understanding on which the Plan was based.* [Page 4].

- ….*The result is a Plan for the Valley which, in the opinion of the United States, is equitable, workable, and economically justifiable.* [Page 6].

- ….*International law recognizes that each of the nations sharing an international river system has a right to a portion of the water. There is no single, generally accepted principle, however, on which the division of the water can be based*. [Page 13].

It is clear from these quotations that the basic intention of the Johnston Plan was to derive equitable allocations of the Jordan River for the co-riparians (to be viewed essentially as water rights, although this term was not specifically cited in the Johnston Plan). The method used to attempt this determination involved the computation of the needs for water for agricultural irrigation *only*, for use in Lebanon, Syria and Jordan, with the residual flows being allocated to Israel. The methodology used by Johnston does not comply with modern-day attempts to determine equitable utilization patterns for shared watercourses in two particularly important respects:

- Customary international water law provides a number of factors to be taken into account when determining equitable and reasonable utilization patterns for international watercourses (see Table 1 in Section 2.4 above). The computation of volumetric requirements to satisfy only one type of demand (that for agricultural irrigation) does not therefore match the current philosophy in relation to the determination of equitable allocations.

- The Johnston team took no account of the groundwater or other surface water available to the co-riparians, and dealt only with the surface waters of the Jordan River system. This also fails to comply with modern methods for attempting to determine equitable allocations of international watercourses, as the availability of other sources of water should be taken into account in this process, and international water law covers groundwaters as well as surface waters.

In addition, it is notable that the four co-riparian States addressed by the Johnston Plan were treated in distinct fashions. Thus, Johnston proposed the allocation of sufficient flows to the three Arab States to satisfy the within-basin demand for irrigation, with the residual flow being allocated to Israel and no constraints being imposed on whether this was utilized within the basin, or externally. The result of this process is shown in Table 4. It is notable, as discussed in detail by Phillips *et al.* (2006a, in press), that the allocation proposed by the Johnston team for Israel has been frequently quoted incorrectly by previous authors.

Table 4. The allocations to co-riparians underpinning the Johnston Plan of 30 September 1955 (see Phillips *et al.*, 2006a, in press). All data are shown as million cubic metres/year. The annotations below the Table are precisely those shown by Johnston in his "Chart 2"; he used the term 'Hula' to refer to the Huleh swamp.

Country	Total Water	Jordan River	
		Diversion	Stream Depletion
Lebanon	35	35	23
Syria	132	132	93
Jordan	720[1]	477	477
Israel[4]	616[2]	466[3]	463
Total	**1,503**	**1,110**	**1,056**
Saline water		28	28

It is concluded that the allocations proposed in the Johnston Plan cannot be considered to determine the water rights of the co-riparians of the Jordan River, as these would be calculated at the present time.

4.4 The current status of water utilization

This section of the present report summarizes the current utilization of the water resources of the Jordan River basin. Both groundwaters and surface waters are addressed, and comments are provided on the availability to the co-riparians of other water resources (outside the Jordan River basin). The data quoted are derived from Phillips *et al.* (2006b, in press) and are updated in certain instances compared to those from the Aquastat database of the Food and Agriculture Organization (FAO).

While many authors claim that the present abstraction rates from the Jordan River are similar to those proposed by the Johnston Plan, this is not the case. Phillips *et al.* (2006b, in press) have provided the most recent data on the average abstraction rates, which are compared to those of the Johnston Plan in Table 5. It is evident that two parties (Syria and Israel) are abstracting greater volumes of water than was envisaged in the Johnston Plan, while the other three co-riparians are each receiving much less than the Johnston Plan estimates.

[1] Includes 243 mcm of local water.
[2] Includes 150 mcm of local water.
[3] May be larger as long as stream depletion values govern.
[4] These values include salvaged water from Hula swamp which were not a part of the natural river resources.

Table 5. The present average rates of abstraction from the Jordan River basin, as compared to the proposals in the Johnston Plan. All data are given as MCM/average year, and include both groundwater and surface waters.

	Lebanon	Syria	Israel	Jordan	Palestine
Johnston Plan (1955)	35	132	616	720	
Present-day averages	~10	260	>700	320	~60

The reasons for these differences vary between the countries involved. While international financing organizations gave cognisance to the Johnston Plan estimates in the period between their production and about 1980, this tendency has been eroded since that time, and the co-riparians have essentially competed for the resources in the most recent decades. The following paragraphs provide a summary of the water resources available to each of the five co-riparians, at the present time.

Lebanon is a relatively water-rich country when the resources of the entire State are considered and a comparison is made to the downstream co-riparians, with a *per capita* water availability of about 1,160 m^3/year (somewhat above the 'water scarcity' threshold of 1,000 m^3/person/year). However, this mainly reflects the more abundant resources available in the Awali, the Litani and to some degree the Orontes River (see Annex 1), and the abstraction rates by Lebanon from the Jordan River basin have never approached those envisaged by Johnston. Interestingly, the Johnston Plan envisaged the completion of a hydrological survey of the possibility of increasing storage on the Hasbani River in Lebanon, but this was never completed (Phillips *et al.*, 2006a, in press). Lebanon suffers from a lack of adequate distribution networks, combined with illegal pumping that contributes to high levels of aquifer salinization and pollution. Several instances of threatened or actual armed conflict have eventuated in recent times when Lebanon attempted to increase the rates of abstraction in the upper Jordan River basin, the most recent of these involving the Wazzani Springs and occurring in 2002 (Blanford, 2002; Haddadin, 2002, McCaffrey, 2003; EURRM, 2004). On that occasion, the United Nations stepped in to defuse the threat of armed conflict, and Lebanon's abstraction rates increased slightly thereafter.

Syria has a *per capita* water availability ranging between about 1,000 and 1,600 m^3/year, depending on the extent of upstream withdrawals by other States. Syria's access to fresh water has been severely reduced in recent years by increasing diversions and pollution of the Tigris and Euphrates Rivers upstream, these mainly being caused by the Southeastern Anatolian Project (generally known as the GAP) in Turkey (Rende, 2004; Daoudy, 2005).[9] As noted in Annex 1 in relation to the 1987 agreement with Jordan, Syria has

constructed impoundments on the Yarmouk River in recent years to increase its storage capacity, feeding irrigation water to local agriculture. It is considered unlikely that Syria's near-future requirements for water within the Jordan River basin will be significantly greater than the flows taken at present, which average about 260 MCM/year (Phillips *et al.*, 2006b, in press). The intended construction of the Al Wehdah Dam will therefore principally benefit Jordan (see below). There would, however, be merit in discussions between Syria and Turkey to address the future allocation (and quality) of the waters of the Euphrates River (Rende, 2004; Daoudy, 2005).

Israel over-abstracts from the Jordan River basin and also from the other West Bank aquifers which do not drain to the basin, by comparison to its equitable entitlement (Phillips *et al.*, 2004, 2005, 2006b, in press). A shift to equitable and reasonable allocations would require a reduction in abstraction rates by Israel from these sources, which would threaten to erode Israel's present *per capita* water availability of 330 m^3/year. However, this tendency could be compensated for over time by the additional development of new water, mainly through desalination and increased wastewater re-use as discussed in detail by Phillips *et al.* (2006b, in press) and in Section 7.2.2 of this report. Israel is in an excellent position to achieve this solution, due to its strong technological base; high *per capita* income; and extensive Mediterranean Sea coastline. The current plans for developing new water in Israel reflect this, with a total of 415 MCM/year to be developed over only five years (2004–2008) by the desalination of marine waters and the importation of 50 MCM/year from the Manavgat River system in Turkey (Dreizin, 2004a, 2004b). These volumes will be augmented further by reclaimed flows totalling 55 MCM/year from the desalination of brackish groundwater (Arlosoroff, 2004; Dreizin, 2004a), and the continuing increase in the re-use of wastewater over time for agricultural irrigation. Such additional flows would hopefully reduce the tendency of the Israeli authorities to over-utilize the groundwater aquifers, which has created saline intrusion affecting at least the Coastal Aquifer during the recent drought years of 1999–2002 and thereafter (PCE, 2002; Albert et al., 2004; Fischhendler, in press, 2006).[10]

Jordan is heavily water-stressed at present, with a *per capita* water availability of about 160 m^3/year and with relatively few options for increasing its total water resource (Phillips *et al.*, 2006b, in press). The construction of the Al Wehdah Dam – if completed – offers Jordan a chance to increase

[9] See also Daoudy, M. at <www.dams.org/kbase/submissions/sublist.php?rec=env108>, entitled *Water, institutions and development in Syria: A downstream perspective from the Euphrates and Tigris*. World Commission on Dams (website).
[10] See also Rinat Zafir, *Water quality in coastal aquifer continues to worsen*, Ha'aretz, 12 October 2005.

its abstraction rates from the Yarmouk River system, which would reduce flows downstream to Lake Tiberias (used almost exclusively by Israel, at present). However, the increase in Jordan's share of the Yarmouk would not be dramatic, the dam essentially acting to regulate the flow through the year, rather than to substantively increase Jordan's allocation of the waters of the Yarmouk River. Wastewater re-use is already present at significant levels in Jordan (especially in the East Ghor area of the Jordan River valley; see Fardous and Al-Hadidi, 2004). Most of Jordan's other options for increasing its available water require the use of desalination. The Red Sea – Dead Sea conduit could offer the possibility of significant desalinated flows, amounting to up to 570 MCM/year for Jordan according to current plans.[11] However, the water produced would be expensive in regional terms (Benvenisti, 2004). Other options available to Jordan include desalination at the Aqaba coast, or the importation of water (Phillips *et al.*, 2006b, in press).

Palestine is presently by far the most water-stressed of the co-riparians in the Jordan River basin, with a *per capita* water availability of only about 70 m^3/year. This reflects the imposition of military orders by Israel (shortly after its occupation of Palestine in 1967) which forbade any direct access of Palestinians to water resources, and also effectively eliminated Palestinian access to the West Ghor. The Israeli domination of the regional water resources has continued through the establishment and functioning of the Joint Water Committee after the Interim Agreement of 1995, which essentially provides Israel with an effective veto of Palestinian applications for increased water withdrawals in any area (Selby, 2003). Within Palestine, the water-related problems are particularly severe in Gaza, where the underlying aquifer has been heavily over-pumped for many years and is suffering from both saline intrusion and high levels of contamination from wastewaters (United Nations, 1992; Kelly and Homer-Dixon, 1995; El-Madhoun, 2004). However, many areas of the West Bank (both within the Jordan River basin and externally to this) also suffer presently from a severe paucity of water, and the average *per capita* availability of water to Palestinians is less than one quarter of that available to Israelis (PWA, 2004; Phillips *et al.*, 2006b, in press).

It is concluded here that the overall availability of water to the co-riparians within the Jordan River basin is significantly skewed, with Lebanon and Syria enjoying relatively abundant water resources on a whole-country basis (but mostly externally to the Jordan River basin); Israel being intermediate in the availability of water from various sources, but using the Jordan River flows heavily; and both Jordan and (especially) Palestine being severely water-stressed.

[11] The present plans for the Red Sea-Dead Sea conduit involve a desalination rate of about 850 MCM/year, with Jordan receiving two thirds of this volume. This proposal will be revisited during the Feasibility Study for the construction of the conduit.

4.5 Conflict and cooperation in the basin

Major hydro-political and geopolitical events of relevance to the Jordan River basin co-riparians are shown in Figure 6. The underlying context of the overall Arab-Israeli conflict implies that the utilization of the Jordan Basin waters carries dimensions of identity, security and mutual recognition which are deeply inter-twined with values pertaining to territorial integrity and independence. Tension between the co-riparians has been essentially continuous since the creation of the State of Israel, and even before this with stated Zionist intentions to dominate the regional water resources dating back to the early 1900s. It is extraordinary that the only major international attempt to defuse the water-related conflict occurred exactly five decades ago, and there has been no success in the intervening period in bringing the parties to a negotiated solution concerning the regional water resources (see Phillips 2006a, 2006b, in press). In the face of very high population increases (see below), this situation must change, or further conflict will be inevitable (see Frederiksen, 2003a, in particular). Any such change must, however, be cognisant of the high politics in this area of the Middle East, which altogether dominate other issues and are centred almost exclusively on security-related concerns.

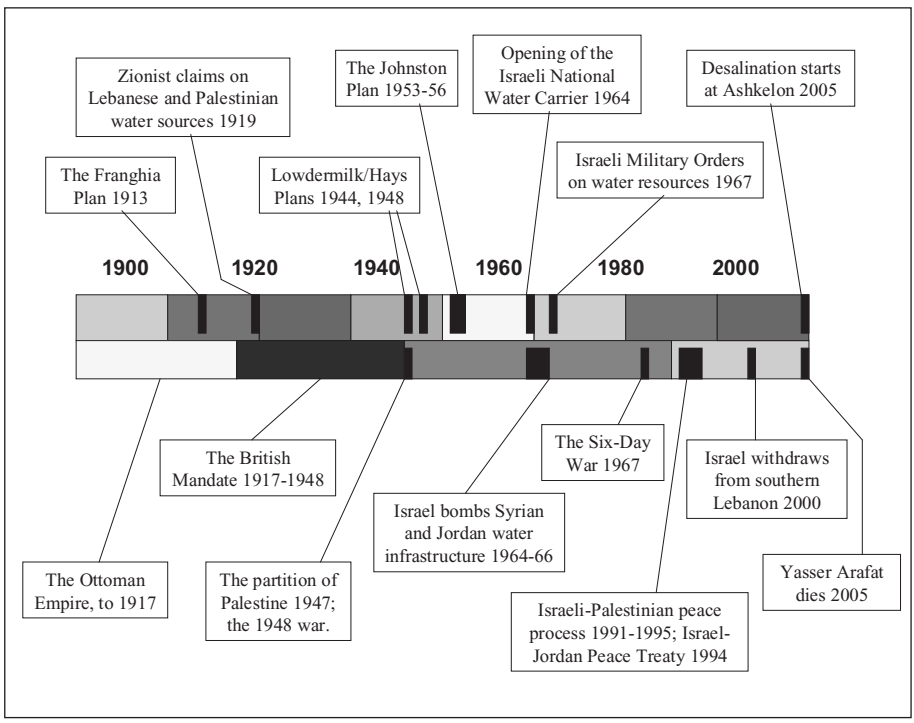

Figure 6. A time-line showing major hydro-political and geopolitical events in the Jordan River basin.

Past conflicts relating to water resources in the Jordan River basin have been listed by Gleick (1993b)[12] and discussed by Wolf (1998b), amongst others. The most frequently cited instances of conflict involve the armed hostilities in the 1950s and 1960s involving Israel and Syria in the demilitarized zone (1949–1967); the Israeli air strikes against the East Ghor Canal in Jordan in 1969; and the relatively recent skirmishes between Israel and Lebanon concerning the waters of the Hasbani and Wazzani Springs. However, this list includes only the armed conflicts, and serious threats of such. As noted in Section 3.2 of the present report, conflict can extend over a wide range of activities.

In the Jordan River basin, tension has existed between a number of the co-riparians for at least the last 40 years, and the allocation of water resources has been a frequently-cited element of this (mainly) cold conflict. Indeed, unease continues to the present between Jordan and Israel despite the existence of the 1994 Peace Treaty (Jordan claiming that the water supplied by Israel is of inadequate quality, or is not delivered in times of drought), and the allocation of the regional water resources remains a highly important aspect of the permanent status negotiations between Palestine and Israel. The ongoing tensions between Israel and Syria include a fundamental conflict over the occupation of the Golan Heights, and this is also intimately connected to the availability and utilization of the Jordan River water resources. Following the 1967 war, Israel effectively reversed its downstream position, by conquering territory in the Golan Heights and the demilitarized zone, and capturing the upstream sources of the Jordan River.

The Arab States have even had disagreements amongst themselves in the past, e.g. between Syria and Jordan in the 1990s on the allocation of the Yarmouk River flows. It is clear, therefore, that the potential for conflict remains high in the region, and the allocation of the available water resources constitutes one potential cause of this. If a basin-wide agreement could be attained on the equitable utilization of the regional water resources, this would undoubtedly reduce the potential for further conflict (El Musa, 1998; Phillips *et al.*, 2006b, in press).

It should also be re-emphasized here that conflicts concerning the use of water resources do not simply relate to inter-State relationships. Kashaigili *et al.* (2003) have recently provided an interesting analysis of internal conflicts over water resources within Tanzania, and such problems certainly also occur within particular areas of each of the Jordan River basin co-riparians. Inter-sectoral competition for water resources also occurs within each of the co-riparians, this being commonly driven by the subsidies which the agricultural sector enjoys in all of the basin States.

[12] See also Gleick, P., Pacific Institute of Oakland, California, at <www.worldwater.org/conflict.htm>.

It is notable that a number of factors affect the tendency of a State to become belligerent concerning the allocation of water resources. These are shown in Table 6, and include the following:

- the self-sufficiency of a State in relation to its endogenous and other water resources (i.e. the degree to which shared watercourses are critical to its survival or well-being);

- the economic capacity of a State, which determines whether it can introduce affordable alternative sources of water supply (e.g. desalination);

- a State's access to global support, in relation to opinion, funds and other factors; and

- the degree of power a State possesses as a hegemon or potential hegemon, which is determined not only by international support, but by a complex network of relationships with its co-riparians, underpinned by military and economic factors.

Table 6. Factors affecting international relations on water allocations. After Allan (2001).

Co-riparians	**Approximate Water Self-sufficiency**[a]	**Economic Capacity**	**Hegemonic Power**	**Access to Global Support**
Syria	20%	Moderate	Weak	Little
Lebanon	99%	Moderate	Very weak	Little
Israel	45%	Strong/diverse	Strong	Very significant
Palestine	~25%	Very weak	Very weak	Very little
Jordan	73%	Weak	Weak	Little

Israel relies relatively little on the Jordan River flows by comparison to some of the other co-riparians, but fares strongly in the other categories shown in Table 6. This has permitted Israel to reach a position of dominance (rather than hegemony) in the basin in terms of the allocation of the available water resources, but the position which Israel has attained cannot be considered to reflect the principles of customary international water law. In particular, the allocation of the Jordan River basin flows certainly does not reflect the

[a] Data on water self-sufficiency shown by Allan (2001) have been updated by the present authors; see also Table 7 below.

demand for equitable and reasonable shares amongst the co-riparians (Phillips *et al.*, 2006b, in press).

Very distinct attitudes exist amongst the co-riparians, to the present scenario relating to the utilization of the waters of the Jordan River basin. These are important here because such attitudes have relevance both to the possibility of conflict in the future (including the possibility that cooperation on international water resources may reduce conflict), and to the potential for sharing benefits. The following paragraphs provide a summary of the recent attitudes of each of the five co-riparians.

Lebanon has reached agreement with Syria on the utilization of the Orontes River (see Annex 1); has sought to protect the Litani River resource from external claims (as the Litani River is believed by the Lebanese authorities to be endogenous, with apparent justification); and has also attempted to slightly increase its utilization of the upper basin flows in the Jordan River system. The latter relate to the Wazzani Springs and the Hasbani River, which constitute one of three upper reaches of the Jordan River as a whole. As noted in Table 5 above, the present utilization of the Jordan River basin flows within Lebanon amounts to only about 10 MCM/year, well short of the estimate by Johnston of 35 MCM/year as a reasonable level of utilization for agriculture within the basin. The Wazzani Springs affair of 2002 is only the most recent of a number of conflicts which have surrounded the use of these waters by Lebanon, and some claim that Israel's recent occupation of southern Lebanon was driven in part by a desire to control the headwaters of the Jordan River (Wolf, 1997; Blanford, 2002; Haddadin, 2002, McCaffrey, 2003; EURRM, 2004).

Syria has also been involved in several conflicts over the waters of the Jordan River basin, these concerning both Israel and Jordan. Conflicts with Israel occurred in the late 1950s during Israeli attempts to construct the off-takes and other works for the National Water Carrier, with frequent violent hostilities in the demilitarized zone (Wolf and Ross, 1992).[13] The current Israeli-Syrian attitudes to borders and water resources need to be understood in the context of the Armistice Agreement signed on 20 July 1949 between Israel and Syria, and the regime which has prevailed since then. The initial boundary problem was created when lines of demarcation were established to separate opposing forces, partly on the basis of the curfew lines. Along with other Arab States, Syria insisted on a peace regime conditional upon return of the borders established in the UN resolution of 1947. Israel maintained control over the zones which it was allocated by the Partition Plan, with an

[13] See also E.Z. Heedier (1995), *Water and war in the Middle East – A military issues paper.* Available at <www.globalsecurity.org/military/library/report/1995/AH.htm>.

additional 3,600 km^2 of Arab lands being taken. This additional area carries particular significance, considering that the zone includes areas at the sources of the Jordan River (north of the Huleh swamp and Tiberias Lake); and the Yarmouk triangle to the south of Lake Tiberias.

The main purpose of the Armistice Agreement was to stop the hostilities, but not to define political borders – as the lines of demarcation were considered as temporary military positions at the time of the truce. However, the ambiguity of the regime fertilized a simmering conflict which prevailed up to the inevitable climax of the 1967 Six-Day War. The two crises of 1951 and 1953 between Israel and Syria correspond to the launching of specific elements of the Israeli Seven Year Water Plan (Israel Government Yearbook, 1951–1952). In 1951, Israel started draining swamps in the Huleh region, which entailed operations in the demilitarized zone. In 1953, Israel initiated work on diversion canals to intercept water from the Jordan River in the demilitarized zone.

By the mid-1960s at the time of the commissioning of the Israeli National Water Carrier, the Arab League as a whole threatened to reduce flows downstream from certain of the headwaters of the Jordan River and its tributaries (Arab League, 1964; Saliba, 1968). This created significant political tension and led to air strikes by Israel against the facilities involved. Many border incidents that pre-dated the 1967 war have been linked to unilateral water projects undertaken after the collapse of the Johnston negotiations. The failure to construct the Maqarin Dam (a feature of almost all of the plans for the development of the basin in the mid-1950s) was undoubtedly connected to such tensions, and the existence of major storage within the basin only in Lake Tiberias continues to reduce the strategic options available for certain of the co-riparians (especially Jordan), to the present day. Some authors have contended that the hostilities in the mid-1960s concerning the regional water resources led to the 1967 Six-Day War, but authoritative views on this differ, and a definitive conclusion is elusive. As noted in Annex 1, the Al Wehdah Agreement of 1987 between Syria and Jordan permitted Syria to impound water in small earthen dams, for use in the agricultural sector. This was agreed to in return for Syrian support for the construction of the Al Wehdah Dam, and the Syrian utilization of the Yarmouk flows has increased as a result, to average about 260 MCM/year presently. It appears very unlikely that Syria would agree to reduce this level of utilization in the future.

Israel has long sought to capture and dominate the region's fresh water resources, and has utilized a variety of tactics and strategies to this end (Schwartz and Zohar, 1991; Wolf, 1998a; Selby, 2005). These have ranged from alleged cloud seeding to increase rainfall in specific areas and hence the volume of run-off into Lake Tiberias (United Nations, 1992), through threats involving the promulgation of bellicose political statements against

neighbouring States (e.g. in the recent Wazzani Springs conflict with Lebanon), to occasional armed hostilities targeted specifically at water-related facilities (e.g. the several air strikes on Syrian and Jordanian works in the Jordan River basin in the mid- to late-1960s). The occupation of Palestine and the Golan Heights which followed the 1967 war (and later, southern Lebanon from 1978 to 2000) allowed Israel to gain control over most of the headwaters of the Jordan River basin. As noted above, the extent to which this was a rationale for the war has been debated, with no clear conclusion. However, it is certain that Israel has sought to retain as much control as possible over the regional water resources, since that time. This has extended to the use of Military Orders prohibiting Palestinian access to water, coupled more recently to the use of an effective veto on Palestinian water use, exercised since 1995 through the Joint Water Committee established by the Oslo II process (e.g. see Selby, 2003, 2005). The 1994 Peace Treaty with Jordan is also considered by most parties to heavily favour Israel in relation to its allocations of water, and has certainly not allowed Jordan to access the volumes from the Jordan River basin that were envisaged in the Johnston Plan (El Musa, 1998; Phillips *et al.*, 2006b, in press). Section 7.2 of this report addresses the very recent attempts by Israel to encourage Palestine to accept desalinated water supplies, rather than to agree to a reallocation of the existing water resources that are shared by Palestine and Israel.

Jordan is in a position of considerable water stress, as noted previously. The *per capita* availability of water in Jordan amounts to approximately 160 m^3/year at present, and the population is growing at about 2.5% *per annum*. Tensions have occurred between Jordan and Syria in the past concerning the use of the Yarmouk River flows, and these are likely to be only partly defused by the ongoing construction of the Al Wehdah Dam (Shamir, 1998, 2002; Haddadin, 2002). The use by Jordan of fossil sources of water is already significant, and an intention exists to significantly increase the supply of fresh water from the Disi Aquifer, shared with Saudi Arabia. Some authors have considered that the latter will amount to a 'pumping race' between the two States (Greco, 2005), and there can be no doubt that Jordan faces particular difficulties in accessing further water supplies, especially as any renegotiation of the terms of the 1994 Peace Treaty with Israel seems a remote possibility. Phillips *et al.* (2006b, in press) have suggested that the main opportunities for Jordan in the future involve an increase in desalinated supplies or the importation of water in bulk, as there is relatively little scope to further increase the re-use of wastewaters (Fardous and Al-Hadidi, 2004). The ongoing attempts by Jordan to reinvigorate proposals for a Red Sea – Dead Sea conduit include a significant desalination facility, and these are discussed in Section 7.2 of the present report.

Palestine faces the most intractable problems of all of the five Jordan River co-riparians, in relation to access to fresh water. These problems have mainly been created during the period of Israeli occupation, since the Six Day War in 1967. In Gaza, the groundwater has been heavily overexploited (mainly by Palestinians, often using illegal wells) for several decades, with present pumping rates being about 140 MCM/year in total. This may be compared to an estimated sustainable yield from the Gaza Aquifer (which is in reality simply a geographically-defined portion of the much large Coastal Aquifer stretching from northern Israel into north-eastern Egypt) of approximately 55 MCM/year. The consequence of this over-utilization of the groundwater is saline intrusion, and this is coupled to contamination of the shallow sand aquifer by wastewaters from various sources. The great majority of the groundwater in Gaza therefore fails to meet international standards for potable waters, and the incidence of waterborne disease amongst the 1.3 million Palestinians in Gaza is reported to be very high (Dreizin, 2004a; El-Madhoun, 2004). Desalinated water is only available in Gaza from very small-volume facilities presently (amounting to about 4 MCM/year in total), and the construction of a regional desalination plant under US AID funding was halted in late 2003 due to hostilities in the second *intifada* (uprising). The Palestinian authorities have emphasized the need for the completion of the regional desalination facility (intended to supply 22 MCM/year in the interim period and 55 MCM/year as an ultimate volume), but no agreement has yet been made to recommence work. In the West Bank, many villages remain unconnected to running water supplies, and the Israeli control of much of the reticulation system implies that water shortages are frequent, especially in summer (United Nations, 1992; PWA, 2004). Access by Palestinians to water is almost completely controlled by the Israeli authorities, due to a combination of Military Orders and the institutionalization of an Israeli veto over any ongoing Palestinian development of water supply systems, through the Joint Water Committee established under the Oslo II process (Selby, 2003; PWA, 2004). The West Ghor area of the lower Jordan River valley was declared a restricted military zone soon after the occupation began in 1967, and Israeli settlers are the only users of groundwater in that area, presently.

The clear conclusion from the above analysis is that the five co-riparians of the Jordan River are each following effectively unilateral strategies with respect to their present and planned future utilization of the regional water resources. This is the case even in the face of agreements between Syria and Jordan; a Peace Treaty between Israel and Jordan which specifically addresses water resources; and the Interim Agreement between Palestine and Israel, also citing specifics on water resources. In reality, the co-riparians are presently competing for the available fresh water resources, with little or no cooperation with each other.

The co-riparians have also failed to discuss the available water resources

in any comprehensive multilateral fashion in recent years, or even in most bilateral scenarios. The *Multilateral Working Group on Water Resources* which was formed through the Madrid peace process in 1991 could have provided an important forum for such an effort, but this fell into disuse in about 1996, and has not been revived to date. Such efforts as have been made to address the allocation of the regional water resources have involved bilateral negotiations between Israel and other parties, which reflects a preferred Israeli tactic aimed at maximizing their own benefits from separating the respective negotiation tracks. The two agreements which have been formed as a result of these negotiations (the 1994 Peace Treaty between Israel and Jordan, and the Interim Agreement between Israel and the Palestine Liberation Organization) cannot be considered to reflect the key principles of customary international water law.

The involvement of the international community in the regional conflicts has achieved relatively little to date, at least in relation to reaching acceptable end-points. While it might be claimed that this has assisted somewhat in providing a platform for the Israeli-Jordanian Peace Treaty of 1994 and in defusing the Israeli-Lebanese conflict in recent years, the patterns of water utilization in the region remain deeply inequitable, and certainly unsustainable.

4.6 Factors relating to potential benefits

As discussed in Section 3.4 of this report, a framework for analyzing potential benefits has been created, and this is applied to each of the Case Studies addressed in the present report. The indicators pertaining to the three categories of benefits are listed for the Jordan River basin co-riparians in Table 7, data being abstracted from the CIA World Factbook[14] for most statistics; from Phillips *et al.* (2006b, in press) for water availability; from the FAO Aquastat database for dependency ratios; and from UNDP (2005) for the Gini coefficient. A comparison of the security-related indicators reveals certain trends, some of which have already been referred to in the present chapter. Thus, for example:

- Military expenditures vary greatly amongst the co-riparians, being especially high in Israel in both *per capita* terms and as a percentage of GDP, and being notable also in Jordan. Israel's tendency to resort to military actions has long been supported by the USA, which supplies much of the materiel utilized by Israel (to the extent that the USA is regarded as being a surrogate force in the region by at least some actors). Israel receives the largest US-derived economic and military aid worldwide, estimated at a cost of US$65 billion for the period between 1948 and

[14] See <http://www.cia.gov/cia/publications/factbook/>.

1996 (Bar-Siman-Tov, 1998: 231). This maintains Israel's position of dominance in the region (as opposed to hegemony; compare this to the stances of Egypt and China, as discussed in Chapters 5 and 6).

Table 7. Selected indicators for the co-riparians of the Jordan River basin. Data for Palestine have been generated as averages of Gaza and the West Bank, in some cases. ND: No data available.

Indicator	Lebanon	Syria	Israel	Palestine	Jordan
Security-related Indicators:					
Military expenditure *per capita* (US$/year).	141	46*	1,452	ND [Low]	254
Military expenditure (% of GDP).	3.1	5.9*	8.7	ND [Low]	14.6
Water availability/use (m^3/*per capita*/year).	1,160	945	331	72	157
Water dependency ratio (%).	0.8	80.3	55.1	~75	22.7
History of water-related agreements.	Few; bilateral	Few; bilateral	Few; bilateral	Few; bilateral	Few; bilateral
Intra-basin cooperation (institutionally).	Minor	Minor	Minor	Minor	Minor
Geopolitical/Governmental stability.	Low	Moderate	Moderate	Low	Moderate
Immigration/emigration.	High	Low	High	Very high	High
Level of regional integration.	Low	Low	Very low	Low	Low
Economic Indicators:					
GDP *per capita* (PPP, US$).	5,000	3,400	20,800	725	4,500
Population below poverty line.	28%	20%	18%	67%	30%
Life expectancy at birth [M/F].	70/75	69/71	77/82	71/74	76/81
Infant mortality rate/1,000 births.	24.5	29.5	7.0	20.8	17.3
Literacy rate [M/F, %].	93/82	90/64	97/94	ND [Low]	96/86
Energy use (kWh/person/year).	2,254	1,318	6,103	ND [Low]	1,232
Agriculture as % of GDP.	12	25	2.8	9.0	2.4
Industry as % of GDP.	21	31	38	28	26
Environmental Indicators:					
Importance of flow regime.	Low	Minor	High	Minor	Minor
Water quality index (pollution, salinization).	Minor problems	Moderate problems	Moderate problems	Major problems	Major problems
Environmental flows (base flows).	Not addressed	Not addressed	Not addressed	Not addressed	Not addressed
Sustainability of water use.	Moderate	Moderate	Very low	Very low	Very low
Biodiversity.	Moderate	Moderate	Low	Very low	Low
Other Useful Indicators:					
Gini index.	ND	ND	35.5	ND	36.4
Population growth rate (%).	1.26	2.34	1.20	3.36	2.56
Services as % of GDP.	67	44	59	63	71
Water management including sectoral subsidies.	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture

* Data from official Government sources; may be underestimated.

- As noted previously in this chapter, cooperation amongst the co-riparians has been very minor to date, and a state of conflict has persisted for the last half-century at least, ranging from cold conflict to acute episodes of violent military aggression. The historical water-related agreements amongst the co-riparians are almost all bilateral, as discussed in Annex 1.

- The only inter-basin transfer of significance involves that in Israel through the National Water Carrier, to the Negev. This in itself was the source of significant conflict over the period running up to its inauguration in 1964, and debate concerning its economic significance to Israel continues to the present.

- Major displacement of the population has occurred (principally in the 1948 and 1967 wars, and mainly involving Palestinian relocation to the other Arab co-riparians and elsewhere), and the effects of this persist to date. Even in Israel, a high percentage of the population comprises recent immigrants.

The basin States can be considered as forming a generally unstable geopolitical region, and instability within the region threatens additional areas in the Middle East and elsewhere, due to ethnic and other form of tensions. Attempts to date by the international community to ease tensions or attain a lasting peace have been largely unsuccessful.

The economic indicators shown in Table 7 emphasize the major inequalities amongst the basin States, with Israel being much more developed in a western sense than the other co-riparians, and Palestine being generally similar in economic character to the sub-Saharan African nations (compare these data to those in Tables 14 and 15 for the Nile River basin). The sectoral contributions to GDP are particularly revealing, with Israel's agricultural activities contributing very little to its GDP but demanding some 70% of its available water resource, provided at massive subsidies (and certainly unsustainable in the medium or longer terms).

Criticisms of this approach (e.g. see PCE, 2002) have been effectively ignored by the political elite in Israel, which continues to attempt to dominate the regional water resources, their utilization, and their management according to ideological rather than hydrological or other accepted criteria (Feitelson, 2002, Frederiksen, 2003a, 2003b; Selby, 2003, 2005; Phillips *et al.*, 2005), in some cases at least by successfully subordinating water-related issues to other topics (Jägerskog, 2003).

Data for virtual water imports in the region are of particular interest. Tables 8 and 9 reveal that Israel is a massive net importer of virtual water (see also Allan, 1994, 1996, 1998, 2001, 2002, 2003), despite protestations that its dominance of the regional water resources is required for 'food security'.

In reality, the annual importation of virtual water by Israel is equivalent to about three times its available internal water resources. Interestingly, Syria is a net exporter of virtual water, notwithstanding its stance that upstream co-riparians treat it unfairly (compare Daoudy, 2005 to Unver, 2005). These trends are discussed in further detail in Chapter 7 of the present report.

Table 8. Virtual water flows by country for four of the co-riparians of the Jordan River basin (data for Palestine were not cited by the source). All data as MCM/year. ND: No data provided. After Chapagain and Hoekstra (2004a, 2004b).

Country	Gross Virtual Water Flows							
	Related to the Trade of Crop Products		Related to the Trade of Live-stock Products		Related to the Trade of Indu-strial Products		Total Trade	
	Export	Import	Export	Import	Export	Import	Export	Import
Israel	575	4,111	140	687	71	2,156	786	6,954
Jordan	97	4,103	165	462	25	228	287	4,794
Lebanon	212	2,744	75	1,379	4	380	291	4,503
Syria	4,025	3,131	512	143	126	213	4,664	3,488

Country	Net Virtual Water Import			
	Related to the Trade of Crop Products	Related to the Trade of Live-stock Products	Related to the Trade of Indu-strial Products	Total Trade
Israel	3,537	547	2,084	6,186
Jordan	4,006	297	203	4,506
Lebanon	2,532	1,304	376	4,212
Syria	-894	-386	87	-1,176

The Gini indices are also illuminating, in particular because these point specifically to inequalities within the various basin States. Data are unfortunately not available from UNDP (2005) for three of the co-riparians, but the indices for both Israel and Jordan reveal significant inequities within their societies. Direct experience of the other co-riparians reveals that the same is true, perhaps even especially so for Palestine and Syria. The importance of internal social inequities in driving civil disobedience is very clear in all of the Jordan River co-riparians, and the combination of this with general distrust creates a tinderbox which threatens to ignite at short notice.

Amongst the environmental indicators, the *per capita* water availability data are striking, revealing massive downstream inequity (the scale of which is unknown elsewhere globally). The *per capita* availability of water in Palestine is amongst the lowest of any country in the world, and Jordan is also deeply water-stressed. Water pollution problems are of great significance to the three downstream co-riparians in particular, with Palestine facing a water crisis in Gaza which has not been addressed to date and certainly threatens the viability of the future Palestinian State. The pollution problems in all three downstream co-riparians reflect the historical mismanagement of the water resources, and this is especially the case in both Israel and Palestine, but for distinct reasons in the two cases (Phillips *et al.*, 2004, 2005). There can be no doubt whatever that the present utilization of the regional water resources is unsustainable in the three downstream co-riparians, at the least.

Table 9. Water footprints for four of the co-riparians of the Jordan River basin (data for Palestine were not cited by the source). All data as 10^9 m^3/year, except the water footprint data, all as m^3/person/year. ND: No data provided. After Chapagain and Hoekstra (2004a, 2004b).

Country	Population (million)	Use of Domestic Water Resources				
		Domestic water withdrawal	Crop Evapotranspiration		Industrial Water Withdrawal	
			National Consumption	Export	National Consumption	Export
Israel	6.2	0.47	1.63	0.20	0.112	0.00
Jordan	4.8	0.21	1.45	0.07	0.035	0.00
Lebanon	4.3	0.41	1.71	0.09	0.028	0.00
Syria	16.0	0.59	25.40	4.08	0.246	0.08

Country	Use of Foreign Water Resources			Water Footprint		
	National Consumption		Re-export of Imported Products	*Per capita*	Agricultural Sector	
	Agricultural	Industrial			Internal	External
Israel	4.28	2.09	0.59	1,391	264	694
Jordan	4.37	0.21	0.22	1,303	301	908
Lebanon	3.92	0.38	0.20	1,499	397	913
Syria	2.82	0.16	0.50	1,827	1,588	176

It is also notable that the 'pure' environmental indicators involving such matters as base river flows and biodiversity are generally given short shrift in the region. There has never been any serious consideration of base flow requirements in the Jordan River, and the upstream withdrawals by Israel (and to a much lesser extent by Syria and Jordan) have served to markedly reduce the level of the Dead Sea in the last four decades, as discussed previously. Biodiversity is not considered to be a major issue in the region by the Governments of relevance, and the riverine system has been so severely impacted by previous activities that this is unlikely to become a driving force for future improvements.

4.7 Conclusions

It is clear that the co-riparians of the Jordan River basin essentially compete for the available regional water resources in a heavily securitized type of zero-sum scenario, and little or no cooperation has been evident between them in the past (in reality, quite the opposite). Such agreements as have been generated to date have almost all been of a bilateral nature, and it may be concluded that none of these has complied with the principles of customary international water law. Thus, the available water resources are not shared in an equitable and reasonable manner amongst the co-riparians, and the overall pattern is one of domination by Israel in particular, through a long-term strategic integration of considerations of water resource availability into its geopolitical stance, coupled to the threat of hostile action. The inability of the international community to address this inequity is striking, and has been described by one highly experienced commentator (Frederiksen, 2003a) as an abrogation of international responsibility.

Section 7.2 of this report discusses how such a lamentable situation may be reversed, with the objective of attaining a positive-sum outcome for all parties.

Chapter 5: Case Study 2 The Kagera River basin

This chapter of the present report addresses the second of the Case Studies, concerning the Kagera River basin (or more accurately, sub-basin) at the headwaters of the White Nile. Because the Kagera and the Nile are interlinked both physically and in terms of their historical and ongoing management, the sections within this chapter discuss both systems, either separately or in combination.

5.1 The basin geography

5.1.1 The Nile

The Nile River is about 6,800km in length, and its basin covers 3.1 million km^2 – approximately 10% of the land mass of Africa – running from south to north over 35 degrees of latitude (Nicol, 2003). In total, 10 co-riparians share the Nile, with a combined population of 300 million (40% of the total African population; some 160 million of these live within the Nile basin). Four of the co-riparians to the Nile River are amongst the ten poorest countries in the world (Burundi, Eritrea, Ethiopia and Tanzania), and two of these are co-riparians in the Kagera River basin. The Kagera River basin comprises just less than 2% of the total area of the Nile River basin (Figures 7 and 8), but is very significant for three specific reasons. Firstly, historical institutional development and inter-State agreements exist for the Kagera basin that could form a part of the foundation of future benefit-sharing scenarios in the Nile Basin as a whole. Secondly, the Kagera River basin is characterized largely by the use of endogenous water resources, introducing the important issue of endogenous *versus* exogenous water, and more specifically the rights, duties and obligations associated with these two conditions into the Nile Basin as a whole. Thirdly, the issue of out-of basin transfers is of relevance for the co-riparians to the Kagera basin, and this is an important element of the hydro-political dynamics of the Nile Basin as a whole.

The Nile River has two main upper branches: the White Nile originating in the equatorial lakes region (which includes the Kagera River basin), and the Blue Nile which rises in the highlands of Ethiopia. The areas of the various co-riparians within the basin are shown in Table 10, with data for average rainfall also being provided. This shows the very marked decrease in precipitation with distance northwards, the main transition occurring in northern Sudan and Eritrea, and continuing into Egypt. As a reflection of this, all of the waters in Rwanda and Burundi are produced internally (i.e. are endogenous water resources), while most of the surface waters in Sudan (77%) and Egypt (97%) are derived from external sources in the upstream reaches of the Nile (i.e. are exogenous water resources). The Nile Basin is

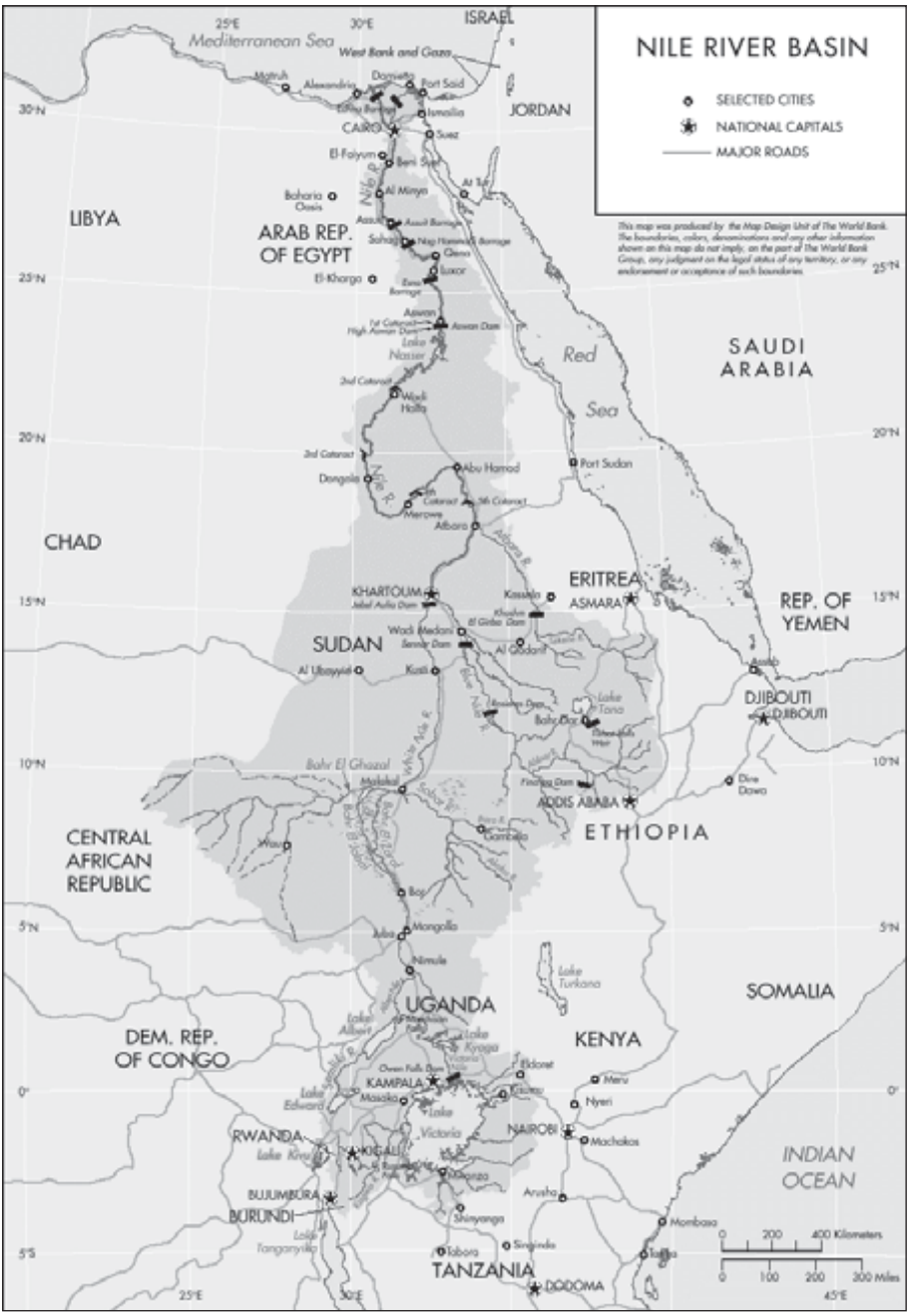

Figure 7. The Nile River basin. After the Nile Basin Initiative, *Nile River Basin map* [on-line]. <http://www.nilebasin.org/nilemap.htm>

also characterized by one unique feature – the downstream country (Egypt) is the most reliant on exogenous water resources of any country in the world (Gleick, 1993b: 117). It is impossible to fully understand the potential for

benefit-sharing without grasping this fundamental reality and unique driver of hydro-politics in the Nile River Basin as a whole – the dynamics unleashed by endogenous *versus* exogenous flows in specific sub-basins.

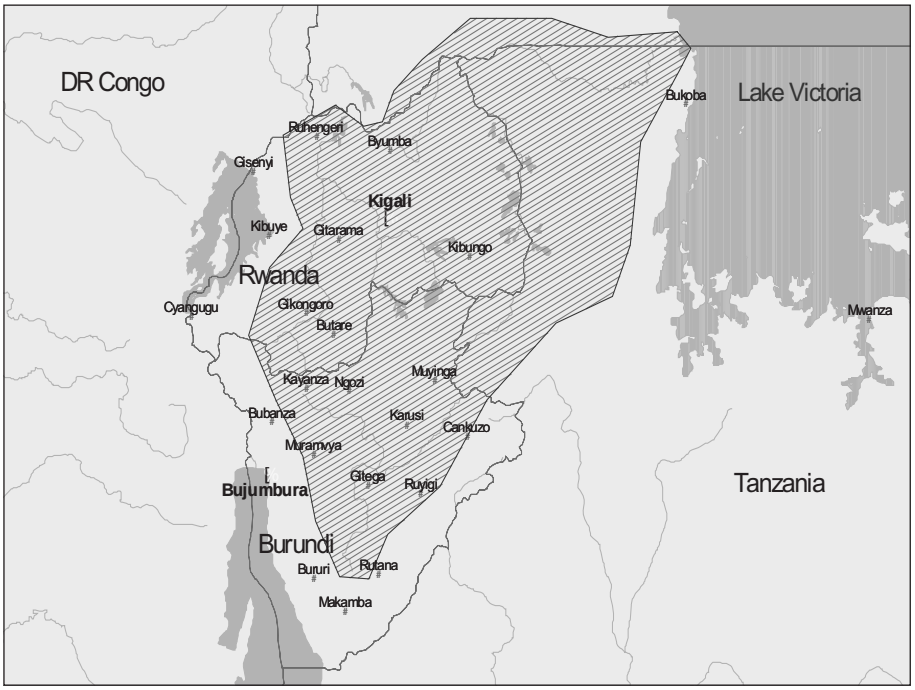

Figure 8. The Kagera River basin. After the Nile Basin Initiative, *A new approach to the joint management of river basins in the Lake Victoria basin: The Nile Equatorial Lakes Subsidiary Action Program (NELSAP)* [on-line]. <http://www.nilebasin.org/nelsap/documents.htm>

One of the most important areas within the Nile River basin in relation to hydrology is the Sudd in southern Sudan. The Albert Nile becomes the Bahr el Jebel as it enters the Sudd, and the Bahr el Gazal River originating in south-western Sudan joins the main river at this point. The Sudd constitutes one of Africa's most important wetlands, and consists of a vast maze of swamps, channels and lakes. The area of the Sudd is also highly sensitive to variations in the upstream rainfall, expanding over five-fold after years of high rain in the equatorial lakes region. In addition, less than half of the flows entering the Sudd remain at the exit therefrom, to feed the White Nile. In an attempt to circumvent such losses due to evaporation, the Jonglei Canal was designed to partially by-pass the Sudd and deliver flows more efficiently downstream to the White Nile (running from Borr to Malakal, and estimated to enhance downstream flows by about 8,000 MCM/ year, or some 5–7%).

Table 10. The Nile River basin: areas and rainfall by country.[15]

Country	Total area (km^2)	Area in the basin (km^2)	% of area of basin	% of total area of country	Average annual rainfall in the basin (mm)		
					Min.	Max.	Mean
Burundi	27,834	13,260	0.4	47.6	895	1,570	1,110
Rwanda	26,340	19,876	0.6	75.5	840	1,935	1,105
Tanzania	945,090	84,200	2.7	8.9	625	1,630	1,015
Kenya	580,370	46,229	1.5	8.0	505	1,790	1,260
DR Congo	2,344,860	22,143	0.7	0.9	875	1,915	1,245
Uganda	235,880	231,366	7.4	98.1	395	2,060	1,140
Ethiopia	1,100,010	365,117	11.7	33.2	205	2,010	1,125
Eritrea	121,890	24,921	0.8	20.4	240	665	520
Sudan	2,505,810	1,978,506	63.6	79.0	0	1,610	500
Egypt	1,001,450	326,751	10.5	32.6	0	120	15
Entire basin		3,112,369	100.0		0	2,060	615

Construction of the 360 km Canal commenced in 1978, but ceased in 1983 after the completion of about 240 km, due to the civil war (Howell *et al.*, 1989; Collins, 1990). The project remains incomplete to date, but the recent cessation of hostilities in the Sudan could offer an opportunity for its completion. However, any decision would need to balance a demand for the retention of the Sudd wetlands, with the needs downstream. The status of the Jonglei Canal remains hotly contested, and the rationale for draining a wetland of major international significance such as the Sudd will undoubtedly draw very considerable attention amongst the global environmental community. Lessons in this regard have been provided by the highly contested nature of a similar project, designed to 'enhance the yield' of the Okavango wetland system, by dredging a similar canal (Scudder *et al.*, 1993). It can therefore be presumed that any planned attempts to complete the construction of the Jonglei Canal would meet with a similar response to that in the Okavango case. The viability of this option needs to be evaluated in the context of global reflexivity that characterized the end of the 20th Century.

Close to Malakal, the Sobat River joins the White Nile, providing flows from the southern Ethiopian foothills. The White Nile and the Blue Nile merge at Khartoum, and the Atbara River (which forms the border between Ethiopia and Eritrea) then joins the main stem of the Nile as the last

[15] From FAO: <http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/W4347E/w4347e0k.htm>.

major tributary before the Mediterranean Sea, far to the north. The Blue Nile and the Atbara River are the predominant contributors of water to the downstream sections of the Nile River, accounting for the majority of the flow leaving Sudan and entering Egypt. However, this varies considerably over time, as shown in Table 11.

Table 11. Variations in discharges (as km^3 or thousands of MCM/year) at different locations on the Nile River, listed in order from upstream to downstream.[16]

Location	Average annual discharges (km^3)		
	1912–1982	1948–1970	1961–1970
Exit of Lake Victoria	27.2	29.4	41.6
Exit of Lake Kyoga	26.4	30.1	44.1
Exit of Lake Albert	31.4	33.7	48.8
Mongalla (White Nile)	33.1	36.8	52.6
Malakal (White Nile)	29.6	31.6	37.8
Khartoum (Blue Nile)	50.1	49.8	45.9
Mouth of the Atbara River	10.6	12.1	10.9
Dongola (Nile River)	82.7	86.2	86.2

Egypt has developed and is implementing major projects for diverting Nile River flows out-of-basin, to support irrigation in the Sinai and in its Western Desert. This is a significant development in hydro-political terms because it introduces the concept of out-of-basin transfers in the context of the Nile, potentially opening the door to similar aspirations in the upper reaches of the basin as a whole. This is one of the important drivers of hydro-political dynamics in the context of benefit-sharing arising from this specific Case Study. The El-Salam (Peace) project, which is also known as the Northern Sinai Agricultural Development Project, involves a canal designed to be 261 km in length (Figure 9). This structure runs eastwards from Damietta near the mouth of the Nile River, and dips 14 metres to pass under the Suez Canal in four large tunnels. The scheme was conceptualized in the late 1970s under President Anwar Sadat, following his famous visit to the Israeli Knesset in 1977. Inflows derive in equal parts from the Nile River near its mouth, plus agricultural drainage water from the Sewr and Hadous drains in the Delta. The section to the east of the Suez Canal is known as the

[16] See footnote [15] for the source of these data.

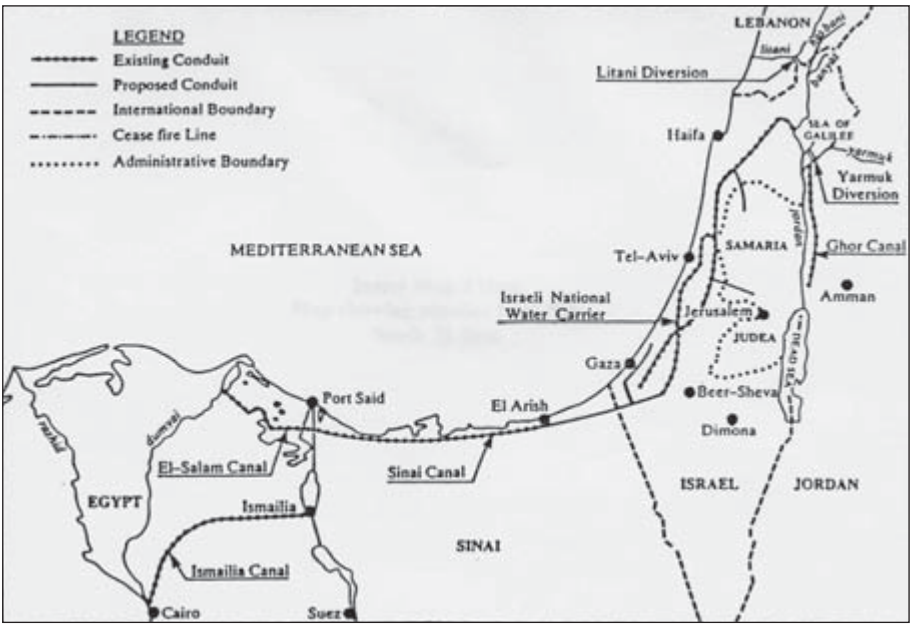

Figure 9. Map of the El-Salam Canal as originally conceived. After Wolf (1998b).

Sheikh Jaber el-Sabah Canal, reflecting the source of funds for its construction. In total, some 620,000 feddans of irrigated land are foreseen in five separate blocks (the last at Wadi el Arish), only 220,000 feddans of these being to the west of the Suez Canal.[17]

The Toshka project (named after the Toshka depression close to the proposed off-take from the Nile, but also sometimes known as the Southern Valley Agricultural Development Project) is a more recent initiative. This project was inaugurated by President Mubarak in early 1997, and seeks to divert 5,500 MCM/year of Nile waters from Lake Nasser through the 310 km Sheikh Zaved Canal to new cities in the Western Desert. The resulting reduction in volumes available downstream would reportedly be partially offset by the increased re-use of wastewaters and the introduction of improved agricultural practices in the Nile Delta. Two smaller agricultural projects involving out-of-basin transfers are also being developed by Egypt, these being the East Owaynat Project and the Darb El-Anar'aen Project (Siam and Moussa, 2003).

Three separate international programmes have been initiated on the Nile River basin in the last 40 years. The first of these was focused on the hydrology of the upper reaches of the White Nile in particular (the HYDROMET

[17] One feddan is equivalent to 4,200m2.

project), and extended from 1967 to 1993. The second project was known as TECCONILE (Technical Co-operation for the Promotion of the Development and Environmental Protection of the Nile Basin), which grew out of the earlier UNDUGU Commission and ran from 1993 to 1999. Six of the co-riparians were directly involved, the other four (Burundi, Eritrea, Ethiopia and Kenya) having observer status. The Nile River Basin Action Plan (NRBAP) was drafted in 1995 as a part of this effort. In 1999, the Nile Basin Initiative (NBI) commenced as a replacement for the TECCONILE project, and the NBI has continued to the present. A Strategic Action Program for the NBI was prepared, consisting of two main components – a Shared Vision Program (SVP) and various Subsidiary Action Programs (SAPs).[18]

The Subsidiary Action Programs under the NBI are geographically defined, involving the eastern Nile (ENSAP) and the Nile equatorial lakes, including Lake Victoria (NELSAP). Eight of the co-riparians are involved in NELSAP activities, including all of the four from the Kagera River basin. The main focus of NELSAP projects is on the development of the agricultural and fisheries sectors in the upper White Nile, including the Kagera River basin; water resource management; the development of hydroelectric power and its transmission; and the control of the water hyacinth (see below).

5.1.2 The Kagera

Four co-riparians contribute flow to the Kagera River basin, these being Burundi, Rwanda, Tanzania and Uganda. The basin is characterized by a predominance of endogenous water resources, and this contrasts with certain of the downstream riparians to the Nile River that are highly reliant on exogenous water (and are therefore potentially vulnerable to upstream withdrawals). The Kagera basin is 59,800 km^2 in total area and includes some 75% of the land area of Rwanda, and approximately half that of Burundi (see Figure 8 above). The regional rainfall is high especially in the upper elevations, and the fertile soils of the basin support a dense population subsisting mainly on agriculture. For example, agribusiness contributes almost half of the Gross Domestic Product in Rwanda, and is also an important source of exports (mainly tea and coffee, but also some pyrethrum). However, parts of the Kagera catchment as a whole have been damaged by previous land use practices, and attempts at restoration are underway presently in certain areas.

The upper tributaries of the Kagera River include the Nyabarongo River in Rwanda and the Luvinzora River in Burundi, the latter being suggested by some as the famed 'source of the Nile'. The river flows close to the sha-

[18] Of the ten co-riparians, Eritrea alone has not as yet participated actively in the Nile Basin Initiative, although it attends the Council of Ministers (Nile-COM) meetings as an observer.

red border between Burundi, Rwanda and Tanzania under Rusumo Bridge, and then forms the border between Rwanda and Tanzania (through the Akagera National Park). The river then turns eastwards to flow through the Minziro-Sango Bay swamp forest area, and empties into the western side of Lake Victoria just to the north of the border between Tanzania and Uganda. The Minziro-Sango Bay forest ecosystem is composed of the Minziro Forest Reserve in the Bukoba District of north-western Tanzania (249 km^2), and the Sango Bay Forest Reserve in the Rakai District of southern Uganda (600 km^2). This area is of significant importance in its own right, being the largest swamp forest ecosystem in eastern Africa, and also having a connection to wetlands in the adjacent floodplain of the Kagera River (Rodgers *et al.*, 2001).

The Kagera River provides about 40% of the surface water flow of 20,000 MCM/year into Lake Victoria (estimated at about 7,500 MCM/year for the Kagera, or about five times the natural flow of the Jordan River). Lake Victoria is the second-largest lake in the world in terms of surface area (after Lake Superior) at 68,800 km^2, and is famed for its endemic fish species, most of which are cichlids. Its total catchment area is 184,000 km^2, the Kagera River basin constituting about one third of this. The lake surface is controlled by Kenya (6%), Tanzania (49%) and Uganda (45%), and the gross economic product of the lake catchment is about US$4 billion annually, with a population of about 25 million whose *per capita* incomes range between US$90/year and US$270/year (World Bank, 1996). Subsistence fishing and agriculture are the mainstays of the local economy.

The average depth of Lake Victoria is only about 40 metres, and the inflow is dominated by direct precipitation onto the lake surface, which contributes about 85% of the total volume entering the lake in an average year. Of the remainder, about 40% is contributed by the Kagera River basin as noted above, with the bulk of the rest being derived from the forest slopes in Kenya to the north-east (and smaller amounts from the plains of the Serengeti and the Ugandan swamps). There has been extensive debate in the past as to whether the Kenyan flows could be taken out-of-basin and used for irrigation elsewhere, principally in the Kerio Valley. Similar discussions have occurred in Tanzania, relating to the possibility of out-of-basin transfers to the Vembere Plateau in the Manonga River basin and elsewhere (see also below). These possible out-of-basin transfers must be evaluated in light of Egypt's posture on the same issue. This raises the core issue of rights, duties and obligations for all riparian States (specifically as they pertain to out-of-basin transfers), which is a characteristic of the Nile Basin as a whole.

The level of Lake Victoria is highly sensitive to changes in the upstream precipitation, and the lake acts as a long-term buffer in controlling downstream flows (in part, due to hydraulic structures within the system, including the Owen Falls Dam). The outflows from Lake Victoria occur predominantly through evaporation (also estimated at about 85% of the

total), with the remainder mainly entering the Victoria Nile flowing through Owen Falls, Lake Kyoga, Lake Albert and the Murchison Falls, and forming the Albert Nile which flows onwards into Sudan.

Concerns have arisen in recent years in relation to the water quality in Lake Victoria. The available evidence reveals a significant decline in water quality over time, with increasing turbidity and signs of eutrophication (the latter including frequent algal blooms with a high incidence of toxic blue-green algae, and also problems with the water hyacinth, *Eichhornia crassipes*). The water hyacinth is thought to have been introduced to the lake from the upper tributaries of the Kagera River (FAO, 2002).[19] The overall changes in water quality and the fisheries are believed to be linked to the introduction of exotic fish species (including the Nile perch *Lates niloticus* in the late 1950s), coupled to continuous increases in the pollution loading from land-based sources (Kaufman, 1992; World Bank, 1996). A tripartite agreement was signed between Kenya, Tanzania and Uganda to establish the Lake Victoria Environmental Management Program in 1994 (see also Annex 1 to this report), and attempts have continued to date to reverse the deterioration in water quality and maintain fishery success.[20] These have included the signing of a *Protocol for Sustainable Development of the Lake Victoria Basin* in 2003, which is discussed in Annex 1 in greater detail. There is also concern over the deterioration in wetlands in the headwaters of the Nile (Wood, 2005), which has direct implications for future downstream yields. The *Nairobi "Headwater" Declaration*[21] is of considerable relevance to the Kagera Sub-Basin (Haigh *et al.*, 2005). The last two articles of this declaration read as follows:

> 23. *Attention should also be paid to alternative measures that would reduce the dependence of downstream areas on the resources of headwater areas, including reducing wastage and increasing the efficiency of resource utilization, not least of water;*
>
> 24. *The equitable distribution and use of headwater resources remain a major concern, and planning and management of headwater regions needs to be integrated within the broader framework of watershed management that addresses the concerns of both headwater inhabitants and those downstream, including those living in coastal areas.*

[19] See also Agaba *et al.*, Biological control of water hyacinth in the Kagera River headwaters of Rwanda: A review through 2001, at <http://www.cleanlake.com/rwanda_bio_paper.htm>.
[20] See Beare and Rushoke, Integrated development of fishing villages in Kagera region, Tanzania, at <http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/005/AC350E/AC350E00.HTM>
[21] See the United Nations University site at <http://update.unu.edu/archive/issue22_10.htm>

Initiatives developed in recent years under the Nile Basin Initiative (NBI; see below) are currently starting to bear fruit. The early work of the Kagera Basin Organization (commencing in 1976 but becoming dormant in the early 1990s and being finally dissolved very recently) is now being taken up through a forum driven collaboratively by the World Bank in partnership with the riparian States, and with strong links to the NBI. The Integrated Kagera River Basin Management and Development Project (a so-called "multi-purpose development project") which is presently being launched is of particular note, as is the Lake Victoria Environmental Management Project (LVEMP), the next stage of which will be coordinated through the East African Community. The first of these has identified five areas where development needs are especially pressing, and a number of development options (see Table 12).

Table 12. Areas of pressing development needs and development options within the Kagera River basin.[22]

Areas of Pressing Development Needs	Development Options
Watershed management	Flood management and control
	River transport/navigation
Water supply and sanitation	Water supply services
Agricultural sector activities	Rain-fed and irrigated agriculture
Power supply/infrastructure	Hydropower generation (Rusumo Falls/other)
	Road development
Environmental awareness	Reforestation
	Remediation/protection of wetlands
	Management of national parks/tourism

The principal objective of these projects is to *"develop tools and permanent cooperation mechanisms for the joint, sustainable management of the water resources in the Kagera River basin, in order to prepare for sustainable development-oriented investments to improve the living conditions of the people and to protect the environment"* (WWW, 2005a). The World Bank envisages a range of benefits arising from the multi-purpose project, as shown in Table 13.

[22] See World Bank Report No. 15429-APR: Staff Appraisal Report for the Republic of Kenya, United Republic of Tanzania, and the Republic of Uganda for the Lake Victoria Environmental Management Project. June 18, 1996. <http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1996/06/ 18/000009265_3961214131704/Rendered/INDEX/multi-0page.txt>

Some of these have recently been subjected to initial cost-benefit analyses (J.Granit, personal communication) and this process is beginning to clarify the benefit-sharing aspects of relevance to the co-riparians, although further detail is needed.

Table 13. Suggested benefits from the multi-purpose Kagera River basin development. After the World Bank (2005).

To the region	• Stability, and the "peace dividend"	
	• Economic integration (EAC, Burundi, Rwanda and DRC)	
	• Regional infrastructure assets	
To the riparian countries	• Sediment control	• River regulation
	• Watershed management	• Biodiversity conservation
	• Energy supply and rural electrification	• Commercial development
	• Irrigation & agribusiness	• Private sector development
To the downstream riparians	• Water quality	
	• Water hyacinth control	
	• Sediment reduction	
	• Regional stability	
	• Growing trade markets	

5.2 Historical agreements on water-related issues

5.2.1 General

Historical agreements on water-related issues are listed here chronologically for both the Nile as a whole and for the Kagera River basin in the specific, as all of these may have an influence on the management of the resources in the Kagera basin headwaters. Details concerning the agreements are provided in Annex 1 to this report, whilst a general overview is provided in the following sub-section. As may be anticipated, the agreements of relevance are extensive for the Nile in particular, and include the following:

- a protocol between Great Britain and Italy from 1891 concerning the Atbara River;

- a territorial lease agreement between Great Britain and the Congo signed at Brussels in 1894, modified by a further agreement in 1906;

- an exchange of notes between Great Britain and Ethiopia dated 1902 and relating to the Blue Nile and other watercourses;

- an agreement between Great Britain, France and Italy of 1906 relating to Abyssinia, modified and extended by an Exchange of Notes between the United Kingdom and Italy in 1925;

- an exchange of notes in 1929 between the Egyptian and the United Kingdom Governments, including extensive technical detail and pertaining to the use of the Nile waters for both irrigation and navigation (usually known as the 1929 agreement);

- an agreement between the United Kingdom and Belgium dated 1934, concerning trans-boundary river flows and water rights in Tanzania, Rwanda and Burundi;

- an exchange of notes and memoranda between the United Kingdom (representing Uganda, in some cases) and Egypt between 1946 and 1953;

- the agreement of 1959 between Egypt and the Sudan on the utilization of waters of the Nile River;

- an agreement between Burundi, Rwanda and Tanzania in 1977 to form the Kagera Basin Organization (KBO), which Uganda joined also in 1981;

- the Framework for General Cooperation between Egypt and Ethiopia from 1993;

- the agreement from 1994 between Kenya, Tanzania and Uganda on the establishment of the Lake Victoria Environmental Management Program; and

- the Protocol for Sustainable Development of the Lake Victoria Basin, signed by Kenya, Tanzania and Uganda in November 2003.

Certain other accords exist which are of less specific relevance to the issues addressed in the present report, including that between Egypt and Uganda of 1998 pertaining to the control of the water hyacinth. The agreements discussed above are reviewed briefly in the following sub-section, in relation to water rights and related issues.

5.2.2 Broad overview of the existing agreements

The Nile River basin: While many historical agreements exist for the Nile River basin as noted above and as discussed in Annex 1, no basin-wide agreement exists on the utilization of the watercourse as a whole, despite decades of effort involving several international programmes. As noted in the review provided at Annex 1, most of the existing agreements are of a bi-lateral nature, with a few extending (or purporting to extend) to additional co-riparians, chiefly by virtue of these countries having been administered by Britain during the colonial era. The 1929 and 1959 agreements are the only documents detailing specific volumetric allocations of the Nile River waters, and both of these involve only the Sudan and Egypt, with little or no consideration of the development needs of upstream co-riparians. There has been extensive comment in recent years concerning the applicability of the earlier agreements signed by colonial powers, with various Kenyan, Tanzania and Ugandan Government representatives stating that these are not considered to bind the current independent States (see the recent review by Okoth-Owiro, 2004).[23] This attitude stems originally from the so-called Nyerere Doctrine on State Succession, formulated by President Julius Nyerere of Tanganyika at the time of independence, shortly before Tanzania was formed through the unification of Tanganyika and Zanzibar. The Nyerere Doctrine was crystallized in a 1961 declaration by the Government of Tanganyika to the Secretary General of the United Nations, reading as follows:

> *As regard bilateral treaties validly concluded by the United Kingdom on behalf of the territory of Tanganyika, or validly applied or extended by the former to the territory of the latter, the Government of Tanganyika is willing to continue to apply within its territory on a basis of reciprocity, the terms of all such treaties for a period of two years from the date of independence – unless abrogated or modified earlier by mutual consent. At the expiry of that period, the Government of Tanganyika will regard such of these treaties which could not by the application of rules of customary international law be regarded as otherwise surviving, as having terminated.*

Similar sentiments were expressed in a letter dated 04 July 1962 from the Tanganyika Government to the Governments of Britain, Egypt and the Sudan, and also in a 1963 letter from the Government of Uganda to the Secretary General of the United Nations. Various authors have since debated this matter at considerable length in legal terms (e.g. see Seaton and Maliti,

[23] Also McGrath, C. and Inbaraj, S. (2004), *Unquiet flows the Nile*, at <http://www.ipsnews.net/interna.asp? idnews=21932>; also Defegu, Gebre Tsadik (2004), The Nile waters: Moving beyond gridlock, at <http:www. addistribune.com/Archives/2004/06/11-06-04/NILE.htm>.

1973; Okidi, 1982; Godana, 1985; Brownlie, 1990; Okoth-Owiro, 2004), with many commentators debating the validity and/or precise meaning of Articles 12 and 34 of the *Vienna Convention on Succession of States in Respect of Treaties* of 1978. The present report is not an appropriate vehicle for additional in-depth legal comment on this matter. However, the issue is a fundamental element of the hydro-political dynamics of the Nile River Basin and is of great importance to any future solution to the allocation of the Nile flows and/or to the sharing of benefits from the river system. It is clear that the division of the Nile River waters on the basis of the 1929 and 1959 agreements is neither equitable nor reasonable at present.

The Kagera River basin: Only three agreements of specific relevance to this report have been made to date concerning the Kagera River basin, and none of these cites volumetric allocations. The first agreement from 1977 has effectively been overtaken by later events, and the Kagera Basin Organization has ceased operations (although it appears possible that it may soon be resurrected in an alternative guise; see below).[24] It is notable that there is a history of such dynamics in southern Africa also, where the management of the Limpopo, Incomati and Maputo River Basins went through a phase of failed institutions, but which evolved over time into robust arrangements (which even included volumetric allocations in some cases). The 1994 agreement between Kenya, Tanzania and Uganda on the Lake Victoria Environmental Management Programme (which includes the Kagera River basin) remains in force, and has been extended by the 2003 Protocol for the Sustainable Development of the Lake Victoria basin. The project is currently entering a new phase under the East African Community, with Burundi and Rwanda being likely to join shortly. Very recently, efforts driven mainly by the World Bank but linked back to the Nile Basin Initiative have laid the platform for renewed and (allegedly) integrated development of the Kagera River basin, including the probable construction of the Rusumo Falls Dam.

5.3 Conflict and cooperation in the basin

"Egypt is a gift of the Nile." (Greek historian Herodotus, circa. 486–425 BC).
"He who controls the Nile controls Egypt." (Halford, 1936).
"Water flows towards the powerful and the rich." (Fradkin, 1981).

[24] See also Mbaziira, Rashid, Nsubuga Senfuma and Rachael McDonnell, *Institutional development in the Nile Equatorial Lakes sub-basin: Learning from the experience of the Kagera Basin Organisation*, at <http://www.iwmi.cgiar.org/Africa/files/RIPARWIN/05/EARBM_Papers/Theme4/Rashid%20Mbaziira.doc>.

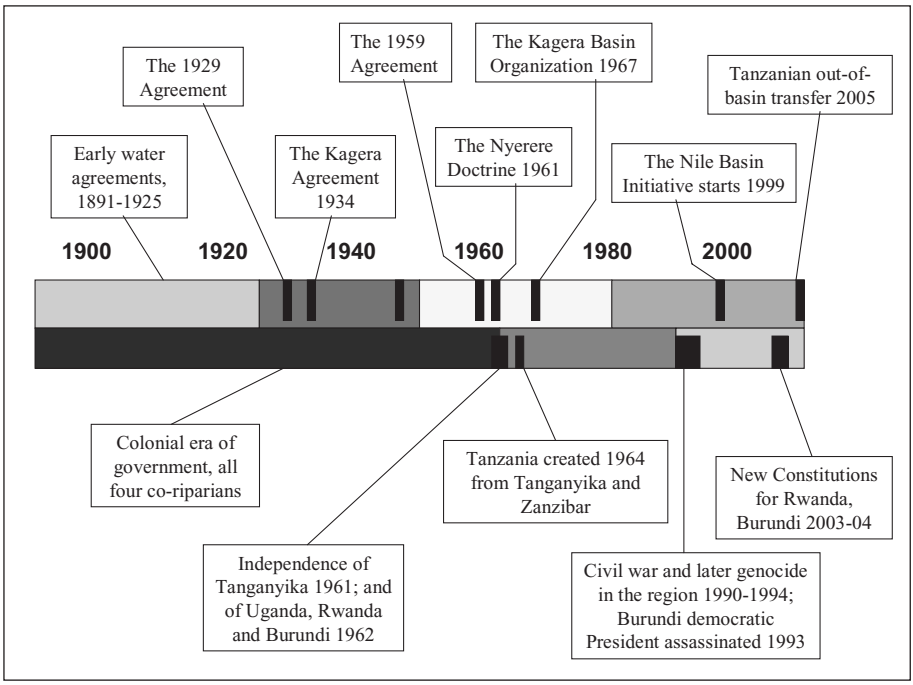

Figure 10. A time-line showing major historical and hydro-political events in the Kagera River basin.

Significant geopolitical and water-related events in the Nile River basin (emphasizing those in the Kagera River basin) are shown in Figure 10. The basin has had a turbulent political history in the last 15 years in particular.

With relevance to the Nile basin as a whole, Bulloch and Darwish (1993) reviewed the long-term military preparedness of the Egyptian authorities in the event that upstream parties might attempt to divert the flow of the Nile River. This extends allegedly to developed and regularly updated plans for military intervention by Egypt in several of the upstream States, and even externally to the basin under some circumstances. Nevertheless, at least some of the more recent statements by Egyptian diplomats have suggested that a peaceful solution should be sought. The logic of this is based on Cold War thinking which has since been proven to be unreasonable and improbable. Similarly, the whole 'water wars school' has been largely discredited, as discussed previously in this report. A far more realistic assessment is to view the Nile Basin as an element of a Regional Security Complex (Allan, 2000: 246; see Figure 11), providing an analytical foundation for assessment of the major 'push and pull factors' at work in the region.

The recent move by Egypt towards diplomacy is certainly distinct from its past statements. This is in keeping with the changed political reality of the post-Cold War era, and reflects the validity of viewing the *problématique* through the conceptual lens of a Regional Security Complex. For its part, Ethiopia has refused to accept the validity of either the 1929 or the 1959

agreements between Egypt and the Sudan, and has asserted/ reserved its right to utilize the waters of the Blue Nile, without recognizing any limitations on this (Whiteman, 1964; Kendie, 1999). The partial (minor) diversion by Ethiopia of waters of the Blue Nile and the Sobat River in the late 1970s triggered threatening statements by President Anwar Sadat of Egypt, and these were continued thereafter on a number of occasions (Waterbury, 1979; Bulloch and Darwish, 1993; Shapland, 1997; Kendie, 1999; Erlich, 2002).

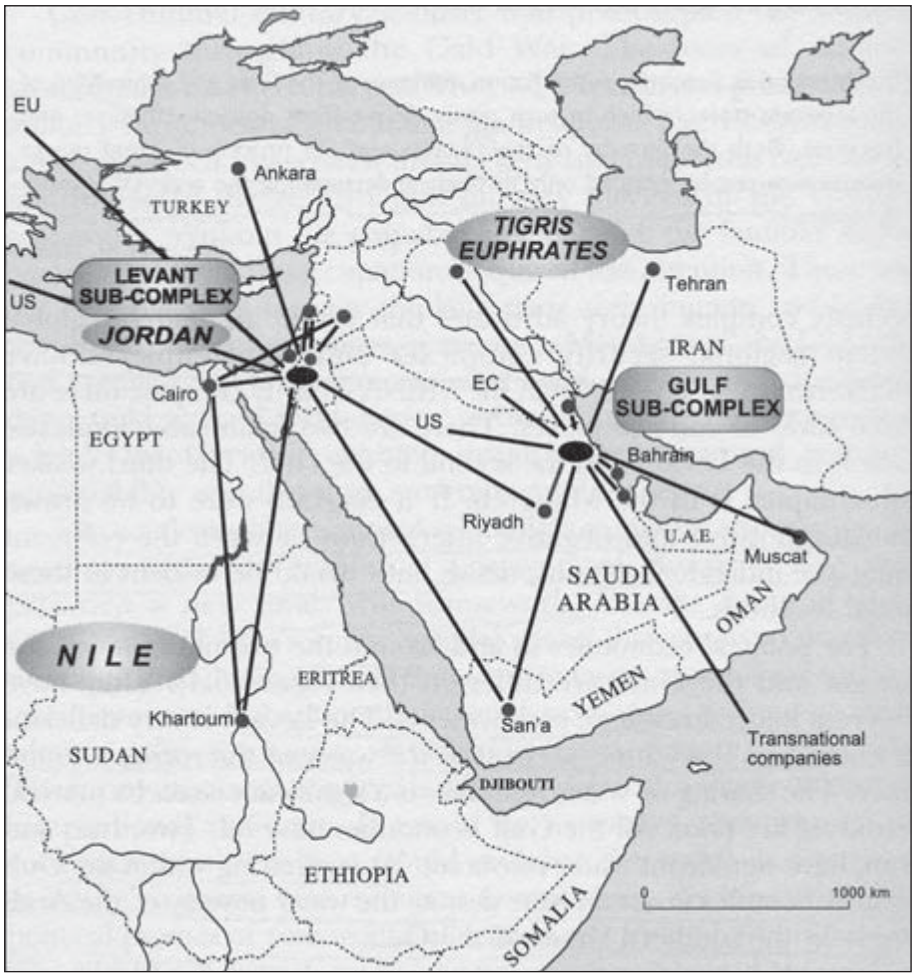

Figure 11. The Middle East-North Africa Security Complex. After Allan (2000: 246).

In 1980, the Ethiopian Government sent a statement to the Organization of African Unity accusing Egypt of mis-using the waters of the Nile, and President Sadat countered publicly with a threat of war (Kendie, 1997; Erlich, 2002). One element of such disquiet was the previous statement by

President Sadat that 1% of the waters of the Nile would be delivered to the Negev Desert in Israel for irrigation purposes – and possibly also to serve water needs in Jerusalem. This offer was made as part of the process leading to the March 1979 Peace Treaty between Israel and Egypt, but was never taken up by Israel as it was contingent upon finding a solution to the Israeli-Palestinian conflict. Despite this, it is interesting that such a hydrological link between the first and second Case Studies discussed in the present report has in any event almost been created, as the extreme north-eastern end of El-Salam Canal (see Section 5.1.1 above) is very close geographically to Israeli territory. The earlier forms of rhetoric may be interpreted in the light of Cold War political posturing that was fashionable at the time, and should not be extrapolated into the future with any degree of certainty.

Similar bellicose rhetoric from Egypt was evident in the early 1990s, during a presentation to Parliament by Dr. Hamdi el-Taheri concerning his earlier report to a Parliamentary Select Committee.[25] The report suggested that both Ethiopia and Uganda present a threat to downstream flows on the Nile River, and that continuing unrest in the Sudan would threaten the completion of the Jonglei Canal.

Ethiopia and the Sudan both protested thereafter in 1993 over the Egyptian plans for the Northern Sinai Agricultural Development Project (see Section 5.1.1 above), leading the Egyptian Foreign Minister to make warning statements to the Sudan's Islamic leader Hassan al-Turabi, and the Egyptian Water Resources Minister Abdel-Hadi Radi to comment that the 1959 agreement was a *"red line that can never be crossed."* The 'warm conflict' continued through to the end of the 1990s, with President Mubarak threatening to bomb Ethiopia if its plans to build a dam on the Blue Nile were continued (Scheumann and Schiffler, 1999; EIPD, 2000). Further veiled threats were exchanged between Egypt and Ethiopia during and following both the eighth Nile 2002 Conference in Addis Ababa in June 2000, and the meeting concerning the International Consortium for Cooperation on the Nile (ICCON) in mid-2001.

Several other upstream co-riparians have recently threatened again to ignore previous agreements on the allocations of flows from the Nile River. In February 2004, a Parliamentary Committee in Uganda endorsed a motion by Member of Parliament Amon Muzoora, seeking to abrogate the colonial-era agreements on the Nile River.[26] Similar events occurred in Kenya at the same time period, with a call for the inclusion of a new requirement in the draft Constitution for Kenya that all international treaties should be reviewed. In Tanzania, the same mood has led the Government to commence an US$85 million project to take water from Lake Victoria out-of-basin to Kahama

[25] See Yacob, Y. at <http://www.ethiopiafirst.com/news2004/Jan/From_undugu.html>
[26] See <http//www.allafrica.com/stories/2000402160513.html>

in the Shinyanga region through a 170 km pipeline, with the China Civil Engineering Construction Corporation being awarded the contract (Beyene and Wadley, 2004). The relevance of this out-of-basin issue has been noted earlier, as has that of the Nyerere Doctrine. Such upstream activities could certainly be considered to infringe some of the previous agreements on the Nile basin as a whole, but (as noted) the parties concerned have stated frankly that they do not consider themselves to be bound by these. It is in this context that the strategic relevance of the Nyerere Doctrine must be understood, because the core logic of that doctrine is that States which obtained sovereign independence are not necessarily bound by agreements entered into by their former colonial masters, unless they expressly agree to be bound by those conditions – as attested to by various agreements in southern Africa (Ashton *et al.*, 2005). It is in this context that the main hydro-political dynamics in the Nile Basin become most evident.

While Burundi and Rwanda have not been centrally involved in this debate to the present, it is clear that at least some co-riparians of the Kagera River are becoming increasingly impatient for a solution to the dilemma created by the historical agreements. This has the potential to lead to further unilateral action similar to the recent decision of Tanzania to transport water out of the basin, and the Kagera co-riparians may well begin to compete for the limited resources unless new initiatives defuse the situation (see Kashaigili *et al*. 2003, for additional commentary on the regional competition for water resources in Tanzania). The principal initiatives of note are discussed in Section 7.2 of the present report, and include both hydrological initiatives and institutional approaches which could serve to defuse tensions in the basin.

Amongst the other co-riparians of the Nile, the stance of the Sudan is particularly interesting. On the one hand, the Sudan was a party to the two main agreements of 1929 and 1959, and benefited significantly from the second of these in particular which allocated to the Sudan the majority of the flows created by the construction of the Aswan High Dam and Lake Nasser (see Annex 1). Against this, the *per capita* allocations from the Nile system for the Sudan in the 1959 agreement were only about 65% of those for Egypt if calculated on current-day populations (see above). The higher population growth rate in the Sudan (2.6% at present, as opposed to about 1.8% for Egypt; see also below) continues to widen this gap over time, and this is reminiscent of the bilateral situation between Palestine and Israel as discussed in Chapter 4 of this report. The requirement in Article 5 of the 1959 agreement that the Sudan should reach a 'unified view' with Egypt to counter any claims by upper Nile co-riparians also acts as at least a theoretical constraint to the creation of friction between these two parties.

The recent cessation of the civil war in southern Sudan will also alter the regional geopolitics, and it appears possible that the completion of the Jonglei Canal may now be countenanced, which would enhance downstream flows markedly. This would trigger new environmental concerns, however,

bringing in different actors and thereby changing the hydro-political *status quo*. In essence, this implies that the completion of the Jonglei Canal would probably have to be internally funded, because multilateral finance agencies would be unlikely to support it for fear of becoming the target of attack by powerful environmental activist groups.

5.4 Factors relating to potential benefits

Indicators related to potential benefits are listed in Table 14 for the Kagera River basin, with comparable data for the remaining co-riparians of the Nile River basin being shown in Table 15. Data are again taken from the CIA World Factbook[27] for most attributes; from the FAO Aquastat database for water availability and dependency ratios; and from UNDP (2005) for the Gini indices. The co-riparians of the Kagera River basin may all be characterized as very poor countries (Burundi and Tanzania being amongst the world's ten poorest nations), and they each depend very heavily on their agricultural sectors. The cost of water is heavily subsidized in all of these countries, and subsistence agriculture is the mainstay of the employment in each case (with fishing also being of significance for those countries bordering Lake Victoria).

Table 14. Selected indicators for the co-riparians of the Kagera River basin.

Indicator	Burundi	Rwanda	Tanzania	Uganda
Security-related Indicators:				
Military expenditure *per capita* (US$/year).	6.1	5.9	0.56	6.2
Military expenditure (% of GDP).	6.0	3.2	0.2	2.2
Water availability/use (m^3 *per capita*/year).	566	683	2,591	2,833
Water dependency ratio (%).	0	0	9.9	40.9
History of water-related agreements.	Very few	Very few	Few	Few
Intra-basin cooperation (institutionally).	Minor; KBO etc.	Minor; KBO etc.	Moderate; KBO, EAC	Moderate; KBO, EAC
Geopolitical/Governmental stability.	Unstable	Unstable	Moderate	Moderate
Immigration/emigration.	Massive	Massive	Low	Low
Level of regional integration.	Low	Low	Moderate	Moderate
Economic Indicators:				
GDP *per capita* (PPP, US$).	600	1,300	700	1,500
Population below poverty line.	68%	60%	36%	35%

[27] See <http://www.cia.gov/cia/publications/factbook/>.

Life expectancy at birth [M/F].	43/44	46/48	45/46	51/52
Infant mortality rate/1,000 births.	69.3	91.2	98.5	67.8
Literacy rate [M/F, %].	58/45	76/65	86/71	79/60
Energy use (kWh *per capita*/year).	21.6	23.1	69.8	51.4
Agriculture as % of GDP.	48	41	43	36
Industry as % of GDP.	19	21	17	21
Environmental Indicators:				
Importance of flow regime.	Low	Low	Minor	Minor
Water quality index (pollution, salinization).	Moderate	Moderate	Moderate	Moderate
Environmental flows (base flows).	Partly addressed	Partly addressed	Partly addressed	Partly addressed
Sustainability of water use.	Moderate	Low	Low	Low
Biodiversity.	Moderate	High	High	High
Other Useful Indicators:				
Gini index.	33.3	28.9	38.2	43.0
Services as % of GDP.	33	38	37	43
Population growth rate (%).	2.22	2.43	1.83	3.31
Water management including sectoral subsidies.	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture

Table 15. Selected indicators for the other six co-riparians of the Nile River basin.

Indicator	DRC	Kenya	Ethiopia	Eritrea	Sudan	Egypt
Security-related Indicators:						
Military expenditure *per capita* (US$/year).	1.56	5.23	4.61	33.1	14.6	31.5
Military expenditure (% of GDP).	1.5	1.3	4.6	13.4	3.0	3.4
Water availability/use (m^3 *per capita*/year).	25,183	985	1,749	1,722	2,074	859
Water dependency ratio (%).	29.9	33.1	0	55.6	76.9	96.9
History of water-related agreements.	Very few	Few	Very few	Very few	Mostly bilateral	Mostly bilateral
Intra-basin cooperation.	Minor	Some initiatives	Minor	Minor	Some initiatives	Some initiatives
Geopolitical/-governmental stability.	Low	Moderate	Low	Low	Low	Moderate
Immigration/-emigration.	High	Low	Moderate	Moderate	High	Low
Level of regional integration.	Low	High	Low	Low	Moderate	Moderate

Economic Indicators:						
GDP *per capita* (PPP, US$).	700	1,100	800	900	1,900	4,200
Population below poverty line.	ND [High]	50	50	50	40	17
Life expectancy at birth [M/F].	47/51	49/47	48/50	51/53	57/60	68/74
Infant mortality rate/1,000 births.	92.9	61.5	95.3	74.9	62.5	32.6
Literacy rate [M/F, %].	76/51	91/80	50/35	70/48	72/51	68/47
Energy use (kWh *per capita*/year).	69	128	27	50	60	975
Agriculture as % of GDP.	55	19	47	12	39	17
Industry as % of GDP.	11	18	12	26	20	33
Environmental Indicators:						
Importance of flow regime.	Low	Minor	Low	Low	Moderate	Moderate
Water quality index (pollution, salinization).	Minor problems	Moderate problems	Major problems	Major problems	Moderate problems	Moderate problems
Environmental flows (base flows).	Not addressed	Not addressed	Not addressed	Not addressed	Not addressed	Not addressed
Sustainability of water use.	Moderate	Low	Low	Low	Moderate	Low
Biodiversity.	Moderate	High	Moderate	Low	High	Low
Other Useful Indicators:						
Gini index.	ND	42.5	30.0	ND	ND	34.4
Services as % of GDP.	34	63	41	62	41	50
Population growth rate (%).	2.98	2.56	2.36	2.51	2.60	1.78
Water management including sectoral subsidies.	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture

The security-related indicators stand in stark contrast to even the poorer nations in the Jordan River basin (see Table 7 in Chapter 4), *per capita* military expenditures being one or many orders of magnitude lower in the African nations. Burundi and Rwanda have been less active than the other two co-riparians of the Kagera River system in entering into regional agreements or cooperative programmes, in part because Tanzania and Uganda are involved in projects concerning Lake Victoria (and both are members of the East African Community, with Kenya being the third member). Ethnic instability and violence have existed in Burundi and Rwanda in particular for many years, spilling over into genocide in 1994, with the deaths of at least 800,000

inhabitants. This created massive displacement of their respective populations, the remnants of which still exist at present.

The economic indicators for the Kagera River co-riparians reflect their high degree of poverty. Energy consumption is exceptionally low in all four countries, and the availability of electricity constrains development in rural communities in particular. The data for virtual water and the water footprint (shown in detail in Tables 16 and 17 for the ten co-riparians of the Nile River basin as a whole) reveal the subsistence nature of the economy in Burundi and Rwanda in particular, with higher virtual water exports in foodstuffs produced by Tanzania and Uganda. The Gini indices suggest a higher degree of inequality in Uganda than in the other co-riparians, and this is also reflected in the *per capita* GDP data, although the proportions of the populations below the poverty line (taken as a net income of US$2/day) are very high in all of the co-riparians, but especially in Burundi and Rwanda.

The environmental indicators for the Kagera River co-riparians reveal similar patterns in each country, with significant water pollution problems (mainly due to poor sanitation, but also extending to eutrophication, including problems with the water hyacinth) and no consideration of base flow needs in rivers (aside from the general agreement of 1934 on the use of the Kagera River; see Annex 1).

Data on the *per capita* availability of water reveal significant water stress in Burundi and Rwanda in particular, and it is clear that the use of water resources in these upstream nations should be planned with exceptional care. Development projects relating to water resource utilization by any of the four Kagera River co-riparians remain theoretically constrained by the 1929 and possibly also the 1959 agreement between Sudan and Egypt according to some parties, but this is still controversial and cannot be considered to align with the current principles of customary international water law.

Amongst the other co-riparians of the Nile (see Table 15), several factors relating to potential benefits are of note, as follows:

- military expenditures are much higher in Eritrea and Egypt than elsewhere in the Nile basin;

- bilateral water agreements have been most common in the basin, as discussed in detail in Section 5.2 above and in Annex 1;

- inter-basin transfers have been contemplated by Kenya, are underway in Tanzania, and are already in place on a massive scale in Egypt, as noted previously;

- the national economies are heavily dependent on agriculture in the DRC, Ethiopia and Sudan in particular, with Egypt's economy being much less dependent on this sector;

Table 16. Virtual water flows by country for the ten co-riparians of the Nile River basin. All data as MCM/year. ND: No data provided. After Chapagain and Hoekstra (2004a, 2004b).

Country	Gross Virtual Water Flows							
	Related to the Trade of Crop Products		Related to the Trade of Live-stock Products		Related to the Trade of Indu-strial Products		Total Trade	
	Export	Import	Export	Import	Export	Import	Export	Import
Burundi	329	130	0	2	0	8	330	140
DR Congo	259	396	0	107	ND	59	259	561
Egypt	1,755	11,445	221	1,466	729	711	2,705	13,622
Eritrea	14	238	18	7	ND	27	31	272
Ethiopia	2,143	346	90	2	5	89	2,238	437
Kenya	4,638	2,361	161	13	28	182	4,828	2,555
Rwanda	219	255	4	7	0	13	224	275
Sudan	7,251	520	273	10	56	89	7,580	619
Tanzania	3,173	970	52	11	2	85	3,227	1,066
Uganda	4,432	1,201	77	3	1	88	4,511	1,293

Country	Net Virtual Water Import			
	Related to the Trade of Crop Products	Related to the Trade of Live-stock Products	Related to the Trade of Indu-strial Products	Total Trade
Burundi	-199	1	8	-190
DR Congo	136	107	59	302
Egypt	9,690	1,245	-18	10,915
Eritrea	225	-11	27	241
Ethiopia	-1,797	-88	83	-1,801
Kenya	-2,277	-149	154	-2,272
Rwanda	36	2	13	51
Sudan	-6,730	-263	33	-6,960
Tanzania	-2,203	-41	83	-2,161
Uganda	-3,231	-74	87	-3,218

Table 17. Water footprints for the co-riparians of the Nile River basin (Eritrea is combined with Ethiopia and no data were provided by the primary authors for Uganda). All data as 109 m3/year, except the water footprint data, all as m3/person/year. ND: No data provided. After Chapagain and Hoekstra (2004a, 2004b).

Country	Population (million)	Use of Domestic Water Resources				
		Domestic water withdrawal	Crop Evapotranspiration		Industrial Water Withdrawal	
			National Consumption	Export	National Consumption	Export
Burundi	6.7	0.04	6.98	0.32	0.001	0.00
DR Congo	50.3	0.20	36.16	0.79	0.058	ND
Egypt	63.4	4.16	45.78	1.55	6.42	0.66
Ethiopia	63.5	0.13	42.22	2.22	0.10	0.00
Kenya	29.7	0.44	18.63	4.35	0.079	0.01
Rwanda	7.6	0.04	8.10	0.22	0.011	0.00
Sudan	30.8	0.89	66.62	7.47	0.189	0.04
Tanzania	33.3	0.11	36.39	3.15	0.024	0.00

Country	Use of Foreign Water Resources			Water Footprint		
	National Consumption		Re-export of Imported Products	*Per capita*	Agricultural Sector	
	Agricultural	Industrial			Internal	External
Burundi	0.13	0.01	0.01	1,062	1,036	19
DR Congo	0.39	0.08	0.01	734	719	8
Egypt	12.49	0.64	0.49	1,097	722	197
Ethiopia	0.33	0.09	0.02	675	664	5
Kenya	1.92	0.16	0.47	714	626	65
Rwanda	0.25	0.01	0.01	1,107	1,066	34
Sudan	0.48	0.07	0.07	2,214	2,161	15
Tanzania	0.90	0.08	0.08	1,127	1,093	27

- Egypt has a much high *per capita* GDP than the other co-riparians, followed by Sudan and then Kenya;
- the use of electricity is generally low except for Egypt, with a consumption rivalling that of Syria or Jordan (see Table 7 in Chapter 4);
- the Gini indices reveal significant inequality in all of the countries (where data are available);

- problems with water pollution exist universally, these generally involving salinization and poor sanitation;

- base flows in the river systems are not addressed, and the sustainability of water utilization is low to moderate only; and

- biodiversity is high in several parts of the basin as a whole.

The data for virtual water and the water footprints of the additional six co-riparians are once again instructive, with Kenya, Ethiopia and especially the Sudan being major exporters of virtual water (almost exclusively in plant crops). By complete contrast, Egypt is a major net importer of virtual water (see Table 16), surpassing even Israel in this respect (and once again revealing that the national rhetoric concerning food security is illusory). Estimates from several other authors essentially confirm the net importation of virtual water by Egypt, at a similar order to that shown in Table 16 (see Yang and Zehnder, 2002; Siam and Moussa, 2003; Zimmer and Renault, 2003). The water footprint data for Sudan (Table 17) suggest the inefficient use of water resources, perhaps linked to its status in the historical agreements on water allocations. However, the massive evaporation of water in the Sudd will also contribute to this figure, and other factors such as dietary preferences also affect the water footprint.

5.5 Conclusions

There can be no debate that the allocations of the Nile River basin (and by extension, also those to the co-riparians of the Kagera River basin upstream) as laid down by the present international agreements are inconsistent with the principles of customary international water law – although this in itself does not affect their legal validity). The 1929 and 1959 agreements are the key documents, with some parties considering that these remain relevant in all circumstances. However, the Nyerere Doctrine and recent statements by many of the riparians fiercely contest this, laying the political foundation for refutation of the agreements on the ground that they were unreasonable, as they limited the rights of upstream co-riparians without consultation or the consent of those affected. The succession to the 1929 agreement by the former British colonies is also heavily contested by them on legal grounds. The two downstream co-riparians (the Sudan and Egypt) are heavily favoured by these agreements, to the clear detriment of the eight upstream co-riparians. The strategic implications of the Nyerere Doctrine should not be discounted, as they form a fundamental element in the logic that underpins the contestation of the volumetric allocations in the Nile. Similarly, this Doctrine informs the debate about the right of any riparian state to transfer

water out-of-basin if it deems this to be warranted in terms of its strategic national interest. This wording reveals one of the core challenges in the context of benefit-sharing, because the inter-State discourse as it now stands is firmly based on the principles of Realism, while the intellectual foundation of benefit-sharing is rooted in Liberalism or Idealism. The challenge is therefore to define the manner in which third-party actors can offer sufficient inducement for the co-riparians to alter their perception of threat, and their view of the world in which they live.

Egypt is widely documented to be the basin hegemon, having used a range of approaches to attempt to maintain its access to the upstream flows. It is interesting to note that the overall tactics and strategy adopted by Egypt reveal many similarities to those of Israel discussed in Chapter 4 above, although the degree to which Egypt is willing to trigger armed hostilities in response to perceived threats over water resources is perhaps rather less than that of Israel currently. Many of the hydro-political dynamics are driven by posturing and rhetoric, rather than an actual resort to armed force, which is seen to be unsustainable and therefore unlikely in the context of the post-Cold War world of contemporary times.

The Kagera Basin offers a specific element to the general 'texture' of the Nile River Basin as a whole. Thus, it has a history of regime creation and institutional development that can form a valuable foundation for future benefit-sharing scenarios; the upstream riparian states are characterized by relying heavily on endogenous water resources; and the issue of out-of-basin transfers as a right for any sovereign State is at the heart of the overall water *problématique*.

The Nile Basin Initiative has attempted to defuse the potential and actual conflicts over water resources in the basin since 1998, with only limited success. Recent categorical statements on water allocations by certain of the upper co-riparians (in both the White Nile and the Blue Nile) show that the problems concerning such allocations have not been solved, and the shifting of the discourse towards benefit-sharing has not been successful in assuaging the concerns of many of the upstream parties. Section 7.2 of the present report provides proposals as to how improvements may be made.

Chapter 6: Case Study 3 The Mekong River basin

This section of the present report addresses the last of the three Case Studies, involving the Mekong River basin in Southeast Asia.[28] The Mekong River basin has attracted considerable attention due to a long and somewhat successful history of institutionalized river basin cooperation (Jacobs 1992), while also experiencing recent challenges in terms of the potential alteration of complex ecological and social systems (Dore and Xiaogang, 2004). The basin is not characterized by either water shortages or open conflicts, but rather by future threats to the ecosystem-based services; endemic poverty; and a subdued water-related rivalry. The institutional cooperation is in this context both noteworthy and crucial.

6.1 The basin geography

6.1.1 General

The co-riparians to the Mekong River basin are China[29], Myanmar (formerly Burma), Thailand, Laos, Cambodia, and Vietnam. The area of the basin is unevenly distributed over their territories (Table 18). In China, the river travels through Yunnan Province, covering a large part of that area, but a minor part of China as a whole. Myanmar has only a small area within the basin, while Thailand and Laos share the river as a border for a considerable stretch. In addition, the river passes through the inland areas of Laos, and the watershed covers most of that country. Cambodia is almost all within the watershed, whilst the basin covers a minor part of Vietnam (the Delta area), but this is exceptionally crucial in terms of economic value.[30]

The source of the Mekong River lies in the Tibetan plateau in the southwest of China, and it runs through the six co-riparians to terminate in the South China Sea (Figures 12 and 13). The area of the Mekong River basin is 795,000 km^2, and the river has an annual flow of approximately 475,000 MCM/year, depending on where it is measured. The total length of the river is about 4,800 km; it is the eight largest river in the world in terms of flow, the 12th longest, and is ranked 21st in terms of river basin area.

Largely located in the tropical zone of Asia, the basin is subject to monsoon rains which fall in distinct seasonal patterns over the year, varying

[28] The Mekong River is also known as the *Dza-chu* in Tibet, *Lancang Jiang* in China, *Mae Nam Khong* in Thailand, *Mae Khong* in Laos, *Mekongk* in Cambodia, and *Cuu Long* in Vietnam.
[29] The People's Republic of China, termed 'China' here for convenience.
[30] The central highlands of Vietnam and parts of the north of the country are also located within the Mekong River basin.

also with geography within the basin. In the driest area (the Korat Plateau in north-eastern Thailand), the annual rainfall can be as low as 1,000 mm, whereas in more humid areas precipitation can reach three times this amount. This results in massive variations in seasonal flow of the river, where the wet season flow may amount to as much as 30 times that in the dry season (just over 5,000 MCM/day, as compared to 170 MCM/day).

Table 18. Physical data for the Mekong River Basin. After MRC (2003). NA: not applicable.

	China	Myanmar	Lao PDR	Thailand	Cambodia	Vietnam	Total Basin
Area (km^2)	165,000	24,000	202,000	184,000	155,000	65,000	**795,000**
Catchment as % of country	2	4	97	36	86	20	**NA**
% of MRB	21	3	25	23	20	8	**100**
Average flow (m^3/sec)	2,410	300	5,270	2,560	2,860	1,660	**15,060**
Rainfall as % of total in basin	16	2	35	18	18	11	**100**

By any standard (and by complete contrast to the other two Case Studies addressed here), the area is extremely water-rich. As a basin-wide average, water availability *per capita* in the Basin States of the Mekong massively exceeds that for most of the co-riparians addressed in the other Case Studies. Despite this, in Cambodia, Laos and the Mekong Delta, less than half of the population has access to water of acceptable quality for potable use. In Thailand and the remainder of Vietnam this ratio is distinctly higher (MRC, 2003: 57).

The Mekong River basin is in many ways a near-pristine area with limited water consumption *per se*. No significant inter-basin transfers exist at present, and only two main-stem dams have been constructed in the upper basin, with relatively limited downstream impact. Although populated by some 75 million inhabitants, there are few major population centres (Phnom Penh far downstream being the only major city on the river), and no industrial centres. Even modern/intensive agriculture is limited to some parts of the Korat Plateau and areas of the Delta, in Thailand and Vietnam respectively. Hence in general terms, water quality is of a relatively high standard throughout the river basin. A large number of tributaries contribute to the main stem of the River, the most important including the Nam Ngum in Thailand, and the Se San and the Ton Le Sap in Cambodia, which have each been the subject of controversial disputes in relation to various projects. Major plans exist in many areas of the basin for exploiting the resource in the future.

6.1.2 The ecology and livelihood systems

The key to the Mekong River system concerns water and its related resources, rather than water availability *per se*. The critical aspect involves the ecological system which sustains some 80% of the basin inhabitants. As Fox and Sneddon (2005: 2) note:

> *Critically, for millions of people, who live in the lowlands, it is not the water alone that is the natural resource of greatest concern. Rather, it is the variability and complexity of an intact ecosystem – driven by annual flood pulse – that is the resource of immediate, and arguably highest, value.*

Some 80% of the population in the basin live in the rural areas, and most sustain themselves on small-scale primary production. There is relatively little agro-industry in the area (again, certain areas of Thailand and the Delta partly excluded); agriculture is at best semi-intensive, and there are virtually no major plantations. The relatively wealthy own their own land and can afford to invest in intensification and mechanization of the agricultural production, whereas most survive on small plots with relatively inefficient (but secure) agricultural production. Most of the population fish occasionally, but the landless (the poor) rely on fisheries and other types of foraging for their very survival. Within the basin as a whole, at least 25% of the population lives below the poverty line (Kaosa-ard, 2003: 84).

A special feature of the Mekong is that a large part of the downstream plain is flooded in the wet season, transferring nutrients to the fields, inundating forests, and providing spawning habitat for many fish species. There are an estimated 1,200–1,700 species of fish in the Mekong, including a number threatened by extinction (such as the Irrawaddy dolphin and the giant catfish; MRC, 2003: 57). The fish catch is sometimes as high as two million tonnes a year, and sustains 40 million people on a full- or part-time basis (MRC, 2003: 101). For instance, the Ton Le Sap supports one of the most efficient inland fisheries in the world, providing more than 70% of the protein intake for some 75% of the population in a large part of Cambodia. Biodiversity in the downstream areas of the basin is immense, and two of the three most recently discovered mammals in the world have been found in this area. In 'normal years', flooding is not a problem – but rather a blessing, for most people. However, several floods of unusual intensity have occurred in the last decade with substantial costs for remediation works, although relatively few lives were lost.

Threats to the balance of the ecosystem services consist *inter alia* of dam construction, pollution, over-fishing, global warming and associated climate change, erosion, population growth, and insensitive modernization in general. Other threats include corruption, crude resource-grabbing, and severe

Figure 12. The Mekong River basin.

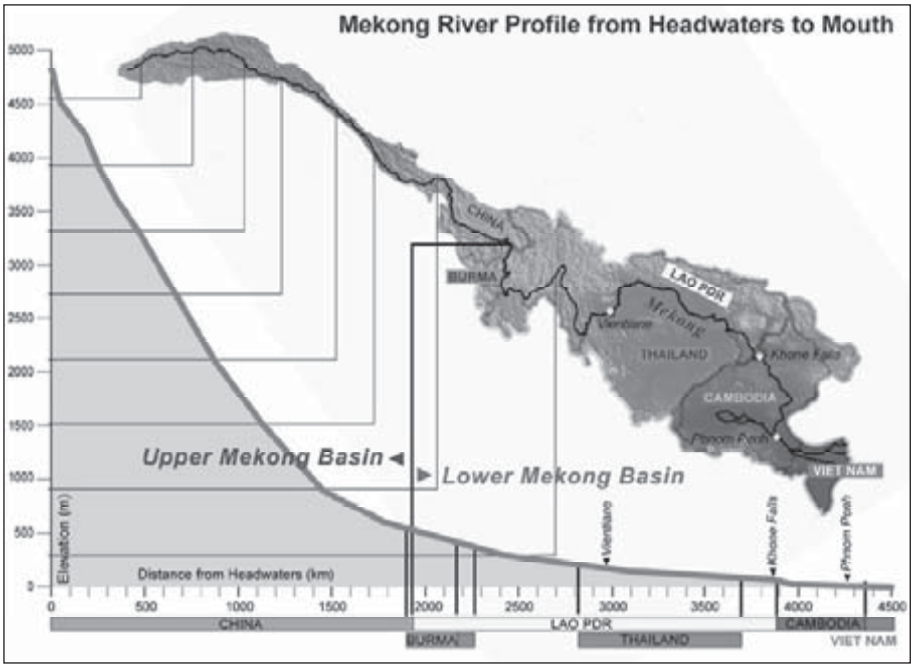

Figure 13. The Mekong River basin, showing certain hydrological characteristics. After Radosevic (2005).

Government policies chasing growth rather than protecting the ecological balance.

6.1.3 The economic geography of the Mekong River basin

The Mekong River basin provides a multitude of opportunities for various stakeholders. A brief overview is provided below of the key rationales for resource utilization in various parts of the basin.

The river travels through Yunnan, China, largely across a barren landscape including deep gorges and high altitude drops (see Figure 13), with only minor agricultural areas nearby. Hence, there is limited exploitation of the water in this area, with no major abstractions. Since the early 1990s, two major main-stem dams have been built on the otherwise unexploited upper reaches of the river. As many as 12 more dams are planned for the area, at least two of which would rank among the largest such structures in the world when completed (see below). These dams may have a major environmental impact, including particularly the loss of water through increased evaporation, and a change in the downstream flow regime. Myanmar uses the river water for small-scale subsistence livelihood systems of a decentralized nature.

For Laos, however, the Mekong and its water resources represent a hope

for future prosperity, best caught in the phrase describing the country as the 'Kuwait of Southeast Asia', referring to its abundance of hydropower potential in relation to its population. The Mekong basin covers almost the entire country (Figure 12), and Laos contributes over 30% of the water to the system. Five small dams have been constructed in Laos to date, most notably including Nam Ngum (the first dam of international importance, completed in 1965), while a further dam is currently under construction (Nam Theun 2). Hydropower constitutes a major export commodity for Laos.

The Mekong River does not flow within Thailand, but the basin covers a considerable portion of that country. Importantly, that area of Thailand is densely populated, highly agriculturally-dependent, and contains the poorest communities. This makes the local communities highly dependent on the natural resources that the Mekong system offers. Some intensive agricultural systems are located in this area.

The river enters the plain in the northern part of Cambodia, where wetland systems dominate the landscape. It then crosses through central Cambodia, the basin covering a major portion of the country. At Phnom Penh, the main stem of the river is joined by the Ton Le Sap River. At the start of the wet season, the level of the main stem of the river rises faster than that of the tributaries, resulting in a natural reversal of flow. This takes place most significantly in the Ton Le Sap River, building up water in the Ton Le Sap Lake (which increases five-fold in area in the wet season). Forests are inundated, plains are flooded, and the entire ecological system is defined by this annual 'flood pulse', which is entirely natural in origin. Finally, the river flows into Vietnam through a large delta system. This area constitutes a very complex and efficient fishery/agricultural area, which is inhabited by about 18 million people and produces more than half of the annual rice production in Vietnam. The Delta is constantly threatened by the dual dynamic of flooding, and saltwater intrusion.

6.1.4 The management of the basin[31]

As in most international river basins, the relationship between the upstream and downstream parties in the Mekong system is politicized and controversial, imbued with various power relations based on the present water utilization and the alleged future needs. In general terms, China occupies the hegemon's position in the basin, due to its political power. The regional hegemon in this instance is also the upstream State (by contrast to the Nile River basin), and this results in an extreme asymmetry of power relations. Until recently, however, water-related development in Yunnan Province

[31] Several of the controversial issues addressed briefly here are discussed at greater length below.

has been minor, leaving the four downstream countries (in the absence of Myanmar) to negotiate the utilization of the river's resources between themselves.

From a Cold War-induced artificial consensus, real diverging interests resurfaced amongst the downstream co-riparians in the early 1990s. The stances of these parties can be described in brief as follows:

- Thailand seeks cheap energy (hydropower), more water for its modernized agriculture sector, and enhanced flows in the Chao Praya Basin stretching through central parts of the country;

- Laos primarily wishes to realize its hydropower generating potential;

- Cambodia would be best served by the conservation of the current hydrological regime, including the seasonal flooding which gives rise to the huge fishery; and

- Vietnam wishes to construct hydropower facilities in the central highlands, as well as to protect the efficient agriculture and aquaculture production in the Delta.

These varying demands were successfully negotiated and codified in a framework agreement (the 'MRC Agreement'), which was signed by the four downstream co-riparians in April 1995 (see below and Annex 1 to this report). Within this constellation, Thailand and Vietnam are the major actors, and Thailand (with its more developed economy and upstream geographical position) is the key player. Laos and Cambodia had a minor influence on the 1995 agreement, although it can be said that the mutual needs were respected in good faith, overall. However, the MRC Agreement included a number of unresolved issues that are still subject to negotiations – this in part, because it did not include all of the riparian States. For example, the Water Utilization Program (WUP) – a process financed by the World Bank – is now in its seventh year of negotiations to attempt to address the outstanding issues, but only limited progress has been made.

In addition to the above, China has embarked upon a major dam-building programme in the upper reaches of the Mekong. Significant impacts are already evident in terms of changes in flow patterns and sediment transport (MRC, 2003: 214), and it is likely that the construction of further dams will exacerbate these fundamental ecological problems. Moreover, the water allocation principles underlying the MRC Agreement by the four lower co-riparians are based on the historical flows before the dam construction in the upper reaches. If the historical flows are significantly altered, the 1995 agreement may become obsolete, and this would undermine any further attempt at cooperative river basin management.

6.1.5 Pressing development challenges

It is important to emphasize here that the controversies on the Mekong River basin are not a function of water allocation *per se*. However, flows in volumetric terms are nevertheless a key indicator for the condition of the river, the sustainability of fisheries, and the risk of saline intrusion in the downstream reaches. The more controversial challenges facing development projects encompass one or several of these basic issues (see Table 19).

The most controversial aspect of any future development of the basin involves the dichotomy between *exploiting its natural resources*, while at the same time *maintaining an ecological balance*. The original development plan for the basin produced in 1960 envisaged massive interventions. Since then, both ecological and political awareness have increased markedly, and from the early 1990s a more sophisticated thinking on these issues has emerged (as partly codified in the 1995 agreement). Controversy over several poorly planned and implemented dam-building ventures (e.g. Pak Moon, Pa Mong, and Yali Falls) served to put that issue on the public and political agendas, and both international and regional environmental NGOs have been highly efficient in broadening this debate. The Pak Moon project was utilized as a Case Study in an investigation of the World Commission on Dams, and received a poor rating. It is notable that very recent documentation released by the Swedish authorities urges great caution in the construction of dams of this type (SKVD, 2005).

The World Bank and others have recently approved the funding of a major dam in Laos – Nam Theun 2 – which has been debated for three decades (World Bank, 2004d). The Nam Thuen 2 facility is reportedly to be one of the 'new generation' of hydropower dams, where externalities are included in the estimated costs, the redistribution of benefits to local stakeholders is explicitly acknowledged, and environmental studies are extensive. However, critics abound, and there is no doubt that the facility will impact ecosystems and interrupt existing livelihoods. The ambition of the enlightened pro-interventionists is that with sufficient planning, the dichotomy between infrastructure intervention and ecosystem integrity will vanish, but this remains to be proven.

Moreover, the vast majority of the existing plans, debates and institutionalized planning concern the *lower* Mekong River Basin. As noted above, in the upper reaches in China, a massive dam-building strategy was initiated in the 1990s (Dore and Xiaogang, 2004). However, detailed information has not been provided by China, and the precise short- and long-term impacts from such interventions remain unclear.

A second key challenge in the management of the Mekong River basin is to acknowledge the need to reach consensus on what 'equitable utilization' between upstream and downstream co-riparians might mean, in real terms. Controversial issues here involve minimum and maximum flow regimes;

the water consumption for irrigation and through evaporation from major impoundments; and plans for the out-of-basin transfer of water.

The last of these issues is especially controversial amongst the co-riparians. It is known that plans exist for transferring water from the upper Mekong into the Yiangtse Kiang River in China, and also from the Mekong system to the Chao Praya River basin in Thailand. Both of these are feasible in purely technical terms and appear likely to be considered further, but there is no evidence that either option will be pursued within the near future.

Finally here, it is noted that many of the Mekong River basin communities are exceptionally poor. Although the Basin States are mostly experiencing high economic growth at present, poverty in the rural areas remains deep – especially in Cambodia and Laos, but also in certain areas of Vietnam and Thailand. The poorest communities are those most dependent on functioning ecosystems, with rich fisheries, high biodiversity and access to lakes, streams, wetlands and forests which underpin sustainable rural livelihoods. Modernization through interventions such as dam construction may return investment to the State or to the urban middle classes (or to national or trans-national companies), but it is the rural poor that typically lose their security and income (Cowan and Shaw, 2003; Fox and Sneddon, 2005). In general terms, it is rare that major projects manage to balance loss and risk from the side of the poor, with benefits experienced by the more wealthy (McCully, 1996).

6.2. Historical events and agreements on water-related issues

6.2.1 General

The cooperation around water resources in the Mekong basin is often cited as one of the most successful in the Third World (e.g. Jacobs 1992; Radosevich 1996). It has roots back to the 1940s, and has survived such violent events as the Vietnam War and the Khmer Rouge era in Cambodia. Regional cooperation in the basin has also persisted in spite of structural impediments such as the Cold War-induced division among the countries and historical animosities. This has given rise to the brand 'The Mekong Spirit', which has throughout the history of the Mekong cooperation been held up as something very special and commendable (Sophonboon, 1970; Takahashi, 1974; Jacobs, 1992). The Mekong Spirit was referred to in the negotiation of the 1995 agreement, and is still proudly cited among the countries in the lower basin.

At the same time, the cooperation has always involved only the lower Basin States, failing to comply with the most frequently raised demand for high-quality watershed management, namely that the river basin authority constituency should coincide with the geographical extent of the watershed (Falkenmark and Lundvist, 1995). The upper riparians, Myanmar and China,

have only recently started to engage in discussions on the future basin development and mutual obligations, and their input has remained minor to date.

Table 19. Key development challenges in the Mekong River Basin.[32] After MRC (2003).

Key Challenges	Visible Expression	Examples	Potential Problems	Potential Benefits	Resolving the Dichotomies
Development intervention *versus* Environmental integrity.	The construction of major dams; works for improved navigation; the building of bridges and roads.	Nam Theun 2 (Laos); Yali Falls (Vietnam); Manwan, Dachaoshan (China).	Minimum flow too low; maximum flow insufficient; biological production interrupted; reduced resource base.	Improved infrastructure supporting economic modernization and growth.	(i) Ecologically sophisticated approach to 'development' (the MRC Environment programme). (ii) Enhanced dialogue with the environmental movement. (iii) Interventions only if conditions are fulfilled.[33]
Equitable utilization between upstream and downstream co-riparians.	Water consumption and regulation (out-of- basin transfers; irrigation schemes, evaporation from impoundments).	Dam construction upstream; Kon-Chi Munn and other irrigation schemes (Korat Plateau; the Delta).	International tensions from unsolicited resource grabbing; sub-optimal development due to insecurity.	If successful, enhanced regional cooperation and community spirit.	(i) Recognition of mutual needs throughout basin. (ii) A successful WUP process. (iii) Regional benefit-sharing.
Economic development *versus* poverty reduction.	Basin development strategies created by non-democratic elites, with thin public participation.	Lack of public input to the MRC work; no local development gains from interventions such as Yali Falls and Pak Moon.	Rural underdevelopment continues or is even intensified; interventions support the urban middle class only.	Economic modernization; net economic benefits; regional growth.	(i) Increased transparency and public participation. (ii) A successful BDP. (iii) Enhanced propoor policies (e.g. water management integrated in PSRP).

[32] WUP: Water Utilization Program. BDP: Basin Development Plan. PSRP: Poverty Sector Reduction Program.

[33] The Hydropower Programme of the MRC (MRC, 2000), signed by all the lower Mekong Governments, has as its key approach that hydropower dams can be built only if a certain number of criteria are satisfied.

The events and agreements that have guided the cooperation in the Mekong River basin are as follows:

- The Economic Commission for Asia and the Far East (ECAFE, a United Nations body later re-named ESCAP), was created in 1946 and played a major role in the creation of the first phase of river basin cooperation.

- The Committee for Coordination of Investigations of the Lower Mekong Basin was established through agreement in 1957, in Bangkok. This was the agreement behind the original 'Mekong Committee'.

- In 1965, Thailand and Laos signed a convention on developing the power potential within Laos of the Nam Ngum River, a tributary of the Mekong.

- The Joint Declaration of Principles for utilization of the waters of the Lower Mekong Basin was an operationalization of the 1957 agreement, based on the principle of equitable use, and signed in 1975.

- The establishment of the Interim Committee for Coordination of Investigations of the Lower Mekong Basin was the response in 1978 to the escalation of regional conflict and the temporary absence of Cambodia from the Mekong Committee.

- The *Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin* was signed in Chiang Rai, Thailand on 5 April 1995 by the Governments of Thailand, Laos, Cambodia and Vietnam. This agreement is aimed at *"Cooperation in all fields of sustainable development, utilization, management and conservation of the water and related resources of the Basin"*, and forms the basis for the creation of the Mekong River Commission. The document is popularly known as the 'MRC Agreement', and is referred to as such in the present report.

- A Commercial Navigation Agreement was signed on 20 April 2000 by the Governments of China, Burma, Laos and Thailand. This is embedded in the more general 'Golden Quadrangle Cooperation', including the same four parties, dating back to 1992.

- Cambodia and Vietnam signed a bilateral agreement in 2002 in order to prevent downstream damage on Cambodian soil caused by Vietnam hydropower development. This focused on the need for the exchange of high-quality information between the signatories.

- 'Preliminary Procedures for Notification, Prior Consultation and Agreement' arising from the WUP process (see below) were signed by representatives of the four lower co-riparians in November 2002.

Of these, the 'original' agreement forming the Mekong Committee in 1957 (codified in 1975) and the agreement forming the Mekong River Commission in 1995 are of paramount importance, whereas the others can be seen as being of lesser or subsidiary relevance.

6.2.2 Broad overview of the existing agreements

As noted above and in Annex 1, water-related agreements between the four lower co-riparians of the Mekong River date back to 1957, when the original 'Mekong Committee' was created by statute. The first agreement covered only *"the area of the drainage basin of the Mekong river situated in the territory of the participating governments"*, but noted that the Committee could *"[d]raw up and recommend to participating governments criteria for the use of the water of the main river for the purpose of water resources development"* (Chapter IV[c]).

The 1965 Convention between Laos and Thailand covered the establishment of inter-connectors for the power transmission system between the two countries, and predicated the completion of the Nam Ngum Dam in Laos.

The Joint Declaration of Principles in 1975 referred to the area of the basin *"south of China"* and included the following statement in Article V:

> *Individual projects on the Mainstream shall be planned and implemented in a manner conducive to the system development of the Basin's water resources, in the beneficial use of which each Basin State shall be entitled, within its territory, to a reasonable and equitable share.*

It is interesting that even at that early stage, emerging principles of international water law (available at that time in the Helsinki Rules of 1996) were espoused, and beneficial uses were cited. Article VI of the 1975 agreement cited factors to be used to determine 'reasonable and equitable shares' of water, and these were identical to the factors in Article V [II] of the Helsinki Rules, with the exception that the 1975 agreement included a new item concerning cost-benefit ratios of individual development projects. Section B of the 1975 agreement introduced the concept that the 'mainstream' of the river should be developed against a distinct set of constraints from those operating in tributaries, although Article XXI then suggested that 'major tributaries' might also be considered as part of the 'mainstream' (although such tributaries were not defined in the agreement). Article XXIV covered the maintenance of the ecosystem, noting that *"each Basin State shall take*

such measures as are practicable and reasonably necessary to avoid or minimize detrimental effects upon the ecological balance of the Basin, or any part thereof." No volumetric allocations to the four lower co-riparians were included in the agreement.[34]

As noted elsewhere, the 1995 agreement between the four lower co-riparians is the key document of present relevance in the Mekong River basin. This continues the reliance on principles of international water law, including 'reasonable and equitable utilization' and 'the prevention and cessation of harmful effects' to other co-riparians. It also stipulates that inter-basin diversions are subject to prior consultation and agreement between the parties. While a range of general statements are provided in the agreement concerning minimum and maximum flows, no volumetric allocations are cited and Article 26 mandates that this topic may be addressed by the Joint Committee at a later time. The present Mekong River Commission was established by Chapter 4 of the agreement, coupled to an attached Protocol.

6.2.3 Activities of particular significance: WUP, BDP, Environment Program

Under the MRC Agreement of 1995, there are three 'core programmes', five sector programmes and one support programme. The three core programmes involve the Water Utilization Program (WUP) pertaining directly to Article 26; the Basin Development Plan (BDP), which is the successor – albeit a more sophisticated and functional version – to the Mekong Plan from 1970; and the Environment Program (EP), which is crucial for the 'sustainability' aspect of the agreement.[34]

The WUP aims to:

> *…improve water management and ensure mutual beneficial water utilisation in the Lower Mekong River Basin while maintaining its ecological balance. In order to accomplish these objectives, the WUP will create an integrated knowledge base, providing data and decision support, as well as a comprehensive hydrological modelling package. These will serve as the basis for the creation of a set of rules governing water use.*

The WUP explicitly took Article 26 of the MRC Agreement as its point of departure, and started to develop six sub-categories within a special Technical Drafting Group of the MRC, financed under a World Bank contract:

[34] The descriptive elements of the present review of the three core programmes are from MRC material, notably their home page <www.mrcmekong.org/programmes/wup/wup.htm>

1. procedures for data and information exchange;
2. preliminary procedures for notification, consultation and agreement;
3. procedures for monitoring existing water uses;
4. procedures for notification, consultation and agreement;
5. rules for the maintenance of flows; and
6. rules for water quality.

To date, the first three of these have been accepted, and the fourth is presently being addressed, with preliminary procedures for notification, prior consultation and agreement having been issued by the MRC in 2002 (MRC, 2002). As could be expected, the 'soft' issues of information-sharing, monitoring, and procedures for notification have been easier to negotiate than the more intractable matters relating to water flow and quality. The negotiation on 'maintenance of flows' (item 5 above) is widely expected to be more difficult to finalize, and the changing flow regime upstream in China will undoubtedly complicate any future negotiations (see Karnjanakesorn, 2005).

The Basin Development Plan (BDP) seeks to contribute to regional development, working through the establishment of a comprehensive IWRM strategy which will provide a water utilization plan for the lower Mekong basin. It aims to foster sustainable development; respond to the needs of the poor; and ensure that economic growth and development is in harmony with the environment (see footnote [32] above) The BDP seeks to develop a region-wide plan of the utilization of the available water resources, and involves five stages: (i) analysis of the lower Mekong basin and sub-areas; (ii) analysis of development scenarios; (iii) strategy formulation; (iv) compilation of a long-list of programmes and projects; and (v) the production of a short-list of programmes and projects.

In managing this, the BDP has developed a particular method. Thus, 10 'sub-areas' (each corresponding to sub-catchments) of the lower Mekong basin have been defined, and development scenarios have been produced for these (including present water availability, water demand, and possible future interventions). This process serves to provide an inventory of the demand for water resources in a cross-sectoral and trans-boundary manner, and was explicitly designed to attempt to optimize the basin-wide benefits while retaining local participation. It also serves to contribute to decisions on where and how to allocate water resources most efficiently within the basin. As stated by the MRC (2003), the BDP process provides *"a means for examining national plans in the context of the Lower Mekong Basin to determine their significance for other riparian countries and to identify areas where joint initiatives could provide a regional benefit"*.

In many ways, the ambition of the BDP reads like an idealized form of IWRM. However, the participatory, basin-wide and comprehensive ambitions of the programme description have never been entirely fulfilled. Delays, inadequate commitments by the co-riparians, narrow nationalistic

attitudes, and insufficient participation have all been reported (Torell and Öjendal, 2003). There is a considerable risk of yet another 'planning dinosaur' (albeit a decentralized and participatory version), in the making.

Finally, the Environment Program (EP) aims to gather and disseminate data on the ecological integrity of the basin, in order to promote sustainable development within the whole system. It seeks to:

- increase the environmental and socio-economic knowledge on the basin;
- improve the dissemination and accessibility of environmental information;
- ensure that social, economic and ecological concerns are incorporated in basin-wide environmental policies and procedures (in line with Article 3 of the 1995 Agreement);
- improve the awareness and capacity of MRC and riparian Government personnel to address trans-boundary and basin-wide environmental issues; and
- ensure that development initiatives are planned and implemented with a view to minimizing negative environmental impacts in the Mekong River Basin.

In essence, these three core programmes deal with the key issues of the MRC Agreement: the allocation of water resources; the profiles of development intervention; and the sustainability of any proposed development. In combination – and if successful – they would correspond to most of the theories on policy development and the attainment of high-quality water resource management. However, the real implementation phase of the work is awaited.

6.2.4 The upper reaches of the Mekong

Most of the above text relates to the *lower* Mekong Basin. Historically, there have been few reasons to actively involve China (and even less Burma/Myanmar) in the institutionalized management of the Mekong River basin. However, the political economy of water utilization is changing drastically on a global level, and perhaps especially so in China. China is experiencing both an endemic water shortage and an accelerating energy crisis (Andrews-Speed *et al.*, 2005), and these threaten the sustainability of Chinese economic growth and may therefore potentially be construed as national security threats. In this situation, more aggressive utilization of the available water resources is seen as an integral part of the Chinese development strategy for

the future, involving the creation of a western 'gateway' to Southeast Asia (McCormack, 2001; Dore, 2003: 431).

Two major types of interventions in the natural flow of the Mekong in China are feasible. The first of these (which is also the less likely and will certainly not be pursued within the near future) involves the diversion of water from the Mekong basin into the Yangtze Kiang River basin. At one point, the two major rivers are only some 80 km apart, and a diversion is sometimes marked on Chinese maps. This would, however, create a major change in the natural flow of both rivers and would impact particularly severely on downstream societies in the Mekong River basin. The concept has not been voiced by Chinese sources in recent years.

The more likely intervention in the natural flow would be caused by the realization of the so-called 'Lancang Cascade', exploiting a vertical drop of 800 meters in a stretch of 750 km of the upper river (see Figure 13 above). Yunnan Province harbours in excess of 40% of the hydropower potential in the entire Mekong River system (450 TWh/year), of which only 1.8% is presently developed. Although this cited potential is most unlikely to match that which is actually economically feasible, the overall conditions are favourable for hydropower development in this area (Dore and Xiaogang, 2004).

Two dams are already constructed on the main-stem of the upper river, and two more are under construction. These are:

- the Manwan, finished in 1996, with an overall storage capacity of 920 MCM and an installed capacity of 1,500 MW;

- the Dachaoshan, completed in 2003 (storage capacity of 890 MCM; installed capacity of 1,350 MW);

- the Jinghong, (storage capacity of 1,233 MCM; installed capacity of 1,500 MW); and

- the Xiaowan, with a storage capacity of 14,560 MCM and an installed capacity of 4,200 MW, towering a staggering 292 metres high at the crest.

It is intended that the Jinghong and the massive Xiaowan Dam will be completed in 2010. In addition, at least four more dams are in the planning and design phases, of which the Nuozhadu is even larger than the Xiaowan, with a planned storage capacity of 22,400 MCM and an installed capacity of 5,500 MW (Dore and Xioagang, 2004: 15).

These interventions are expected to have considerable impacts, three of which are worthy of particular note. Firstly, they will alter the natural flow regime of the river and the dependent environmental flows considerably, and will therefore impact on the overall ecology (MRC, 2003). This will

have consequences in both the upstream and downstream reaches, which have not yet been fully determined. The argument is sometimes made that the dam construction programme will reduce the wet season flooding and increase the dry season flow (Chapman and Daming, 1996), hence 'adding value' to the river. However, this view is generally dismissed as being far too simplistic to be applicable to complex ecological systems, as well as being based on a misunderstanding of the subsistence-level water demand pertaining to the natural (undisturbed) hydrological flow regime in downstream reaches of the system. Secondly, it will be virtually impossible to define flows and water allocation in the lower basin if the incoming flows are neither stable, nor agreed upon (or even predictable by the lower co-riparians, perhaps). In the extreme case, at least parts of the MRC Agreement may be rendered obsolete, if no room to manoeuvre is left to the 'mid-stream' or the downstream States.[35]

A third less dramatic intervention involves the navigation improvement programme carried out in cooperation between China, Thailand, Laos and Burma (Dore, 2003: 425; IUCN, 2003). Blasting has already taken place on Lao territory and has improved the navigational capacity of that reach of the river to a certain extent. However, this occurred in vital spawning grounds for fish, triggering an outcry from environmental organizations which has caused the works to come to a temporary halt. This provides a valuable insight into the possible future hydro-political dynamics within the basin when major flow perturbation starts to impact negatively on ecosystem integrity. Such events provide windows of opportunity for NGOs to get involved, by leveraging issues and bringing pressure to bear on multilateral financing agencies. In hydro-political analytical terms, these can be thought of as being trigger-events.

China is not a member of the MRC and is therefore technically not bound by the MRC Agreement. The involvement of China in the MRC to date has been as an observer of the proceedings. Tentative recent signs have suggested that China may be willing to take a greater interest in river basin management. For instance, China is a party to the ASEAN's Mekong Basin Development Cooperation (AMBDC). China is also a driving force in the ADB-GMS programme,[36] which has regional scope and coverage. It is also a partner to the 'Golden Quadrangle Cooperation', and the quadrilateral 'Commercial Navigation Agreement', as noted previously. However, these agencies neither

[35] The agreement between Laos and Thailand to maintain the flood pulse allowing reverse flows in the Ton Le Sap is threatened by the proposals for main-stem dams in China. Dore (2003: 432) reports that some elements in the Thai administration perceive an opportunity for proceeding with the huge Khong Chi Mun irrigation project in Thailand, if it is agreed that others downstream may require the maintenance of flows in their territories.

[36] The 'ADB-GMS' is the Asian Development Bank, Greater Mekong Sub-region program, which largely deals with infrastructure planning and financing (ADB, 1996).

deal with water resources management, nor include a comprehensive joint regional programme. Most importantly, none of them are of a 'regulatory' nature, but they concentrate principally on the financing of infrastructure.

6.2.5 Conclusions on the status quo

International cooperation in the lower Mekong River Basin is historically well-entrenched, institutionally genuine and seemingly comprehensive. The Strategic Plan for 2001–2005 of the MRC could have been taken out of a textbook on trans-boundary water management. Its core programmes are equally impressive in their ambition. In combination, these programmes constitute a rare attempt at optimizing the benefits of the water resources, rather than being a compromise between riparians trying to maximize their own share of the benefits.

Doubts can be raised, however, as to the real substance of these programmes, as well as to the commitments of the co-riparians to the emerging results from the MRC work. On several recent occasions, national priorities have taken precedence over regional agreements/policies, each time delegitimizing the work of the MRC. In the 'common pool' resource literature, this would be considered to endanger attempts at voluntary cooperation (see Chapter 3 in this report). The existing regional cooperation also fails to cover the entire basin, and China is currently pursuing a massive programme of dam construction, while remaining within the Mekong River Commission only at observer status. The potential threats to the integrity of the Mekong River system as a whole are clear, and the 1995 agreement cannot protect the rights of the downstream co-riparains if upstream parties are not brought into the process.

6.3 The current use of the water resources

As already noted, none of the co-riparians in the Mekong River basin could be considered to be water-stressed in conventional terms. Nonetheless, there is fierce competition for water resources between countries and also between different uses, and these two are not always compatible. Discussion of the *per capita* water availability to the populations of the co-riparians is altogether meaningless, for the reasons noted previously. As an alternative, the use of water within distinct economic sectors in the basin is discussed below.

6.3.1 Agriculture

Agricultural activities in the basin range widely, e.g. from small-scale rice production in paddy fields in Cambodia, to commercial food production in Thailand; and from upland subsistence in the mountainous areas, to in-

tensive agriculture in the Delta in Vietnam. Overall, the yield/unit area is relatively low, so there is scope for considerable intensification. Although the share of agriculture in the regional GDP as a whole is declining over time, the number of people primarily preoccupied with agriculture remains very high (See Table 20).

Table 20. Data for the agricultural sector for the four lower Basin States in the Mekong River basin. After MRC (2003).

Country	Irrigated area (in the basin), Million Ha	Agriculture as % share of GDP	Agriculture as % share of employment	Population/ km² land in total	Population/ km² arable land
Vietnam	1.7	20	65	220	400
Cambodia	0.39	30	80	70	250
Laos	0.28	50	85	10	460
Thailand	0.94	8	55	110	210

Despite being located in one of the world's largest river basins, most of the regional agriculture is rain-fed, and rice is the staple crop. In some parts of the basin, two harvests (or even three in the Delta) are produced annually. Typically, there is a mix of fast- and slow-growing rice, of rice and other crops, and of commercial and subsistence products. The Basin States are pursuing development strategies aimed at increasing agricultural production, but these are often in contradiction with the activities of individual farmers who prefer to maximize security rather than overall output, by spreading and diversifying (Scott 1976; Miller 2003).

The major abstraction of water from the basin occurs for irrigation. Structural constraints exist to any further major increase in the area under irrigation. Thus, in China and Laos there are steep valleys with limited scope for irrigation, while in Thailand irrigation and intensification has been largely maximized due to water scarcity caused mainly by a lack of major storage facilities. In Cambodia there are significant institutional shortcomings, and in Vietnam – where irrigation and intensification has made most headway the last decade – the Delta is a high-risk area, prone to both flooding and salt water intrusion.

Overall, the fact that most agriculture is carried out by small-scale subsistence farmers who also fish and forage, renders major interventions precarious and probably unsustainable. Both irrigation and intensification tend to interfere with the existing regime and risk producing poverty for the many, accompanied by relative wealth for the few. In addition, the rapid increase in the use of fertilizers and pesticides over the last decade (and in the area under irrigation) has caused considerable environmental problems such as

soil acidity, salinization, and salt water intrusion.

Data for virtual water flows in the Mekong River basin are shown in Table 21, while those on water footprints are shown in Table 22. It is notable that net water exports from both Vietnam and (especially) Thailand are very considerable, and these reflect the use of the Mekong's water resources to grow rice and other staple crops for export as well as for domestic consumption. Rice is a 'water-hungry' crop by comparison to many others (Chapagain and Hoekstra, 2004b), and relies on the availability of either high natural water flows or a strong irrigation infrastructure. It is also responsible for an astonishing 21.3% of the overall global water consumption for crop production (Chapagain and Hoekstra, 2004b), which is much higher than any other primary crop.

6.3.2 Hydropower

The potential hydropower expansion has always been a key driver for the 'grand plans' of the Mekong system (Table 23). It is typically estimated that 'the total potential for feasible projects' is 55,000 MW, of which approximately 75% are on the main stem of the river (MRC, 2003: 206). Of this potential, only 8% is currently exploited. As always, hydropower constitutes a particular attraction as it seems to 'provide free energy' (or at least sustainable energy), and dams – especially the massive ones – have a particular iconic status for some, symbolising modernity and progress.

Beyond the 'iconic value' of the dams, there is a real need for enhanced energy production in the region. China is entering an energy crisis (Andrews-Speed *et al.*, 2005), with rapidly accelerating national demand (and costs for importing oil). In the lower Mekong basin, it is estimated that during the period 2000–2020, the demand for energy will quadruple (MRC, 2003: 210). If global oil prices remain at elevated levels, the rationale for hydropower increases further. However, the development of hydropower is the mode of water utilization which may be most at odds with other forms of utilization (e.g. Öjendal and Torell, 1997).

Concerns over the impacts of major dams are of course not new (see the recent review by WCD, 2000; also SKVD, 2005). Certain major international financing institutions have been heavily criticized by some commentators for supporting dam construction projects, and these are always controversial. In the Mekong River system, concerns exist primarily over the potential construction of major dams in the main-stem of the river (and perhaps also in major tributaries), as these are more likely to interfere substantially with the natural flow regime and hence affect the biodiversity and productivity downstream, in Cambodia and Vietnam in particular. The willingness of China to participate in the Greater Mekong Sub-region program (with its emphasis on infrastructure), coupled to its distancing from the MRC forum, generates real concerns in this area. However, other co-riparians are also

strongly interested in the development of hydropower, and this matter can be considered a major threat to the basin's future integrity.

6.3.3 Fisheries

The Mekong system constitutes one of the most diverse and efficient inland fisheries in the world, with up to 1,700 species of fish. Many small-holders in the lower Mekong basin approach the fishery sector as an integrated facet of agriculture, which reduces the quality of data on catch sizes. The collection of frogs and lizards etc. is also a significant dimension of many rural livelihoods at the subsistence level.

Table 21. Virtual water flows by country for the six co-riparians of the Mekong River basin. All data as MCM/year. ND: No data provided. After Chapagain and Hoekstra (2004a, 2004b).

	Gross Virtual Water Flows							
	Related to the Trade of Crop Products		Related to the Trade of Livestock Products		Related to the Trade of Industrial Products		Total Trade	
Country	Export	Import	Export	Import	Export	Import	Export	Import
Cambodia	25	418	24	34	ND	89	49	541
China	17,429	36,260	5,640	15,247	49,909	11,632	72,978	63,139
Laos	246	161	22	10	ND	40	258	211
Myanmar	1,447	885	100	72	ND	171	1,547	1,128
Thailand	38,429	9,761	2,856	1,761	1,655	3,596	42,940	15,117
Vietnam	11,124	2,278	165	291	ND	848	11,289	3,417

	Net Virtual Water Import			
Country	Related to the Trade of Crop Products	Related to the Trade of Livestock Products	Related to the Trade of Industrial Products	Total Trade
Cambodia	394	10	89	492
China	18,831	9,608	-38,277	-9,839
Laos	-85	-12	40	-57
Myanmar	-562	-28	171	-419
Thailand	-28,668	-1,095	1,941	-27,823
Vietnam	-8,846	126	848	-7,827

It is estimated that the catch in the basin exceeds 1.5 million tonnes *per annum*, and with another 500,000 tonnes from aquaculture activities, the annual catch is above two million tonnes. In Cambodia alone, the catch is estimated to approach 400,000 tonnes annually, making the small country

the fourth largest inland fishery nation in the world, after China, India and Bangladesh (MRC, 2003: 101). In excess of 40 million people are estimated to be engaged in fishery activities in some form, every year within the basin. On average, some 36 kg of fish is consumed *per capita*/year within the basin. A large share of this is the product of local communities and individuals using small-scale and moderately efficient methods, and this contributes very considerably to rural livelihoods and local food security. Overall, the fisheries within the basin are estimated to be worth US$2,000 million annually at the first point of sale (and perhaps 50% more than this amount at the final consumer).

Table 22. Water footprints for the co-riparians of the Mekong River basin. All data as 10^9 m^3/year, except the water footprint data, all as m^3/person/year. ND: No data provided. After Chapagain and Hoekstra (2004a, 2004b).

		Use of Domestic Water Resources				
		Domestic water withdrawal	Crop Evapotranspiration		Industrial Water Withdrawal	
Country	Population (million)		National Consumption	Export	National Consumption	Export
Cambodia	11.9	0.05	20.4	0.05	0.014	ND
China	1,257	33.3	711	21.5	81.5	45.7
Laos	5.22	0.10	7.20	0.25	0.13	ND
Myanmar	47.5	0.34	73.9	1.53	0.15	ND
Thailand	60.5	1.83	120	38.5	1.24	0.55
Vietnam	78.0	3.77	85.2	11.0	11.3	ND

	Use of Foreign Water Resources			**Water Footprint**		
	National Consumption		Re-export of Imported Products		Agricultural Sector	
Country	Agricultural	Industrial		*Per capita*	Internal	External
Cambodia	0.45	0.09	0.00	1,766	1,715	38
China	50.0	7.45	5.69	702	565	40
Laos	0.17	0.04	0.01	1,465	1,380	32
Myanmar	0.94	0.17	0.02	1,591	1,557	20
Thailand	8.73	2.49	3.90	2,223	1,987	144
Vietnam	2.27	0.85	0.29	1,324	1,091	29

However, the fisheries are highly vulnerable, depending heavily on the existing hydrological flow regime, including the 'flood pulse', the inundation of forests, the reverse flows into tributaries, free access to spawning grounds, the maintenance of appropriate water quality, and protection from overfishing. Most of these are threatened by the current plans for development of the river basin as a whole.

Table 23. An overview of the present generation of hydroelectric power in the Mekong River basin. After MRC (2003).

Country	Name of Station	Location	Capacity (MW)	Output (GWh/year)	Date Completed
China	Manwan	Mainstream	1,500	7 870	1993
	Dachaoshan	Mainstream	1,350	5 930	2001
Myanmar	----------				
Thailand	Sirindhor	Tributary	36	115	1968
	Chuklabhorn	Tributary	15	62	1971
	Ubolratana	Tributary	25	75	1966
	Pak Mun	Tributary	136	462	1997
Lao PDR	Nam Ngum	Tributary	150	900	1965
	Xeset	Tributary	45	150	1991
	Theun Hinboun	Tributary	210	1,645	1998
	Houay Ho	Tributary	150	600	1999
	Nam Leuk	Tributary	60	184	2000
Cambodia	----------				
Vietnam	Dray Ling	Tributary	13	70	1995
	Yali	Tributary	720	3 642	2 000

6.3.4 Transportation

The Mekong is a historically important means of transportation in the region, and arguably represents the foundation for the historical civilizations, as well as the initial interest in colonization by the French (Osborne, 1999). Until recently, the terrestrial infrastructure was scanty, rendering overland transportation difficult.

The present river-borne traffic includes both local and commercial use. Commercial vessels up to 5,000 Dead Weight Tonnes (DWT) can enter the port at Phnom Penh in the wet season, and to 3,000 DWT in the dry season. Phnom Penh is the largest port in Cambodia. Vessels of 70 DWT can reach the Lao border in the wet season. Upstream of that point, there are rapids which are not navigable. However, to the north of these rapids (in Laos and far up into China), the river is again navigable with some restrictions, allowing for the use of vessels ranging from 60 to 300 DWT in the wet season. Very little infrastructure exists in terms of dredging to protect the channels, however.

The river-borne transportation is of high value to the co-riparians. Although statistics are scarce, the availability of this transportation route is believed to be essential for poverty alleviation (MRC, 2003: 221–222). The border trade is significant, recent figures being as follows:

- US$350 million between Laos and China;
- US$350 million between Thailand and Laos;
- US$88 million between Thailand and China;
- US$325 million into and out of Cambodia; and
- US$4,000 million for imports and exports for Vietnam.

Some 24% of the passenger traffic in the lower Mekong basin utilizes the inland waterways, and 65% of the goods are transported by this route (MRC, 2003). A major debate is ongoing amongst the riparians concerning the relative merits of road and river-based transport. Recent rock blasting projects in Lao (paid for by China) were recently halted due to protests from environmental groups (Dore, 2003: 425), as noted previously in this chapter.

6.3.5 Tourism

Tourism is the fastest growing economic sector globally, and with the exception of areas of Thailand that are mainly outside the Mekong basin, the sector has been grossly under-developed to date in the region. This is certainly not due to lack of potential, but reflects previous conflicts, poor infrastructure, and the under-estimation of its potential monetary value.

However, Article 1 in the MRC Agreement states that the riparians shall cooperate to develop *"…irrigation, hydropower, navigation, flood control, fisheries, timber floating, recreation and tourism, in a manner to optimize the multiple-use and mutual benefits of all riparians and to minimize the harmful effects that might result from natural occurrences and man-made activities."* Tourism is therefore a legitimate element of the future development of the lower basin at least and could be of very considerable importance for the generation of income, although the otherwise comprehensive 'State of the Basin Report' (MRC, 2003) makes no mention of tourism.

A recent assessment of initiatives to date relating to tourism and 'community-based ecotourism' concluded that the lower basin has major potential and that the negative aspects of tourism could be mitigated or protected against (Leksakundilok, 2004). It is notable that about US$1 billion was invested for the construction of the 720MW Yali Falls Dam in the Central Highlands in Vietnam (Baird, 2000: 3), and a similar investment in the tourism sector could have dramatic long-term effects on the region's economy.

6.4. Conflict and cooperation in the basin

It has been argued that the Angkor Empire (reigning in the mainland region of Southeast Asia from the 9th to the 15th centuries) built and based its power on the existence of a 'hydraulic regime', where control over water resources was a crucial means for achieving political power (Groslier, 1966).

When the irrigation system degenerated and the soil turned saline, yields fell, the surplus decreased, military might declined, and the empire fell apart under pressure from Thai expansion. While access to plentiful water resources was undoubtedly only one facet of the empire's culture and power base, its importance in building the regime should not be underestimated.

A time-line of more recent events of political and hydrological significance in the basin is shown in Figure 14 below. The first signs of regional cooperation over water in the 1940s in the Mekong system may be seen in light of the emerging development ambitions of the independent States and the willingness of the UN system (e.g. ECAFE) to assist in the process of decolonization. In the late 1950s and throughout the 1960s, the four lower Mekong Basin States were all capitalist countries that needed to join forces in order to resist the communist challenge in the region. One of the most significant reasons for launching the Mekong Development Plan was to support the capitalist regimes in the region. In the light of the increasing success of the communist rebellions in the 1960s, the efforts were reinforced to speed up 'development'. For instance, US president Lyndon Johnson claimed that the Mekong project could "*dwarf the TVA*" (Tennessee Valley Authority; see Radosevich, 1996: 248), and in a famous speech at Johns Hopkins in 1965, he promised to contribute a billion US dollars to the Mekong project with the aim that:

> *A peaceful but honorable resolution of the conflict in South Vietnam and Laos may be found in a bold plan for land and water development which already unites factions in four nations of Southeast Asia. For seven years, Cambodia, Laos, Thailand and South Vietnam have been working with little publicity and without disagreement on a huge development program. These four countries, which do not cooperate on anything else, have reached accord on development of the Lower Mekong Basin. (Takahashi, 1974: 54).*

This reflects a desperate attempt at making the project 'pay off' in terms of economic development, in order to secure the political situation according to the then-prevailing US national security paradigm. The optimistic view of a future capitalist development system spearheaded by the Mekong Committee soon came to a halt, however. By the latter half of the 1960s, the Vietnam War had become a major conflict and was about to spread into Cambodia and Laos. The increased US engagement in the Vietnam War made the enthusiasm and the financial support for the Mekong project decline, and the atmosphere in the region was hardly conducive to the commencement of any large-scale or long-term projects.

In the early 1970s, the Mekong cooperation was generally regarded as a remarkable success. However, these judgments took account of some future

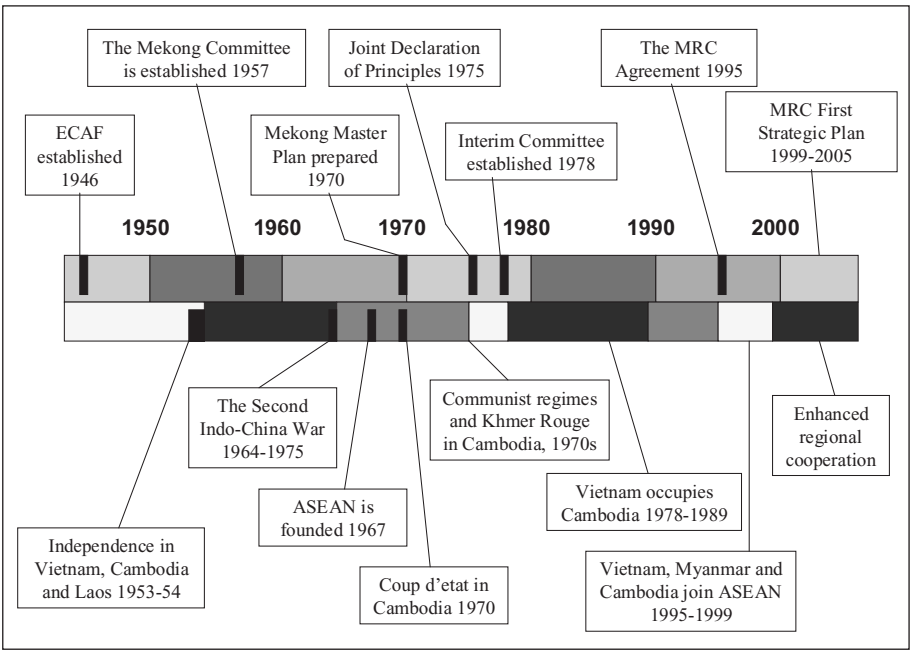

Figure 14. A time-line showing major historical and hydro-political events in the Mekong River basin.

victories that were not yet won. The overthrow of President Sihanouk in Cambodia and the subsequent political degeneration, the political instability in Laos, and the intensifying Vietnam War, all rendered the year 1970 a negative turning point for the Mekong Committee. For its part, the Committee paid little attention to the security problems, arguing that the Basin is so large that even if there were security problems in some areas, there would always be space for conducting other projects elsewhere:

> *As for security, the future like the past is undoubtedly fraught with difficulties but this need not be a major problem. Many secure sites are available for construction and extension of tributary projects, irrigation works and pioneer projects…. The saving grace is the sheer size of the lower Mekong basin where, even while some areas are plagued by insecurity, as has been the case for decades, there is still wide scope for unhindered development planning and investment. (Mekong Committee Annual Report, 1974, taken from Jacobs 1992: 147).*

In 1975, the 'Joint Declaration of Principles' for river management was signed by the four countries (see Annex 1). The same year, the next blow to the work of the Committee occurred, with communist regimes taking

power in (South) Vietnam, Laos and Cambodia. The Communist regimes in Vietnam and Laos were absent from the newly-formed Interim Mekong Committee in the 1976 and 1977 meetings, but returned in 1978 (Jacobs, 1992: 153). The Khmer Rouge made Cambodian participation impossible during 1975–78, and the result was a *de facto* suspension of the powers of the original Mekong Committee.

Although the Khmer Rouge was eventually overthrown, Cambodia was not welcomed back into the Interim Mekong Committee. The Heng Samrin/Hun Sen Government in Cambodia indicated a will to participate, but Thailand refused to recognize this Government as legitimate.[37] It became clear that the Interim Committee would continue to be crippled and unable to implement any mainstream projects without Cambodia. It was just as clear that the Cambodia conflict had to be solved (and a Government recognized) before Cambodia could re-join the Committee. The statutes for the Interim Mekong Committee stated that the full Mekong Committee would resume its activities *"...once all members of the latter Committee.... have decided to participate in that organization"* (IMC, 1978: Article 3). Cambodia would thus automatically be readmitted into the activities involving regional river cooperation once it had a recognized Government, or so it was believed at the time. During this period, funding for the Committee decreased and it has been stated that its major achievement was one of serving as a point of contact between Vietnam and Thailand, keeping up a diplomatic channel of sorts in the midst of the Cold War (Le, 1973).

It was widely assumed that the absence of Cambodia from the (Interim) Mekong Committee would be terminated as soon as the political regime in Phnom Penh was recognized by the Thai authorities. It was obvious that Cambodia regarded the Mekong issue as a key for breaking the international isolation. However, the possibility of realizing the long-awaited, large-scale plans raised the stakes and reinvigorated national interests, and a number of actors became interested in renegotiating the previous agreement pertaining to the basin. The somewhat idealistic and euphoric atmosphere of a joint interest among the riparians that was whipped up in the Cold War era was now absent. Instead, a tighter analysis of pros and cons was completed, and threat perceptions became more deeply entrenched. In short, this represented a classic case of securitization dynamics at work in the Mekong River basin. In this situation, the role of the Interim Mekong Committee became crucial by becoming an alternative 'diplomatic channel' in the absence of many other forms of inter-State contact.

[37] Only the Soviet Block, Vietnam, Cuba and India recognized the Government in Phnom Penh that was installed by the Vietnamese. It presided in Phnom Penh from 1979 to 1991, when the United Nations Transitional Authority took over the responsibility for the administration of the country according to the Peace Accord. This reveals the Cold War dynamic in a rather dramatic fashion.

"It is time", Prime Minister Chattichai of Thailand said in 1988, *"to turn the battle fields of Indochina into a marketplace."* While perhaps premature, the vanishing Cold War made this statement tantamount to a declaration of the emerging Thai policies *vis-à-vis* Indochina. Once the Government in Phnom Penh was recognized in 1993 and it became clear that Vietnam would join ASEAN in 1995, the pattern of conflict in mainland Southeast Asia changed drastically. By contrast to the earlier events, this represents an example of desecuritization dynamics at work. While historical legacies, differing political cultures, and several unresolved issues such as the sharing of trans-boundary waters, fishing rights, and the treatment of minorities were still present as seeds of conflict between Thailand and Vietnam, the overall ambition was one of cooperation for mutual benefits. Cambodia and Laos were minor players in this scenario, but the overall changes were essentially seen to be in their interests also. Within this larger context, the success of concluding the negotiations on the MRC Agreement of 1995 may have come as no surprise.

As noted elsewhere, cooperation within the Mekong basin is incomplete without the involvement of China (and Myanmar). If Realist-oriented politics reign in Southeast Asia, this too may occur in the future. The inter-dependence of States within the region as a whole is growing rapidly, and the mutual benefits from enhanced trans-national flows are increasing. Various political and institutional agreements involving China in the broader political arena have been concluded in recent times.[38] It could therefore be expected that the cooperation within the Mekong River basin may also be enhanced within the not too-distant future.

6.5 Sharing benefits

With up to three million casualties during the Vietnam War and a further two million deaths during the regime of the Khmer Rouge in Cambodia, mainland Southeast Asia has suffered some of the most violent conflicts in the era since the Second World War. The justification for avoiding a recurrence of such events situation is obvious. To some extent, the 'battlefields' *have* turned into 'marketplaces', and the current tensions do not relate to territory or mutual recognition, but rather to economic growth and market

[38] The 'ASEAN+3' process has progressed, knitting ASEAN closer to China, Japan and South Korea. The *Framework Agreement on Comprehensive Economic Co-operation between ASEAN and China* and the trade agreement aiming at creating an *ASEAN-China Free Trade Zone* by 2010/2015 were signed in 2002 and 2003, respectively. The *Joint Declaration on ASEAN-China Strategic Partnership for Peace and Prosperity* was signed at the Seventh ASEAN-China Summit on 08 October 2003 in Bali, and was followed by a Plan of Action signed by the parties during the ASEAN summit in Vientiane in December 2004. The *Treaty on Amity and Co-operation* has also recently been concluded.

access. Consequently, 'water wars' appear an unlikely prospect in the region. Nevertheless, two distinct threats may be perceived. The first of these would be derived from growing domestic tensions in relation to local scarcity scenarios, due to a changed regime in access to the regional water resources. The second would involve the risk of sub-optimal regional development, causing an inter-State rivalry with unforeseeable consequences. The sharing of benefits within the Mekong River basin would address both of these threats, at least in part.

Table 24 shows indicators for the co-riparians of the Mekong River basin, as utilized in the previous two Case Studies.[39] Comments on the various categories within the data presented are provided below.

Table 24. Selected indicators for the co-riparians of the Mekong River basin.

INDICATORS	Myanmar	Cambodia	China	Laos	Thailand	Vietnam
Security related Indicators:						
Military expenditure *per capita* (US$/year).	0.9	8	51	18	27	78
Military expenditure (% of GDP).	2.1	3.0	4.3	0.5	1.8	2.5
Water availability/use (m^3 *per capita*/year).	21,898	36,333	2,258	63,184	6,527	11,406
Water dependency ratio (%).	15.8	74.7	0.61	42.9	48.8	58.9
History of water-related agreements.	None	Significant	Few	Significant	Significant	Significant
Intra-basin cooperation (institutionally).	None	Major	Minor	Major	Major	Major
Geopolitical/governmental stability.	Low	Low	Stable	Moderate	Stable	Stable
Immigration/-emigration.	Low	Low	Low	Low	Low	Low
Level of regional integration.	Very Low	Significant	Significant	Significant	High	Significant
Economic Indicators:						
GDP per capita (PPP, US$).	1,700	2,000	5,600	1,900	8,100	2,700
Population below poverty line.	25	40	10	40	10	29
Life expectancy at birth [M/F].	58/64	57/61	71/74	53/57	70/74	68/74

[39] The data in Table 24 are based on individual States. Except for Cambodia and Laos, they should be interpreted with caution, as relatively minor parts of the other four countries are within the basin.

Infant mortality rate/1,000 births.	67.2	71.5	24.2	85.2	20.5	26.0
Literacy rate [M/F, %].	89/81	85/64	95/86	77/55	95/90	94/87
Energy use (kWh *per capita*/year).	81	7	125	484 (sic)	642	372
Agriculture as % of GDP.	57	35	14	50	9	22
Industry as % of GDP.	9	30	53	27	44	40
Environmental Indicators:						
Importance of flow regime.	Minor	Critical	Moderate	Moderate	High	Critical
Water quality index (pollution, salinization).	Good	Good, but declining	Good	Good	Good	Good, but declining
Environmental flows (base flows).	Not addressed	Critically important	Not addressed	Important	Important	Critically important
Sustainability of water use.	Very high	High	Low	Moderate	Moderate	Moderate
Biodiversity.	Very High	Very High	Significant	High	Significant	Very high
Other Useful Indicators:						
Gini index.	ND	40	44	37	51	36
Services as % of GDP.	34	35	33	23	47	38
Population growth rate (%).	0.42	1.81	0.58	2.42	0.87	1.04
Water management including subsidies.	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture	Subsidized agriculture

Amongst the security-related indicators, military expenditure within the Mekong River basin is generally moderate, although the higher *per capita* spending of Vietnam is notable. China's significant total military expenditure has more to do with its global aspirations of Superpower status than with events in the Mekong Basin *per se*. The political regimes are presently reasonably stable – although not necessarily democratic – especially in the three major powers within the basin (China, Thailand and Vietnam). Immigration and emigration rates have been quite low in recent years, although there is significant population displacement within the individual States, due largely to reasons connected to poverty and the perceived availability of improved opportunities in non-rural regions.

The countries in the lower Mekong basin have embarked upon a major economic development plan which aims to optimize the gains from the available resources with as little negative impact as possible, while at the same

time taking the views of various stakeholders into account. During this development phase, they are attempting to bridge the contradiction between the 'equitable' and 'optimal' use of water resources, that is a central issue of almost all hydro-political situations. The Mekong basin contains some of the poorest populations in the world, at least outside sub-Saharan Africa. Even for the somewhat richer countries (Thailand and China), the communities within the Mekong River basin are among the poorest in the nation. Individuals below the poverty line account for between 10% and 40% of the national populations – significant in all of the co-riparians. The two least powerful countries of the basin – Cambodia and Laos – are among the poorest, and are therefore the most dependent on primary production and ecosystem integrity.[40] These two States therefore depend most heavily on the equitable allocation of water resources (and/or any benefits from these).

The environmental indicators in Table 24 confirm the very considerable importance of this category for the basin as a whole. The data shown for *per capita* water availability in China refer to the entire State, and the availability of water within the Chinese portion of the Mekong basin is much higher than this, being comparable to that for the other co-riparians. Water quality problems are largely local in nature, reflecting the general abundance of the water resources. Interestingly, base flows of the river have been considered only in peripheral terms (as minimum flows in the various agreements), and more remains to be done in this area to address the real needs of the downstream co-riparians with regard to seasonal flows. Biodiversity ranges from significant to very high in the basin as a whole, and constitutes a major driver for its future protection.

6.6 Conclusions

The Mekong River basin differs significantly from the other two Case Studies addressed here, mainly because of its relatively pristine nature and its unusual flow regime. The second of these gives rise to the flood pulse, which is critical in sustaining downstream communities, many of whom live at the subsistence level and depend fundamentally on the water resources, either directly or indirectly (or both). Any significant changes to the flood pulse will rearrange the political dynamics within the basin as a whole, and may give rise to increasing levels of conflict.

It is also notable that the Mekong River basin differs from the other two Case Studies in relation to the strength and duration of its institutional

[40] The figures in Table 24 may be somewhat misleading in the case of Cambodia, with industrial contributions to the economy being artificially inflated recently by the growth of the textile industry to service export quotas to the USA. The agricultural sector remains of great importance, and 85% of the population lives in rural areas.

component. This has survived major regional conflicts, and is considered by some to have constituted an important political link between certain of the co-riparians during difficult times. However, two of the six co-riparians have never been truly engaged in the regional institutional management of the basin waters, and this remains the case, to date.

The key development paradox of the region is that economic growth is necessary to bring many of the populations out of poverty, but the 'classical' route involving the subsidized construction of massive infrastructure is most unlikely to provide the optimal result in this respect for the poorer sections of the populations. Although tempting (and possibly rewarding in the short-term), the greater exploitation of the regional water resources through massive infrastructure development coupled to industrialization offers a dangerous route towards improvements. To illustrate, industrialization in Cambodia during the last decade has been very considerable, but much of the population remains dependent on primary production – and hence, on the available water resources, primarily those of the Mekong River system. Similarly, in Thailand (and after three decades of sensationally successful economic growth), a significant percentage of the work force remains within the agricultural sector, especially within the basin in the area of the Korat Plateau.

Section 7.2.4 of the present report considers options for the future in the Mekong River basin.

Chapter 7: Interrogation of the Case Studies; broader implications

This chapter analyses the Case Studies, discussing the basic themes of the current project as a whole, i.e. the link between trans-boundary waters; conflict; and benefits. Section 7.1 uses the indicators shown previously for each of the three Case Studies, in a form of analysis developed specifically for the present work. We have named this analysis the Inter-SEDE model, denoting its international financing components and the three categories of drivers (security; economic development; and environment; see Section 3.4.3 above). The inputs to and outputs from the Inter-SEDE model for each of the Case Studies are discussed, with details relegated to Annex 2 of the report. Comments are then provided on the unique nature of the key drivers in each of the Case Studies, and the implications of this for the sharing of benefits. Section 7.2 then returns to the specifics of the three Case Studies, proposing options for improvements in each instance, and addressing a number of the key issues and questions raised in the Terms of Reference for the present project. Section 7.3 addresses issues of broader relevance, including the applicability of the conclusions from the Case Studies to other trans-boundary watercourses.

7.1 The Inter-SEDE model

7.1.1 Using the indicators to analyze key drivers

To create the input to the Inter-SEDE model, the 21 riparians included in the three Case Studies have each been ranked for all of the indicators shown in Tables 7, 14, 15 and 24 above, and the resulting ranks have then been placed in five bands (1–5; high number denoting high importance; see Annex 2 for details). Examples of this process are shown pictorially in Figure 15. Both numerically quantified and semi-quantified (descriptive) indicators can be included in this analysis, and the banding process eliminates the influence of major outliers in the data for particular indicators, which could otherwise 'drown out' the influence of other indicators. It is noted that some commentators have suggested that the mix of quantified and qualitatively described indicators is not appropriate due to statistical reasons, but this is not the case where complex statistical analyses have not been undertaken, and there is no theoretical bar to the type of analysis shown here. Annex 2 provides full details on the ranking and banding procedures used, and we encourage other authors to employ these data for comparative purposes in their own future studies investigating the utility of the Inter-SEDE model.

The banding data describing the indicators have then been summarized in the matrices shown at Tables 25–27. This process as a whole generates

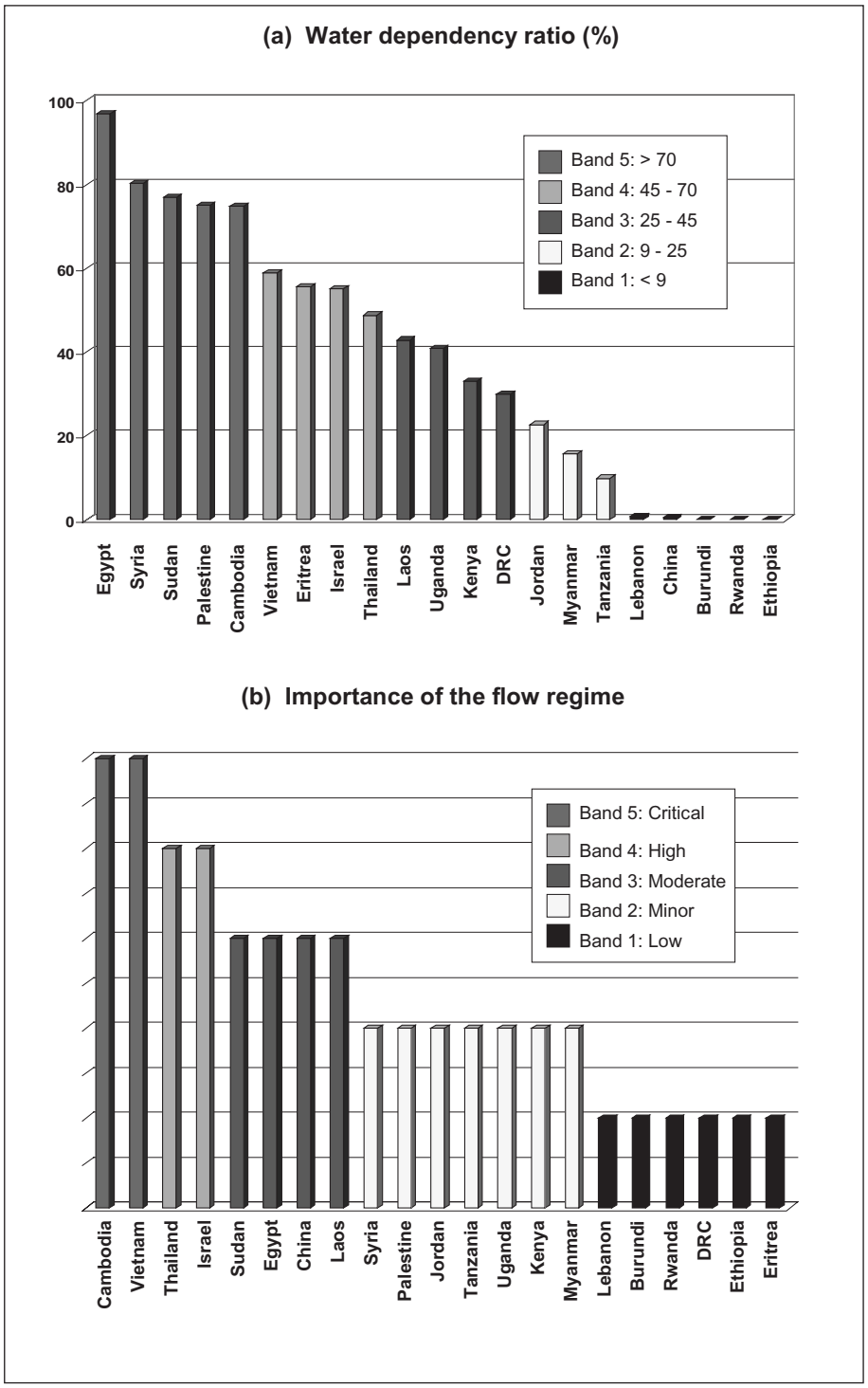

Figure 15. Examples of the ranking and banding procedures used to address quantified and descriptive indicators.

a comparative picture of the importance of the various indicators in each of the three categories selected for the analysis (security, economic development, and environment), both between basins and within basins. This constitutes the key output from the Inter-SEDE model, and a number of distinct types of interpretive analysis may be undertaken on the basis of the matrices shown in Tables 25–27. It may be noted that:

- The model is relatively insensitive to the precise indicators selected. This is shown by a comparison of the output for the three Case Study basins, for each of the specific indicators. For example, Table 25 shows that the predominant importance of the security-related indicators in the Jordan River basin is evident amongst almost the entire suite of specific indicators selected in the security category (the only exception being immigration/emigration, where the massive population movements in Burundi and Rwanda in the last 15 years skew the data for the Kagera River basin). The same consistent predominance is observed very strongly for environmental indicators in the Mekong River basin (Table 27).

Table 25. Security-related indicators for the 21 co-riparians of the three Case Study basins, and the remaining co-riparians of the Nile River.

Basin/Country	Military expenditure *per capita*	Military expenditure (% of GDP)	Water availability/use	Water dependency ratio	Water-related agreements	Intra-basin cooperation	Geopolitical/Governmental stability	Immigration/emigration	Level of regional integration	**Totals**
The Jordan River:										
Israel	5	5	5	4	3	4	3	2	5	**36**
Jordan	5	5	5	2	3	4	3	3	4	**34**
Lebanon	5	4	3	1	3	4	4	3	4	**31**
Palestine	1	1	5	5	3	4	4	4	4	**31**
Syria	4	5	3	5	3	4	3	1	4	**32**
Averages, Jordan:	*4.0*	*4.0*	*4.2*	*3.4*	*3.0*	*4.0*	*3.4*	*2.6*	*4.2*	***32.8***
The Kagera River:										
Burundi	3	5	4	1	4	4	5	5	4	**35**

Rwanda	3	4	4	1	4	4	5	5	4	**32**
Tanzania	1	1	3	2	3	2	2	1	3	**18**
Uganda	3	3	3	3	3	2	2	1	3	**23**
Averages, Kagera	*2.5*	*3.2*	*3.5*	*1.7*	*3.5*	*3.0*	*3.5*	*3.0*	*3.5*	***27.0***
The Nile River, others:										
DRC	2	2	1	3	4	4	4	3	4	**27**
Egypt	4	4	4	5	2	3	3	1	3	**29**
Eritrea	4	5	3	4	4	4	4	2	4	**34**
Ethiopia	2	4	3	1	4	4	4	2	4	**28**
Kenya	3	2	4	3	3	3	3	1	1	**23**
Sudan	3	3	3	5	2	3	4	3	3	**29**
Averages, entire Nile:	*2.8*	*3.3*	*3.2*	*2.8*	*3.3*	*3.3*	*3.6*	*2.4*	*3.3*	**27.8**
The Mekong River:										
Cambodia	3	3	1	5	1	1	4	1	2	**21**
China	5	4	3	1	3	4	1	1	2	**24**
Laos	4	1	1	3	1	1	3	1	2	**17**
Myanmar	1	3	1	2	5	5	4	1	5	**27**
Thailand	4	2	2	4	1	1	1	1	1	**17**
Vietnam	5	3	1	4	1	1	1	1	2	**19**
Averages, Mekong:	*3.7*	*2.7*	*1.5*	*3.2*	*2.0*	*2.2*	*2.3*	*1.0*	*2.3*	***20.8***

- The relative importance of the different categories of drivers is clearly evident for the three Case Study basins (and for the Nile River as a whole). Security-related factors predominate heavily in the Jordan River basin but are much less evident in the Mekong basin, with the Kagera/Nile system being intermediate in this respect (Table 25). This reflects the heavy securitization in the Jordan River basin, as noted elsewhere in the present report. In the Mekong system, environmental factors are of much greater importance (Table 27), these being related to the flow regime; the generally pristine nature of the basin; and its very high productivity and biodiversity.

- The output from the Inter-SEDE model relating to economic development (Table 26) is of particular interest. The indicators used in this case have been grouped, and describe both the degree of poverty and the development potential within each basin (again in a comparative fashion, both within and between basins, due to the ranking/banding procedure used). The development potential is assessed here by considering the availability to each of the riparians of energy resources, and

their reliance on agriculture and industry, plus the availability of water resources to underpin future development. The reliance on agriculture and industry measures the potential for water to be utilized in applications with higher added value, hence contributing to increased economic prosperity. While this is a somewhat 'blunt indicator', there can be no doubt that a transition towards industrial uses of water would lead to positive economic development in the predominantly agriculturally-based economies of most or all of the very poor countries addressed in this analysis.

Table 26. Economics-related indicators for the 21 co-riparians of the three Case Study basins, and the remaining co-riparians of the Nile River.

	Poverty-related Indicators					**Development Potential**				
Basin/Country	GDP *per capita*	Population below poverty line	Life expectancy at birth	Infant mortality rate	Literacy rate	Energy use *per capita*	Agriculture as % of GDP	Industry as % of GDP	Water availability/use	**Totals**
The Jordan River:										
Israel	1	1	1	1	1	1	1	2	1	**10**
Jordan	3	3	1	2	1	2	1	3	1	**17**
Lebanon	2	2	1	2	2	2	2	4	3	**20**
Palestine	5	5	1	2	3*	3*	1	3	1	**24**
Syria	3	2	2	3	2	2	3	3	3	**23**
Averages, Jordan:	*2.8*	*2.6*	*1.2*	*2.0*	*1.8*	*2.0*	*1.6*	*3.0*	*1.8*	***18.8***
The Kagera River:										
Burundi	5	5	5	4	5	5	4	4	2	**39**
Rwanda	4	5	5	5	4	5	4	4	2	**38**
Tanzania	5	3	5	5	3	5	4	4	3	**37**
Uganda	4	3	4	4	4	5	3	4	3	**34**
Averages, Kagera	*4.5*	*4.0*	*4.7*	*4.5*	*4.0*	*5.0*	*4.7*	*4.0*	*2.5*	***37.0***
The Nile River, others:										
DRC	5	5*	5	5	4	5	5	5	5	**44**
Egypt	3	1	2	3	5	3	2	3	2	**24**

Eritrea	5	5	4	5	4	5	2	3	3	**36**
Ethiopia	5	5	5	5	5	5	4	5	3	**42**
Kenya	4	5	5	4	2	4	2	4	2	**32**
Sudan	4	4	3	4	4	5	3	4	3	**34**
Averages, entire Nile:	*4.4*	*4.1*	*4.3*	*4.4*	*4.0*	*4.7*	*3.3*	*4.0*	*2.8*	***36.0***
The Mekong River:										
Cambodia	3	4	3	5	3	5	3	3	5	**34**
China	2	1	1	2	1	4	2	1	3	**17**
Laos	4	4	4	5	4	4	5	3	5	**38**
Myanmar	4	2	3	4	3	5	5	5	5	**36**
Thailand	2	1	1	2	1	3	1	2	4	**17**
Vietnam	3	2	2	3	2	4	3	2	5	**26**
Averages, Mekong:	*3.0*	*2.3*	*2.3*	*3.5*	*2.3*	*4.2*	*3.2*	*2.7*	*4.5*	***28.0***

** Estimates*

- The model output reveals particular poverty in the Kagera River basin (and to some degree in the Nile system as a whole), and the output is again highly consistent between the various types of indicators. Poverty indicators are much less highly ranked/banded for the Jordan River basin, with the Mekong system being intermediate. Interestingly, the analysis as a whole suggests strongly that the development potential of the Mekong system is high, as abundant water resources exist to underpin future transitions out of poverty. While the same is true to some degree in the Kagera system, this can only be realized if the four riparians are in fact not constrained by the 1929 and 1959 agreements between Egypt and the Sudan, discussed in Chapter 6 of this report, as they so contend. In the Jordan River basin, water volumes are clearly inadequate to support future economic development (and the present allocation is heavily inequitable, constraining the poorer parties). This implies that an alternative solution is needed for the Jordan riparians.

- Importantly, the output from the Inter-SEDE model also reveals distinctions between the co-riparians within each basin. Thus, for example, Israel scores somewhat higher on security-related indicators amongst the Jordan River basin riparians, and is very clearly differentiated on economic indicators also (reflecting the large differences in poverty within the basin as a whole). Similarly, Egypt stands out amongst the Nile co-riparians in relation to economic indicators, as do both China and Thailand in the Mekong system. Such asymmetries are of very considerable importance as drivers of potential inter-State conflict within

basins, especially if these are coupled to an inequitable allocation of either water flows or benefits which may arise from the use of the shared water resources. It is clear that where a basin hegemon is also advantaged in relation to water allocations and economic prosperity, the potential for conflict is significant and the need for equitable readjustment is considerable.

Table 27. Environment-related indicators for the 21 co-riparians of the three Case Study basins, and the remaining co-riparians of the Nile River.

Basin/Country	Importance of flow regime	Water quality index	Environmental flows (base flows)	Sustainability of water use	Biodiversity	**Totals**
The Jordan River:						
Israel	4	2	1	1	1	**9**
Jordan	2	1	1	1	1	**6**
Lebanon	1	3	1	3	2	**10**
Palestine	2	1	1	1	1	**6**
Syria	2	2	1	3	2	**10**
Averages, Jordan:	*2.6*	*1.8*	*1.0*	*1.8*	*1.4*	***8.2***
The Kagera River:						
Burundi	1	2	2	3	2	**10**
Rwanda	1	2	2	2	4	**11**
Tanzania	2	2	2	2	4	**12**
Uganda	2	2	2	2	4	**12**
Averages, Kagera:	*1.5*	*2.0*	*2.0*	*2.25*	*3.5*	***11.25***
The Nile River, others:						
DRC	1	3	1	3	2	**10**
Egypt	3	2	1	2	1	**9**
Eritrea	1	1	1	2	1	**6**
Ethiopia	1	1	1	2	2	**7**
Kenya	2	2	1	2	4	**11**
Sudan	3	2	1	3	4	**13**
Averages, entire Nile:	*1.7*	*1.9*	*1.4*	*2.3*	*2.8*	***10.1***
The Mekong River:						
Cambodia	5	4	5	4	5	**23**

China	3	5	1	2	3	**14**
Laos	3	5	4	3	4	**19**
Myanmar	2	5	1	5	5	**18**
Thailand	4	5	4	3	3	**19**
Vietnam	5	4	5	3	5	**22**
Averages, Mekong:	*3.7*	*4.7*	*3.3*	*3.3*	*4.2*	***19.2***

It is also notable that external entities considering the provision of international assistance would be well-served by the detailed consideration of such an analysis. The general output from the Inter-SEDE model within the three overall categories (security, economic development and environment) provides a first-order view of the main drivers within a trans-boundary basin. As an example, it is clear that any approach to offer assistance to the Jordan River co-riparians would need to be of a totally distinct nature to that preferred for the Kagera or the Mekong systems. Furthermore, the ability of the model to 'unpack' the various drivers both by indicator and by country provides important second-order and more detailed insights, allowing potential financing organizations to tailor their assistance to the particular issues faced by each co-riparian, and then to aggregate these into a preferred approach for the basin as a whole.

As noted previously, the consistency of the output shows that the Inter-SEDE model is relatively insensitive to the specific indicators employed. However, we do not suggest here that the indicators employed in the present analysis should be considered sacrosanct, or that additional types of indicators within one or more of the three broad categories could not be of utility in other trans-boundary basins. We offer the Inter-SEDE model as a tool for further development, and we believe that this would lead to significant improvements in the understanding of development alternatives in trans-boundary basins. Where researchers wish to analyze further basins using the same methodology, the indicators used here (and the banding created for the three Case Studies) can be utilized for comparative purposes, hence allowing other basins to be placed in the context and spectrum provided by the Case Studies discussed herein.

7.1.2 Benefits of relevance

The output from the Inter-SEDE model allows an analysis of benefits of potential relevance in each of the Case Studies, and this is discussed further here. Table 28 considers the potential benefits on a geographical basis, providing insights into the potential for improvements within each basin at levels ranging from the household, through the sub-national, national and regional levels, to global concerns.

Where the relevance of a benefit category varies for individual Basin States, this has been (somewhat subjectively) weighted from low [1] to high [5] in Table 28. The following text explores potential benefits within each of the three categories of drivers utilized in the Inter-SEDE model, based both on the model output and the additional analysis provided in Table 28.

Table 28. An analysis of benefits of relevance to the three Case Studies. W: Weight, extending from [1] low to [5] high.

Category of Benefit	Scale	Jordan River Basin	
		W	Reason
Security	Global	4	Potential global destabilizing force.
	Regional	5	Promote peaceful relations.
	National	1–5	Reduce military expenditure; promote economic growth. I5/J2/S4/L1/P1
	Sub-national	4	Stabilize the societies (societal security).
	Household	5	Prevent human insecurity.
Economic Development	Global	1	Minor impact on food production worldwide.
	Regional	4	Enhance chances of major regional development plans and trade.
	National	1–5	Differential enhanced food production. I1/S3/L2/J4/P5
	Sub-national	1–5	Differential enhanced food production. I1/S3/L2/J4/P5
	Household	1–5	Differential enhanced local household consumption. I1/S3/L2/J4/P5
Environment	Global	1	Minor contribution to biodiversity.
	Regional	3	Promote sustainable management of trans-boundary resources.
	National	3–5	Promote sustainable management of water resources. L3; others 5
	Sub-national	3–5	Promote sustainable management of water resources. L3; others 5
	Household	1–5	Promote access to sufficient water resources. I1/S3// L3/J4/P5
Category of Benefit	**Scale**	**Kagera River Basin**	
		W	**Reason**
Security	Global	0	Dislocated from global view.
	Regional	5	Promote peaceful inter-State relations.
	National	5	Prevent collapse/failure of States (e.g. Rwanda, Burundi, DRC, Uganda).
	Sub-national	5	Prevent further genocide; stabilize the societies.
	Household	5	Prevent further human insecurity.

Economic Development	Global	0	Dislocated from global view.
	Regional	2	Mildly enhance investment/development.
	National	3–5	Increased primary production enhances investment development. B5/R5/T4/U3
	Sub-national	3–5	Enhance local investment development. B5/R5/T4/U3.
	Household	5	Enhance local consumption; reduce poverty.
Environment	Global	2	Some contribution to global biodiversity.
	Regional	4	Promote biodiversity in Lake Victoria.
	National	4	Improve sustainable utilization of land.
	Sub-national	4–5	Improve sustainable utilization of land. B4; others 5
	Household	5	Improve sustainable utilization of plots.
Category of Benefit	**Scale**	**Mekong River Basin**	
		W	**Reason**
Security	Global	1	Affects global political role of China.
	Regional	3	Maintain good regional relations.
	National	2–4	Prevent national unrest. Ca3/V4/L2/Ch4/T2/C3.
	Sub-national	3	As above but differences amongst social groups.
	Household	5	Essential for securing resources/livelihoods.
Economic Development	Global	2	Some impact on food production worldwide (especially rice).
	Regional	4	Enhance chances of major regional development plans.
	National	1–5	Enhance primary production. Ca5/V5/L3/T3/Ch2/M1
	Sub-national	3–5	Enhance livelihoods in various areas. Ca5/V5/L5/Ch3/T3
	Household	4–5	Enhance local consumption.
Environment	Global	4	Major contribution to biodiversity.
	Regional	5	Secure ecosystem services.
	National	3–5	Improve sustainable utilization of land and natural resources. Ca5/V5/L4/T3/Ch3/M1
	Sub-national	3–5	Improve sustainable utilization of land and natural resources. Ca5/V5/L4/T3/Ch3/M3
	Household	3–5	Enhance local livelihoods. Ca5/V5/L4/T3/Ch3/M3

Security-related benefits: The water-related problems in the Jordan River basin may be perceived as a potential source of global destabilization, whilst this is not so for either of the other two Case Studies. Concerns pertaining to security are also significant on all of the lower geographical scales within the Jordan River basin: at the regional level, because of the continual political tension between the co-riparians; at the national level, because military expenditure could be reduced and funds could be channelled towards sustainable development; and also at lower geographical scales, due to competition for resources (including water) by distinct sectors of the various populations.

Security concerns are of vital importance at the regional and lower levels in the Kagera River basin, and possible future problems amongst the Kagera Basin States should be addressed without delay, in order to reduce the potential for regional conflict. The sustainable development of the basin is a key objective in this regard, and this requires equitable access to sufficient water resources of appropriate quality (especially given the agriculturally-based economies amongst the co-riparians).

It is important to note here that the potential for conflict in the Kagera River basin does not relate strictly to inter-State conflict, but more to ethnic conflict (the 1994 genocide, plus many other connected events both before and since) and conflict between communities – some of which relates to access to basic resources including both land and water (Sellström and Wollgemuth, 1996). The alleviation of poverty (and especially of economic differences between sectors of the populations within the basin) is of key over-riding importance, and this point is again echoed in the text below concerning economic indicators.

The security-related issues in the Mekong River basin are altogether distinct from those in the Kagera system. The ongoing cooperation between at least four of the six co-riparians in the basin reflects this, and the principal concerns exist at the household level, where the maintenance of the flood pulse and its potential for generating huge benefits connected to fisheries and agriculture (directly supporting millions of poor inhabitants in the Delta and Ton Le Sap regions especially) is a critical aspect of the Mekong system as a whole. This has immediate implications for the future management of the Mekong River basin, in that it is clear (for example) that the construction of major main-stem dams in the upstream and/or middle reaches of the Mekong River would be likely not only to reduce the economic return from the system as a whole, but also to plunge the downstream populations into severe poverty, thereby becoming a driver of potential future conflict.

Economic development: All three Case Studies include at least some Basin States with very low GDP *per capita*, as shown in the Tables in Chapters 4–6 concerning the indicators. In addition, many of the economies of the co-riparians are heavily dependent on the agricultural sector, which is always considered the 'thirstiest' in terms of the need for water, and policies in the agricultural sector have a significant impact on water quality. However, there are also major distinctions between individual Basin States. In the Jordan River basin, for example, the massive military expenditure by Israel stands in stark contrast to that of the other co-riparians, and this is accompanied by a very low reliance of the Israeli economy on agriculture and a high importation of virtual water (see Table 8 in Chapter 4). Jordan shares some similarities with this profile, but the most striking aspect derives from a comparison of Israel and Egypt. Each of these countries enjoys a much higher *per capita* GDP than its respective co-riparians, and both have taken

hegemonic and/or belligerently dominant stances in relation to the regional water resources. However, neither Israel nor Egypt actually depends heavily on its agricultural sector as a source of primary income, and both are very high importers of virtual water. This point is returned to in later text in the present chapter.

In the Jordan River basin, trade is considerable between Palestine and Israel, especially in plants and plant products. This occurs despite the denial by Israel of Palestine's water rights, and the highly asymmetrical (and inequitable) allocation of water between the co-riparians (Phillips *et al.*, 2006b, in press). Labour costs in Palestine are a fraction of those in Israel, and a more equitable allocation of the region's water resources could provide a positive-sum economic outcome for both parties – and should therefore constitute a powerful inducement to cooperate. The exceptionally high percentages of poverty and malnutrition in Palestine (Hawari, 2003; World Bank, 2004a)[41] would also be dramatically reduced by such a reallocation of the available water resources. Despite this, Israel continues to jealously guard the region's available water resources and to heavily subsidize its agricultural sector, which is responsible for a very small percentage of its GDP but uses some 70% of the regional water resources. Frederiksen (2003a) has been particularly forthright in pointing to the inevitable conflict if this situation is not resolved. The very high population growth rates in Palestine (over 3% in the West Bank and greater than 4% in Gaza, with the total population doubling every 20 years) continue to drive an increasing domestic demand for water, and it is clear that a regional change in water supply/demand management is inevitable if conflict is to be avoided in the future. This must include a shift over time from an almost totally agriculturally-based economy, towards the use of water to provide higher added value in industrial applications.

The co-riparians of the Kagera River basin are all true agricultural subsistence economies at present, although fishing is also important for the two co-riparians (Tanzania and Uganda) whose territories include part of Lake Victoria. Population growth rates averaging between 1.8% (Tanzania) and 3.3% (Uganda; see Table 14) continue to place pressure on the available water resources, and the co-riparians appear to be essentially united in their resolve not to recognize the applicability to them of the colonial-era agreements assuring flows of water almost exclusively to the Sudan and Egypt, far downstream. The recent decision by the Tanzanian Government to proceed unilaterally with out-of-basin transfers of water offers a portent of problems to come in the basin as a whole, particularly when considered against the backdrop of the historically bellicose statements made by the Egyptian authorities. Populations below the poverty line (taken as US$2/day in Table 14)

[41] See also Pearce, Rohan: Palestine: Israeli occupation leads to poverty, malnutrition. See <http://www.greenleft.org.au/back/2002/504/504p17.htm>

are especially high for the two upper co-riparians, both of which access the majority of their water resources from the Kagera River basin. The potential for renewed conflict – ethnic and otherwise – is clear. A solution is needed to allow the sustainable development of the basin, without creating downstream belligerence by feeding existing threat perceptions and further stimulating the securitization dynamic in the basin.

In the Mekong River system, the exceptional reliance of the downstream co-riparians on the flood pulse has already been noted. If wide-scale poverty is to be avoided amongst these (large) populations, the natural flow regime of the river must be maintained. Threats to this are clear, especially given the very high economic growth rates in China and its rapidly increasing requirement for electrical power, coupled to the political intransigence of the Myanmar Government. The downstream co-riparians remain at risk under circumstances where China and Myanmar refuse to cooperate fully in the Mekong River Forum.

Environmental benefits: A key difference between the three Case Studies relating to environmental issues involves the extraordinarily high biodiversity of the Mekong Delta and connected systems. While the basin wetlands and the fisheries of Lake Victoria fed by the Kagera River remain of some consequence in terms of biodiversity (notwithstanding the impacts of encroachment and changes to the aquatic ecosystem caused partly by the introduction of the Nile perch in the 1950s), these are altogether outweighed by the biodiversity of the downstream reaches of the Mekong River. In the Jordan River system, biodiversity is generally low and the co-riparians have opted to develop and utilize the water resources to the maximum extent possible, ignoring all requirements for environmental/base flows in rivers and also allowing the level of the Dead Sea to drop precipitously during the last four decades since the commissioning of the National Water Carrier by Israel. The ongoing attempt to reinvigorate interest in a Red Sea-Dead Sea conduit may provide a solution to the historical shrinkage of the Dead Sea (Benvenisti, 2004), but concerns remain as to whether that project can be considered economically viable.

The degradation of water quality is also an important concern in some Basin States. Both Palestine and Jordan have suffered in this regard, with a general trend towards deteriorating water quality with distance downstream in the Jordan River system as a whole. This has been exacerbated by the historical mismanagement of the regional water resources by both Israel and Palestine (e.g. PCE, 2002; see also Section 7.2.5 below). In the Kagera River basin, water quality concerns also exist, some of which have significant impacts downstream (e.g. problems with the water hyacinth). A very clear need exists for improvements in access both to potable water of adequate quality and to acceptable levels of sanitation, in order to provide basic human services and reduce nutrient levels in Lake Victoria. Any future development of

the basin should also consider the need to control fertilizer use, as this also adds nutrients to the downstream system. Water quality problems in the Mekong River system are rather more local in nature, and less important in general terms than in the other two basins studied here.

The sustainable management of the available water resources is of course a key objective in each of the three Case Studies, but it is clear that this has not eventuated to date in any of the basins. The lack of basin-wide agreements (or widespread cooperation) constitutes a primary reason for this, but it is also clear that holistic development plans are absent in most cases – or if present, are commonly ignored by the Basin States themselves, and even by international funding organizations on occasion. The general tendency of donor organizations is therefore to direct funds at particular topics, ignoring both connected issues in the same geography, and effects on a broader geographic scale. This issue is addressed in more detail in the following subsection, and also in Section 8.3 of the present report.

7.1.3 Does 'one size fit all?'

It is abundantly clear from the output of the Inter-SEDE model and the analysis presented above that each of the three Case Study basins presents distinct and unique characteristics, and that no one pattern of future economic (or water-related) development will be successful throughout these – or indeed other – international watercourses. In all of the Case Studies, the international agreements attained to date are either inadequate (failing to reflect the fundamental principles of customary international law, for example), or act as a potential or real constraint to the future sustainable use of the available water resources, which underpin the economies of the countries involved. However, the particularities of each basin differ even in this respect, and no single 'recipe' can be defined which would lead to improvements in each of the basins. This matter is addressed in further detail in Section 7.2, which provides specific options for future improvements in each of the three Case Study basins.

One factor of key importance is highlighted by data concerning virtual water imports. An analysis of the basin-specific information provided in Chapters 4–6 shows the following:

- Some Basin States display effectively neutral importation of virtual water, implying that their (mainly agriculturally-based) economies rely upon the water resources which are available nationally. Within this type of scenario, the key objective is to use the available water resources to the greatest effect in relation to economic returns. This implies one or more of the following strategies: (a) a trend towards the more efficient use of water, e.g. incorporating drip irrigation; (b) the production of crops with higher economic margins, whilst ensuring the existence

of available trade outlets for these; and/or (c) the development of specific industrial applications which provide much higher economic returns per unit volume of water. The first two of these relate to intra-sectoral allocative efficiency, designed to improve economic returns for a given unit volume of water. The third category concerns inter-sectoral allocative efficiency, and is of key importance for economies that are almost totally dominated by the agricultural sector.

- Other Basin States (even some of those in arid regions, with a history of conflict relating to their water resources) are significant net exporters of virtual water. This type of profile is typified by Syria in the Jordan River basin, and by the Sudan in the Nile system. The volumes of virtual water involved are considerable in each of these cases – almost the equivalent of the entire flow of the River Jordan annually in Syria, and about five times this volume for the Sudan. If such exports of virtual water do not account for very significant foreign earnings, the trading strategies of the countries involved are obviously flawed. The same is true to a lesser extent for several other co-riparians of the Nile River basin, including Ethiopia, Kenya, Tanzania and Uganda. It is notable from Tables 8 and 16 that in all these cases, the production and trade in plant products is responsible for the majority of the virtual water exports, and these commonly have very low added value. This can be flagged as a key element of any future strategy by third-party actors wishing to promote a policy of benefit-sharing.

- A few Basin States are major net importers of virtual water. Israel and Egypt are the best examples here, and as noted previously, the similarity of the strategies of these two countries in relation to hegemonic tendencies and dominance over the regional water resources is striking (especially as they are strange political bed-fellows). The classical rhetoric in both countries is that food security is an all-important national objective, but the data presented here show that this is altogether illusory in each case. Given that both countries are also in a highly advantaged economic position *vis-à-vis* their respective co-riparians, it is evident that a more mature approach to international trade would bring potential win-win outcomes arising from the altered allocation of water resources.

The importance of the hydrological flow regime of a river (as opposed to merely water quantities – and including sediment transport, nutrient recycling and the ecological results of extreme events) should also be recognized. Even in this instance, potential gains can only be made in each basin by using specific coherent strategies. Thus, for example, positive-sum outcomes in the Nile basin may be attained through the minimization of evaporation

by moving storage facilities upstream, and/or perhaps by reducing 'losses' in wetland areas such as the Sudd (within the thresholds of ecological acceptability and sustainability). In the Mekong River basin, the flow regime is a critical element of the system as a whole, and great reductions in net benefits would result if the flood pulse were to be lost, or substantively altered. This distinction reflects the fact that the Nile River has already been heavily developed, while the Mekong River basin is mostly in a near-pristine condition at present. It also points to the importance of addressing the specifics of the local and regional hydrology in each basin, optimizing opportunities for the use and re-use of water on a regional (basin-wide) scale, rather than allowing each Basin State to follow its own whims and desires, irrespective of its geographical position in relation to the other co-riparians.

Concerns arising from out-of-basin transfers must also be addressed. The out-of-basin transfer of flows from the Jordan River basin to the Negev are clearly of unilateral benefit only (if indeed, any benefits accrue from this activity at all), and these have been largely responsible for significant ecological damage downstream (to Jordan, Palestine and the Dead Sea). In the Kagera/Nile system, the situation is more complex, because if net benefits are to be considered, those arising from out-of-basin transfers upstream (e.g. in Tanzania) should be compared to any benefits which might arise from Egypt's massive out-of-basin transfers close to the terminus of the basin (El-Salam Canal and the Toshka project being the two largest). In this regard, what is preferred by one riparian State can easily be claimed by another, using the same underlying logic of national sovereign right to utilize a given resource. Against the background of the Nyerere Doctrine and the more recent statements by upstream co-riparians of the Nile system, future conflicts appear to be inevitable relating to out-of-basin transfers within the system as a whole.

Benefits arising from the generation of hydroelectric power cannot be divorced from those connected to other uses of water resources. Such power generating facilities may affect river flows relatively little (e.g. where run-of-the-river systems are envisaged), although even in these cases controversy has existed in some basins (e.g. where Botswana has objected to Namibian proposals concerning the Okavango River due to concerns over possible changes to natural siltation dynamics in the Okavango Delta downstream arising from the proposed development of the Popa Rapids facility; also the dispute between Pakistan and India over the Baglihar Dam on the Chenab River in India). Larger schemes involving major dams and impoundments have much greater consequences for evaporative losses, as evidenced by the comparison of the effects on water flows of power generation at the Aswan High Dam, compared to that in Ethiopia upstream (see Chapter 5 of this report). Given the almost universal paucity of access to energy amongst the poorer Basin States within the Case Studies addressed here, it is clear that any system designed to share benefits should rely on an electrical grid of wi-

de geographic scale, supplying all co-riparians at reasonable (i.e. affordable) tariffs. In such a circumstance, decisions as to the preferred site of power generation should be made on the grounds of optimizing power generating capacity, whilst minimizing water losses, and ensuring that all co-riparians are treated equitably in relation to access to both the power and water resources, in concert. It is notable that very few Feasibility Studies addressing preferred sites for hydroelectric generation contain specific comment on the impacts of potential works on water flows to all co-riparians within the basin, although this is clearly an important consideration. Where available flows are affected, the co-riparians should effectively be requested to "trade energy for water", and equitable solutions should be sought which address both of these factors in concert.

Table 29. Existing or potential forms of benefit-sharing scenarios. 'PSO' denotes a positive-sum outcome.

Basin	Countries	Benefit-Sharing Scenario
Bramaputra	India and Nepal	Hydropower / flow.
Columbia	USA and Canada	Water storage, head , floods / energy
Euphrates	Turkey, Iraq and Syria	Water storage / flood protection.
Jordan	Israel and Palestine	Water volume / food. PSO.
Jordan	All five co-riparians	Increased overall water availability. PSO.
Kagera	All 4, and Uganda, Kenya and Tanzania	Flow to Lake Victoria / fisheries.
Mekong	Thailand and Vietnam	IBT in high flow / flood pulse retention.
Mekong	Laos and Thailand	Energy / flow.
Mekong	Upper 4 riparians/, and Cambodia and Vietnam	Flow regime / fisheries, plus biodiversity.
Murray-Darling	Australian States	Environmental flows / nature protection.
Nile	Egypt/Ethiopia	Dam relocation, reduced evaporation. PSO.
Nile	Egypt/Sudan	Reduced evaporation, Sudd. ***Note*** negative environmental impacts.
Okavango	Botswana/Angola	Nature protection / foreign debt.
Orange/Senqu	Lesotho/RSA	Water [volume, storage, head] / foreign debt plus hydropower. PSO.
Orange/Senqu	RSA/Namibia	Upstream availability / environmental flows at the estuary.

However, the examples given above address only a few types of benefits, and the preferred objective (as noted elsewhere in this report) should be to 'broaden the basket of benefits' and to attract co-riparians to benefit-sharing by offering a wide mixture of potential inducements. This implies a broad

range of forms of 'trade', some including water resources or flows *per se*, and others involving benefits which relate to the water resources and their utilization, but are of a secondary nature. Although some believe this to be a novel concept, Table 29 shows examples of benefit-sharing in this broad sense which have either been taken up, or may be considered in the future. It is notable that certain of these reflect positive-sum scenarios, and these are of particular significance and importance to the co-riparians involved (see also Section 7.2 below).

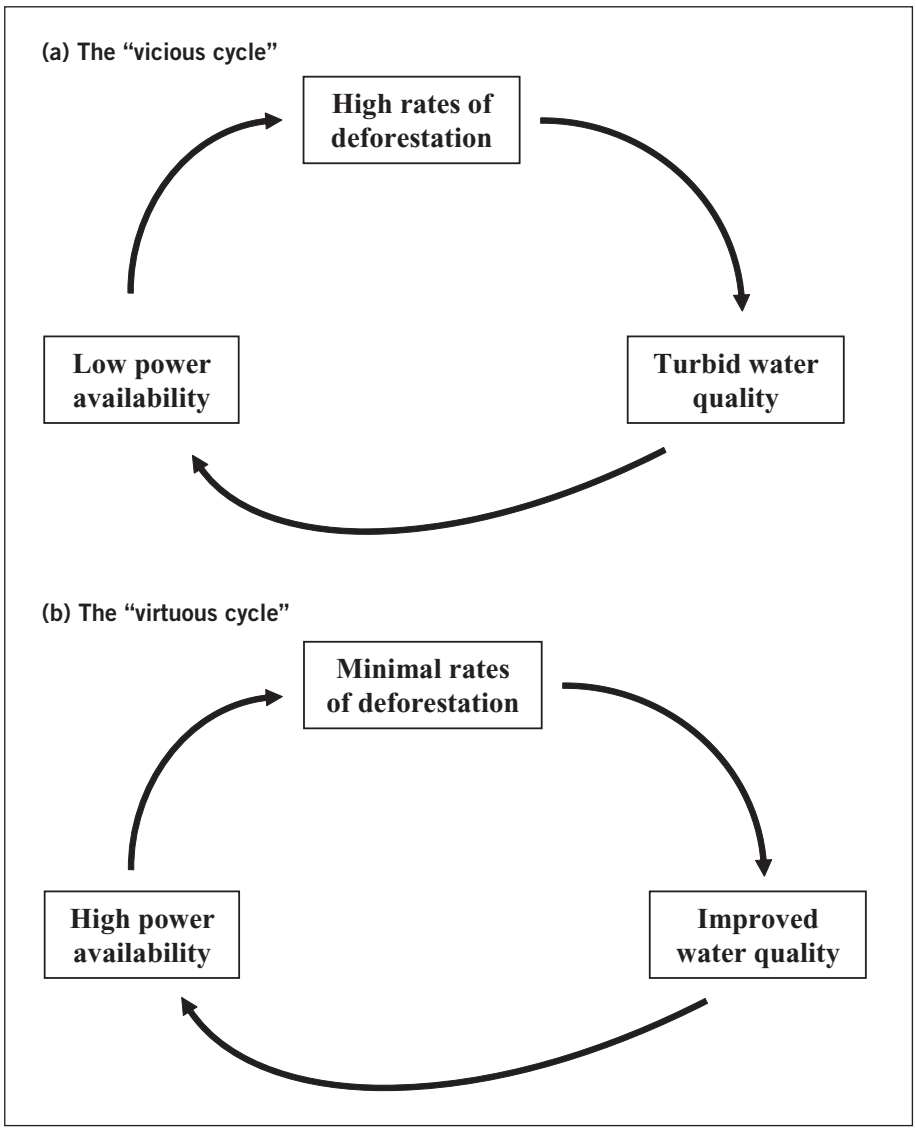

Figure 16. The existing "vicious cycle" in Rwanda relating deforestation to the quality of water resources and energy generation, and the "virtuous circle". After World Bank (2004b).

In at least some cases, even broader concerns should be addressed by international attempts to reduce poverty in developing nations. The Kagera River basin offers a good example here, potentially linking water resources, power generation and land use/deforestation in an overall package of benefits. The extent and pace of deforestation amongst the Kagera co-riparians vary significantly, *per annum* rates being estimated by the FAO for the decade between 1990 and 2000 as 9.0% in Burundi; 3.9% in Rwanda; 2.0% in Uganda; and 0.2% in Tanzania.[42] A recent Country Framework Report for Rwanda (World Bank, 2004b) noted the connection between deforestation, negative impacts on water quality (mainly through siltation), and power generation (effects on hydroelectric turbines), calling for the replacement of the 'vicious cycle' which exists presently with a 'virtuous cycle', as shown in Figure 16. Other important links also exist between aid for agricultural development, tendencies towards deforestation, and the use of regional water resources. International funding organizations commonly focus only on single sectors (e.g. attempting to improve agricultural practices), ignoring negative impacts in other sectors (e.g. the protection of forests, and the sustainable use of trans-boundary and other water resources).

It is clear that 'one size most certainly does not fit all', and that the issues faced in attempting to attain more equitable allocations of water resources or benefits (of various categories) must be addressed in a basin-specific fashion, with strategic trade-offs occurring at different levels of scale. Thus, preferred options for improvements – and perhaps especially for poverty reduction in the specific – vary from location to location, and will best be based on a holistic view of optimal development strategies, taking account of a multitude of inter-connected factors. The following section returns specifically to the Case Studies to develop this theme, and provides examples of options for potential improvements, which vary for each basin.

7.2 Options and proposed approaches for improvements

This section reconsiders the Case Studies in detail, providing both general and specific scenarios for future development in each instance. General issues are touched upon initially, and the three Case Studies are then addressed in turn, with brief comments on the matter of joint water management being provided thereafter.

[42] <http://www.fao.org/forestry/foris/webview/forestry2/index.jsp?siteId=5621&sitetreeId=22027&langId=1&geoId=0>

7.2.1 General issues

Equitable allocations *versus* benefits: Phillips (2005) has argued that the demand under customary international law for the equitable allocation of water resources, and the apparently competing approach for sharing benefits, are in fact two sides of the same coin. Basin States are fundamentally interested in attaining a fair and just apportionment of international water resources (and other natural resources), and the benefits arising from these.

The examples provided above on trading water resources and electrical power can be extended into many other areas, such as the exchange of water resources for traded food products deriving from these (see the discussion of virtual water below and elsewhere in the present report). The recent documentation developed for the Kagera River basin (see Table 13 above and World Bank, 2005) is beginning to move a consideration of benefit-sharing forwards. As noted by Phillips (2005) however, water allocations should be agreed by the co-riparians if a basis is to be generated either for the sharing of benefits, or the calculation of compensation, which may be due from one co-riparian to another.

While some progress has been made concerning the sharing of benefits in the power sector in the Nile system (which is to be expected given the strong link between water flows and hydroelectricity in the region; see Sadoff *et al.*, 2002), there has been little of real substance developed in relation to other types of benefits, as yet. In addition, some authors have questioned whether the sharing of benefits through some form of market allocation would in fact satisfy demands for equitable and reasonable allocations of the water resources, either theoretically or practically (Beyene and Wadley, 2004). For example, many States would encounter difficulties with employment in the agricultural sector if they were to agree to reduce operations in that sector in favour of benefit-sharing with other co-riparians. While this could be offset by development in other sectors using a policy based on inter-sectoral allocative efficiency, the social implications would need to be clearly understood and addressed. Migration to urban centres would probably arise, along with other disruptive elements associated with a change in lifestyle from an agriculturally-based society to an industrial nation. This is often seen by Governments as a threat to the foundations of their political power-base, and is likely to be of particular concern to Egypt. It may be concluded, therefore, that the sharing of benefits cannot be considered a universal panacea, and does not provide a 'one-stop' alternative to the consideration of the equitable allocation of water resources. At best, benefit-sharing will be highly complex to establish, and will not be implemented without risk.

Virtual water: Both Allan (2003) and Warner (2003) have emphasized the role that virtual water imports can play in defusing conflicts over transboundary water resources, in the Middle East and elsewhere. Unfortunately,

such calls have commonly 'fallen on deaf ears' within the policy-making community. However, there can be no doubt that trade in virtual water constitutes one of the keys to the future sustainable use of water resources on both regional and global scales (Earle and Turton, 2003; Haddadin, 2003; Turton *et al.*, 2003). While constituting an important strategic option for water-stressed States, a virtual water-based policy also poses significant challenges. This is specifically the case where economies are not sufficiently diversified to generate the foreign exchange with which to pay for food imports in a sustainable fashion. There is a fine line between virtual water trade as a viable solution to water stress in developing nations, and the 'slippery slope' into future economic dependency.

Within-basin demands: The issue of within-basin and out-of-basin demands for water (and utilization of water) must again be addressed here, especially in the context of the Kagera River basin and the Nile basin as a whole. An excellent review of out-of-basin transfers has been published by Snaddon *et al.*, (1999), and this makes a number of important points concerning the potential ecological impacts of such schemes, in particular. As noted previously, Tanzania has recently opted to construct a major scheme to take water from the catchment of Lake Victoria, to irrigate crops at Kahama in the Shinyanga region. The very large out-of-basin transfers by Egypt have also been discussed in Chapter 5 of this report. Some commentators have argued that within-basin needs should take precedence over out-of-basin demands for water (e.g. El Musa, 1998), and this was certainly a major point of debate during the development of the Johnston Plan for the Jordan River basin in the mid-1950s (Phillips *et al.*, 2006a, in press). However, this is by no means a universally accepted principal, and the economies of some countries such as South Africa depend heavily on out-of-basin transfers (e.g. Basson *et al.*, 1997: 55; Snaddon *et al.*, 1999; Turton, 2000b; 2003a: 189, Turton and Meissner, 2002; Ashton and Turton, in press; see also Figure 4 and associated text in Chapter 3 of this report). Indeed, the future economic viability of the entire SADC region is probably dependent on such transfers in future (Heyns, 2002). Arguments may be made to support either stance on water transfers, as follows:

- Where States rely heavily on a single source of water, their development may be constrained demographically if they are unable to transfer water out-of-basin. Egypt has made this claim frequently in relation to the waters of the Nile River basin, and has used this to partly justify the major out-of-basin schemes such as the Toshka and El-Salam projects. This acknowledges the sovereign right of each independent State to decide its strategic priorities, and need not necessarily lead to solutions that are un-negotiated with interested and affected parties (although the latter has eventuated in the Egyptian case).

- If out-of-basin transfers are used to justify greater allocations of water from particular resources to the detriment of other co-riparians, this should generally not be considered to be acceptable practice. This matter is covered within the norms of contemporary international water law, but is not part of the Harmon Doctrine on which the original volumetric allocations in the Nile Basin were essentially decided. In many respects, the allocations proposed by the Johnston Plan could also be considered in this light (see Chapter 4 above, and Phillips *et al.*, 2006a, in press). The only exception to this might occur if out-of-basin transfers were to give rise to benefits for all parties, which would exceed those where flows are retained exclusively within the basin. This has certainly not been demonstrated for either the Jordan or the Kagera/Nile systems, to date.

Securitization and Desecuritization Dynamics: As implied by the comments in Chapter 3 of this report, the relationship between Technocrats and Securocrats is considered by the present authors to be an essential component of the trans-boundary water sharing dynamic as a whole. All basins differ in this respect, which is why security is such an important component of the analytical model discussed at the commencement of this chapter. Where securitization is inevitable due to other concerns perceived by the co-riparians to be over-riding (e.g. in the Jordan River basin), this must be overcome by generating sufficient shared benefits that the hydrosphere can be addressed in its own right. This will occur where all parties agree that a solution is sufficiently seductive that it cannot be ignored, whatever other constraints may exist on their relationships. On the basis of a highly detailed study of the original documents pertaining to the Johnston Plan, Phillips *et al.*, (2006a, in press) concluded that such an outcome was within reach in the mid-1950s in the Jordan River basin, although a basin-wide agreement was eventually narrowly missed on that occasion (probably due to much broader concerns which fuelled the Suez crisis in 1956).

A much more recent example in the same geography is also instructive. In the autumn of 2005, Jordan, Israel and Palestine completed a two-year process of negotiations concerning the triggering of a Feasibility Study for the Red Sea-Dead Sea conduit. This procedure involved tripartite committees at both the political and technical levels, and the key to a successful conclusion related primarily to the interface between these committees (and more particularly, that between the individuals represented on them). In the Jordan River scenario, past hostilities and distrust are such that the parties must be provided with a significant range of potential benefits even to agree to proceed with an initial Feasibility Study, and guarantees were also required that any such agreement would not affect other pending negotiations (such as those on Permanent Status

between Palestine and Israel).[43] The importance of personal relationships between Technocrats and Securocrats should not be underestimated.

The other two Case Studies addressed here reveal different dynamics in this respect, although in all cases the interplay between the technical and political actors is apparent as a driver of what may be attainable. In the Kagera and the Mekong basins, a sub-set of co-riparians exists, although the dynamics differ in the two cases. The four Kagera co-riparians are essentially arrayed in opposition to the historical agreements between the two extreme downstream co-riparians in the Nile (Sudan and Egypt), but there has been little real coherence between them to date in developing their shared case. This is no doubt due in part to the dissolution of the Kagera Basin Organization, and the new initiatives under the Nile Basin Initiative and by the East African Community may provide redress in this respect. A number of technically-based options for improvement have been offered (and more are proposed Section 7.2.3 below), but the political arena remains mired in rhetoric and stated or implied threats between States – this, despite international involvement over many years. In the Mekong, the four downstream co-riparians are proceeding without any coherent input from China or Myanmar, and this generates a continuing threat to the stability of any future agreement in the basin. In both of these basins, any future attempt to generate significant economic improvements will be likely to succeed only if the securitization-desecuritization dynamics are addressed specifically, and if the benefit-sharing scenarios can be made sufficiently attractive to overcome other intervening factors in the political arena.

7.2.2 The Jordan River basin

Recent proposals: Three recent proposals are of note in relation to the potential for an enhanced availability of fresh water to the Jordan River co-riparians. These involve the following:

- the proposed importation of fresh water in bulk by Israel, from Turkey;
- Israeli proposals for increased levels of desalination, to supply both their own population and the Palestinians; and
- a Jordanian initiative to reinvigorate studies on a Red Sea – Dead Sea conduit.

[43] Information based upon personal communications between Dr. David Phillips and officials of the Palestinian Authority.

Negotiations for the importation of fresh water from the Manavgat River system in southern Turkey to either Haifa or Hadera in Israel have been ongoing for several years. A contract is presently in place for the importation of 50 MCM/year of fresh water to Israel (Rende, 2004). However, this relies on the completion of a second contract for the fabrication and use of large tankers, plus the construction of a single point mooring system off the Israeli coast (Dreizin, 2004a; Gürer and Ülger, 2004; Rende, 2004). It appears at present that the completion of the second contract is a somewhat distant prospect.

The recent Israeli proposals for increased levels of desalination were prompted largely by a change in attitude amongst the Israeli authorities, following the drought years of 1999–2002 and the Knesset enquiry towards the end of that period (PCE, 2002). The present plans as outlined by Arlosoroff (2004) and Dreizin (2004a, 2004b) are summarized by Figure 17. These involve a total of 55 MCM/year of desalinated brackish water inland, plus a further 365 MCM/year of desalinated coastal seawater. The latter would be produced by a total of six coastal facilities, to be constructed over a period of about four years. The first of these (Ashkelon) came on-line in mid-August 2005, and supplies some 100 MCM/year annually. This capacity of Israel in particular for increasing the available fresh water in the region is most notable, and this volume of 420 MCM/ year of 'new water' will be referred to again below.

A statement by Shamir (2004) released in May 2004 provided a preview of Israel's intentions relating to the future provision of fresh water to the Palestinians. In testimony to the Committee on International Relations of the United States House of Representatives, Shamir stated that *"the only viable long-term solution for the West Bank"* involves major desalination on the Mediterranean coast (proposed at Hadera/Casarea), funded by the donor community or by the Palestinians. This assessment and conclusion is flawed in a number of respects, and has not been accepted by the Palestinian Authority. Its major flaws are:

- it fails to address the high costs of pumping desalinated water from the Mediterranean Sea to the West Bank;

- it does not acknowledge the fact that desalinated water produced within Israel at the Mediterranean coast would best be utilized by the near-coastal Israeli population, which also has a significant demand for fresh water;

- it ignores the need for a reallocation of the existing regional water resources, to attain an equitable and reasonable allocation between two independent sovereign States existing peacefully side-by-side; and

- it fails to recognize Israel's responsibilities in relation to customary international water law, or to other elements of international law (see in particular, Frederiksen, 2003a).

A recent proposal by the Israeli authorities for the provision of desalinated water from Ashkelon to the Palestinian population in Gaza[44] provides a further example of this Israeli approach to addressing the water rights of the Palestinians, relying on the provision of 'new water', rather than the equitable allocation of the existing resources.

As noted previously in this report, Jordan faces diminishing options in relation to the availability of fresh water, and this is especially the case when the sustainability of supply is considered. The current use of the Disi Aquifer and other fossil sources is unsustainable over time, and this is also true of the ongoing attempts to trigger the construction of a Red Sea – Dead Sea conduit. The latter effort has recently entered the stage where a Feasibility Study may be launched, to be overseen by the World Bank (Benvenisti, 2004). At the present time, the project envisages the inclusion of a desalination facility with a total capacity of 850 MCM/year of produced fresh water. It is currently suggested that 67% of this volume (i.e. about 570 MCM/year) would be reserved for use by Jordan, with the remainder being shared in some as-yet undefined fashion by Israel and Palestine. However, these and other details will only be confirmed by the Feasibility Study, which will not be completed before late 2006 at the earliest.

A possible solution: A potential solution for the allocation of the regional water resources in the Jordan River basin has recently been developed by Phillips *et al.* (2006b, in press), and this is outlined here. The key elements of the proposal involve: (a) the generation of a positive-sum outcome in terms of the regional water resources; and (b) the reallocation of the existing resources during a transition period, in which 'new water' would replace any reallocated flows. These twin concepts were developed originally to address the bilateral situation concerning the allocation of the water resources available to Palestine and Israel in combination (Phillips *et al.*, 2004). The quantification of the water rights of Palestine and Israel was initially completed on the basis of the proposals by Shuval (1992, 2000, 2005) involving equal *per capita* shares for the two populations. This involves the allocation of a minimum water requirement of 125 m^3/person/year (equivalent to 342 litres/person/day) for all purposes other than agricultural use.

If these proposals were to be followed, the combined populations of Israel and Palestine (numbering 10.38 million, presently) would utilize about 1,300 MCM/year of the regional water resources for domestic, urban and

[44] Palestinian Water Authority, personal communication to Dr. David Phillips.

industrial use. This amounts to about 53% of the total water resource available to these two parties in an average year, which would leave a reasonable

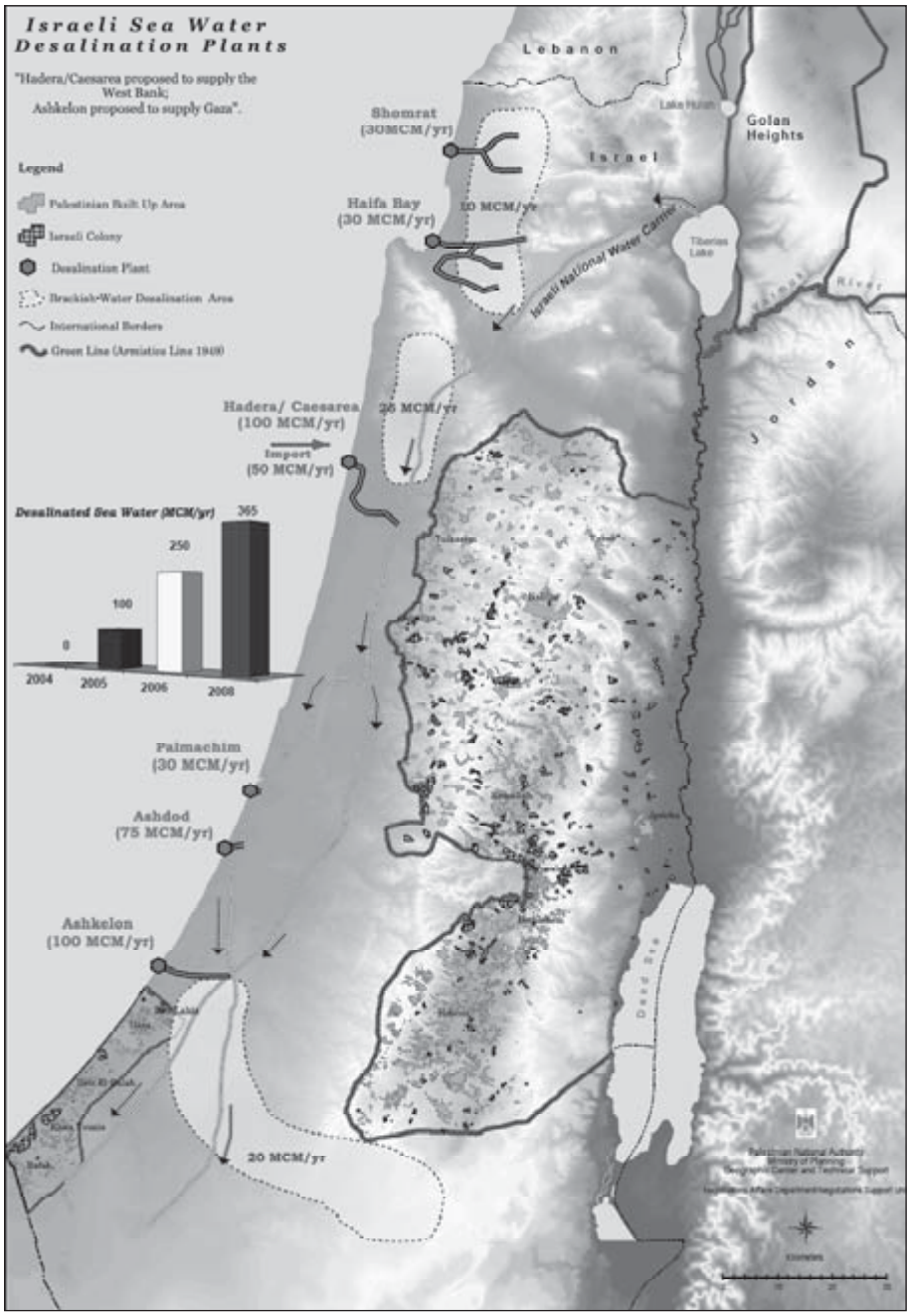

Figure 17. The recent Israeli proposals for desalination. (After Arlosoroff, 2004; Dreizin, 2004a, 2004b).

margin to support agricultural activities, at least at the present time.

Phillips *et al.* (2004) proposed that the reallocation of the existing water resources between the two parties should occur gradually over time, as shown in Figure 18. This would in any event occur in practical terms, as an increased allocation of the regional resources to Palestine could not be realized immediately, due to the paucity of available infrastructure and the time taken for demographic changes to take place. Thus, the Palestinian demand for water could only be satisfied once new infrastructure is constructed and brought on-line, and when other changes (such as the recommencement of agricultural activities in the West Ghor of the Jordan River valley) have been completed.

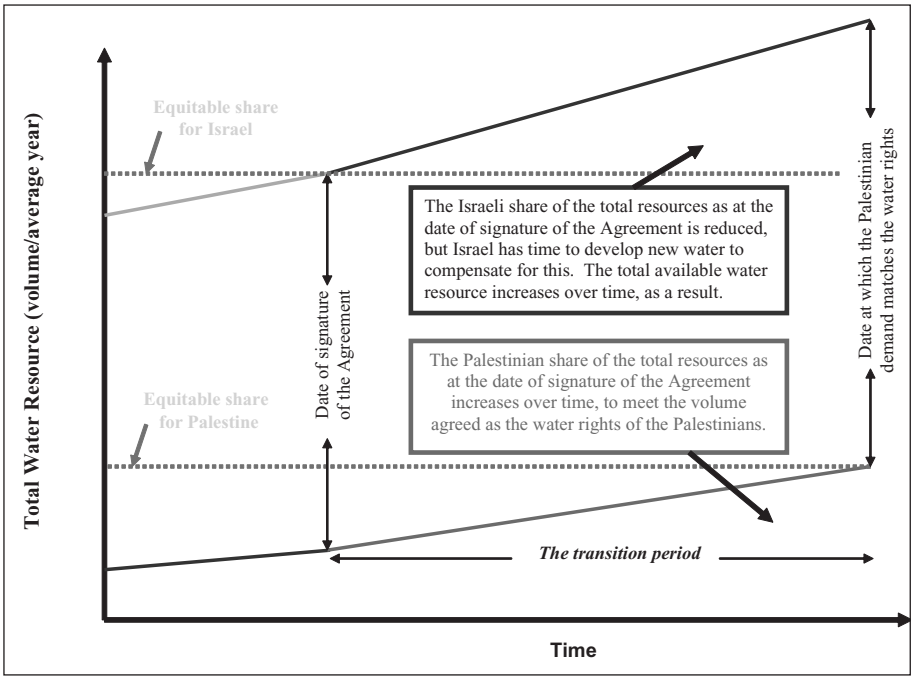

Figure 18. A diagrammatic representation of the anticipated changes to water allocations during the transition period.

Importantly, this provides scope for Israel to expand its own available water resources, as shown in the upper inclined line in Figure 18. Phillips *et al.* (2004) calculated that Israel could easily replace the water volumes which were to be subject to reallocation, by a combination of increased wastewater re-use; desalination, and the bulk importation of water, as discussed in Section 4.4 above. This approach also avoids a zero-sum outcome where water gained by one party during the reallocation process is lost by another in equal amounts, and generates a positive-sum outcome, where both parties

may retain sufficient quantities of water (Phillips *et al.*, 2004, 2005).

Such an approach could provide the crucial incentive to all parties to consider the proposal seriously, and can become the trigger that changes the inherent securitization dynamic into one of desecuritization, leading to eventual cooperation – and possibly also to 'spill-over' into other areas of the bilateral (and perhaps multilateral) debate. It also generates politically acceptable solutions for the two parties, as the Israelis could gain water security without reducing the available supplies in total, and the Palestinians could attain their water rights.

This general concept has been expanded to address the five co-riparians of the Jordan River basin (Phillips *et al.*, 2005, 2006b, in press). In relation to these resources as a whole, Phillips *et al.* (2005) noted that the most critical need is to address the water stress of Jordan and (especially) Palestine. Once again, a positive-sum outcome was proposed, coupled to a transition period during which reallocations of the available regional resources are to be compensated by the production of 'new water', as shown in Figure 19. The changes to the current water allocation patterns were proposed to involve the following (see Phillips *et al.*, 2006b, in press):

- As shown by an analysis of within-basin demand, Lebanon and Syria could abstract higher volumes from the Jordan River in the future, but data for *per capita* water availability for populations within the basin show that there is little urgency for this to occur within the near future. Relatively small increases in abstraction rates may therefore be required for Lebanon and Syria at a later time, as shown in Figure 19. Future negotiations with the two upper co-riparians in this respect would do well to extend to other (linked) issues, concerning political matters and trade. The possibility that 'spill-over' could be involved from the trans-boundary water issue into the wider political arena is real in the case of the Jordan River basin, and the co-riparians remain on the brink of possible major breakthroughs in stability, if past rhetoric and hatred can be placed to one side.

- Israel relies on the Jordan River for about 30% of its total present supply of water (notwithstanding its very low population within the basin). This would need to be reduced if an equitable and reasonable allocation to the co-riparians is to be realized, but such an outcome will only be realized if the prevailing threat perceptions are assuaged as the result of a substantial reduction in the securitization dynamic in the basin. Israel can replace this volume with new water, and any reduction in the overall water available to Israel could be avoided if the transition period during the reallocation process is appropriately managed. The total resource volume available to Israel could therefore remain constant, or even increase over time. This forms a substantial

incentive, especially if linked to the 'peace dividend' arising from a sustained reduction in hostility.

- Jordan needs to substantially increase the total water volume available to its population over time, reducing the current water stress. It appears unlikely that Jordan will be able to access additional flows from

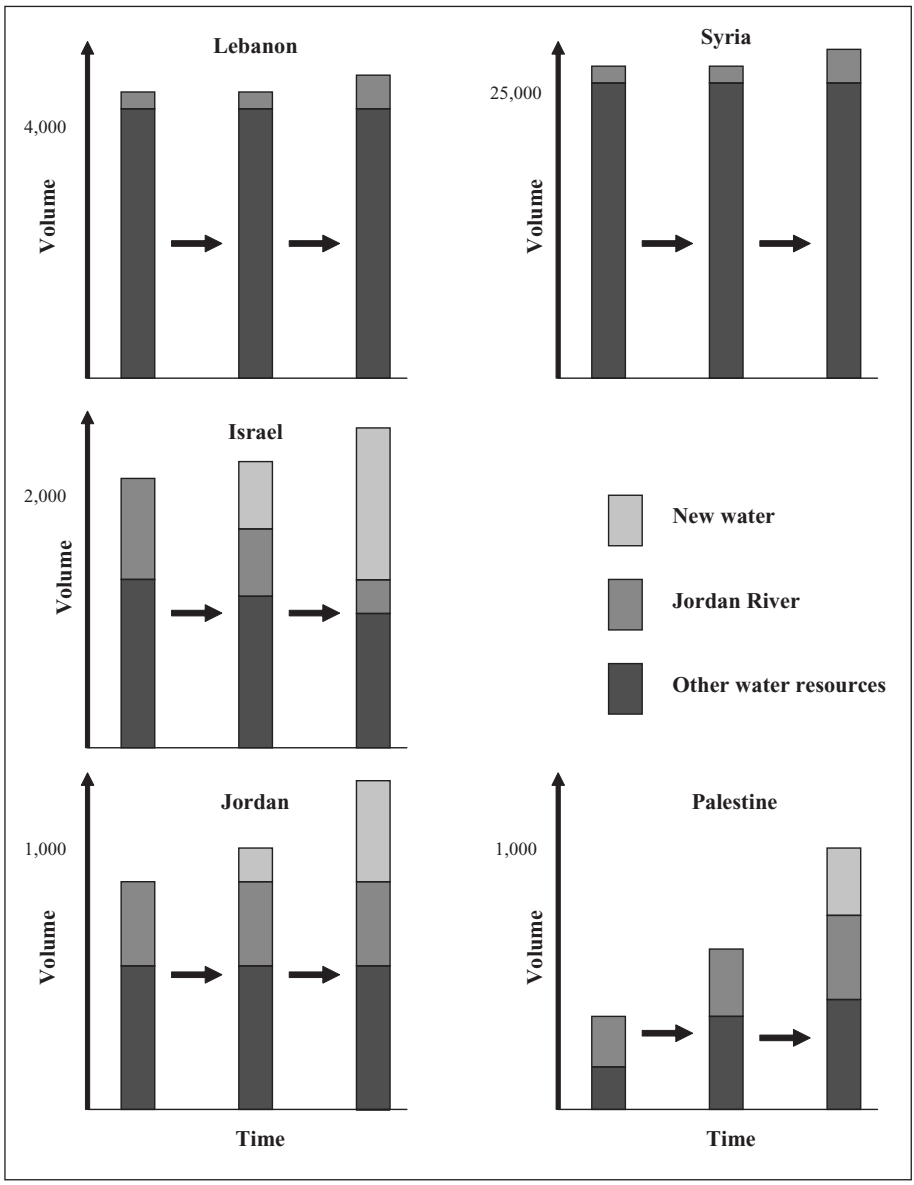

Figure 19. Possible changes over time in the availability/allocation of water resources to the co-riparians of the Jordan River basin. After Phillips *et al.*, 2006b (in press).

the Jordan River basin, given its prior agreements with Syria, and the terms of the Israeli-Jordanian Peace Treaty of 1994. Jordan will therefore need to actively seek to develop new sources of water, both to enhance the *per capita* volumes available to its growing population, and to reduce the current reliance on non-sustainable resources (including the Disi Aquifer in particular). Available options for Jordan include further increases in wastewater re-use; the Red Sea – Dead Sea conduit; desalination at Aqaba; and the importation of fresh water from a number of potential sources.

- Of all the co-riparians, Palestine faces the most critical shortage of fresh water, and several previous authors have noted the need to remedy this as part of any attempts at generating regional stability (Shuval, 1992, 2000, 2005; Isaac, 1994; El Musa, 1998; Frederiksen, 2003a, 2003b, 2005). A number of options are open to Palestine, all of which could be further developed during the time course shown in Figure 19. In the early stages, a more equitable allocation of the existing regional water resources could be agreed, with the permanent status negotiations between Israel and Palestine, being the principal vehicle for this to be realized. In particular, far greater access could be provided for the Palestinian population to the groundwater resources of the West Bank, and the Palestinians could be permitted to realize their equitable share of water of acceptable quality from the Jordan River. Thereafter, Palestine would need to develop new water through the enhanced re-use of wastewaters and the introduction of large-scale desalination in Gaza.

Calculation of the total volume of new water that would be required to attain the positive-sum outcome shown in Figure 19 reveals that about 1,000 MCM/year would be needed in total, at the present time. It is readily apparent, judging from the recent Israeli activities in this regard (see above), that this target is achievable over a relatively short time period. The provision of 1,000 MCM/year of 'new water' could simply be achieved through a combination of desalination and enhanced wastewater re-use (Phillips *et al.*, 2006b, in press). This could be accompanied by improvements in the overall efficiency of water use, which would effectively replicate recent Israeli advances elsewhere in the region.

However, the increasing populations of the five Jordan River basin co-riparians suggest that the importation of water in bulk will probably still be needed at some stage in the future, whether the Red Sea – Dead Sea conduit is constructed or otherwise. The so-called 'Mini Peace Pipeline' from the Seyhan and Cehyan Rivers in Turkey appears worthy of additional consideration in the future (see Figure 20), although some States have expressed wariness due to a possible dependence on water sources external to their political borders (Rende, 2004; Phillips *et al.*, 2006b, in press). There will also

be a need to reassess the water volumes utilized in the agricultural sector in the region as a whole, which accounts for at least 70% of the total volumes used at present (Phillips *et al.*, 2004, 2005, 2006b, in press).

It may be concluded here that the principal problem concerning fresh water in the Jordan River basin involves the inequitable allocation of the available resources, which has eventuated because the co-riparians have essentially competed for water over the last several decades under a heavy securitization dynamic, and have not cooperated with each other (either in using the available resources wisely, or in developing new sources of fresh water).

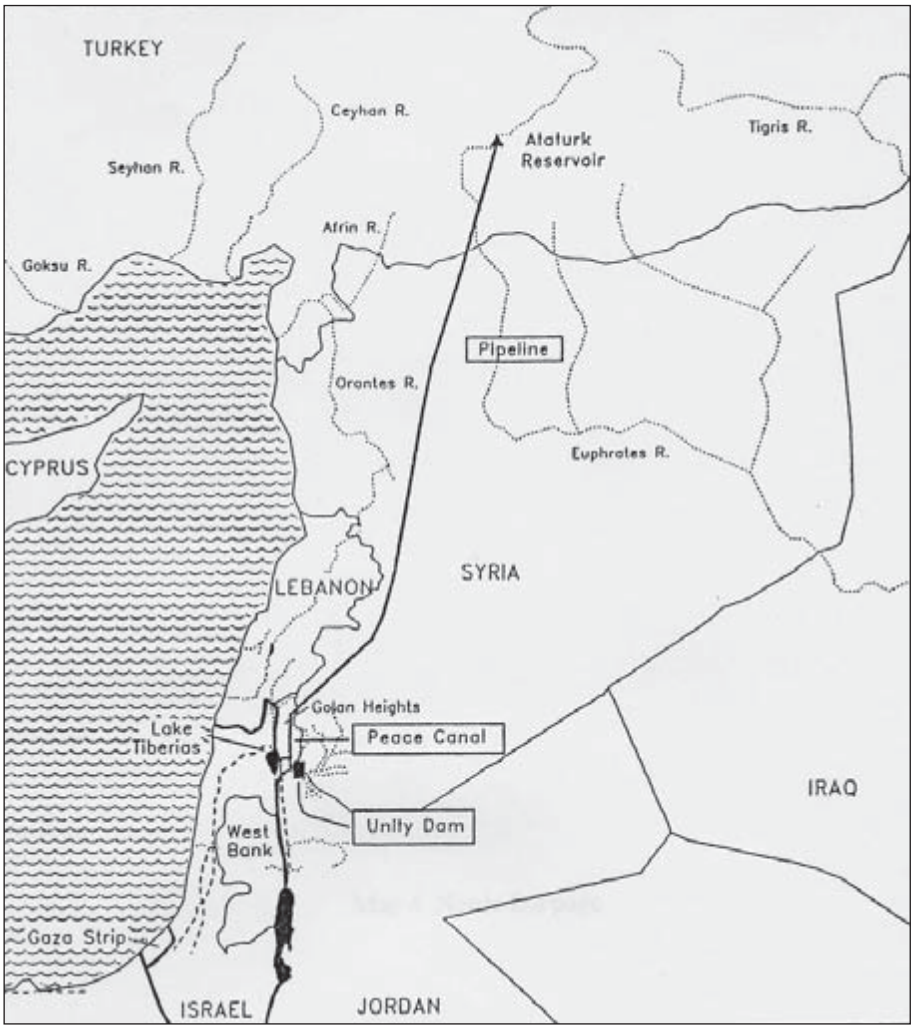

Figure 20. Diagrammatic representation of an early version of the Mini Peace Pipeline. After Wolf (1998b). The more recent proposals involve abstraction from the Seyhan and Ceyhan Rivers in Turkey, rather than the Euphrates River.

7.2.3 The Nile/Kagera River basins

Equitable allocations or benefit-sharing?: As noted previously in Chapter 5, the historical allocations of the water resources of the Nile River cannot be considered to be either equitable or reasonable, as these terms are currently understood within the framework of customary international water law (Waterbury, 1979, 2003; Amare, 2000; Arsano, 2000; Tafesse, 2000; Okot, 2003; Beyene and Wadley, 2004). Beyene and Wadley (2004) have discussed a number of theoretical arguments favouring the need for reallocation of the water resources in the Nile basin. These are held up to support the principle of 'distributive justice' (Walzer, 1983; Rawls, 1991), which they claim to be relevant to natural resources, including water (Beitz, 1979). In relation to shared water resources, distributive justice may be seen as being the equitable and reasonable allocation of water between the various co-riparians, as expressed by both the Helsinki Rules (1966) and the United Nations Convention on the Law of the Non-navigational Uses of International Watercourses (United Nations, 1997).

Early documents relating to the Nile Basin Initiative state that the vision is to achieve *"…. sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources"* (CoMWANBS, 1999). Whether this refers to equitable utilization in volumetric terms can clearly be debated, as it may be argued that the upstream co-riparians have little recourse to the attainment of equitable volumetric allocations if the historical agreements are to hold force. The volumetric allocations as they currently stand for the Nile cannot be considered to be equitable, because of three vital flaws. Firstly, the two key agreements of 1929 and 1959 were made between only two of the ten co-riparians, in effect becoming a constraint to future economic growth and development that can be regarded as being unreasonable and even harmful to most of the Basin States. Secondly, the legal principle on which those allocations were based has since fallen into disuse. Finally, the affected riparians have recourse to arguments based on the Nyerere Doctrine, which provides a political and legal way of challenging this initial inequity. This is the essence of the Nile *problématique*, and any robust solution needs to recognize these fundamental drivers and develop a viable strategy to navigate around the constraints that they pose.

As discussed previously, a recent trend involves the attempted use of market mechanisms to address the problems of the allocation of Nile waters (Beyene and Wadley, 2004; Nicol, 2005). Beyene and Wadley (2004) have argued that the need to account for the benefits and effects on other co-riparians of planned water resource development projects (see CoMWANBS, 1999) implies that distributive justice is the key objective, even if the co-riparians do not agree to replace the historical treaties with new agreements. Perhaps encouragingly, most of the recent debate has centred on the equita-

ble distribution of benefits, rather than that of the volumetric resources as such (Nicol, 2005). Although some clarity has been attained, particularly for the co-riparians of the Kagera (World Bank, 2005, and Chapter 5 above), specifics have not yet been proposed in relation to the sharing of benefits in the basin as a whole. In addition, Phillips (2005) has noted that while *water allocations and water utilization* can be separated from each other (leaving space for changing allocations between co-riparians over time, and for trading benefits for volumetric allocations where this is desired), any system of sharing benefits must nevertheless be related in some fashion to volumetric allocations, as otherwise no coherent platform exists for deciding on how the benefits may be shared (or on compensation).

Possibilities for generating a positive-sum outcome: Certain authors have discussed the quest for equitable utilization and/or the sharing of benefits in the Nile River basin, providing potential options for the future. For example, Whittington and McClelland (1992) first proposed the establishment of reservoirs in Ethiopia as a partial or full replacement for the Aswan High Dam and Lake Nasser, claiming that this would markedly reduce the overall evaporation rates. Later authors have also taken up this concept (Kliot, 1994; Whittington *et al.*, 1995; Elhance, 1999; Kendie, 1999; Tafese, 2000; Stroh, 2003),[45] which appears to have hydrological merit, at least. Lake Nasser is estimated to lose some 15,000 MCM/year of Nile water through evaporation (Waterbury, 1979; Kendie, 1999), and upstream storage losses would be much less than this, although estimates vary considerably. Not only would overall evaporation rates be reduced, but downstream flooding would also decrease if upstream storage were to be preferred. Claims concerning the total increase in the overall volume of the resource that could be attained by hydraulic optimization have ranged between 6,000 MCM/year and 21,400 MCM/year, but are in any event substantial and would provide scope for increased allocations to upstream users (especially Ethiopia). Whittington and McClelland (1992) went so far as to cite possible equitable allocations for the Blue Nile, considering that these might amount to 14,000 MCM/year each for Ethiopia and the Sudan, and 52 MCM/year for Egypt. However, such volumes would vary over time due to fluctuations in natural flows, and in any event are a subject for the co-riparians themselves to negotiate and agree, preferably according to the principles of customary international water law.

What is evident to the present authors is that a positive-sum outcome will require a new approach to the problem, especially in view of the recent tendencies of some riparians to 'play chicken on the Nile' by proceeding

[45] See also Wild, J.: *Towards an economic reallocation of Blue Nile water*, at <http://www.geogr.unipid.it/ B7SEM.HTM>

unilaterally with projects that have clear implications for other Basin States (Waterbury and Whittington, 1998). This in turn will need to be based on a nuanced understanding of water as a flux rather than a stock, where benefits can be multiplied because of different uses of the same water volumes at distinct parts of the hydrological cycle or basin flow. This is the major challenge of benefit-sharing, and is one of the reasons why the existing literature is so weak, being based largely on historical assumptions and understandings of water as an unvarying stock, needing volumetric allocations as a measure of equity.

The potential saving of water from the completion of the Jonglei Canal has already been discussed (see Section 5.1.1 of this report). The reduction in evaporation through the Sudd that could result from the completion of the Canal is estimated to increase the flow by a further 8,000 MCM/year at that point, which amounts to about 6% of the present downstream volume in that reach of the river, over an average year. Consequential effects would occur in certain areas of the wetlands in the Sudd, which would need to be mitigated. It is notable that the recent cessation of the civil war in southern Sudan may provide an opportunity for the completion of the Jonglei Canal. However, changes in global thinking about environmental sustainability are likely to impact significantly on the viability of the Jonglei Canal construction as a realistic option for increasing the overall water availability, so caution needs to be expressed when considering this option. In addition, the 1959 agreement between Egypt and the Sudan mandates that any savings created by this project should be shared equally by the Sudan and Egypt, rather than being available for upstream co-riparians (on the White Nile and its upstream stretches in this instance, including the Kagera River basin). This part of the 1959 agreement in particular would appear to need reconsideration, and there may be possibilities for the upstream co-riparians to claim a share of any enhanced flows which may be generated in the future within the system as a whole.

One significant source of water has not been fully developed in the Nile River basin to date – namely, groundwater. Egypt is known to have significant reserves of fossil groundwater in the Nubian sandstone basin, and the Nile River basin as a whole is associated with large groundwater supplies, particularly in some of the upper stretches including the Kagera basin (Ashton and Turton, in press). As in many other parts of Africa, surface waters have been the primary source of flows utilized to date and very little is known of potential or existing groundwater supplies in many areas – or of how these relate hydrologically to surface waters (Turton, 2005b, Turton *et al.*, 2006). Clearly, the use of fossil sources of groundwater is not sustainable in the long term, but many renewable sources of groundwater also exist in the Nile system as a whole, and these have not been fully explored or developed as yet.

It is notable here that all three of the possibilities considered above amount to the generation of positive-sum outcomes, in that they would each

generate a larger total water resource within the Nile River basin, for sharing between the co-riparians (Stroh, 2003). Other methods are also available through the provision of new water, including the introduction of greater levels of desalination of seawater and brackish waters by several of the co-riparians. Egypt in particular has an extensive coast with a very large population either at the coast, or nearby at minor elevation. The costs of desalination have fallen considerably over the last two decades, especially due to the introduction of new and improved reverse osmosis technologies. The present-day costs of desalinated seawater range from about US$0.55/m^3 upwards, depending on the technology selected; the scale of the facilities; and other factors such as pumping costs to reach the consumers. This is comparable to the costs for many groundwater supplies, and for some treated surface waters (Puri, 2005).[46] There is clearly scope for certain of the Nile River co-riparians to consider the introduction of large-scale desalination, such as has occurred in recent years in Israel (see Chapter 4 of this report). In addition to Egypt, this could include the Sudan, Eritrea and Kenya, all of which have significant populations and water demands at or near the coast.

It is also clear that at least some of the co-riparians in the Nile River basin could increase their water utilization efficiencies, especially in the agricultural sector which comprises the great bulk of the water demand. The high *per capita* allocations from the Nile enjoyed by Egypt at present (see above) reflect the profligate use of water in the agricultural sector in that country, which in turn partly relates to agricultural irrigation practices and cropping patterns which could be substantially improved (Rosegrant *et al.*, 2002; Siam and Moussa, 2003).

A necessary condition for the success of any benefit-sharing approach amongst the Nile River co-riparians is to generate a new 'basket of options', based on incentives that are powerful enough to change the paradigm by which water resource management is practiced in contemporary times. Central to this approach is the capacity of the Governments concerned to develop incentives for innovation (social ingenuity, as defined by Homer-Dixon, 1994b, 1996, 2000). It is this 'ingenuity gap' that is hampering our understanding of benefit-sharing, because the parties are attempting to frame complex problems within historical concepts that are incapable of solving those problems.

Turning once again to the specific case of the Kagera River basin, it is notable that certain of the approaches suggested above could be introduced without significantly impacting the two downstream co-riparians that have so astutely concentrated on the development of agreements concerning their own supplies. Thus, for example, it is clear that the savings in water supplies

[46] Presentation by Puri, S. at the World Water Week in Stockholm, 25 August 2005. A cost of US$0.75/cubic metre was cited as an average for developing nations.

created through hydrological adjustments within the basin as a whole (e.g. the transfer of major storage to the Blue Nile; the partial by-passing of the Sudd wetlands by the completion of the Jonglei Canal; more efficient conjunctive use of aquifer systems) could generate new supplies for upstream allocation, without affecting downstream flows. Part of the reason for this is the highly seasonal nature of the surface water volumes, with peak flows being used very inefficiently by all parties (one consequence of this being the argument by Egypt that it may take unused peak flows out of the basin, with impunity). This opens the door to an upstream consideration of out-of-basin transfers, which is a key element in the overall *problématique* of the Nile River Basin.

The potential for enhanced water use efficiencies is also of great importance, as increased efficiencies in the agricultural practices of any of the co-riparians (but especially Egypt) could maintain productivity and the marginal economic value of the agricultural sector, while reducing the heavy sectoral demand for water volumes. This same pattern has been noted for the Jordan River co-riparians (especially in relation to Palestine; see Chapter 4 above), and there are very considerable benefits to be realized through such an approach. One major reason that such an approach has not been taken up to date involves the heavy subsidization of water for agricultural use, which is almost universal throughout the region.

It is notable that the Kagera River Basin offers a unique opportunity in the context of benefit-sharing for a number of reasons. Firstly, there is a history of regional cooperation and institutional development in the Kagera basin, which creates some form of a platform on which future cooperative endeavours can be built. Secondly, given the gross power asymmetries within the Nile Basin as a whole, the existence of an upstream entity that is potentially stronger than the isolated voices of each Kagera sub-basin riparian State alone, is an encouraging factor. Thirdly, the Kagera Basin has a specific history of violence and genocide, raising the stakes for failed attempts at sustainable peacemaking to such an extent that ambitious ventures deserve to be considered by third-party stakeholders. Fourthly, Pike's Law (Turton, 2004, 2005b) can be applied to this case. In essence this proposes that the likelihood of attaining an agreement on water utilization decreases by the cube of the number of riparian States involved. Thus, in complex basins with many riparian States, fragmentation into smaller sub-units is both feasible, and in many cases, this may be the only way to make sustained progress. Finally, there is considerable merit to the argument that benefit-sharing is based on a new paradigm that considers water as a flux, meaning that upstream use (in the form of hydropower, for example) does not necessarily represent a net loss to the downstream co-riparians and can therefore become part of a new positive-sum outcome.

In relation to Pike's Law (Turton 2004, 2005b), the following may also be mentioned. As noted previously, one of the problems created by the histo-

rical agreements in the Nile River basin is that most of them involved very few of the co-riparians, with bilateral accords predominating (and often involving downstream parties only). The Nile Basin Initiative has encountered repeated difficulties dealing with the contrasting attitudes and desires of the ten co-riparians, with a whole-basin agreement (or at least one that would involve specific volumetric allocations) continuing to be elusive. Under this circumstance, it would appear that there is scope for addressing the two major tributaries of the Nile River separately, at least to some extent. While this does not match the accepted wisdom that river basins should be addressed as a whole, it may nevertheless be of utility in this particular case.

It may be concluded here that while the historical agreements relating to the uses of the waters of either the Kagera River basin or the Nile basin as a whole have not led to the equitable and reasonable utilization of the resources as defined by customary international water law, certain opportunities exist which offer hope for the future. These include the following:

- The use of a more holistic approach to water management within the Nile River basin as a whole, which could reduce the present massive losses due to evaporation and would improve the overall level of utilization of the flows, both in the flood period and at other times.

- The development of a more coherent storage mechanism for peak flows on the Blue Nile in particular, as a specific element of the above.

- The consideration of possible hydraulic mechanisms (within the bounds of environmental sustainability) to reduce evaporation in the Sudd, which could benefit either upstream countries or downstream co-riparians (or both).

- The development of desalination at specific sites to augment the available water supplies, where this is feasible and economically justifiable.

- The more efficient use of groundwater (although this would need to be prefaced by more detailed studies of the groundwater volumes which are available, and their relation to surface water flows).

- The introduction of much greater efficiencies in water utilization in the agricultural sector by all of the co-riparians, including a thorough review and reconsideration of irrigation techniques and cropping patterns in particular, and the introduction of greater levels of water and wastewater re-use.

- The adjustment of trading patterns to optimize virtual water flows into

and out of the co-riparians of the Kagera River basin, and those of the Nile River basin as a whole. This could be coupled to the abandonment of political stances relating to the demand for food security, which in any event is illusory at present for States in any form of advanced economic development.

It is notable here that these options available in the Kagera and Nile systems differ substantially from those of relevance to the Jordan River basin. The 'big bang' type of solution proposed by Phillips *et al.* (2006b, in press) for the Jordan River system is unique to that geography, taking account not only of the hydrological characteristics of the basin, but also the long-term political attitudes of the co-riparians and the heavy securitization dynamics in the region. Options for the Kagera and Nile basins represent more of a 'mixed bag', with incremental improvements being available in a large number of distinct areas. This points again to the fact that 'one size does not fit all', and that preferred options for improvements must be developed against the specific backdrop of each basin, taking account of a range of hydrological, political and other characteristics. The following sub-section addressed the situation in the Mekong, and once again options for improvements are unique to that basin.

7.2.4 The Mekong River basin

As discussed in Chapter 6 and in Section 7.1 above, the constraints on future development in the Mekong River basin are of an altogether different type to those in the other two Case Studies addressed in this report. A particular characteristic of the Mekong system involves the existence of a dichotomy of views as to the current status of the Mekong River Commission and its work, extending in many cases to perceptions of the Governments of the co-riparians and their willingness to become fully engaged in the river management process. Table 30 shows these views in outline. It is noted that while the institutional aspect of the Mekong River basin was formerly considered by some authors to have essentially been resolved (e.g. see Jacobs, 1992; Jacobs and Wescoat, 1994), more recent views have been much more cautious (Osborne, 2000: 435), and there has been particular criticism of the level of implementation of the MRC Agreement of 1995. The present report does not seek to pass judgements on these issues, but simply to point to the dichotomies as one important element of the regional discourse in general, reflecting the unusual nature of the securitization/desecuritization dynamics in the basin as a whole.

Classical approaches to watershed management involve the need to address river basins in their entirety, if coherent management practices are to be established. Customary international water law reflects this, as do the guidelines and laws of many States and of bodies such as the European Com-

munity. There are a number of reasons for this, extending from relatively simple issues involving wasteload allocations, through the far more complex benefit-sharing considerations addressed by the present report. Whole-basin management is generally considered essential for all watercourses, whether these are of a trans-boundary nature or otherwise. However, the use of a whole-basin approach has arguably even greater importance in the management of trans-boundary watercourses.

Table 30. Dichotomies in perceptions of the past and present trans-boundary watercourse management process in the Mekong River basin.

Topic of concern	Benevolent view	Critical view
Institutional set-up	Ideal (for the lower basin).	Dysfunctional, not including all members in the basin.
Regional cooperation	Most successful in the south; continued with only minor interruptions since the 1950s.	Stalled. Almost 60 years of preparation for the Master Plan to date, with extremely limited results.
The Existing MRC Agreement	Comprehensive. Based on international legal instruments for trans-boundary water management.	A façade. The Agreement fails to address the fundamental differences between the co-riparians.
Efficiency of the implementation of the MRC Agreement	The WUP, BDP, EP are core programmes of high technical and political sophistication, and are fully underway.	Ten years after the Agreement was signed, very limited progress in its implementation has been made.
Match between equitable and efficient use of the resources	A strong match, allowing for interventions, while containing protective mechanisms for key necessities.	A poor match. In reality, no limitations exist on upstream developments or water utilization.
Match between economic growth and sustainability	A strong match. Major interventions are only carried out if they satisfy the overall framework of sustainability.	A poor match. The key value of ecosystem services for local livelihoods is not recognized, and the upstream co-riparians remain unconstrained.

It is also relevant to note that policies developed within the MRC forum need to be implemented at national levels by the involved co-riparians, and this process has also been found wanting in the past by certain commentators (e.g. Osborne, 2000). The strengthening of the National Mekong Committees within each of the individual Basin States would therefore best accompany any broadening of the MRC as a whole.

The absence of China and Myanmar from real inputs to the Mekong River Commission (and its predecessors; see Chapter 6 and Annex 1) therefore constitutes an important impediment to ongoing attempts to optimize either flow allocations or the sharing of benefits arising from the basin's water resources. The fact that both States are in extreme upstream positions is also

important in this respect. However, this argument should not be over-stated. The average flow contributions of China and Myanmar in combination to the basin constitute about 18% of the total flow (see Table 18 in Chapter 6). This is significantly outweighed by the contribution of Laos alone at 35%, and both Thailand and Cambodia each contribute greater flows to the system (when assessed as a long-term average) than does China.

The general robustness of the MRC Agreement of 1995 also merits consideration. At an unofficial meeting in Kantaburi in Thailand in the autumn of 2004, this issue was discussed by a number of prominent policy makers and long-term observers of the Mekong issue. The general view was that the MRC Agreement as signed in 1995 was 'as good as it could be' at the time, and that if the negotiations had continued, the Agreement would probably have been further diluted. Thus, the MRC Agreement is viewed by many as a framework document for the basin, founded on the emerging international law on shared water resources – and thus recognizing those instruments for regulating international watercourses – and as such, is extremely valuable. However, its remaining controversial points need to be addressed and fully clarified if the Agreement is to be considered truly robust as a vehicle for future progress in the basin. Clearly, the value of the MRC Agreement is hostage to the efficient implementation of its parts. As to the latter, the WUP, BDP and EP are the key processes as discussed in Chapter 6, and it is too early as yet to judge the success of these programmes.

Returning to Tables 25 and 28 above, two aspects are emphasized in relation to security issues in the Mekong River basin. The first represents how national concerns integrate into the overall regional debate. It appears presently that increasingly diverging interests exist amongst the co-riparians on how – and where – to best use the available water resources. If a more comprehensive dialogue is not opened, a conflict between upstream and downstream interests appears inevitable. This will be likely to pit social unrest and proliferating poverty in rural areas downstream, against hegemonic (high-politic) tendencies to drive onwards with large infrastructural developments upstream. However, the interplay between the regional water resources and other aspects of high politics (especially concerning trade relations) seems to offer a glimpse of a positive-sum outcome. Thus, 'spill-over' from increasing regional political cooperation and enhanced regional trade relationships (see Chapter 6) could well benefit water cooperation, which in turn would support the economic dynamism.[47]

If the maintenance of the natural flow regime (and especially the flood

[47] There is a wide range of economic benefits that would interplay with a more collaborative approach to river management, such as increased cross-border trade between China and Thailand or Laos; more effective transportation networks between South-east Asia and China, developing Chinese export and import through Thailand, Cambodia, and Vietnam; and cooperation on such issues as the regional ecology and biodiversity.

pulse) is the critical issue for the Mekong River basin (as argued persuasively by Fox and Sneddon, 2005, in particular), it is clear that the construction of major impoundments – especially on the main-stem of the river – is a critical issue of concern. Even in the absence of comprehensive data and high-quality predictive modelling, it is evident that significant further dam construction in the upstream reaches of the Mekong River basin threatens the overall system integrity, and especially the flood pulse which largely sustains the downstream co-riparians. The fact that China has not engaged fully in the institutional mechanism intended to manage the watercourse as a whole implies that this threat continues. The very fast economic development of China in recent years is inexorably coupled to rapidly growing demands for electrical power, and unless the basin hegemon is brought into the management process as a whole, adverse impacts on the downstream co-riparians appear to be inevitable in the longer-term, at least.

However, China is not alone in this scenario. Laos also wishes to maximize its hydropower potential, and this could again affect the downstream co-riparians markedly. The five dams completed to date within the Laos territory are all relatively small (see Table 23 in Chapter 6), but there is massive scope for increased hydropower development in the country.

The upstream-downstream dynamic and issue linkage characteristics in the Mekong River basin are thus especially clear. If the natural flow regime is eradicated (or even substantively altered), the downstream parties will be heavily disadvantaged due to reductions in the present huge fishery and agricultural outputs, most of which sustain very poor subsistence-level populations. Conversely, the availability of electrical power in the basin is low and constrains future economic development. Under these circumstances (and addressing just these two major driving factors in isolation), it is clear that an optimal compromise would best be sought, with a degree of hydropower development in specific locations, designed to affect the flood pulse as little as may be possible. To reach such a compromise, three specific matters will play in centre stage:

- the hydrodynamics of the system as a whole need to be understood in great detail, with a high-quality predictive modelling capability also being available;

- the basin must be considered in its entirety, with a wide range of options for future hydroelectric generation being compared against each other, again in detail; and

- benefit-sharing scenarios need to be clarified on the basis of the options generated from the above studies, such that all of the co-riparians can gauge whether they are prepared to accept specific scenarios for future development.

In some ways, this process has already been started within the Basin Development Plan (BDP), as noted in Section 6.2.5 of Chapter 6. For example, the MRC has access to significant predictive modelling capability relating to the hydrological characteristics of the basin, and validation of the models continues, improving their utility in supporting policy decisions on the siting of dams. However, the restriction of the BDP to the lower Mekong basin – and its preference in addressing development scenarios in sub-basins – renders the ongoing process questionable. This is because the generation of a consensus based on a holistic vision of the watercourse as a whole (and trading-off various types of benefits available in upstream and downstream locations) is vital, if an optimal solution to the future economic development is to be found.

It is notable also here that benefit-sharing scenarios in the Mekong River basin are of a multi-directional nature in relation to the upstream-downstream dynamic. If the downstream parties wish to retain the benefits of the flood pulse (and this therefore constitutes a constraint on the potential infrastructure development upstream), the upstream co-riparians should be offered benefits arising from this. There are many ways in which this may be achieved, but the creation of a specific trade regime would appear particularly attractive in the circumstances of the basin, as previously implied. This could extend to primary crops – needed by many millions of the mostly subsistence-level populations within the basin – and also to the sharing of hydroelectric power and other forms of benefits arising from the river.

In addition, there is considerable scope within the Mekong River basin for certain of the types of improvements discussed in Chapter 5, relating to the Kagera River basin. Thus, greater water use efficiencies could be introduced in the mid-basin countries in particular (especially Thailand), serving to offset at least some of the effects of potential later upstream impoundments. Further intra-sectoral efficiencies could be sought through crop selection also, at least where exported products are involved (Rosegrant *et al.*, 2002). This would entail moving partially away from the staple rice production (generating huge virtual water exports for Thailand and Vietnam in particular; see Table 21 in Chapter 6) and towards crops which are less 'thirsty' and have higher economic returns. Inter-sectoral allocative efficiencies should also be re-assessed, particularly in both China and Thailand. As shown in Table 21, Thailand is a net importer of virtual water in industrial products, and this emphasizes its under-developed industrial sector, which is capable of generating much higher added value from the available water resources than can be obtained from the agricultural sector.

In summary, it can be seen that this third Case Study shares some of the attributes of the other two examples addressed above, but the admixture of potentially available improvements differs in both scale and 'flavour'. The Mekong River basin is unusual in that *per capita* water availabilities are massive compared to the other two Case Studies, but access to water resources

nevertheless remains an essential component of the livelihoods of a great majority of the populations within the basin (especially those at the subsistence level). Given the huge volumes of water within the system, a balanced development scheme which optimizes benefits for all the co-riparians should be attainable. However, this can only be realized if all six co-riparians are included in the process, and work collaboratively and transparently. This implies that further desecuritization should be sought, with the objective of expanding the Mekong River Commission and strengthening the links between the technical and political processes at work within all six of the co-riparians. A Parallel National Action model again comes to mind as a possible approach, coupled to the strengthening of trade-related ties in particular (especially those with a strong relationship to the basic water resource, such as primary crop production and the generation of electrical power).

7.2.5 Joint water management

One of the four requirements listed in the Terms of Reference pertaining to the "Key issues and questions" for the present study is as follows: *"Build scenarios for development in the river basins, focusing in particular on situating the role of the potential benefits that could be reaped from joint river management."* Scenarios for future development in the three Case Study basins are discussed above, and the potential for the sharing of benefits is also addressed. The present section appends brief comments on the specific issue of joint water management in trans-boundary river systems.

While an argument could be made that the historical management of any of the trans-boundary rivers addressed as Case Studies by the present report has been less than adequate, the case of the Jordan River basin merits particular scrutiny in this regard. The drought extending from 1999 to 2002 triggered a Knesset (Parliamentary) enquiry in Israel, which was highly critical of Governmental attitudes and actions in the water resource sector (PCE, 2002). Amongst other matters, the Israeli Parliamentary Committee emphasized the need to improve the overall management of the regional water resources; the requirement to cease over-abstraction from the Coastal Aquifer (see also Fischhendler, 2006, in press); and the demand for closer monitoring of other aquifers. The Parliamentary report was ignored by the Sharon Government in Israel, largely to spare condemnation of the agricultural lobby (Feitelson, 2002).

In keeping with themes developed in the present report, it is argued here that joint water management is not a panacea for developing a sustainable approach to the use of shared water resources. The management of regional water resources would best reflect holistic visions of preferred development patterns (and also optimal scenarios for benefit sharing, where these can be developed). Where watercourses are of a trans-boundary nature, some form of joint management is preferred, but this should be seen as a component of

holistic strategies and systems, rather than a key driver of the same. In trans-boundary basins, a political consensus must obviously be shared with the co-riparians, and the comments in section 3.2.2 of this report on approaches involving Parallel National Action are again potentially of relevance if the thorny issue of sovereignty is to be addressed.

In practical terms, the distinct forms of joint water management need to be considered, and preferred solutions again vary between the basins concerned. In certain cases, co-riparians favour narrowly-focused entities, which seek merely to confirm agreed volumetric allocations of water to the parties. This is the approach preferred to date by at least the Palestinians in the Jordan River basin, and reflects the fact that the co-riparians have little or no real interest in sharing benefits, but a primary interest in ensuring that any agreed volumetric allocations are received in full. Such an attitude is typified by Israel's refusal to recognize Palestinian water rights and accept equitable allocation of the available resources, even though this could generate an economically positive-sum outcome through the trading of low-cost agricultural produce from Palestine to Israel. The Kagera system offers an example of the other extreme, where the Kagera Basin Organization (KBO) was afforded an exceptionally broad mandate upon its establishment, as discussed in Chapter 5 and Annex 1. The attempt in the Kagera basin clearly reflected a wish to optimize shared benefits from the river, as a point of departure. Its initial failure is generally considered to be attributable to the consequences of the broader ethnic conflict in the region, rather than any fundamental weakness in its conceptualization. The Integrated Kagera River Basin Management and Development Project presently being developed by the World Bank in partnership with its regional counterparts appears likely to be of considerable future significance, and has retained a broad mandate (see Section 5.1.2 of this report). This is considered appropriate from a policy perspective, given the intimate link between the allocation and utilization of the trans-boundary water resource in such a geography.

In the Mekong River basin, joint water management effectively only exists between the four downstream co-riparians, and it may be argued that even this occurs only in a semi-formalized fashion (see Table 30 above). As noted elsewhere in this report, the absence to date of official inputs from China and Myanmar to joint management of the Mekong provide an obstacle to the development of truly holistic views of the system, and increase the potential for unilateral decisions in the future (particularly by China) with the possibility of major adverse effects on basin-wide productivity and/or benefits.

Once again, therefore, it is clear that "one size does not fit all" (see also Section 7.1.3 above). It may be argued that joint management in some form is an essential component of the sustainable development of trans-boundary waters – and where successful, should also resolve nascent disputes amongst the co-riparians, hence reducing levels of conflict. However, the preferred

type of management forum differs greatly from basin to basin, according to the specific preferences of the co-riparians.

7.3 Implications of broader relevance

The analysis above shows that the three categories utilized in the theoretical model discussed at the commencement of this chapter cover most or all of the critical aspects of relevance to trans-boundary watersheds. Importantly, all of the categories have unique applications in each of the basins addressed here as Case Studies, and the same would clearly be the case for other trans-boundary watercourses also. Thus:

- In certain cases, security issues are predominant and this heavily influences any attempt at bringing the co-riparians to a mutually beneficial conclusion (e.g. as in the Jordan River basin). In such scenarios (and where attempts at desecuritization have been unsuccessful), the benefits must be packaged in such a fashion that they become acceptable within the existing political scenario. The 'big bang' option proposed by Phillips *et al.* (2006b, in press) was generated with this in mind, and is intended to be sufficiently seductive to all five co-riparians of the Jordan River that differences over other issues may be placed to one side, during its consideration. It is notable in this case that international actors will have a critical role in bringing the co-riparians to the negotiating table and offering linked benefits (finance for the involved infrastructure, and other types of support). However, the drive for a peaceful solution to the Middle East conflict (and especially that between Palestine and Israel) is exceptionally strong, and international political will therefore exists in some abundance.

- The importance of economic parameters again varies between different basins, and also to each of the co-riparians within a given basin. While all States display a general desire for economic advancement, the routes this can take vary significantly in each instance, and benefit packages must therefore be tailored with care to each co-riparian within a basin. Thus, for example, such packages would be likely to be centred around water availability *per se* in the Jordan system because of the reasons noted above and elsewhere in this report. However, this would not be the case in most other systems (as the securitization dynamic is usually weaker, and other Governments are commonly interested in a range of potential benefits). The remit for the Kagera Basin Organization at its initial establishment reflects this especially well, and the ongoing attempts to re-establish a similar body within the broader framework of the Nile Basin Initiative are again addressing

a broad package of benefits. In such circumstances, 'trading water for other benefits' becomes altogether feasible, and the principle challenge lies in broadening the basket of available options and determining an equitable division of the various types of benefits. In the Kagera system, it is clear that such a process should not only derive an optimal benefit-sharing solution within the sub-basin, but should extend this to the Nile River basin as a whole. The possibility that large systems such as the Nile basin should be considered alternately *in toto* and by sub-basin is again noted.

- Some trans-boundary watercourses have unique environmental characteristics which demand precedence where economic development scenarios are being generated or considered. The flood pulse in the Mekong River basin provides one such example, but there are also important environmental characteristics within sub-basins in other catchments (e.g. the wetlands in the Kagera basin and the Sudd in the Nile system; also the delta in the Okavango River basin discussed elsewhere in this report). In at least some of these cases, there is a clear requirement for the maintenance of specific attributes of the systems concerned, often in a relatively pristine state. This does not, however, imply that economic development cannot take place – simply that it should rely on other options. For example, the largely unspoiled areas within the Kagera River basin (such as the Kagera National Park and the Minziro-Sango Bay forest ecosystem) merit sustainable development for tourism, with very considerable possibilities for foreign earnings. Rwanda has already begun to take advantage of such possibilities in the Virunga National Park and elsewhere, and the global thirst for ecotourism is such that these areas offer very great potential for enhancing livelihoods and the economic benefits available to the indigenous population. There can be little doubt that the same principle holds true in at least the southern reaches of the Mekong River system, and the co-riparians involved would do well to consider all possible options to enhance the utilization of the available water resources, to optimize their economic returns (such as has largely already eventuated in the Okavango River basin). Thus, even the maintenance of pristine conditions (with little or no 'classical' development of large impoundments or industry) offers very significant possibilities for income generation and improvements in poverty.

Three other matters of generic relevance to trans-boundary basins should also be emphasized here. The first of these relates to their hydrological characteristics. All trans-boundary basins display complex hydrology, often with very considerable variations in flow both within and between years. The capturing of peak flows and their optimal use remains a key technical challenge

in many such watersheds, and the use of major impoundments is not always the preferred solution. Even where these may be desired as a means of maximizing water availability through distinct seasons, the choice of preferred location for major dams is a deeply challenging exercise. As noted previously for the Nile River basin, very considerable net improvements in water availability may be attained with the optimal location of such structures. However, decisions on such matters tend again to be driven by high politics, and basin hegemons are commonly successful in determining preferred outcomes. The present report suggests that a much broader view should be taken of such matters, with decisions on major impoundments taking account of effects on the sharing of the water resources between all co-riparians (both upstream and downstream of possible sites), and the potential for sharing other benefits also. Hydroelectric power is an obvious linked benefit (and electricity can be transmitted over large distances with few losses, by contrast to water), but other important linkages also exist. Thus, for example, any agreement by the upper co-riparians in the Nile that Egypt may utilize the peak flows downstream should garner significant benefit to the former parties – but this is not the case at present. The positive-sum outcome available between Israel and Palestine relating to water and the production of food again comes to mind, and it is clear that the desecuritization process is once more critical if such outcomes are to be attained.

Secondly, it is notable that both intra-sectoral and inter-sectoral allocative efficiencies are of great importance in determining the overall scale of benefits attained from trans-boundary watercourses. Israel has made significant strides in relation to water efficiency in agriculture, more than doubling its agricultural output *per* unit volume of water through the last three decades (Sheskin and Regev, 2001). Bizarrely, however, Israeli agricultural practices have taken little account of the virtual water content of crops, and crop selection remains inappropriate in many areas as a result. In addition, the Israeli establishment continues to provide precious regional water resources to the agricultural sector at about 10% of cost, and such massive subsidies simply lead to the unsustainable utilization of the resource (PCE, 2002). Practices in Palestine are no better, but for different reasons connected to an inability to access front-end investment to introduce water efficient technologies, and an adherence to historical cropping patterns which do not maximize economic returns *per* unit volume of water. Attempts to change the historical methods have been largely unsuccessful, the farming community being especially heavily averse to change. Such attitudes extend to Governments also in relation to inter-sectoral allocative efficiencies, with rhetoric on 'food security' being particularly evident. As shown in Chapters 4 and 5 of this report, the notion of food security in both Israel and Egypt is altogether illusory, and yet the ongoing political rhetoric relating to the agricultural sector remains dominated by the concept (with Palestine and Syria also commonly citing such a demand).

The issue of inter-sectoral allocative efficiencies is tied closely to virtual water flows, and this represents the third issue of general importance in trans-boundary watercourses. As noted previously, virtual water should not be viewed as a panacea for water-scarce regions, in part because the importation of foodstuffs requires foreign currency, and some of the poorer nations have very limited access to such reserves. Nevertheless, it is clear that a deeper understanding of virtual water flows would be beneficial for certain States, and there is clear scope for the integration of this matter into philosophies and strategies for future economic development. The further reduction in trade barriers through ongoing efforts of the World Trade Organization would obviously also be of benefit in alleviating poverty amongst communities and populations relying mainly on subsistence-level agriculture, and this provides an indication of the breadth of holistic vision required to develop optimal solutions for the efficient use of trans-boundary water resources. If future economic development is to be optimized (and any chance is to exist in attaining certain of the Millennium Development Goals, for example), the preferred solution for water-scarce States will reflect a unique blend of allocations to achieve the maximum degree of inter-sectoral allocative efficiency, taking account of possibilities for virtual water trading, and the economic returns available from the use of water in each of the sectors. The development of a deeper understanding of this topic as a whole is a matter of urgency, as populations in water-scarce regions continue to grow rapidly and the enhanced demand for domestic supplies of fresh water further constrains its availability for the 'thirsty' agricultural sector on which so many of the poorer nations have relied, to date.

Chapter 8: Addressing the remaining issues

Most of the issues raised by the Terms of Reference for the present study have been covered in the previous sections of this report. This chapter provides additional comments in the following outstanding areas:

- the three key questions raised in Section 3.5 are reassessed, offering further information on key points of relevance to trans-boundary waters, conflict, the sharing of benefits and regional integration;
- securitization and desecuritization issues in trans-boundary basins are reviewed once again, in the light of the Case Studies and other information; and
- comments are provided on the role of international financial assistance in trans-boundary basins.

8.1 Reprise of the three key questions

As noted in Section 3.5, three key questions exist when it comes to the sharing of benefits of potential relevance to trans-boundary watercourses. These need to be addressed in greater detail from a policy perspective in order to develop an understanding of the type of leverage that can be exerted by external third-party actors (see also Section 8.3 below).

8.1.1 Question 1: Is water resource management an independent variable?

Having shown that water resource management is seldom (if ever) an independent variable, it becomes necessary to 'unpack' the specific role that it can play in a benefit-sharing scenario. It is argued here that while water resource management is not a sufficient condition for economic growth and development, it is a necessary condition. Thus, while water resource management is not an independent variable in its own right, it is certainly an interceding variable, which means that policy-makers need to be creative in the manner in which that they understand the process, if they are to optimize the potential of possible benefit-sharing scenarios.

One of the complexities associated with the cause-effect linkage arises from the fact that water is fugitive in nature, moving through the landscape and biosphere over space and time. Human beings tend to be comfortable thinking about water as a stock, with a given value. In reality, however, water is a flux – moving, expanding, shrinking, and remaining elusive to the whims of human ingenuity when applied in the form of engineering solutions. The

consideration of this phenomenon has been attempted in some of the literature on benefit sharing. For example, Klaphake (2005) looks narrowly at the benefits arising from specific engineering-related projects, adhering to those elements that can be easily measured. This analysis is overly simplistic, however, even if it is empirically verifiable in a narrow sense. A bolder effort is found in the work by Claassen (2005), where the notion of benefits is linked to the overlap between ecosystems (as defined by watercourses) and economies (as defined by provincial borders). Using the ECO^2 Model as a tool, Claassen (2005) and his team have derived common currency between ecosystems and economies by measuring the absorptive capacity of the former when acting as sinks, and the remedial costs of the latter when applying technologies to remove pollution loads from return flows. This approach provides some form of understanding when considering trade-offs. It views ecosystems as having a measurable and therefore finite capacity to absorb shocks (such as pollution loads), and quantifies these by allocating each user a potential (reasonable) slice of the overall 'resource cake'. Stated differently, the ECO^2 approach can be developed further to understand benefits arising from the accrual of mitigation costs and potential utility, and then interrogating the model by changing known values. The ECO^2 experimental approach is currently being considered for a larger and more complex study during 2006 in the Blesbokspruit and associated aquatic ecosystem in South Africa, at which time it will be refined beyond the current version. The effect of this approach in terms of a benefit-sharing model is profound, and includes the following:

- First, some understanding starts to arise from the linkage between cause and effect. This immediately assists in focusing the mind of decision-makers around a limited range of possible future scenarios.

- Second, the volume of the 'different voices' in each contested scenario can be accurately gauged by verifying the real relative impact of a change in future positions. For example, in the case used to test the ECO^2 model, the 'voice of the tobacco industry was generally very loud', but closer examination showed that an increase in salt load that would decimate the tobacco industry in a specific basin, would in fact result in many orders of magnitude more jobs in other parts of the local economy. This factored the tobacco industry out of the equation, greatly reducing the level of 'noise' in the system, and then allowed a more meaningful debate to take place around more viable options, such as increasing the allocation of water to other types of industry. It also allowed a quantifiable figure to be generated as a possible starting point for negotiations with the tobacco industry representatives regarding potential compensation for losses. However, these issues are always sensitive and of necessity complex, so the tool alone is not

capable of resolving the matter of compensation. Nevertheless, it has the capability of informing a negotiated process that can lead to a fair and equitable allocation of a contested resource by generating a point of departure in a future strategic trade-off scenario.

- Third, once specific issue-linkages are established, the approach allows for a basket of possible trade-offs to be developed. This shifts the problem from the specific watershed, into the strategic domain of the 'Problemshed' as discussed earlier (Allan, 1999; Earle, 2003). In turn, this facilitates a dialogue of benefit-sharing to take root and become viable.

- Fourth, the very process of engagement between key stakeholders changes their own perception of reality. This fosters learning, and serves to shift the dominant mode of thinking away from securitization (which is based on threat perceptions arising from other sources which become linked to water management) to desecuritization, which is based on buy-in to a belief that cooperation *per se* generates a positive-sum outcome by providing accelerator processes through which benefits can be leveraged further. This is the foundation of positive-sum outcomes.

- Fifth, confidence is built between previously hostile and antagonistic stakeholders (which commonly takes the focus of Government). The possible suspicions that individual stakeholders might have based on historic experiences are defused, and this reduces them to less hostile perceptions.

- Sixth, the process of institutionalization is boosted, as the new data become legitimized and the processes by which those data are processed into useable format become streamlined and better understood by those that will be most affected by the decision-making process. Institutions are almost always more durable than individuals, so institutional strengthening starts to factor-out the potential role that belligerent gate-keepers can play in continuing to securitize water resource management.

- Finally, institutions are needed if benefit-sharing is to occur as a legitimate economic transaction. For example, consideration being given by downstream Botswana in the Okavango Basin to pay upstream Angola for *not* developing the resource would require an institutional mechanism to calculate the compensation, and to monitor and ensure payment. The same principle is relevant to possible compensation to upstream States, relating to out-of-basin transfers by Egypt close to the terminus of the Nile River basin.

8.1.2 Question 2: What role can water management play in regional integration?

As suggested previously, probably the best example of water resource management as a driver of regional integration is found in the Southern African Development Community (SADC). When South Africa joined the SADC in 1994, the very first Protocol that was signed in terms of the SADC Founding Charter was the Protocol on Shared Watercourse Systems (Ramoeli, 2002: 105). This became the foundation for regional economic integration within SADC, much like the Coal, Atomic Energy and Steel agreements that underpinned the European Economic Community in the early days of the European Union.

This example shows how water resource management can play a major role in developing the foundation on which the future economic growth and prosperity of an entire region can be based. What is significant about the SADC case is that in the darkest days of the regional conflict, even when military conflict was being waged in specific river basins, cooperation still occurred between water resource managers (Turton, 2005b). This means that the River Basin Organizations (RBOs) that exist presently have withstood the dual test of fire and time. Having emerged from such a baptism, these RBOs can now serve as robust institutions that facilitate inter-State contact, while developing platforms through which scarce water resources can be used optimally between all stakeholders.

This is important in the context of the current study, where it can be argued that the Kagera Basin Organization (KBO) was founded on a core vision that created an institutional entity and a shared heritage that might be robust enough to revive. The consequence of such an effort could be enormous in the context of benefit-sharing, not least concerning the role it could play in addressing the gross asymmetries of power within the Nile Basin as a whole. The riparian States to the Kagera River basin would certainly be collectively more powerful in negotiating with Egypt and Sudan, than each would be on its own. This provides a strong incentive for the Kagera sub-basin riparian States to cooperate in the first place. Similarly, Egypt and Sudan could expect more reliability in terms of adherence to any agreement reached with a stronger and more robust regional entity such as the KBO (in a reinvigorated guise). This scenario becomes inherently positive-sum in configuration, and therefore deserves to be explored in greater detail.

8.1.3 Question 3: How is benefit-sharing manifest, and therefore measurable?

Having noted in Section 3.4 that benefit-sharing is of necessity embedded in a larger set of bigger external issues, benefit-sharing becomes the outcome of a process of issue-linkage. Arising from this by a process of extrapolation,

three broad sets of benefits start to become apparent as key motivating factors for decision-makers:

- **Security** is a fundamental issue with a number of scales. This means that security, in and of itself, is an issue that underlies the very existence of human civilization. Insofar as water resource management can provide a platform for that civilization (by reducing uncertainty and increasing the assurance of supply needed to unleash the multiplier effects of good human health, stable economic employment and a belief in some future prosperity that motivates most human beings), this should be understood as a high-order potential outcome.

- **Economic development** is a driver of human cooperative spirit, and underpins any notion of security that informs the larger setting in which people find themselves. If a population is gainfully employed, they have more to protect and therefore are less likely to venture into antisocial behaviour. Similarly, if wealth is spread in society in a reasonably equitable fashion, then the incentive for criminal activity is reduced.

- Both of the above elements are nested in the **environment**. By providing security of access to environmental resources, threat perceptions are allayed and desecuritization processes can start to gain acceptance. Similarly, humans are part of the environment, sustaining livelihood from it, but also impacting on it. Thus, the environment as a sink translates into thresholds of sustainability, and protection of the environment becomes a specific management objective that in and of itself can start to drive the type of cooperative spirit that underpins any form of benefit-sharing. There is a requirement to determine cause-effect linkages, developing a sound understanding of thresholds beyond which specific sets of variables become non-linear in their relationship. Similarly, the notion of the environment as a future renewable resource can be considered to underpin concepts of sustainable development. Finally, environmental health translates to good human health, specifically for poor and marginalized communities that are highly dependent on ecosystems for their livelihoods and basic food security. All of these become high-order outcomes that are benefits in their own right, easy to quantify and therefore possible to 'sell' to negotiators as components of a larger basket of benefits accruing from a positive-sum approach to the problem.

These three elements – security, economic development and the environment – can be thought of as underpinning a scheme of regional development that embraces benefit-sharing as a core principle. This scheme can become a basic framework for future conceptualization of benefit-sharing in the water

sector and can be called the WEALTH scheme, which in its simplest form can be depicted as follows:

Water sustains all forms of biological life and as such becomes an enabling factor;
Energy is needed to provide livelihoods and to sustain a modern economy;
Access is needed to financial institutions, justice, markets and resources;
Land is needed to underpin human livelihoods;
Technology that is appropriate is needed to convert resources into livelihoods; and
Health of both ecosystems and biological organisms is an output of benefit-sharing.

Within this context, it is important to note that institutions are important. Benefit-sharing would be impossible without robust institutions, and this is where the Parallel National Action approach becomes valuable (as noted previously). By focusing on institutional strengthening, the dynamics of de-securitization are fostered. This results in institutional learning, as problems are re-defined and issues are linked over time. By developing redundancy, the role of individual gate-keepers is factored out of the overall equation of inter-State relations. By fostering coordination and cooperation, wider ranges of possible solutions are developed, making for a 'bigger basket' of potential benefits to be shared.

8.2 Securitization and desecuritization: Resolving the 'water-security dilemma'

The desecuritization of water-related issues should focus on three core variables of the process of water-sharing: interests, power and rights. The identification of the core interests of the various actors provides both a direct and indirect measure of the entanglement of water-related and security issues. An actor has an intrinsic interest if it values agreement on an issue *per se*. The interest becomes instrumental when placed in relation to major collateral or future advantage.

Some actors also have an intrinsic interest in delineating a lasting settlement to the hydraulic issue – sometimes involving both the search for water and food security – while others will seek to satisfy wider strategic interests tied to regional security. The contrasts between each of the three Case Studies addressed by the present report are again evident here. In this particular context, issue-linkage may be used tactically by parties by adding issues ('changing the game'); including direct and indirect actors on the agenda ('party arithmetic'), or within a process of securitization of all issues in generating a 'power-security dilemma' (Buzan, 1991; Buzan *et al.*, 1998: 132).

Such tactics may either 'win the game' for a hegemon, or may alternatively allow the downstream or weaker co-riparian to 'narrow the power gap', thus bringing the upstream or stronger riparian to at least a minimal agreement (Daoudy, 2005). This process can also be conceptualized as 'tactical issue-linkage' (Haas, 1980).

The securitization of water-related issues (linking water to national security concerns) is of a dual nature, with threat perception as a key variable because of its capacity to link issues of national security with perceptions of growing water scarcity (Turton, 2003a; 2003d). In such scenarios, regional instability is generally increased, but short-term cooperation over water may in fact be promoted. One illustration of this is represented by the dynamics between [downstream] Syria and [upstream] Turkey in the Euphrates Basin. The issue-linkage made between water sharing and the upstream country's security concerns over Kurdish insurgency brought the two riparians to a minimal agreement on water allocation in 1987 (Daoudy, 2004). However, since agreements of this type tend to be bilateral (ignoring other co-riparians) and are therefore at least somewhat unstable, downfield cooperation tends to be limited.

To have useful effect, the process of desecuritization therefore needs to be more geographically inclusive, and needs to focus on threat perceptions as a critical interceding variable (Turton, 2003a; 2003b). This requires addressing the asymmetry inherent to most water conflicts, but also understanding the way in which issue-linkage occurs through the mechanism of threat perception. One way forward would be to address water rights, but the prognosis for the success of this approach is limited if the role of threat perception as a mechanism of issue-linkage is ignored. The attainment of water rights (i.e. the equitable and reasonable utilization of the common water resource within a basin), has constituted the heart of the gradual process of codification of customary international water law, over many decades. This process led to the adoption of the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses (United Nations, 1997). The objective of the General Assembly of the United Nations in this instance was to promote harmonious practices of water management between upstream and downstream co-riparians, with a view to preventing unilateral abuses and the eruption of conflicts. This Convention has not as yet been ratified by a sufficient number of countries to enter into force as international law. It has, however, crystallized customary rules with relation to State behaviour, allowing riparians to appeal to this body of rules as enforceable international water law. It is argued here that the 'water rights approach' is critical to some trans-boundary basins, as the securitization dynamics do not allow anything other than agreement on specific volumetric allocations, which can be easily monitored and verified. In other basins, the partial desecuritization dynamic allows a much broader consideration of volumetric allocations alongside benefit-sharing scenarios. Solutions must

therefore be sought on a case-by-case basis, taking account of the securitization-desecuritization scenario. The Inter-SEDE model provided in Chapter 7 of this report provides an initial framework for such an approach.

Other parts of the present report have also emphasized the importance of robust regional and international institutions in providing much-needed infrastructure for the promotion and coordination of benefit-sharing. Strong institutions can also act in a major role in promoting economic growth and stability (Turton, 2003d: 91). The process of desecuritization can hence be supported by emerging legal rules and norms of State behaviour, which can be enforced both internally and externally. However, it is again cautioned that the preferred institutional set-up and dynamic varies from basin to basin, according to a range of factors (see Section 7.2.5).

In concluding here, it is noted that preventing or reducing water conflict should constitute a core objective of policy-makers in the water community. In order to achieve this, we need to understand the dynamics of issue-linkage, of which threat perception is but one element in a complex array of factors. We now see a clear global trend towards the securitization of water-related issues, specifically where a prevailing threat perception allows such issues to be linked to fears of national survival, thereby unleashing the process of securitization which eventually leads to zero-sum outcomes which are not conducive to any possible benefit-sharing approach. In general terms, States will commonly tend to employ strategies to improve short-term gains, rather than engage in cooperative efforts towards the attainment of long-term solutions, and a comprehensive settlement is therefore not realized. This process of securitization occurs in stealth, and can lead to increased long-term instability between States, outweighing any immediate short-term benefits that individual parties may enjoy. Durable and peaceful relations between States require that benefits are shared, as only then can sustainable and equitable practices be realized.

8.3 The role of international financial assistance

8.3.1 The paucity of stated policies

Giordano and Wolf (2003: 166) have claimed that *"[t]he past decade has witnessed a perhaps unprecedented number of declarations as well as organizational and legal development to further the international community's objective of promoting cooperative river basin management."* Against this, the present authors consider that at the purely policy level, trans-boundary water management appears caught between the *Scylla* of general neglect, and the *Charybdis* of blind faith in its ability to rescue international politics from its frequent crudities. Hence, after three decades of struggling to attain a place on the global policy agenda, cooperation over trans-boundary waters is now touted as a means of promoting peace and development in otherwise trou-

bled regions (Development Forum/DES 1998; Giordano and Wolf, 2003; World Bank, 2004c: 39).

However, coherent policy development relating to interventions by the international community in trans-boundary waters is sparse, at best. Over a decade after the recognition that the lion's share of still-available freshwater resources is to be found in international watercourses (e.g. McCaffrey 1993: 92; *cf.* Conca, 2006), most international financial organizations and bilateral donors have no specific policy for addressing *international* watercourses *per se*. It is acknowledged here that the primary actors in international river basins are sovereign States, and that decisions on water allocations or the sharing of benefits should be made between those States, which perhaps places external actors in awkward positions with limited legitimacy. However, there is an evident willingness on the part of international bodies to assist – witness the very considerable input of the World Bank and the UNDP particularly in at least two of the Case Studies addressed here (and many other trans-boundary watersheds), and the sustained interest and input over more than three decades from the Swedish authorities (see Chapter 2 of this report), to cite but two examples.

The existing policy statements from possible non-Governmental candidates which might contribute to trans-boundary water-related issues (the World Bank, UNDP, the World Water Council, Green Cross, UNESCO, UNEP, etc.) all recognize the need to address trans-boundary issues. However, none of these statements addresses the key issues relating to trans-boundary water management, or proffers a solution to the more intractable issues embedded in such work, as discussed in previous chapters of the present report. For example, in its recent *Water Resources Sector Strategy*, the World Bank (2004c: 12) stated that:

> *[Water] can be a major catalyst for cooperation at all levels – even economic integration. Experience has shown that cooperative programs for water resources have been important to regional integration and stability…. Water management is moving from being just a local issue to being a national and an international issue, requiring new approaches to financing, dispute prevention and resource management.*

However, the report mentions trans-boundary issues in passing, in two places only in its overall length of 74 pages. Despite the statement that *"[t]he World Bank is increasingly asked to facilitate and support cooperative management of international water resources"* (World Bank, 2004c: 70), there is no discussion of trans-boundary issues in their own right, nor is any policy offered on how (or when) to address these types of issues. To the contrary, the report excels in discussing economic sectors and Case Studies outlining plans on national levels.

There can be no doubt that *ad hoc* work by several entities with individual basins (e.g. the World Bank in the Nile Basin Initiative, the Kagera River basin and elsewhere; various bilateral funding organizations in the Jordan River basin; the UNDP in the Nile and also the Kura Basin in South Caucasus) has been of significant value, but there is no coherent policy vision on which this rests. This appears to represent a step backwards from previous rather loftier ambitions regarding interventions in international watercourses (e.g. see Kirmani, 1990; Rangeley, 1994; Kirmani and Le Moigne 1997; Caflisch, 1998; Salman and Boisson de Chazournes, 1998). In line with this, OED (2002: 9) stated that:

> *The [World] Bank's considerable comparative advantage in areas central to achieving its poverty alleviation mission – its multi-sectoral capacity, analytical expertise, and in-depth country knowledge – is under-exploited. The Bank's ability to mobilize resources, in contrast, has been very important to the development of new programs. More rigorous processes to ensure appraisal, fiduciary, and other monitoring and evaluation functions, only some of which are now in place, will help enhance quality.*

In relation to concerns at the national level as opposed to attempts to address the more complex and intractable trans-boundary issues, Cook and Sachs (1999: 442) have noted the following:

> *International Assistance programs are mostly directed to national governments rather than supranational entities.… this pattern is partly the result of the charters of aid-granting institutions, both at the international level (for example the IMF and World Bank) and at the national level (for example, donor agencies in high-income countries). It is also the result of the fact that the political weakness of regional bodies becomes self-fulfilling. Donor agencies do not give to 'weak' regional bodies, and as a result those bodies do not gain strength, capacity and financial viability.*

Giordano and Wolf (2003: 170) added fuel to this fire by concluding that:

> *Many international basins still lack official cooperative management frameworks, and even where such structures are in place key components crucial for long-term success are frequently absent. With a knowledge of these weaknesses, however, the international community together with basin states have an opportunity to better focus on the specific institution building needs within the world's international river basins and thereby promote stronger, more resilient water management networks.*

It therefore appears that international financing would best focus at least part of its effort on trans-boundary water resources *per se*, and specifically on the institutional aspects. This is part of the approach of the World Bank in the Kagera River basin at present, and is to be applauded. However, within such frameworks, basin States must contribute real political will, and be prepared to compromise in an open-handed and transparent fashion, if either equitable resource allocations or benefit sharing (or both) are to be fully realized. The task for the external actors is a delicate one, as it should constitute catalysis rather than domination; and should ensure that the sovereignty of basin States remains unimpeded.

One of the most interesting recent developments regarding the position of international financing institutions and some bilateral donors involves the discussion on 'global public goods'. While this suffers to some degree from its 'trendy image' and threatens to become a mantra for certain parties (as did the 'sustainability' concept some years ago), the approach has some merit. Thus, to the extent that water scarcity and water conflict are recognized as a common concern, sound trans-boundary water management may be envisaged as a 'global public good', i.e. it not only benefits the directly affected parties (the co-riparians), but also the international community as a whole. Viewed in this fashion, the international community has an obligation to develop (and seek general recognition for) a preferred policy and approach for supporting trans-boundary water management. Some commentators extend this to the area of international moral responsibility, at least in the case of particular conflicts concerning trans-boundary water resources (see Frederiksen, 2003a, 2003b).

Generally, international interventions attempt to provide three pillars (with varying emphasis) to assist in trans-boundary watersheds: (i) technical competence and best practices; (ii) assistance in negotiation and mediation skills, including the provision of legal and other experts in the water sector; and (iii) the facilitation of investments in trans-boundary settings. All seek to achieve this from an 'authoritative' position where common norms and standards can be developed and subsequently utilized. The World Commission on Dams (WCD) managed to a large extent to produce a consensus on water management across a broad spectre of actors (WCD, 2000). SKVD (2005) has recently built upon this effort, and some form of consensus on major infrastructure projects and the means by which they may be legitimized appears to be emerging. It will be important in the near future for all financing institutions to consider such initiatives, and to 'speak with one voice' on the matters.

It is also notable that on some occasions at least, financing entities may need to act as 'referees' in trans-boundary basins, if equitable outcomes are to be attained. This is particularly the case where basin hegemons have either previously attained positions of unfair dominance, or are attempting to do so within the framework of an ongoing scenario receiving external assistance.

The need for riparians to acknowledge that the *status quo* is not necessarily the best starting point for negotiations on equitable and reasonable use is important in such circumstances, especially where basin hegemons have reserved more than an equitable allocation through previous agreements or other means. Two of the three Case Studies addressed here fall into this scenario, although the hegemons involved in each case have used somewhat distinct tactics to attain their present dominant position. In such instances, external financing entities face a challenging task, this involving balancing their powers of persuasion to ensure an equitable outcome, against the possible perception of the riparians of intereference in their State sovereignty. It is notable that the increasing strength of customary international water law over time provides legitimacy to attempts by an enxternal financing party to persuade intransigent hegemons of a preferred course of action, although it is very important that the external parties act consistently and in accordance with established international standards and approaches.

Several parties have proposed the establishment of a body with international responsibilities for addressing water-related topics, including trans-boundary watersheds. Calls have been made for an 'International Shared Water Facility'; an 'International Water Cooperation Facility'; a 'World Commission on Water, Peace and Security'; and a 'Water Mediation Facility' (ODI and Arcadis, 2000; van Steenebergen, 2001; Robertson, 2004: 10). None of these initiatives has borne fruit, as yet. However, the urgent need for a more coherent approach is clear, the World Bank (2004: 42) suggesting that global funding should increase from US$70 billion/year to US$180 billion/year in order to ensure that water-related goals established for the year 2015 may be met. As much of the water involved is in trans-boundary basins, these will remain a focus of efforts in the near future.

8.3.2 Proposed keys to future approaches to international assistance

The present authors suggest that five specific keys exist in relation to future financial assistance programmes relating to trans-boundary waters. These are outlined below.

[1] The need to elevate the acknowledged importance of trans-boundary waters: As discussed previously in this report, trans-boundary waters are of critical importance to developing nations in particular. If poverty alleviation is to remain a major target of international assistance, international financial institutions (IFIs) and bilateral donors must accept the need to tackle the topics addressed in this report, and must elevate issues concerning trans-boundary watercourses on their policy agendas (and as noted in the previous sub-section, ensure that such policy agendas are both comprehensive and transparent in this respect). The global public good argument as outlined above provides additional justification for this step, if such is needed.

[2] The need for long-term commitment: The coherent management of trans-boundary watercourses cannot be introduced over short time periods, in any geography. Activities such as encouraging desecuritization, addressing sovereignty, and building trust amongst co-riparians require significant time, with long-term external support. Even in basins such as the Mekong River (where external support has been available for most of a five decade period, to date), much remains to be achieved. It is not sufficient (or appropriate) for IFIs or bilateral donors to 'dabble' in these issues, as this is generally counter-productive.

[3] The need for a consensus-based approach by external parties: It is common for IFIs and bilateral donors to work from distinct agendas. Whilst to some degree this is unavoidable, it is also often counter-productive and in some circumstances major threats to coherent progress may be perceived. The scenario discussed here of the divisions between the Mekong River Commission and the Greater Mekong Sub-region program (see Chapter 6 above) offers one example where a long-term commitment by several bilateral donors may be contradicted or even undermined by a separate IFI-driven effort. The inability of the various parties to address these contradictions to date constitutes a real threat to the long-term sustainable development of that watercourse.

[4] The need for a holistic vision: The consensus to be derived amongst the international parties as described above should be based on a broad and holistic vision of the preferred pathway for future economic development within specific trans-boundary basins. The classical approach involving Integrated Water Resource Management is coming under ever-increasing scrutiny, and the present authors believe this to be much too narrow a focus to act as a coherent platform for future economic development in trans-boundary basins. The use of the Inter-SEDE model as described here can assist in first-order decisions as to how the development potential of specific trans-boundary basins may be realized.

[5] The need for true collaboration, with top-level commitment: Many international assistance programmes relating to trans-boundary waters are touted as collaborative efforts between one or more external funding organizations and the involved co-riparians. However, it is acknowledged by some commentators at least that this is often not the case, and co-riparians frequently 'tell the donors what they want to hear' in order to continue to receive financial support for the continuation of programmes which may lack real political commitment. In such circumstances, the external funding organizations may become part of the problem, rather than an element of the solution. Top-level political commitment must be sought from the co-riparians to circumvent such scenarios, and the IFIs and donors should seek catalytic roles, rather than attempting to drive the process as a whole.

Finally here, specific comment is merited concerning the standpoint of Swedish international assistance for issues relating to trans-boundary waters. With a population of only about 9 million, Sweden cannot be a major source of finance for large infrastructure-related programmes in developing nations. The role occupied classically by Sweden has been one of catalysis, tending to lead in the areas of policy debate and consensus-building. This is perceptible as a trend from more than three decades ago, with the hosting of the first United Nations Conference on the Human Environment in Stockholm in 1972. The recent initiative towards *Shared Responsibility* and a proactive stance in relation to globalization continues this trend, and is to be applauded. It is suggested that future Swedish assistance should continue to concentrate on policy development in the present rapidly-changing global environment, coupled to an increased effort at leveraging funds from the major financial institutions, founded on a platform of real global consensus. Swedish assistance can be important in all five of the key areas noted above in such a catalytic sense, and the present authors believe that this report will assist in such a process.

Chapter 9: Conclusions relating to the key issues and questions

This report produced for the Expert Group on Development Issues of the Swedish Ministry of Foreign Affairs builds upon many previous efforts by that body concerning issues relating to trans-boundary waters, and in particular on the study by ODI and Arcadis (2000). The latter work provided a convincing case that robust trans-boundary water management constitutes an international public good. The present report seeks principally to analyze two further issues – whether cooperation on trans-boundary water management can assist in reducing conflicts; and what role the sharing of benefits between co-riparians may play in this process. Three Case Studies are used to assist in this analysis: the Jordan River basin in the Middle East; the Kagera River basin at the headwaters of the White Nile; and the Mekong River basin in Southeast Asia. These were carefully selected for inclusion in the present study, due to their complementary nature.

By virtue of the breadth of the issues addressed, this report covers many inter-linked topics. A comprehensive set of conclusions on all the matters addressed is provided in the Executive Summary of the report. The conclusions presented here relate to core issues only from the Terms of Reference, and respond to the four specific "key issues and questions" therein, as noted below.[48]

Key Issue/Question 1: *Make an assessment of the relevant literature on water and conflict/cooperation as well as a review and development of the literature on the sharing benefits theory.*

The available literature on water and conflict/cooperation is reviewed comprehensively in the present report in Chapter 3, with additional comments being provided elsewhere as relevant. It is noted that while several authors have suggested that 'water wars' are inevitable in the future, in reality, co-riparians often prefer to cooperate over trans-boundary water resources. However, neither conflict nor cooperation should be viewed in an 'all or nothing' sense, and both can be 'un-packed' to reveal a full spectrum of relationships between riparians (and also within States). Conflict within States is suggested as being at least as important as conflict between States, and the potential for both of these is enhanced, as ever-increasing pressure is placed on the availability of water. Trans-boundary waters are of exceptional importance in this regard, especially in developing nations and amongst the poorest communities, which rely most heavily on natural resources.

[48] The key issues and questions as presented here have been re-ordered from those shown in the Terms of Reference, but are otherwise reproduced as provided to the authors.

The literature on benefit-sharing is also reviewed in the body of the report. It is suggested that the sharing of benefits has been addressed to date only in a 'soft' fashion by most authors, with few specifics being provided beyond the catch-phrase level. There is a clear need for further development of the concept as a whole, and this should involve much greater specificity as to why co-riparians of trans-boundary watercourses may either wish to or agree to share benefits, rather than simply dividing the water resources amongst themselves. The over-riding importance of security-related dynamics is noted, and in heavily securitized scenarios it is clear that benefit-sharing is not a viable option. However, all trans-boundary basins differ in this respect, and the sharing of benefits is certainly of relevance for the co-riparians of some watercourses. In these cases, any successful benefit-sharing scheme will require the generation of a 'broad basket' of possible benefits to act as an inducement to each co-riparian to be involved. In addition, benefit-sharing will need to be established based on concrete inducements which can be quantified, such that each party may decide whether its interests are best-served by being included in such a scenario. It is noted also that the sharing of benefits is of a multi-directional nature, and will be possible only if the upstream-downstream dynamic which dominates many trans-boundary watercourses can be transcended by the relevant co-riparians.

Key Issue/Question 2: *Build scenarios for development in the river basins, focusing in particular on situating the role of the potential benefits that could be reaped from joint river management.*

Scenarios and specific proposals for development in each of the three Case Study basins are provided in Chapter 7 of the report. These vary considerably in all cases, mainly because of the interplay between factors relating to security, economic development, and the environment. A theoretical model (termed the Inter-SEDE model) is proposed for use in 'un-packing' the effects of these categories of drivers, and this is applied to the three Case Studies. The output from the model indicates the degree to which each of the watercourses – and each of the co-riparians – is amenable to distinct forms of benefits. It is suggested that the Inter-SEDE model could be utilized in other trans-boundary basins, and could also inform policy decisions by external parties as to how assistance may best be provided.

Joint river management is also addressed in Chapter 7, and it is noted that preferred forms of joint management vary between the watercourses considered. This is once more heavily influenced by the securitization-desecuritization dynamic within each basin.

Key Issue/Question 3: *Analyse the possible 'spill-over' effects of water cooperation. Are there ways to utilise this phenomenon as a conflict prevention tool?*

The potential for 'spill-over' between cooperation on water and conflict prevention as a whole is discussed at several points in the report. It is noted that 'spill-over' of this type is in fact a 'two-way street', with potential for positive effects in each direction. In certain trans-boundary basins, enhanced cooperation on the sharing of water (or the benefits arising from water resources) offers real promise for defusing tensions and reducing broader conflicts. This is particularly the case where a heavy securitization dynamic exists (e.g. in the Jordan River basin), but where viable options can nevertheless be found to induce the parties to agree on solutions concerning water availability (initially, in isolation from other potentially interfering issues).

Basins such as the Mekong River offer a different example, where water-related cooperation has already been an element of closer political ties between at least the four downstream co-riparians. However, the two upstream parties persist at present in ignoring overtures to join this effort, and this represents an important potential destabilizing force which must be dealt with if the gains to date are to be consolidated. In the Kagera River basin, the urgent need to drive economic development and defuse ongoing ethnic tensions should certainly recognize the key importance of trans-boundary water resources, but must also deal with the interplay between the upstream and downstream co-riparians within the Nile River system as a whole. The importance of previous agreements between the riparians and of water management institutions is again highlighted.

Key Issue/Question 4: *Analyse key areas for development partners in which closer coordination and overview of organisational structures are needed with regards to the potential of utilizing the benefits of trans-boundary water cooperation.*

This matter is alluded to at various points in the report, and addressed specifically in Section 8.3. It is noted that there is a dearth of developed/stated policy amongst international financial institutions and bilateral donors concerning trans-boundary waters, coupled to generally insufficient attention to this most important element of international assistance. This is considered to be regrettable, given the understanding that such waters constitute a global public good.

Five key areas are proposed for international financial institutions and bilateral donors to emphasize in the future in this respect:

- the general need to elevate funding for trans-boundary water management up their agendas for financing;

- the need for long-term commitments, rather than the more typical project-related efforts of relatively short duration;

- the need for a consensus-based approach by all external parties;

- the need for a holistic vision, rather than relying on narrow perspectives which do not take account of all the factors of relevance; and

- the need for true collaboration between external funding organizations and co-riparians.

Finally, it is suggested that the Swedish authorities should continue to play a catalytic role emphasizing policy development and the formation of a consensus amongst external funding entities, such that future assistance in the management of trans-boundary waters may address the new world-wide agenda presented by the pressures of globalization.

Chapter 10: Literature cited

Adams, A. (2000) Social impacts of an African dam: Equity and distributional issues in the Senegal River valley. Working Paper of the World Commission on Dams, Thematic Reviews, Social Issues.

ADB (1996) *Economic Cooperation in the Greater Mekong Subregion – an Overview*. Asian Development Bank, Manila.

Al Wehdah Agreement (1987) Al Wehdah [Unity] Dam Agreement, November 23, 1987. Syrian Law No. 32, Official Gazette of 09 December 1987.

Albert, J., Melloul, A. and Benoit, G. (2004) Possible controls on the spatiotemporal chloride distribution in the Coastal Aquifer of Israel. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.

Allan, J.A. (1994) Overall perspectives on countries and regions. *In: Water in the Arab World: Perspectives and Prognoses*, pp. 65–100. Rogers, P. and Lydon, P. (eds.). Harvard University Press, Cambridge, Massachusetts.

Allan, J.A. (1996) *Water, peace and the Middle East: Negotiating resources in the Jordan Basin*. Tauris Academic Publications, London.

Allan, J.A. (1998) Virtual water: A strategic resource. Global solutions to regional deficits. *Groundwater*, 36 (4), 545–546.

Allan, J.A. (1999) Water in international systems: A Risk Society Analysis of regional problemsheds and global hydrologies. Paper presented at the Conference *Sustainability, Risk and Nature: The Political-Ecology of Water in Advanced Societies*, Oxford University, 15–17 April 1999.

Allan, J.A. (2001) *The Middle East Water Question: Hydropolitics and the Global Economy*. I.B. Tauris, London.

Allan, J.A. (2002) Water resources in semi-arid regions: Real deficits and economically invisible and politically silent solutions. In: *Hydropolitics in the Developing World: A Southern African Perspective* (Turton, A.R. and Henwood, R., Eds.), pp. 23–36. African Water Issues Research Unit, Pretoria.

Allan, J.A. (2003) Virtual water eliminates water wars? A case study from the Middle East. In: *Virtual Water Trade: Proceedings of the International Expert Meeting on Virtual Water Trade* (Hoekstra, A.Y., Ed.), pp. 137–145. Value of Water Research Report Series No. 12, November 2003, IHE Delft, the Netherlands.

Amare, G. (2000) Nile waters – hydrological cooperation vs hydropolitics. Proceedings of the VIII Nile 2002 Conference, 26–29 June, Addis Ababa.

Amery, H. (1998) The role of water resources in the evolution of the Israeli-Lebanese border. *GeoJournal*, 44 (1), 19–33.

Andrews-Speed, P. et al. (2005) *The Strategic Implications of China's Energy Needs*. Adelphi Papers, Routledge, London.

Anglo-French Agreement (1926) Agreement of Good Neighbourly Relations Concluded between the British and French Governments on Behalf of the Territories of Palestine, on the One Part, and on Behalf of Syria and Great Lebanon, on the Other Part. Signed at Jerusalem, February 2, 1926.

Arab League (1964) Statement of the Council of the Kings and Heads of State of the Arab League Member Countries on its First Session, Cairo, 13–17 January 1964. The Arab League, Cairo.

Arlosoroff, S. (2004) Water demand management – a strategy to deal with scarcity. Israel – a case study. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.

Arsano, Y. (2000) The Nile basin: Upstream perspective of cooperation in the New Millennium. Proceedings of the VIII Nile 2002 Conference, 26–29 June, Addis Ababa.

Ashton, P.J. (2000) Southern African water conflicts: Are they inevitable or preventable? In *Water Wars: Enduring Myth or Impending Reality? African Dialogue Monograph Series No. 2*, Solomon, H. and Turton, A.R. (Eds.), pp. 65–102. ACCORD Publishers, Durban.

Ashton, P.J. and Turton, A.R. (in press). Water and security in Sub-Saharan Africa: Emerging concepts and their implications for effective water resource management in the Southern African region. In *Globalisation and Environmental Challenges* (Brauch, H.G., Grin, J., Mesjasz, C., Behera, N.C., Chourou, B., Spring, U.O., Liotta, P.H. and Kameira Mbote, P., Eds.). Springer Verlag, Berlin.

Ashton, P.J., Earle, A., Malzbender, D., Moloi, B., Patrick, M.J. and Turton, A.R. (2005) *Compilation of all the International Freshwater Agreements Entered into by South Africa with other States.* Final Report for Project No. K5/1515. Water Research Commission, Pretoria.

Axelrod, R. (1984) *The Evolution of Cooperation*. Penguin Books, New York.

Axelrod, R. and Keohane, R.O, (1985) Achieving cooperation under anarchy: Strategies and institutions. *World Politics,* 38, 226–254.

Ayoob, M. (1997) Defining security: A subaltern realist perspective. In *Critical Security Studies* (Krause, K. and Williams, M.C., Eds.), pp. 121–148. University of Minnesota Press, Minneapolis.

Baird, I.G. (2000) *A Study of the Downstream Impacts of the Yali Falls Dam in the Se San River Basin in Ratanakiri Province, Northeast Cambodia*. The Fisheries Office, Ratanakiri Province, and The Non-Timber Forest Products (NTFP) Project, 2000, Ratanakiri. Mimeograph.

Bakour Y. (1991) *Planning and Management of Water Resources in Syria*. Directorate of the Office of the Arab Organisation for Agricultural Development, Damascus.

Bar-Siman-Tov, Y. (1998) The United States and Israel since 1948: A 'special relationship'. *Diplomatic History,* 22 (2), 231–262.

Barbier, E. and Homer-Dixon, T.F. 1996. *Resource Scarcity, Institutional Adaptation, and Technical Innovation: Can Poor Countries Attain Endogenous Growth?* American Association for the Advancement of Science, Washington D.C.

Basson, M.S., van Niekerk, P.H. and van Rooyen, J.A. (1997) *Overview of Water Resources Availability and Utilization in South Africa*. Department of Water Affairs and Forestry, Pretoria.

Beitz, C.R. (1979) *Political Theory and International Relations.* Princeton University Press, New Jersey.

Benvenisti, R. (2004) Addressing the Dead Sea basin water issues. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.

Beyene, Z. and Wadley, I.L. (2004) Common goods and the common good: Transboundary natural resources, principled cooperation, and the Nile Basin Initiative. Breslauer Symposium on Natural Resource Issues in Africa, University of California, Berkeley.

Biswas, A.K. (1997). 'Mar Del Plata: Twenty years later – Concluding remarks. *In Mar Del Plata 20 Years Anniversary Seminar – Water for the next 30 Years. Averting the Looming Water Crisis.* SIWI & SEI, Stockholm.

Blanford, N. (2002) Lebanon in the right over Hasbani. Daily Star (Lebanon), 14 September 2002.

Boesen, J. and Helle, M.R. (2003) From water wars to water riots: Lessons from transboundary water management. *DIIS Working Paper No 2004/6*, DIIS, Copenhagen.

Braid, S. and Turton, A.R. (2004) Parallel National Action: Africa's key to governance. Paper presented at the 14th Stockholm Water Symposium, August 16–20.

Brauch, H.G. (2005a) *Threats, Challenges, Vulnerabilities and Risks in Environmental Human Security*. Source Paper No. 1/2005. United Nations University Press, Bonn.
Brauch, H.G. (2005b) *Environment and Human Security: Towards Freedom from Hazard Impacts*. Intersections Paper No. 2/2005. United Nations University Press, Bonn.
Brownlie, I. (1990) *Principles of Public International Law*. Oxford University Press, Oxford.
Bulloch, J. and Darwish, A. (Eds.) (1993) *Water Wars. Coming Conflicts in the Middle East*. Victor Gollanz, London.
Buzan, B. (1991) *People, States and Fear. An Agenda for International Security Studies in the Post-Cold War Era*. Harvester Wheatsheaf, London.
Buzan, B., Waever, O. and de Wilde, J. (1998) *Security, A New Framework for Analysis*. Lynne Rienner Publishers, Boulder, Colorado.
Caflisch, L. (1998) Regulation of the uses of international watercourses. In *International Watercourses – Enhancing Cooperation and Managing Conflict*, (Salman, S.M.A. and Boisson de Chazournes, L., Eds.). World Bank Technical Paper No. 414, World Bank, Washington.
Chapagain, A.K. and Hoekstra, A.Y. (2004a) *Water Footprints of Nations. Volume 1: Main Report*. UNESCO-IHE Institute for Water Education, Value of Water Research Report Series No. 16, Delft, the Netherlands.
Chapagain, A.K. and Hoekstra, A.Y. (2004b) *Water Footprints of Nations. Volume 2: Appendices*. UNESCO-IHE Institute for Water Education, Value of Water Research Report Series No. 16, Delft, the Netherlands.
Chapman, E.C. and Daming, H. (1996) Downstream implications of China's dams on the Lancang Jiang (Upper Mekong) and their potential significance for greater regional cooperation, basin-wide. In *Development Dilemmas in the Mekong Subregion* (Stensholt, R., Ed.). Monash Asia Institute, Development Studies Centre and Centre of Southeast Asian Studies (Monash University), National Thai Studies Centre (Australian National University) and National Centre for Vietnamese Studies, Melbourne.
Claassen, M. (2005) *Elands Catchment Reserve Assessment Study, Mpumalanga Province. The Ecological Reserve and the Economic Value of the Aquatic Ecosystem in the Elands River*. Department of Water Affairs and Forestry, Pretoria.
Clarke, R. (2004) *The Atlas of Water: Mapping the Global Crisis in Graphic Facts and Figures*. Earthscan Publications Ltd, London.
CoMWANBS (1999) Pamphlet on policy guidelines for the Nile River Basin Strategic Action Program. Council of Ministers for Water Affairs of the Nile Basin States.
Conca, K. (2006) *Governing Water: Contentious Transnational Politics and Global Institution Building*. MIT Press, Cambridge, Massachusetts.
Conley, A. H. and P. H. van Niekirk (2000) Sustainable management of international waters: The Orange River case. *Water Policy*, 2, 131–149.
Cowan, E. and Shaw, B.J. (2003) Mekong River development – Whose dreams? Which visions? *Water International*, 28, (2), 268–275.
Dalby, S. (1997) Contesting an essential concept: Reading the dilemmas in contemporary security discourse. In *Critical Security Studies: Concepts and Cases* (Krause. K. and Williams, M.C., Eds.), pp. 3–32. University of Minnesota Press, Minneapolis.
Daoudy, M. (2004) Syria and Turkey in water diplomacy (1962–2003). In *Water in the Middle East and North Africa: Resources, Protection and Management*, Zereini, F. and Jaeschke, W. (Eds.), pp. 319–332. Springer, Heidelberg.
Daoudy, M. (2005) *Le Partage des Eaux Entre la Syrie, l'Irak et la Turquie: Négociation, Sécurité et Asymétrie des Pouvoirs*. CNRS Éditions, Paris.
de Villiers, M. (1999) *Water Wars: Is the World's Water Running Out?* Weidenfeld and Nicolson, London.
Declaration of Principles (1993) Declaration of Principles on Interim Self-Government

Arrangements. (September 13, 1993). Signed at Washington, D.C.
Deudney, D. (1990) The case against linking environmental degradation and national security. *Millenium*, 19 (3), 461–476.
Development Forum/DES (1998). *International Round Table: Transboundary Water Management – Experience of International River and Lake Commission*, Berlin. (Taken from <http://www.thewaterpage.com/berlinrecom.htm>).
Dinar, A., Rosegrant, M.W. and Meinzen-Dick, R. (1997) *Water Allocation Mechanisms: Principles and Examples*. Working Paper 1779, The World Bank, Washington D.C.
Dore, J. (2003) The governance of increasing Mekong regionalism. In *Social Challenge for the Mekong Region* (Kaosa-ard, M. and Dore, J., Eds.), pp. 406–435. Social Research Institute, Chiang Mai University, Thailand.
Dore, J. and Xiaogang, Y. (2004) *Yunnan Hydropower Expansion – Update on China's energy industry reforms & the Nu, Lancang & Jinsha hydropower dams*. Green Watershed, Kunming.
Dreizin, Y. (2004a) Water development and management in Israel and the region: The overall perspective. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.
Dreizin, Y. (2004b) The impact of desalination. Israel and the Palestinian Authority. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.
du Plessis, A. (2000) Charting the course of the water discourse through the fog of international relations theory. In *Water Wars: Enduring Myth or Impending Reality?* (Solomon, H. and Turton, A.R., Eds.). ACCORD, Green Cross International and the African Water Issues Research Unit.
Dutta, I. and Mishra, A. (2005) *Does Inequality Lead to Conflict?* United Nations University – World Institute for Development Economics Research, Helsinki.
Earle, A. (2003) Watersheds and problemsheds: A strategic perspective on the water/food/trade nexus in Southern Africa. In *Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin* (Turton, A.R., Ashton, P. and Cloete, T.E., Eds.), pp. 229–249. AWIRU, Pretoria and Green Cross International, Geneva.
Earle, A. and Turton, A. (2003) The virtual water trade amongst countries of the SADC. In: *Virtual Water Trade: Proceedings of the International Expert Meeting on Virtual Water Trade* (Hoekstra, A.Y., Ed.), pp. 183–200. Value of Water Research Report Series No. 12, November 2003, IHE Delft, the Netherlands.
ECAFE (1957) *Development of Water Resources in the Lower Mekong River Basin*. Flood Control Series, No 12, United Nations, Bangkok.
Egypt/Ethiopia (1993) Framework for General Co-operation between the Arab Republic of Egypt and Ethiopia. Cairo, 01 July 1993.
EIPD (2000) New proposals and modalities for a Nile accord? Ethiopian Institute for Peace and Development, Occasional Paper Series No. 14, June/July 2000.
El-Madhoun, F.I. (2004) Drinking water quality: Evaluation of chloride and nitrate concentration of well supplies, Gaza Governorates (1990–2002) – Palestine. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.
El-Musa S. (1997) *Water Conflict, Economics, Politics, Law and the Palestinian-Israeli Water Resources*. Institute for Palestine Studies, Washington D.C.
El Musa, S.S. (1998) Toward a unified management regime in the Jordan Basin: The Johnston Plan revisited. *Yale F&ES Bulletin*, 103, 297–313.

Elhance, A.P. (1999) *Hydro-politics in the Third World: Conflict and Cooperation in International River Basins*. United States Institute of Peace Press, Washington, D.C.

Erlich, H. (2002) *The Cross and the River: Ethiopia, Egypt, and the Nile*. L. Rienner, Boulder, Colorado.

EURRM (2004) *EU Rapid Reaction Mechanism – End of Programme Report. Lebanon/ Israel Wazzani Springs Dispute*. European Commission Conflict Perevention and Crisis Management Unit, Brussels.

Exchange of Notes (1923) *Exchange of Notes Constituting an Agreement between the British and French Governments Respecting the Boundary Line Between Syria and Palestine from the Mediterranean to El Hamme, Paris, March 7, 1923*. Initially signed in Beirut on 03 February, 1922.

Falkenmark, M. and Lundvist, J. (1995) Looming water crisis: New approaches are inevitable. In *Hydropolitics: Conflicts over Water as a Development Constraint* (Ohlsson, L, Ed.). ZED Books, London.

Falkenmark, M. and Widstrand, C. (1992) Population and water resources: A delicate balance. *Population Bulletin*, 47 (3). Population Reference Bureau, Washington D.C.

FAO (2002) *Management of the Worst Aquatic Weeds in Africa. FAO Efforts and Achievements during the Period 1991–2001*. Prepared by Labrada, R. and Fornasari, L. Food and Agriculture Organization, Rome.

Fardous, A.-N. and Al-Hadidi, L. (2004) Wastewater management and reuse in Jordan. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.

Feitelson, E. (2002) Implications of shifts in the Israeli water discourse for Israeli-Palestinian water negotiations. *Political Geography*, 21, 293–318.

Fischhendler, I. (in press, 2006) The politics of water allocation. In *Water for Dry Land* (Feitelson, E. and Shamir, U., Eds.). Resources for the Future Press, Baltimore, Maryland.

Fisher, F. (2001) *Optimal Water Management and Conflict Resolution: the Middle East Water Project*. Unpublished manuscript.

Fox, C. and Sneddon, C. (2005) *Flood Pulses, International Watercourse Law, and Common Pool Resources: A Case Study of the Mekong Lowlands*. Research Paper 2005/22, Expert Group on Development Issues, United Nations University and World Institute for Development Economics Research.

Fradkin, P.L. (1981) *A River no More: The Colorado River and the West*. Alfred A. Knopf, New York.

Franco-British Convention (1920) Franco-British Convention on Certain Points Connected with the Mandates for Syria and the Lebanon, Palestine and Mesopotamia, Signed at Paris, December 23, 1920. The League of Nations, Treaty Series, 22, p. 355.

Frederick, K.D. (1996) Water as a Source of International Conflict. *Resources*, 123, 9–12

Frederiksen, H.D. (2003a) The world water crisis: Ramifications of politics trumping basic responsibilities of the international community. *Water Resources Development*, 19 (4), 593–615.

Frederiksen, H.D. (2003b) Water: Israeli strategy, implications for peace and the viability of Palestine. *Middle East Policy*, X (4), 69–86.

Frederiksen, H.D. (2005) Return Palestinian water rights if not land: a proposal. *Middle East Policy*, XII (1), 72–78.

Frey, F.W. (1993) The political context of conflict and cooperation over international river basins. *Water International*, 18, 54–68.

Giordano, M. and Wolf, A. (2003) Sharing waters: Post-Rio international water management. *Natural Resources Forum*, 27, 163–171.

Gledistch, N.P. (1998) Armed conflict and the environment: A critique of the literature. *Journal of Peace Research*, 35 (3), 381–400.
Gleditsch, N.P., Furlong, K., Hegre, H., Lacina, B. and Owen, T. (2005) *Conflicts over Shared Rivers: Resource Scarcity or Fuzzy Boundaries?* International Peace Research Institute, Oslo.
Gleick, P.H. (1993a) Water and conflict: Fresh water resources and international security. *International Security,* 18 (1): 99–104.
Gleick, P.H. (Ed.) (1993b) *Water in Crisis: A Guide to the World's Water Resources.* Oxford University Press, New York.
Gleick, P. (1994) Water wars and peace in the Middle East. *Policy Analysis,* 36, (4), 22–38.
Gleick, P.H. (Ed.) (2004) *The World's Water 2004–2005: The Biennial Report on Freshwater Resources.* Island Press, New York.
Godana, B.A. (1985) *Africa's Shared Water Resources: Legal and Institutional Aspects of the Nile, Niger and Senegal River Systems.* F. Pinter, London.
Golub, J.S. (1996) *Why did they sign? Explaining EC environmental policy bargaining.* EUI Working Paper RSC No. 96/52. European University Institute, San Domenico.
Graham-Leigh, J. (2000) *London's Water Wars: The Competition for London's Water Supply in the Nineteenth Century.* Redwood Books, London.
Great Britain/Congo (1906) Agreement between Great Britain and the Independent State of the Congo, modifying the Agreement signed at Brussels, May 12, 1894, relating to the Spheres of Influence of Great Britain and the Independent State of the Congo in East and Central Africa. London, May 9, 1906.
Great Britain/Ethiopia (1902) Exchange of notes between Great Britain and Ethiopia. March 18, 1902.
Great Britain/France/Italy (1906) Agreement between Great Britain, France and Italy respecting Abyssinia. December 13, 1906.
Great Britain/Italy (1891) Protocol between Great Britain and Italy for the demarcation of their respective spheres of influence on Eastern Africa. April 15, 1891
Greco, F. (2005) The securitization of the Disi Aquifer: A silent conflict between Jordan and Saudi Arabia. First International Workshop on Hydro-hegemony. King's College, London, 21–22 May 2005.
Grey, D. (2001) Sharing benefits of transboundary waters through cooperation. Presentation at the *International Conference on Freshwater,* Bonn.
Gürer, I. and Ülger, M. (2004) Manavgat River water as a limited but alternative water resource for domestic use in the Middle East. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.
Haas, E. (1958) *The Uniting of Europe.* Stanford University Press: Stanford
Haas, E. (1964) *Beyond the Nation State.* Stanford University Press: Stanford
Haas, E. (1970) International subsystems: Stability and polarity. *American Political Science Review,* 64 (1), 98–123.
Haas, E.B. (1980) Why collaborate? Issue-linkage and international relations. *World Politics*, 32, 357–405.
Haddadin, M.J. (2002) Rights to the Hasbani? Daily Star (Lebanon), 18 September 2002.
Haddadin, M. (2003) Exogenous water: A conduit to globalization of water resources. In: *Virtual Water Trade: Proceedings of the International Expert Meeting on Virtual Water Trade* (Hoekstra, A.Y., Ed.), pp. 159–169. Value of Water Research Report Series No. 12, November 2003, IHE Delft, the Netherlands.
Haigh, M.J., Jansky, L. and Prasad, H. (2005) Sustainable management of headwater resources: Headwater control and the contexts of the Nairobi Headwaters Declaration

for the International Year of Freshwater 2003. In *Sustainable Management of Headwater Resources: Research from Africa and India* (Jansky, L., Haigh, M.J. and Prassad, H., Eds.), pp. 1–13. United Nations University Press, New York.
Halford, L.H. (1936) The Suez Canal in Time of War, *Foreign Affairs*, 14, 101.
Hardin, G. (1968) The tragedy of the commons. *Science*, 162.
Hawari, M. (2003) *Fighting Palestinian Poverty: A Survey of the Economic and Social Impact of the Israeli Occupation on the Palestinians in the West Bank and Gaza Strip*. War on Want, London.
Hayton, R.D. and Utton, A.E. (1989) Transboundary groundwaters: The Bellagio Draft Treaty. *Natural Resources Journal*, 29, 668–722.
Helsinki Rules (1966) *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, International Law Association, London.
Heyns, P.S. (1995a) Existing and planned development projects on international rivers within the SADC Region. In *Proceedings of the Conference of SADC Ministers Responsible for Water Resources Management*. Pretoria, 23–24 November 1995.
Heyns, P. (1995b) The Namibian perspective on regional collaboration in the joint development of international water resources. Fifth Stockholm Water Symposium. Sweden.
Heyns, P. (1995c) SADC agreements in existence pertaining to shared water resources. In *Water and Security in Southern Africa* (Ohlsson, L., Ed.), pp. 59–60. Publications on Water Resources, SIDA, Stockholm.
Heyns, P. (1997) Namibia. In *Water Pricing Experiences: An International Perspective* (Dinar, A. and Subramanian, A., Eds.). World Bank Technical Paper No. 386. The World Bank, Washington D.C..
Heyns, P. (2002) Interbasin transfer of water between SADC countries: A development challenge for the future. In *Hydropolitics in the Developing World: A Southern African Perspective* (Turton, A.R. and Henwood, R., Eds.), pp. 157–176. African Water Issues Research Unit, Pretoria.
Heyns, P. (2003) Water resources management in Southern Africa. In *International Waters in Southern Africa* (Nakayama, M., Ed.), pp. 5–37. United Nations University Press, Tokyo.
Homer-Dixon, T. (1993) On the threshold: Environmental changes and acute conflict. *International Security*, 16 (2), 76–116.
Homer-Dixon, T. (1994a) Environmental scarcities and violent conflict: Evidence from cases. *International Security*, 19 (1), 5–40.
Homer-Dixon, T.F. (1994b) The Ingenuity Gap: Can developing countries adapt to environmental scarcity? *Population and Development Review*, 21 (3), 587–612.
Homer-Dixon, T.F. (1996) Environmental scarcity, mass violence and the limits to ingenuity. *Current History*, 95, 359–365.
Homer-Dixon, T.F. (2000) *The Ingenuity Gap*. Jonathan Cape, London.
Hori, H. (2000) *The Mekong – Environment and Development*. United Nations University Press, Tokyo.
Huisman, P., de Jong, J. and Wieriks, K. (2000) Transboundary cooperation in shared river basins: Experiences from the Rhine and North Sea. *Water Policy*, 2, 83–97.
ILA (1966) *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, International Law Association, London.
ILA (1986) *The Seoul Rules on International Groundwaters*. Adopted by the 62nd Conference of the International Law Association, 1986.

ILA (2004) Berlin Rules 2004. Water Resources Law. Fourth Report, 2004. International Law Association, London.
IMC (1978) *Declaration Concerning the Interim Committee for Coordination of Investigations of the Lower Mekong Basin*. Interim Mekong Committee, Vientiane.
Interim Agreement (1995) The Israeli-Palestinian Interim Agreement on the West Bank and the Gaza Strip. Washington, D.C. September 28, 1995.
Irani, R. (1991) Water wars. *New Statesman & Society,* 4 (149), 24–25.
Isaac, J. (1994) Core issues of the Palestinian-Israeli water dispute. In *Environmental Crisis: Regional Conflicts and Ways of Cooperation* (K.R. Spillmann and G. Bachler, Eds.). Proceedings of an International Conference at Centro Stefano Franscini, Ascona, Switzerland, 2–7 October 1994. ENCOP Occasional Paper, No. 14. Swiss Federal Institute of Technology, Zurich and Swiss Peace Foundation, Berne.
Israeli-Jordanian Peace Treaty (1994) Treaty of Peace between the State of Israel and the Hashemite Kingdom of Jordan. October 26, 1994.
IUCN (2003) Large ships or large fish? Mimeograph, International Union for the Conservation of Nature, Gland.
Jacobs, J. (1992) *International River Basin Development and Climatic Change: The Lower Mekong of Southeast Asia*. Ph.D. dissertation, Department of Geography, University of California.
Jacobs, J.W. and Wescoat J.L. (1994) Flood hazard problems and programmes in Asia's large river basins. Asian Journal of Environmental Management, 2 (2).
Jägerskog, A. (2003) *Why States Cooperate over Shared Water: The Water Negotiations in the Jordan River Basin*. Department of Water and Environmental Studies, Linköping University, Sweden.
Johnston Plan (1955) The Jordan Valley Plan. 30 September 1955. 19 pp.
Just & Netanyahu (eds.), 1998, *Conflict and Cooperation on Trans-Boundary Water Resources,* Kluwer, Boston & London.
Juuti, P.S. and Katko, T.S. (Eds.) (2005) *Water, Time and European Cities: History Matters for the Future.* European Commission, Brussels.
Kaosa-ard, M. (2003) Poverty and globalisation. In *Social Challenges for the Mekong Region* (Kaosa-ard, M. and Dore, J., Eds.). Chiang Mai University, Chiang Mai, Thailand.
Karnjanakesorn, C. (2005) Adapting upstream water resources development to downstream water needs – the case of the Mekong basin. Presentation at the *Stockholm World Water Week*, 27 August 2005, Stockholm.
Kashaigili, J.J., Kadigi, R.M.J., Sokile, C.S. and Mahoo, H.F. (2003) Constraints and potential for efficient inter-sectoral water allocations in Tanzania. *Physics and Chemistry of the Earth*, 28, 839–851.
Kaufman, L. (1992) Catastrophic change in species-rich freshwater ecosystems: The lessons of Lake Victoria. *BioScience,* 42 (11), 846–858.
Kaul, I., Grunberg, I. and Stern, M. (Eds.) (1999) *Global Public Goods – International Cooperation in the 21st Century,* United Nations Development Programme, New York.
Kelly, K. and Homer-Dixon, T. (1995) *Environmental Scarcity and Violent Conflict: The Case of Gaza*. Occasional Paper, American Association for the Advancement of Science, and the University of Toronto.
Kendie, D. (1999) Egypt and the hydro-politics of the Blue Nile River. *Northeast African Studies,* 6 (1–2), 141–169.
Kenya/Tanzania/Uganda (1994) Agreement to Initiate Program to Strengthen Regional Coordination in Management of Resources of Lake Victoria. August 5, 1994.
Keohane, R.O. (1984) *After Hegemony: Cooperation and Discord in the World Political Economy.* Princeton University Press, Princeton.
Keohane, R.O. (1994) International institutions: Two approaches. In *International Insti-*

tutions and State Power: Essays in International Relations Theory (Keohane, R.O., ed.). Westview Press, Boulder, Colorado.
Kirmani, S. (1990) Water, peace and conflict management – The experience of the Indus and MeKong River basins. *Water International*, 15 (2).
Kirmani, S. and Le Moigne, G. (Eds.) (1997) *Fostering Cooperation in International River Basins – The World Bank at its Best in Development Diplomacy.* World Bank Technical Paper No. 335, World Bank, Washington D.C.
Klaphake, A. (2005) *Kooperation an internationalen Flüssen aus ökonomischer Perspektive: Das Konzept der Benefit Sharing.* Discussion Paper 6/2005. Bonn: Deutches Institut für Entwisklungspolitik.
Kliot, N. (1994) *Water Resources and Conflict in the Middle East*. Routledge, London and New York.
Kliot, N., Shmueli, D. and Shamir, U. (2001) Institutions for management of transboundary water resources: Their nature, characteristics and shortcomings. *Water Policy*, 3, 229–255.
Korany, B., Brynen, R. and Noble, P. (1993). The analysis of national security in the Arab context: Restating the State of the Art. In *The Many Faces of National Security in the Arab World* (Korany, B., Brynen, R., and Noble, P., Eds.), pp. 1–23. St. Martin's Press, New York.
Krause, K. and Williams, M.C. (Eds.) (1997) *Critical Security Studies: Concepts and Cases.* University of Minnesota Press, Minneapolis.
Lawrence, P., Meigh, J. and Sullivan, C. (2002) *The Water Poverty Index: An International Comparison*. Keele Economics Research Papers 2002/19, Keele University, England.
Le T.-T. (1973) *Regional Cooperation in Southeast Asia: The Mekong Project*. The City University of New York, New York.
Le Marquand, D.G. (1977) *International Rivers: The Politics of Cooperation*. Westwater Research Centre, University of British Colombia, Vancouver.
Leksakundilok, A. (2004) *Ecotourism and Community-based Ecotourism in the Mekong Region*. Working paper No. 10, Australian Mekong Resource Centre, Sydney.
Lowi, M. (1993) *Water and Power: The Politics of a Scarce Resource in the Jordan River Basin*. Cambridge University Press, Cambridge.
Lowi, M. and Shaw, B. (Eds.) (2000) *Environment and Security, Discourses and Practices.* MacMillan Press, London.
Lundqvist, J. and Jønch-Clausen, L. (Eds) (1994) *Putting Dublin Agenda into Practice.* Department for Water and Environmental Studies, Linköping University, Linköping.
Luterbacher, U., Schellnhuber, J., and Wiegandt, E. (2000) *Water Control and Property Rights: An Analysis of the Middle Eastern Situation*. Graduate Institute of International Studies and Potsdam Institute for Climate Impact Research, Potsdam. Unpublished Manuscript.
MacPherson, C.B. (1968) *Hobbes: Leviathan*. Penguin Books Ltd., London.
Makim, A. (2002) *The Changing Face of Mekong Resource Politics in the Post-Cold War Era: Re-negotiating Arrangements for Water Resource Management in the Lower Mekong River Basin (1991–1995)*. Working Paper No. 6, Australian Mekong Resource Centre, Sydney.
Marty, F. (2001) *Managing International Rivers: Problems, Politics and Institutions.* Peter Lang, Bern and New York.
Maslow, A.H. (1943) A theory of human motivation. *Psychological Review*, 50, 370–396.
Maslow, A.H. (1970) *Motivation and Personality.* Harper & Row, New York.
Mathews, J.T. (1989) Redefining security. *Foreign Affairs*, 68 (2), 162–177.
McCaffrey, S. (1993) Water, politics and international law. In *Water in Crisis* (Gleick, P.H., Ed.). Oxford University Press, New York and Oxford.

McCaffrey, S. (2003) Water disputes defined: Characteristics and trends for resolving them. In *Resolution of International Water Disputes, Permanent Court of Arbitration, Peace Palace Papers*, pp. 49–57.
McCormack, G (2001) Water margins: Competing paradigms in China. *Critical Asian Studies*, 33 (1), 5–30.
McCully, P. (1996) *Silenced Rivers – The Ecology and Politics of Large Dams*. Zed Books, London.
McGinnis, M.D. (1986) Issue linkage and the evolution of international cooperation. *Journal of Conflict Resolution*, 30 (1), 141.
Medzini, A. and Wolf, A. (2001) The Euphrates River watershed: Integration, coordination or separation? In *The Multi-Governance of Water through Four Case-Studies* (Finger, M. and Tamiotti, L., Eds.). Report for the World Conservation Union, Commission on Economic, Environmental and Social Policy, Geneva.
Medzini, A. and Wolf, A.T. (2004) Towards a Middle East at peace: Hidden issues in Arab-Israeli hydropolitics. *Water Resources Development*, 20 (2), 193–204.
Meijerink, S.V. (1999) *Conflict and Cooperation on the Scheldt River Basin: A Case Study of Decision-making on International Scheldt Issues between 1967 and 1997*. Dordrecht: Kluwer.
Mekong Secretariat (1989) *The Mekong Committee – A Historical Account (1957–89)*. The Mekong Secretariat, Interim Mekong Commission, Bangkok.
Mendis, D.L.O. (1999) *EPPAWALA – Destruction of Cultural Heritage in the Name of Development*. Sri Lanka Pugwash Group, Columbo.
Miller, F. (2003) *Society-water Relations in the Mekong Delta: A Political Ecology of Risk*. Ph.D. Dissertation, Division of Geography, University of Sydney.
Miller, F. and Hirsch, P. (2003) *Civil Society and International River Basin Management*. Working Paper No 7, AMRC, Sydney.
Mitrany, D. (1966) *A Working Peace System*. Quadrangle Books, Chicago.
Mitrany, D. (1975) *The Functional Theory of Politics*. St. Martin Press, New York.
Moe, C. (2000) From scorched earth to flooded earth: The Generals' Dam on Burma's Salween River. Norwegian Burma Council and Salween Watch Coalition. <http://www.dams.org/kbase/submissions/show-sub.php?rec=SOC057>.
Møller, B. (2001) National, societal and human security: General discussion with a Case Study from the Balkans. In *First International Meeting of Directors of Peace Research and Training Institutions. What Agenda for Human Security in the Twenty-first Century?* Pp 41–62. UNESCO, Paris.
Møller, B. (2003) National, societal and human security: Discussion – A Case Study of the Israeli-Palestine conflict. In *Security and Environment in the Mediterranean. Conceptualizing Security and Environmental Conflict* (Brauch, H.G., Liotta, P.H., Marquina, A., Rogers, P. and Selim, M., Eds.), pp. 277–288. Springer-Verlag, Berlin.
Mostert, E. (2005) *How can International Donors Promote Transboundary Water Management?* Discussion Paper 8/2005. Bonn: Deutches Institut für Entwisklungspolitik.
MRC (2002). *Preliminary Porcedures for Notification, Prior Consultation and Agreement*. Mekong River Commission for Sustainable Development, Phnom Penh, Cambodia.
MRC (2003) *State of the Basin Report*. The Mekong River Commission, Phnom Penh.
Najlis, P. and Kuylenstierna, J.L. (1997) Twenty years after Mar del Plata – Where do we stand and where do we go? In *Mar Del Plata 20 Years Anniversary Seminar – Water for the next 30 Years. Averting the looming Water Crisis*. SIWI and SEI, Stockholm.
Nasser, C. (2002) Beydoun praises Orontes River Agreement. Deal allows dam for Bekaa, Hermel. The Daily Star, Lebanon, 04 December 2002.
Nicol, A. (2002) The dynamics of river basin cooperation: The Nile and Okavango basins. In *Transboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin* (Turton, A.R., Ashton, P.J. and Cloete, E., Eds.), pp.

167–186. African Water Issues Research Unit, Pretoria, and Green Cross International, Geneva.
Nicol, A. (2003) *The Nile: Moving Beyond Cooperation*. With additional material from M. Shahin. UNESCO Technical Documents in Hydrology, PC-CP Series, No. 16. UNESCO, Paris.
Nicol, A. (2005) Concept of benefit sharing as applied to the Nile River basin. World Water Week, Stockholm 2005, SIWI Seminar on benefit sharing from integrated land and water use in river basins.
Nielsson, G. (1990.) The Parallel National Action process. In *Frameworks for International Cooperation* (Groom, A.J.R. and Taylor, P., Eds.), pp. 78–108. Pinter Publishers, London.
ODI and Arcadis (2001) *Transboundary Water Management as an International Public Good*. Ministry for Foreign Affairs, Stockholm.
OED (2002) *The World Bank's Approach to Global Programs: An Independent Evaluation*. Operations Evaluation Department, New York.
Ohlsson, L. (Ed.) (1995) *Hydropolitics: Conflicts over Water as a Development Constraint*. ZED Books, London.
Ohlsson, L. (1998) *Water and Social Resource Scarcity – An Issue Paper Commissioned by FAO/AGLW*. Presented as a discussion paper for the 2nd FAO E-mail Conference on Managing Water Scarcity.
Ohlsson, L. (1999) *Environment, Scarcity and Conflict: A Study of Malthusian Concerns*. Department of Peace and Development Research, University of Gothenburg.
Öjendal, J. (2000a) *Sharing the Good: Modes of Managing Water in the Lower Mekong River Basin*. Ph. D. Dissertation, Department of Peace and Development Studies, Gothenburg University.
Öjendal, J. (2000b) Regional hydropolitics in mainland Southeast Asia. In *The New Regionalism and the Future of Security and Development* (Hettne *et al.*, Eds.). MacMillan, London.
Öjendal, J. and Torell, E. (1997) *The Mighty Mekong Mystery – A Study on the Problems and Possibilities of Natural Resources Utilization in the Mekong River Basin*. SIDA, Stockholm.
Okidi, C.O. (1982) Review of treaties on consumptive utilisation of waters of Lake Victoria and Nile drainage system. *Natural Resources Journal*, 22, 162–181.
Okot, A.O. (2003) *What is the Law that Governs the Management of the Nile Water Resources?* Master's Degree thesis, CEPMLP, University of Dundee, Scotland.
Okoth-Owiro, A. (2004) *The Nile Treaty: State Succession and International Treaty Commitments: A Case Study of the Nile Water Treaties*. Konrad Adenauer Foundation, Nairobi, Kenya.
Osborne, M.E. (1999) *River Road to China: The Search for the Sources of the Mekong, 1866–73*. Avalon Travel, New York.
Osborne, M. (2000) *The Mekong: Turbulent Past, Uncertain Future*. Avalon Travel Publishing, New York.
Ostrom, E. (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press, Cambridge.
Oye, K.A. (Ed.) (1985) *Cooperation Under Anarchy*. Princeton University Press, Princeton.
PCE (2002) Parliamentary Committee of Enquiry on the Israeli Water Sector. Headed by MK David Magan. Report. Jerusalem, June 2002.
Percival, V. and Homer-Dixon, T. (1998) Environmental scarcity and violent conflict: The case of South Africa. *Journal of Peace Research*. 35 (3), 279–298.
Percival, V. and Homer-Dixon, T. (2001) The case of South Africa. In *Environmental Conflict* (Diehl, P.F. and Gleditsch, N.P., Eds.), pp. 13–35. Westview Press, Boulder,

Colorado.
Phillips, D.J.H. (2005) Equitable and reasonable allocations of international watercourses: Water rights and the optimization of economic benefits. International Conference on Integrated Assessment of Water Resources and Global Change: A North-South Analysis. 23–25 February 2005, Bonn, Germany.
Phillips, D.J.H., S. Attili, S. McCaffrey and J.S. Murray (2004) Factors relating to the equitable distribution of water in Israel and Palestine. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.
Phillips, D.J.H., S. Attili, S. McCaffrey, J.S. Murray and M. Zeitoun (2005) The water rights of the co-riparians to the Jordan River basin. First International Conference on Water Values and Rights, Ramallah, Palestine, 02–04 May 2005.
Phillips, D.J.H., S. Attili, S. McCaffrey and J.S. Murray (2006a, in press) The Jordan River basin: 1. Clarification of the allocations in the Johnston Plan. Water International, in press.
Phillips, D.J.H., S. Attili, S. McCaffrey and J.S. Murray (2006b, in press) The Jordan River basin: 2. Potential future allocations to the co-riparians. Water International, in press.
Postel, S. (1999) *Pillar of Sand: Can the Irrigation Miracle Last?* W.W. Norton & Company, New York.
Postel, S.L. and Wolf, A.T. (2001) Dehydrating conflict. *Foreign Policy*, Sep/Oct 2001, Issue 126.
PWA (2004) Technical data of the Palestinian Water Authority, Ramallah, Palestine.
Radosevich, G.E. (1996) The Mekong – A new framework for development and management. In *Asian International Waters – from Ganges-Brahmaputra to Mekong* (Biswas, A.K. and Hashimoto, T., Eds.). Oxford University Press, Bombay.
Radosevic, G. (2005). Negotiating the 1995 Mekong Agreement – The framework for IWRM in the MRB. Presented at *The International Forum on Integrated Water Resources Management of the Mekong River Basin*, Chiang Rai, 28–29 November 2005.
Rake, A. (1997) Water Wars: Disputes over water resources could become the greatest challenge to African countries in the next century. *New African*, April; 15.
Ramana, M.V.V. (1992) *Inter-state River Wars in India*. Orient Longman Ltd., Madras.
Ramoeli, P. (2002) SADC Protocol on Shared Watercourses: Its history and current status. In *Hydropolitics in the Developing World: A Southern African Perspective* (Turton, A.R. and Henwood, R., Eds.), pp. 105–111. African Water Issues Research Unit, Pretoria.
Rangeley, A. et al. (1994) *International River Basin Organizations in Sub-Saharan Africa*. World Bank Technical Paper 250, World Bank, Washington D.C.
Rawls, J.A. (1991) *A Theory of Justice*. Harvard University Press, Cambridge, Massachusetts.
Reisner, M. (1993) *Cadillac Desert: The American West and its Disappearing Water*. Revised Edition. Penguin, New York.
Rende, M. (2004) Water transfer from Turkey to water-stressed countries in the Middle East. 2nd Israeli-Palestinian International Conference on Water for Life in the Middle East, Antalya, Turkey, 10–14 October 2004. Israel/Palestine Center for Research and Information, Jerusalem.
Robertson, K. (2004) *Design Considerations for an International Facility to Promote Cooperation Between States Sharing a Common Water Resource*, M.Sc. Thesis, Delft University, the Netherlands.
Rodal, B. (1996) *The Environment and Changing Concepts of Security*. Commentary No. 47. Ottawa: Canadian Security Intelligence Service Internet Publication.
Rodgers, A., Nabanyumya, R. and Salehe, J. (2001) Beyond boundaries: Transboundary natural resource management in the Minziro-Sango Bay forest ecosystem. GEF-

UNDP Cross-Borders Biodiversity Project, Nairobi.
Romm, J.J. (1993) *Defining National Security: the Non-Military Aspects*. Council on Foreign Relations, PEW Project on America's Task in a Changed World, New York, Council on Foreign Relations Press.
Rosegrant, M.W., Cai, X. and Cline, S.A. (2002) *World Water and Food to 2025: Dealing with Scarcity*. International Food Policy Research Institute, Washington D.C.
Rwanda/Burundi/Tanzania (1977) Rwanda, Burundi and United Republic of Tanzania. Agreement for the establishment of the Organization for the Management and Development of the Kagera River Basin (with attached map). Concluded at Rusumo, Rwanda, on 24 August 1977.
Sachs, J. and Cook, L.D. (1999) Regional public goods in international assistance. In *Global Public Goods – International Cooperation in the 21st Century* (Kaul, I,, Grunberg, I. and Stern, M., Eds.). United Nations Development Programme, New York.
Sadoff, C.W. and Grey, D. (2002) Beyond the river: the benefits of cooperation on international rivers. *Water Policy*, 4, 389–403.
Sadoff, C.W., Whittington, D. and Grey, D. (2002) *Africa's International Rivers: An Economic Perspective*. The International Bank for Reconstruction and Development/The World Bank, Washington D.C.
Saliba S.N. (1968) *The Jordan River Dispute*. Martinus Nijhoff, The Hague.
Salman, S.M.A. and Boisson de Chazournes, L. (Eds.) (1998) *International Watercourses – Enhancing Cooperation and Managing Conflict*. World Bank Technical Paper No. 414, World Bank, Washington D.C.
Savenije, H.H.G. and van der Zaag, P. (2000) Conceptual framework for the management of shared river basins, with a special reference to the SADC and EU. *Water Policy*, 2, 9–45.
Schaaf, C.C.H. and Fifield, R.H. (1963) *The Lower Mekong: Challenge to Cooperation in Southeast Asia*. van Nostrand, Princeton, New Jersey.
Schelling, T. (1960) *The Strategy of Conflict*. Harvard University Press, Cambridge, Massacusetts.
Scheumann, W. and Schiffler, M. (Eds.) (1999) *Water in the Middle East: Potential for Conflicts and Prospects for Cooperation*. Springer-Verlag, Berlin.
Scheumann, W. and Neubert, S. (2005) *Epfehlungen zur strategischen Orientierung der EZ im grenzüberschreitenden Gewässermanagement in Afrika*, Discussion Paper 10/2005. Bonn: Deutches Institut für Entwisklungspolitik.
Schwartz, Y. and Zohar, A. (1991) *Water in the Middle East: Solutions to Water Problems in the Context of Arrangements between Israel and the Arabs*. Jafee Center for Strategic Studies, Tel Aviv (in Hebrew).
Scott, J.S. (1976) *The Moral Economy of the Peasant – Rebellion and Subsistence in Southeast Asia*. Yale University Press, New Haven and London.
Scudder, T., Manley, R.E., Coley, R.W., Davis, R.K., Green, J., Howard, G.W., Lawry, S.W., Martz, P.P., Rogers, P.P., Taylor, A.R.D., Turner, S.D., White, G.F. and Wright, E.P. (1993) *The IUCN Review of the Southern Okavango Integrated Water Development Project*. Communications Division, International Union for the Conservation of Nature, Gland, Switzerland.
Seaton, E. and Maliti, S.T. (1973) *Tanzania Treaty Practice*. Oxford University Press, Nairobi.
Selby, J. (2003) Dressing up domination as 'co-operation': the case of Israeli-Palestinian water relations. *Review of International Studies*, 29 (1), 121–138.
Selby, J. (2005) The geopolitics of water in the Middle East: fantasies and realities. *Third World Quarterly*, 26 (2), 329–349.
Sellström, T. and Wollgemuth, L. (1996) *The International Response to Conflict and Genocide: Lessons from the Rwanda Experience. Study 1: Historical Perspective: Some Ex-*

planatory Factors. (With contributions from P. Dupont and K.A. Schiebe). The Nordic Africa Institute, Uppsala, Sweden.
Shamir, U. (1998) Water agreements between Israel and its neighbors. *Yale F&ES Bulletin*, 103, 274–296.
Shamir, U. (2002) *Jordan River Case Study, Part II: The Negotiations and the Water Agreement between the Hashemite Kingdom of Jordan and the State of Israel*. (With notes from M. Haddadin). UNESCO International Hydrological Programme contribution to the World Water Assessment Programme, IHP-VI Technical Documents in Hydrology, PC-CP Series, No. 15. UNESCO, Paris.
Shamir, U. (2004) Testimony to the Committee on International Relations of the US Congress House of Representatives on 05 May 2004, the hearings being entitled *Water Scarcity in the Middle East: Regional Cooperation as a Mechanism towards Peace*.
Shapland, G. (1997) *Rivers of Discord: International Water Disputes in the Middle East*. St. Martin's Press, New York.
Shaw, W.D. (2005) *Water Resource Economics and Policy: An Introduction*. Edward Elgar, Cheltenham, England.
Sheskin, A. and Regev, A. (2001) *Israeli Agriculture – Facts and Figures. Second Edition*. Ministry of Agriculture and Rural Development, Israel.
Shiva, V. (2002) *Water Wars – Privatization, Pollution, and Profit*. Pluto Press, London.
Shuval, H. (1992) Approaches to resolving the water conflicts between Israel and her neighbors – a regional Water for Peace Plan. *Water International*, 17, 133–143 (1992).
Shuval, H. (2000) A proposal for an equitable resolution to the conflicts between the Israelis and the Palestinians over the shared water resources of the Mountain Aquifer. *Arab Studies Quarterly*, 22 (2), 33–62.
Shuval, H. (2005) A proposal for an equitable reallocation of the shared water resources between Israelis and Palestinians and the other riparians on the Jordan River basin. First International Conference on Water Values and Rights, Ramallah, Palestine, 02–04 May 2005.
Siam, G.M. and Moussa, H.A. (2003) Food security in Egypt under economic liberalization policies and WTO Agreement. International Conference on Agricultural Policy Reform and the WTO: Where are we Heading. Capri, Italy, 23–26 June 2003.
SKVD (2005). *Future Dams: Recommendations to Swedish Stakeholders on Implementing "Dams and Development – A New Framework for Decision Making"*. Swedish Committee for Water and Dam Issues (SKVD), published by the Swedish Water House/ Stockholm International Water Institute, Drottninggatan, Stockholm.
Snaddon, C.D., B.R, Davies, M.J. Wishart, M.E. Meador and M.C. Thoms (1999) A global overview of inter-basin water transfer schemes, with an appraisal of their ecological, socio-economic and socio-political implications, and recommendations for their management. Water Research Commission, Pretoria.
Sneddon, C., Harris, L., Dimitri, R. and Özemi, U. (2002) Contested waters: Conflict, scale, and sustainability in aquatic socioecological systems. *Society and Natural Resources*, 15, 663–675.
Sophonboon, P. (1970) *Politics in International Cooperation: A Case Study in the International Administrative and Development Operation of the Water Resources in the Lower Mekong Region*. Mimoegraph, Claremont Graduate School, Claremont.
Spector, B. and Wolf, A. (2000) Negotiating security: New goals, changed process, *International Negotiation*, 5(3), 409–426.
Stålgren, P. (2000) *Regional Public Goods and the Future of International Development Cooperation – A Review of the Literature on Regional Public Goods*. Working paper No 2, Expert Group on Development Issues, Ministry for Foreign Affairs, Sweden.
Starr, R. (1991) Water wars. *Foreign Policy*, 82, 17–36.
Stroh, K. (2003) Water: An advocate for reason. Win-win solutions for the Nile basin.

International Politics and Society, 4, 1–14.
Sudan/Egypt (1959) Agreement between the Republic of Sudan and the United Arab Republic for the Full Utilization of the Nile Waters. Signed at Cairo, on 8 November 1959.
Swain, A. (2004) *Managing Water Conflict – Asia Africa and the Middle East*, Routledge, London.
Syrian-Lebanese Agreement (1994) Bilateral agreement, Act No. 15 concerning the division of water of Al-Asi River (Orontes) between the Syrian Arab Republic and the Lebanese Republic. September 20, 1994.
Syrian-Jordanian Agreement (1953) Agreement between the Republic of Syria and the Hashemite Kingdom of Jordan Concerning the Utilization of the Yarmuk Waters. Signed at Damascus, on 4 June 1953.
Tafesse, T. (2000) The hydropolitical perspective of the Nile question. Proceedings of the VIII Nile 2002 Conference, 26–29 June, Addis Ababa.
Takahashi, K. (1974) *Framework for Multinational Regional Development: A Case Study in the International Administrative and Financial Cooperation in the Program to Develop the Lower Mekong Basin*. New York University, New York.
Tollison, R.D. and Willett, T.D. (1979) An economic theory of mutually advantageous issue-linkages in international negotiations. *International Organization*, 33 (4), 425–449.
Torell, M. and Öjendal, J. (2003) *Basin Development Plan, Environment and Fisheries Program – Special Report by the Swedish Team on Issues for Continued Dialogue*. SIDA, Stockholm.
Toset, H.P.W., Gleditsch, N.P. and Hegre, H. (2000) Shared rivers and interstate conflict. *Political Geography*, 19: 971–996.
Tripartite Agreement (1996) Declaration on Principles for Cooperation on Water-related Matters and New and Additional Water Resources. (February 13, 1996).
Trottier, J. (2003) The need for multiscalar analysis in the management of shared water resources. In *History and Future of Shared Water Resources* (Hassan, F.A., Ed.). UNESCO-IHP, Paris.
Turton. A.R. (2000a) Water wars in Southern Africa: Challenging conventional wisdom. In *Water Wars: An Enduring Myth or Impending Reality? African Dialogue Monograph Series No. 2* (Solomon, H. and Turton, A.R., Eds.). Accord Publishers, Durban.
Turton, A.R. (2000b) Precipitation, people, pipelines and power: Towards a political ecology discourse of water in Southern Africa. In *Political Ecology: Science, Myth and Power* (Stott, P. and Sullivan, S., Eds.). Edward Arnold, London.
Turton, A.R. (2001) *Towards hydrosolidarity: Moving from resource capture to cooperation and alliances*. Keynote address at the Stockholm International Water Institute (SIWI) Symposium entitled Water Security for Cities, Food and Environment, Stockholm.
Turton, A.R. (2002a) Hydropolitics: The concept and its limitations. In *Hydropolitics in the Developing World: A Southern African Perspective* (Turton, A.R. and Henwood, R., Eds.), pp. 13–19. African Water Issues Research Unit, Pretoria.
Turton, A.R. (2002b) Water and State sovereignty: The hydropolitical challenge for States in arid regions. In *Conflict Prevention and Resolution in Water Systems* (Wolf, A., Ed.), pp. 516–533. Edward Elgar, Cheltenham, England.
Turton, A.R. (2003a) The political aspects of institutional development in the water sector: South Africa and its international river basins. D.Phil.. thesis. Department of Political Science, University of Pretoria.
Turton, A.R. (2003b) Hydropolitics: The concept and its limitations. In *Hydropolitics in the Developing World: A Southern African Perspective* (Turton, A.R. and Henwood, R., Eds.), pp. 13–19. African Water Issues Research Unit, Pretoria.
Turton, A.R. (2003c) An introduction to the hydropolitical dynamics of the Orange

River Basin. In *International Waters in Southern Africa* (Nakayama, M., Ed.), pp. 136–163. United Nations University Press, Tokyo.
Turton, A.R. (2003d) The hydropolitical dynamics of cooperation in Southern Africa: A strategic perspective on institutional development in international river basins. In T*ransboundary Rivers, Sovereignty and Development: Hydropolitical Drivers in the Okavango River Basin* (Turton, A.R., Ashton, P.J. and Cloete, T.E., Eds.), pp. 83–103. African Water Issues Research Unit, Pretoria, and Green Cross International, Geneva.
Turton, A.R. (2004) The evolution of water management institutions in select Southern African international river basins. In *Water as a Focus for Regional Development* (Tortajada, C., Unver, O. and Biswas, A.K., Eds.), pp. 251–289. Oxford University Press, London.
Turton, A.R. (2005a) Hydro hegemony in the context of the Orange River basin. First International Workshop on Hydro-hegemony. King's College, London, 21–22 May 2005.
Turton, A.R. (2005b) A critical assessment of the basins at risk in the Southern African Hydropolitical Complex. Paper presented at the Workshop on the Management of International Rivers and Lakes, hosted by the Third World Centre for Water Management and the Helsinki University of Technology, 17–19 August, Helsinki, Finland.
Turton, A.R. and Earle, A. (2004) An assessment of the Parallel National Action model as a possible approach for the integrated management of the Okavango River Basin. Deliverable D6.2 of the Water Ecosystem Resources in Rural Development (WERRD) Project funded by the European Union. Available online at <http://www.okavangochallenge.com/okaweb/wp6/default00748.htm>.
Turton, A.R., and Earle, A. (2005) Post-Apartheid institutional development in selected Southern African international river basins. In *Water Institutions: Policies, Performance & Prospects* (Gopalakrishnan, C., Tortajada, C. and Biswas, A.K., Eds.), pp. 154–173. Springer-Verlag, Berlin.
Turton, A. and Meissner, R. (2002) The hydrosocial contract and its manifestation in society: A South African case study. In: Hydropolitics in the Developing World: A Southern African Perspective (Turton, A.R. and Henwood, R., Eds.), pp. 37–60. African Water Issues Research Unit, Pretoria.
Turton, A.R., Nicol, A. and Allan, J.A. (2003) *Policy Options for Water Stressed States: Emerging Lessons from the Middle East and Southern Africa*. African Water Issues Research Unit, Pretoria, and Overseas Development Institute, London.
Turton, A.R., Hattingh, H., Claassen, M. and Roux, D. (2005) Towards a model for ecosystem governance: An integrated resource management example. Paper presented at the International Symposium on Ecosystem Governance, Kwa Maritane, South Africa 10–13 October 2005.
Turton, A.R., Hattingh, H., Godfrey, L. and Julien, F. (2006) Unpacking groundwater governance through the lens of a trialogue. Paper presented at the *International Symposium on Groundwater Sustainability* hosted by the University of Alicante and the Spanish Royal Academy of Sciences on 24–27 January in Alicante, Spain.
UNCESCR (2002) General Comment No 15 of the Committee on Economic, Social and Cultural Rights entitled *The right to water (arts. 11 and 12 of the International Covenant on Economic, Social and Cultural Rights)*. UN Document E/C.12/2002/11, 26 November 2002.
UNDP (2005) Human Development Report 2005. United Nations Development Programme, New York.
UNEP (2002) *Atlas of International Freshwater Agreements*. United Nations Environment Programme, Nairobi.
UNESCO-ISARM (2005) *Managing Shared Aquifer Resources in Africa*. United Nations Educational Scientific and Cultural Organization – International Shared Aquifer Re-

source Management IHP-VI, Series on Groundwater, No. 8. CD plus accompanying maps. BGR – Fachgruppe Internationale Zusammenarbeit, Grundwasser, Hannover.
UNGA (1947) Resolution 181 (II). Future government of Palestine. United Nations General Assembly Resolution A/RES/181 (II) (A+B), 29 November 1947.
United Kingdom/Belgium (1934) Agreement between the United Kingdom and Belgium regarding Water Rights on the Boundary between Tanganyika and Ruanda-Urundi. London, November 22, 1934.
United Kingdom/Egypt (1929) Exchange of Notes between His Majesty's Government in the United Kingdom and the Egyptian Government in Regard to the Use of the Waters of the River Nile for Irrigation Purposes. Cairo, May 7th 1929.
United Kingdom/Egypt (1946) Exchange of Notes Constituting an Agreement between the United Kingdom of Great Britain and Northern Ireland and Egypt Regarding the Utilisation of Profits from the 1940 British Government Cotton Buying Commission and the 1941 Joint AngloEgyptian Cotton Buying Commission to Finance Schemes for Village Water Supplies. Cairo, 7 and 10 December 1946.
United Kingdom/Egypt (1949a) Exchange of Notes Constituting an Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Egypt Regarding the Construction of the Owen Falls Dam, Uganda. Cairo, 30 and 31 May 1949.
United Kingdom/Egypt (1949b) Exchange of Notes Constituting an Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Egypt Regarding the Construction of the Owen Falls Dam, Uganda. Cairo, 5 December 1949.
United Kingdom/Egypt (1950) Exchange of Notes Constituting an Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland (on Behalf of the Government of Uganda) and the Government of Egypt Regarding Co-operation in Meteorological and Hydrological Surveys in Certain Areas of the Nile Basin. Cairo, 19 January, 28 February and 20 March 1950.
United Kingdom/Egypt (1952–53) Exchange of notes constituting an agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Egypt regarding the construction of the Owen Falls Dam in Uganda. Cairo, 16 July 1952 and 5 January 1953.
United Kingdom/Italy (1925) Exchange of Notes between the United Kingdom and Italy Respecting Concessions for a Barrage at Lake Tsana and a Railway Across Abyssinia from Eritrea to Italian Somaliland, Rome, 14 and 20 December 1925.
United Nations (1992) *Water Resources of the Occupied Palestinian Territory*. United Nations, New York.
United Nations (1997) *United Nations Convention on the Law of the Non-navigational Uses of International Watercourses*. United Nations General Assembly, A/RES/51/869, 21 May 1997.
Unver, O. (2005) Sharing benefits from upstream water storage: The case of Euphrates-Tigris system. SIWI Seminar: Finding ways to benefit sharing from integrated land and water use in river basins. World Water Week, Stockholm, 27 August 2005.
van der Zaag, P. and Savenije, H.H.J. (2000) Towards improved management of shared river basins: Lessons from the Maseru Conference. *Water Policy*, 2, 47–63.
van der Zaag, P., Seyam, I.M. and Savenije, H.H.J. (2002) Towards measurable criteria for the equitable sharing of international water resources. *Water Policy*, 4, 19–32.
van Steenebergen, F. (2001) Transboundary water management as an international public good, in water security for cities, food and environment – Towards catchment hydrosolidarity. Proceedings of a SIWI Seminar, Stockholm.
Walzer, M. (1983) *Spheres of Justice: A Defense of Pluralism and Equality*. Basic Books, Inc., New York.

Warner, J. (2003) Virtual water – virtual benefits? Scarcity, distribution, security and conflict reconsid*ered. In: Virtual Water Trade: Proceedings of the International Expert Meeting on Virtual Water Trade* (Hoekstra, A.Y., Ed.), pp. 125–135. Value of Water Research Report Series No. 12, November 2003, IHE Delft, the Netherlands.

Waterbury, J. (1979) *Hydropolitics of the Nile Valley*. Syracuse University Press, Syracuse, New York.

Waterbury, J. (1994) Transboundary water and the challenge of international cooperation in the Middle East. In *Water in the Arab World, Perspectives and Prognoses* (Rogers and Lydon, Eds.), pp. 39–64. Division of Applied Sciences, Harvard University.

Waterbury, J. (2003) *The Nile Basin: National Determinants of Collective Action*. Yale University Press, New Haven and London.

Waterbury, J. and Whittington, D. (1998) Playing chicken on the Nile? The implications of micrdam development in the Ethiopian highlands and Egypt's New Valley Project. *Yale F&ES Bulletin*, 103, 150–167.

WCD (2000) *Dams and Development: A New Framework for Decision-Making*. World Commission on Dams. Earthscan, London.

Wendt, A. (1994) Anarchy is what States make of it: The social construction of power politics. In *International Organization and Global Governance: A Reader* (Mansfield, E.D. and Kratochwil, F., eds.). Harper Collins, New York.

Westing, A. (Ed.) (1986) Global Resources and International Conflict: Environmental Factors in Strategic Policy and Action. Oxford Press, New York.

Whiteman, M.D. (1964) *Digest of International Law*, 3, 1011–12. Cited by Kendie (1999).

Whittington, D. and McClelland, E. (1992) Opportunities for regional and international cooperation in the Nile Basin. *Water International*, 17 (3), 144–154.

Whittington, D., Waterbury, J. and McClelland, E. (1995) Toward a new Nile water agreement. In: *Water Quantity/Quality Management and Conflict Resolution: Institutions, Processes, and Economic Analyses* (Dinar, A. and Loehman, E.T., Eds.), pp. 167–178. Praeger, Amsterdam.

Wittfogel; K.A. (1957) *Oriental Despotism. A Comparative of Total Power*. Yale University Press, New Haven.

Wolf, A.T. (1997) Water wars and water reality: Conflict and cooperation along international waterways. Presented at *NATO Advanced Workshop on Environmental Change, Adaptation, and Human Security*. Budapest, Hungary. 9–12 October.

Wolf, A.T. (1998a) Hydrostrategic decision making and the Arab-Israeli conflict. *Yale F&ES Bulletin*, 103, 221–273.

Wolf, A.T. (1998b) Conflict and cooperation along international waterways. *Water Policy*, 1 (2), 251–265.

Wolf, A.T. and Ross, J. (1992) The impact of scarce water resources on the Arab-Israeli conflict. *Natural Resources Journal*, 32, 919–922.

Wolf, A. and Hamner, J. (2000) Trends in transboundary water disputes and dispute resolution. In *Environment and Security, Discourses and Practices* (Lowi, M. and Shaw, W.D., Eds.), pp. 123–148. MacMillan Press, London.

Wolf, A.T., Yoffe, S.B. and Giordano, M. (2003) International waters: Identifying basins at risk. *Water Policy*, 5 (1), 29–60.

World Bank (1996) *Staff Appraisal Report. The Republic of Kenya, the United Repblic of Tanzania, and the Republic of Uganda for the Lake Victoria Environmental Management Project*. World Bank, Washington D.C.

World Bank (2004a) *Thirty Nine Months – Intifada, Closures and Palestinian Economic Crisis*. World Bank, Washington D.C.

World Bank (2004b) *Rwanda: Country Framework Report*. World Bank, Washington D.C.

World Bank (2004c) *Water Resources Sector Strategy: Strategic Directions for World Bank Engagement*. World Bank, Washington D.C.
World Bank (2004d) *Water Resources Sector Strategy: Strategic Directions for World Bank Engagement*. World Bank, Washington D.C.
World Bank (2005) *Support to Multi-Purpose Development of the Kagera River Basin & the Rusumo Falls Project: Approach Paper.* World Bank, Washington D.C., 17 June 2005.
Wouters, P. (2003) *Sharing Transboundary Waters: An Integrated Assessment of Equitable Entitlement. The Legal Assessment Model. Volume 1. Users' Guide and Legal Report*. International Water Law Research Institute, Dundee, Scotland.
WWW (2005a) Integrated Kagera Basin Management and Development Project. Case study on the multi-purpose development of the Kagera River basin and the regional Kagera hydroelectric project (RRFP). World Water Week, Stockholm 2005, Presentation and panel discussion by Ministers.
WWW (2005b) Kagera Multi-purpose Development and the Rusumo Falls Project. Toward regional integration, prosperity and stability in the Kagera Basin. World Water Week, Stockholm 2005, Presentation and panel discussion by Ministers.
Yang, H. and Zender, A.J.B. (2002) Water scarcity and food import: A case study for southern Mediterranean countries. *World Development*, 30 (8), 1413–1430.
Yoffe, S.B. (2001) *Basins at Risk: Conflict and Cooperation over International Freshwater Resources*. Ph.D. dissertation, Department of Geosciences, Oregon State University, Oregon.
Yoffe, S. and Larson, K. (2001) *Basins at Risk: Water Event Database Methodology, Chapter 2*. Department of Geography, Oregon State University, Corvallis, USA.
Young, O.R. (1989) *International Cooperation: Building Regimes for Natural Resources and the Environment*. Cornell University Press, Ithaca.
Zartman, I.W. and Rubin, J.Z. (Eds.) (2000) *Power & Negotiation*. The University of Michigan, Ann Arbor.
Zeitoun, M. (2005a) Conflict and water in Palestine. The consequences of armed conflict on drinking-water systems in Jenin, Palestine. First International Conference on Water Values and Rights, Ramallah, Palestine, 02–04 May 2005.
Zeitoun, M. (2005b) Hydro-hegemony theory – a framework for analysis of water-related conflicts. First International Workshop on Hydro-hegemony. King's College, London, 21–22 May 2005.
Zimmer, D. and Renault, D. (2003) Virtual water in food production and global trade: Review of methodological issues and preliminary results. In: Virtual Water Trade: Proceedings of the International Expert Meeting on Virtual Water Trade (Hoekstra, A.Y., Ed.), pp. 93–109. Value of Water Research Report Series No. 12, November 2003, IHE Delft, the Netherlands.

Annex 1. Historical Agreements Relevant to the Case Studies

1. Historical water-related agreements in the Jordan River basin

1.1 Palestine, Syria and Lebanon

Even the earliest documents listed in Section 4.2.1 of the main report refer specifically to allocations of water from the Jordan River system to various co-riparians, and sometimes also to water rights. The Franco-British Convention (1920) notes in Article 8 that:

> *Experts nominated respectively by the Administrations of Syria and Palestine shall examine in common …. the employment, for the purposes of irrigation and the production of hydro-electric power, of the waters of the Upper Jordan and the Yarmuk and of their tributaries, after satisfaction of the needs of the territories under the French mandate.*
>
> *In connection with this examination the French Government will give its representatives the most liberal instructions for the employment of the surplus of these waters for the benefit of Palestine.*

The Exchange of Notes (1923) between the same parties refers to the demarcation of the border between Syria and Palestine, and serves to clarify certain aspects of the Convention noted above. This states that:

> *The Government of Palestine or persons authorized by the said Government shall have the right to build a dam to raise the level of the waters of Lakes Huleh and Tiberias above their normal level, on condition that they pay fair compensation to the owners and occupiers of the lands which will thus be flooded. …. Any existing rights over the use of the waters of the Jordan by the inhabitants of Syria shall be maintained unimpaired.*

The Anglo-French Agreement (1926) refers in turn to the Exchange of Notes discussed above, and deals with administrative matters connected to the border. Article III of this document states the following:

> *All the inhabitants …. of both territories who, at the date of the signature of this Agreement enjoy grazing, watering or cultivation rights, or own land on the one or the other side of the frontier*

shall continue to exercise their rights as in the past. They shall be entitled, for this purpose, to cross the frontier freely and without a passport …. without paying any Customs duties or any dues for grazing or watering or any other tax on account of passing the frontier and entering the neighbouring territory.

The same rights shall be enjoyed by their employees or tenants and by the employees of the latter.

All rights derived from local laws or customs concerning the use of the waters, streams, canals and lakes for the purposes of irrigation or supply of water to the inhabitants shall remain as at present. The same rule shall apply to village rights over communal properties.

While the general intent of these early agreements to protect the historical water rights of the local inhabitants is to be applauded (and it is clear that the parties intended that shared watercourses should continue to be available to the various populations that had depended on them, to that time), no attempt was made to quantify the rights involved, i.e. to allocate specific volumes or percentages of total flow to particular end-users.

1.2 Syria and Jordan

The Syrian-Jordanian Agreement (1953) relates to the use of the Yarmouk River for both irrigation and hydroelectric power generation, and was intended to preface the construction of the Maqarin Dam. Article 2(a) of the Agreement cites a flow of not less than 10 m^3/second for use by Jordan in irrigation, while Article 8 gives Syria the right to use all spring waters arising in its own territory above the 250 metre level, plus water below the dam for irrigation in the lower Yarmouk basin and eastward of Lake Tiberias, or for other Syrian schemes.

The Al Wehdah Agreement (1987) between Syria and Jordan amended certain of the provisions noted above, particularly in allowing Syria to impound water in small earthen dams, and to use such resources for irrigation and to support livestock. This was agreed to in return for Syrian support for the construction of the Unity Dam (Al Wehdah Dam), located close to the site proposed previously for the Maqarin Dam. Work on the construction of the Al Wehdah Dam commenced in February 2004.[1] It is intended that Jordan will mainly use the waters to compensate for domestic consumption deficits in Amman and the Zarqa Valley, with projects to irrigate about 4,700 hectares in the Jordan Valley. Syria will produce 18.8MW of hydroelectric

[1] See Middle East Online, Assad, *King Abdallah II Launch Dam Project*, 10 February 2004, <www.middle-east-online.com/english/Default.pl?id=8822>.

power from the dam site.

It is notable that the water rights of the two parties were only partially quantified by these Agreements, and the fact that neither of the dams has been constructed to date reduces the present utility of both Agreements.

1.3 Syria and Lebanon

The Orontes (Al-Asi) River rises in Lebanon and flows through Syria, emptying into the Mediterranean Sea within the Turkish Province of Hatay. The Syrian-Lebanese Agreement (1994) on the division of these waters was concluded in the absence of the third co-riparian, and was only endorsed by the Syrian Parliament in late 2002. Both Lebanon and (especially) Syria have developed the Orontes basin heavily, and only meagre flows remain in the downstream reaches within Turkey, as a result. The bilateral agreement allows Lebanon a share of 80 MCM/year from the Orontes, but only in years when the flow within Lebanon amounts to 400 MCM/year or greater. In years when less than 400 MCM/year arises in Lebanon, the Lebanese share decreases by 20%, to 64 MCM/year.

While certain political elements have claimed that Lebanon received a greater share than its water right to the Orontes through the terms of the 1994 agreement (Nasser, 2002), this claim has not been justified on the basis of accepted principles of customary international water law, and some Lebanese hydrologists have taken an opposing view, claiming that Syria was favoured by the agreement. It appears that the division of the available flows was derived through simple negotiation, and no detailed justification for the allocation to Lebanon has been made available. The heavy utilization of the Orontes River by Syria dates back to the French Mandate in the 1930s. Although the Orontes waters represent only about 8% of the overall supply to Syria as a whole, they irrigate one of the most fertile regions of the country (the Ghab) which contributes about 25% to the national production of foodstuffs. Syria's refusal to recognize Turkey's downstream rights on the Orontes basin is rooted in territorial claims on the Hatay region, which remain controversial.

1.4 Israel and Jordan

The Israeli-Jordanian Peace Treaty (1994) addresses water-related issues in Article 6, and also in Annex II. Article 6 (1) cites the term *"rightful allocations"* as opposed to 'water rights'. Shamir (1998, 2002) has suggested that this was necessary to defuse sensitivity to the use of either 'water rights' or 'allocations' in the text, although the precise distinctions between certain of these terms could be debated. Article 6 (2) includes a reference to the avoidance of harm, but the other provisions concerning water in the main text of the Peace Treaty are generic in nature and address mainly the issue of

future cooperation between the parties. The details concerning volumetric allocations are provided in Annex II of the Peace Treaty, and allow for the following:

- the abstraction of 25 MCM/year by Israel from the Yarmouk River (12 MCM in summer and the remaining 13 MCM in winter);

- the use of waters downstream of point 121 at the Adasiyah Dam diversion by either party, such that *"waste of water will be minimized"*;

- the transfer of 20 MCM/year by Israel to Jordan in summer, from the Jordan River directly upstream from the Deganya Gates;

- the storage by Jordan of a *"minimum average"* of 20 MCM/year in the lower Jordan River, south of the confluence with the Yarmouk;

- maintenance of the then-current Israeli uses of Jordan River waters between the confluence with the Yarmouk and that with Wadi Yabis (Tirat Zvi), with an equivalent use by Jordan on the basis that this does not harm Israeli uses; and

- the further provision to Jordan of 10 MCM/year of desalinated water derived from the saline springs in Israel to the north-west of Lake Tiberias, in the winter period and at dates selected by Jordan (this volume to be provided by Israel from the Jordan River until the desalination facility is operative).

Article I (3) of Annex II to the Peace Treaty cites a requirement for the Joint Water Committee shared by the parties (which was also established by the Treaty) to develop a plan for Israel to supply Jordan with an additional 50 MCM/year of water, from a source which was then unidentified. This additional flow has not been provided to Jordan, to date.

It is notable that while certain flows are quantified by the 1994 Peace Treaty, it is altogether impossible to derive an entire picture of the water rights (or *"rightful allocations"*) relevant to the two parties, from its text. In addition, while Article III of Annex II contains general provisions relating to the protection of water quality, the statement at Article III (4) concerning the quality of water to be provided by one party to the other has certainly been proven to be insufficient to protect the interests of Jordan. The Treaty also did not anticipate solutions for times of drought – most recently, such as in the period between 1998 and 2001. Faced with Israel's unwillingness to abide in full by the 1994 Peace Treaty, Jordan has reverted in more recent years to Syria for additional supplies of fresh water.

1.5 Palestine and Israel

The two main agreements which remain in force between the Palestine Liberation Organization and Israel are the Declaration of Principles (1993) and the Interim Agreement (1995), the latter sometimes also being known as the Oslo II accord.

Annex III to the Declaration of Principles is entitled *Protocol on Israeli-Palestinian Cooperation in Economic and Development Programs.* Clause [1] states that the parties will focus on the following:

> *Cooperation in the field of water, including a Water Development Program prepared by experts from both sides, which will also specify the mode of cooperation in the management of water resources in the West Bank and Gaza Strip, and will include proposals for studies and plans on water rights of each party, as well as on the equitable utilization of joint water resources for implementation in and beyond the interim period.*

The use of the term *"equitable utilization"* here is especially notable. The Declaration of Principles pre-dated the Convention on the Law of the Non-navigational Uses of International Watercourses (United Nations, 1997), and it may be assumed that the term was derived from Chapter 2 of The Helsinki Rules on the Uses of the Waters of International Rivers dating from 1966, coupled perhaps to the preparatory work of the United Nations International Law Commission leading to the 1997 UN Convention (which had adopted on first reading, a complete set of draft articles in 1991). In any event, the term has a highly specific legal meaning, which is widely documented and understood.

The Interim Agreement was signed by representatives of Palestine and Israel on 28 September 1995. Article XXXI of that document requires the parties to reach final agreement on a number of issues, through the completion of permanent status negotiations. The negotiations are intended to include water-related issues, and remain to be completed at the present time.

Topics relating to water and wastewater are addressed by Annex III, Appendix 1 to the Interim Agreement (the Protocol Concerning Civil Affairs), principally in Article 40 (entitled 'Water and Sewage'). This included the recognition by Israel of Palestinian water rights in the West Bank, although these were not quantified; laid down agreements on the coordination of the management of water supplies and of wastewater treatment and disposal for the interim period; and specified additional water resources which should be made available to Palestine during the same interim period. It is notable that Article 40 [6] states that *"… [b]oth sides have agreed that the future needs of the Palestinians in the West Bank are estimated to be between 70–80 mcm/year."* General agreements were also included on mutual cooperation, and on the protection of water resources and infrastructure.

Article XXXI of the Interim Agreement states the following, in Clause 6:

> *Nothing in this Agreement shall prejudice or pre-empt the outcome of the negotiations on the permanent status to be conducted pursuant to the DOP. Neither Party shall be deemed, by virtue of having entered into this Agreement, to have renounced or waived any of its existing rights, claims or positions.*

A similar provision is repeated in Article 40 [8] of Annex III, in relation specifically to water resources. Given these provisions, it is clear that the 70 –80 MCM/year cited in Article 40 [6] of Annex III to the Interim Agreement cannot be considered as the water rights of the Palestinians. Thus, the Interim Agreement failed to quantify the water rights of either Palestine or Israel.

1.6 Palestine, Israel and Jordan

The so-called Tripartite Agreement (1996) arose from the Multilateral Working Group on Water Resources, established initially by the Madrid Peace Conference in 1991. While it was signed by representatives of Palestine, Israel and Jordan, the extent to which it legally binds these parties may be debated. The agreement states specifically that it will not affect any of the previous bilateral or other agreements between the three parties. Its text is mostly generic, and addresses cooperation in the field of water resources and the allocation of any new water resource. Notably, Clause [3] under the heading 'Common Denominators' states that *"[d]omestic uses occupy the first priority in the allocation of water resources."* No volumetric estimates of allocations to the parties are cited, and the agreement therefore fails to quantify the water rights of any of the parties, in any meaningful manner.

1.7 The Environmental Code of Conduct

The Bahrain Environmental Code of Conduct for the Middle East was released in 1994. It arose from the Multilateral Working Group on the Environment, which was in turn established at the 1991 Madrid peace process talks. In legal terms, the document is not binding on the regional parties, but its content is nevertheless instructive.

Article 1 of the Environmental Code of Conduct is entitled 'Principles' and the first three of these are as follows:

> *(1) Natural resources of the region shall be utilized on a sustainable basis, and unique environmental resources to the region shall be preserved.*

(2) The parties will strive for a fair and just utilization and coordinated management policies of the shared natural resources in the region.

(3) The parties have the right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other parties.

These principles are highly reminiscent of the demand for the equitable and reasonable utilization of shared watercourses which is enshrined in customary international water law, together with the requirement to avoid causing significant harm to other co-riparians. As noted in Chapter 4 of the main report, however, the parties have by no means adhered to these principles.

2. Historical water-related agreements in the Kagera and Nile River basins

2.1 The early agreements: 1891 to 1925

On 15 April 1891, Great Britain and Italy signed the first international agreement concerning the waters of the Nile River (Great Britain/Italy, 1891). This stated that Italy would not construct works on the Atbara River (which rises in the highlands of Ethiopia and joins the main Nile River to the north of Khartoum, downstream of the confluence of the White and Blue Niles) that would affect its flow through Sudan into the Nile. The principal concern at that time related to irrigation works in the upper reaches of the system, which could have affected flows to downstream sections of the Nile River.

In May 1894, Great Britain signed an agreement in Brussels with the Congo, in which the latter party agreed not to construct any works which would reduce the water flow into Lake Albert, unless in agreement with the Sudanese Government. This was slightly modified by an agreement signed in London between Great Britain and the Congo in May 1906, which altered the boundary between the Sudan and the Congo, affecting the ownership of the Lado Enclave (Great Britain/Congo, 1906).

The exchange of notes of 18 March 1902 between Great Britain and Ethiopia stated that the colonial areas dominated by the former would receive all of the waters of the Blue Nile, unless the parties were to agree on a given project (Great Britain/Ethiopia, 1902). Ethiopia agreed not to interfere with the flow of the Blue Nile, or that in Lake Tana or the Sobat River, except in consultation with the British Government and the Government of

the Sudan. The text of this accord closely resembles that of the agreement between Britain and Italy of 1891 discussed above, and it is notable that some authors claim that the agreement was never ratified (Kendie, 1997).

The December 1906 agreement between Great Britain, France and Italy related to Abyssinia (Great Britain/France/Italy, 1906). This noted that in the event of political or territorial concerns in the region of Abyssinia, the regulation of river flows would be protected in the interests of Great Britain (representing the Sudan) and Egypt (i.e. the two downstream parties).

In mid-December 1925, the United Kingdom and Italy exchanged notes in Rome regarding concessions for a barrage at Lake Tana (Tsana), and a railway across Abyssinia from Eritrea to Italian Somaliland (United Kingdom/Italy, 1925). These notes effectively modified and extended the 1906 tripartite agreement between Great Britain, France and Italy, noted above. The barrage was intended to regulate the flow of the Blue Nile, principally to improve irrigation in the Sudan and Egypt downstream. The concession regarding to the railway was a *quid pro quo* offered by the British Government. The response from the Italian Prime Minister contained a particularly interesting section on water rights, as follows:

> *On their side the Italian Government, recognising the prior hydraulic rights of Egypt and the Sudan, engage not to construct on the head waters of the Blue Nile and the White Nile and their tributaries and effluents any work which might sensibly modify their flow into the main river.*
>
> *I note that His Britannic Majesty's Government have every intention of respecting the existing water rights of the populations of the neighbouring territories which enter into the sphere of exclusive Italian economic influence. It is understood that, in so far as is possible and is compatible with the paramount interests of Egypt and the Sudan, the scheme in contemplation should be so framed and executed as to afford appropriate satisfaction to the economic need of these populations.*

It is clear from these various early agreements that the downstream requirements for flow in the Nile River were given priority, even from the initial international considerations of specific areas of the basin. However, it must be noted that the agreements were negotiated and agreed to between former colonial powers; whether they are binding on the successor States is a legal question that has not been definitively resolved, as yet. This is a key element of the hydro-political dynamics in the Nile River Basin with specific relevance to the Kagera sub-basin, for reasons addressed in Chapter 5 of the main report.

2.2 The first detailed agreement: 1929

The exchange of notes between the United Kingdom and the Egyptian Government in 1929 (United Kingdom/Egypt, 1929) followed a report in 1925 from the Nile Commission, which in turn post-dated the so-called Nile Projects Commission of 1920. Both of these bodies investigated a number of important matters relating to the flow of the Nile River, and particularly the relationship between works in the Sudan and the potential effects of these on downstream flows in Egypt.

The report of the Nile Commission of 1925 was in fact appended to (and cited in) the note of 07 May 1929 from the Egyptian Government to the United Kingdom, and in legal terms therefore constitutes part of the 1929 agreement as a whole. That note contains a number of important statements on behalf of Egypt, including the following:

> *It is realised that the development of the Sudan requires a quantity of the Nile water greater than that which has been so far utilised by the Sudan.… the Egyptian Government has always been anxious to encourage such development, and will therefore continue that policy, and be willing to agree with His Majesty's Government upon such an increase of this quantity as does not infringe Egypt's natural and historical rights in the waters of the Nile and its requirements of agricultural extension, subject to satisfactory assurances as to the safeguarding of Egyptian interests as detailed in later paragraphs of this note.*

The note also states that:

> *The Egyptian Government therefore accept the findings of the 1925 Nile Commission, whose report is annexed hereto, and is considered an integral part of the present agreement. They propose, however, that.… the dates and quantities of gradual withdrawals of water from the Nile by the Sudan in flood months as given in article 57 of the Commission's Report be modified in such a manner that the Sudan should not withdraw more than 126 cubic metres per second before 1936, it being understood that the schedule contained in the above-mentioned article will remain unaltered until the discharge of 126 cubic metres per second is reached. These quantities are based on the Nile Commission's Report, and are therefore subject to revision as foreseen therein.*

This constituted the first agreement on the Nile where specific volumetric allocations were proposed for upstream/downstream parties, but the involvement of a colonial power is once again notable. Significantly, this

agreement did not take account of any possible claims to the water by other upstream riparians, making it inconsistent with modern principles of international law. The volumetric agreement was accompanied by the following caveats:

- That the Egyptian Irrigation Service could ensure in collaboration with the Sudanese authorities that discharges from the recently-completed Sennar Dam in the Sudan complied with the agreement.

- That no works would be undertaken in the Sudan which affected the downstream flow regime in the Nile, without prior Egyptian agreement.

- That any work undertaken in the Sudan by the Egyptian Government to improve downstream flows would be agreed with the *"local authorities"*.

- That the United Kingdom Government would facilitate any monitoring, surveys or works as noted above.

Article 57 of the Nile Basin Commission report contains the fundamental allocations proposed for the Sudan and Egypt, with Article 88 providing a summary of these. The allocations to the Sudan were proposed to increase in a step-wise fashion from 84 m^3/second prior to 1929–30, to 168 m^3/second in 1935–36. The final allocations were complex, being based on a seasonal pattern as follows:

- 168 m^3/second from 01 August to 30 November (14.5 MCM/day or 1,771 MCM over the 122 days);

- 160 m^3/second from 01 December to 31 December (13.8 MCM/day or 429 MCM over the 31 days);

- 80 m^3/second from 01 January to 15 January (6.9 MCM/day or 104 MCM over the 15 days); and

- 52 m^3/second from 16 January to 18 January (4.5 MCM/day or 13.5 MCM over the 3 days).

The quantifiable allocation to the Sudan in the Nile Basin Commissions' report amounted to 2,317.5 MCM/year, with an additional unquantified volume for small-scale 'perennial' pump and basin irrigation in the Sudan, which had been agreed at an earlier time.

2.3 The first agreement on the Kagera system: 1934

The first agreement specific to water allocations within the Kagera River basin was signed by the United Kingdom and Belgium on 22 November 1934, with ratifications being exchanged in May 1938 (United Kingdom/Belgium, 1934). Part of the significance of this agreement is that it was entered into between two colonial powers without any reference to any future aspiration or rights of colonies once they gained independence. The agreement sought to extend earlier protocols of 1924 and 1934 on the boundaries between 'Ruanda/Urundi' (now Rwanda and Burundi) and 'the Tanganyika Territory' (now Tanzania) and concerned both abstractions from and inputs to trans-boundary rivers between the involved countries.

The agreement effectively stated that the countries would not interfere substantively with the flow of such trans-boundary rivers, and would not pollute them to the detriment of the downstream party. The parties were permitted to divert up to half of the low-season flow at any point in trans-boundary rivers, provided that *"such water after use shall without substantial reduction be returned to its natural bed."* A system of prior notification of the intended use of such trans-boundary rivers was also included in Article 6 of the agreement, and Articles 8 and 9 noted that customary rights with respect to access to the river, and to navigation, fishing and other uses would be respected. The Kagera River is the major watercourse affected by this agreement.

2.4 Agreements in the 1940s and early 1950s

In December 1946, the United Kingdom and Egypt exchanged notes pertaining to trade in cotton, which had specific relevance to water supplies (United Kingdom/Egypt, 1946). An enclosure attached to the note from the Egyptian authorities stated that only 25% of the Egyptian population received adequate supplies of potable water at that time. Interestingly, it also noted that groundwater was available in some areas and was generally of good quality, and the agreement sought to utilize the profits from cotton production to develop groundwater abstraction schemes for rural villages in Egypt. The scheme was of considerable significance in relation to the overall population, with 11.5 million inhabitants in mainly rural areas being intended to benefit.

The construction of the Owen Falls Dam in Uganda was addressed by an agreement of late May 1949 between the United Kingdom and Egypt (United Kingdom/Egypt, 1949a), with the United Kingdom acting as the colonial power in Uganda. This agreement stated the following in Article 4, relating to Egyptian interests several thousands of kilometres downstream:

> *The two Governments have also agreed that though the construction of the dam will be the responsibility of the Uganda Electricity Board, the interests of Egypt will, during the period of construction*

[be] represented at the site by an Egyptian resident engineer…. and his staff…. to whom all facilities will be given for the accomplishment of their duties. Furthermore, the two Governments have agreed that although the dam when constructed will be administered and maintained by the Uganda Electricity Board, the latter will regulate the discharges to be passed through the dam on the instructions of the Egyptian resident engineer [to] be stationed with his staff at the dam….

This agreement reflects a similar approach to that of the early accords discussed above, and it is interesting that paragraph 5 of the note from the British Government specifically cited the 1929 agreement discussed previously. It is clear from this that the parties involved were unusually eager to protect flows to the extreme downstream co-riparian, at all costs. The contractual agreements relating to the construction of the Owen Falls Dam were confirmed in an additional exchange of notes between the same parties in early December 1949 (United Kingdom/Egypt, 1949b). Yet further notes which were exchanged between the parties in the period from January to March 1950 instigated a meteorological and hydrological survey for the equatorial lakes region, the purpose of this being specifically stated as "….*the ever-growing need for Egypt to collect all possible data about the Lakes…"* (United Kingdom/Egypt, 1950). Egyptian involvement in the surveys and monitoring programmes was guaranteed by the agreement, and the Egyptian Government also agreed in 1952 –53 to pay compensation for *"interests affected by the implementation of the scheme"*, this involving the need to raise the level of Lake Victoria by up to three metres (United Kingdom/Egypt, 1952–53).

2.5 The 1959 Agreement between Egypt and the Sudan

The agreement of 08 November 1959 between Egypt and the Sudan is commonly cited as the most important (and some believe, relevant) accord concerning allocations of water in the Nile River basin (Sudan/Egypt, 1959). It is notable that despite the fact that it involved only two of the co-riparians, even the title of the agreement states that it covers the 'full utilization' of the Nile waters. This reflects the doctrine of 'absolute territorial integrity', the mirror image of the Harmon Doctrine (a principle dating from the year 1895 representing a position of absolute territorial sovereignty) neither of which is now recognized as forming part of international law on trans-boundary waters.

The first article of the agreement states that the *"acquired rights"* of the parties amount to 4,000 MCM/year for the Sudan and 48,000 MCM/year for Egypt (named the United Arab Republic in the agreement). These figures are not justified in any fashion. The construction of both the *"Sudd*

el Aali Reservoir" (now known as Lake Nasser, formed by constructing the Aswan High Dam) by Egypt and the Roseires Dam on the Blue Nile by the Sudan (completed in 1966) are then cited, and these works alter the flow allocations to the parties. The net benefit from Lake Nasser was cited as 22,000 MCM/year, to be allocated as 14,500 MCM/year to the Sudan and 7,500 MCM/year to Egypt. These allocations brought the share of the Sudan to 18,500 MCM/year, with that of Egypt being 55,500 MCM/year. The Aswan High Dam was constructed between 1964 and 1971.

The agreement also covered the payment by Egypt of 15 million Egyptian pounds for compensation for damage to Sudanese properties (including the relocation of the population of Halfa), due to the construction of the Aswan High Dam and the formation of Lake Nasser. Annex 2 of the agreement noted that the payment would be made in instalments between 1960 and 1963.

The third Article of the 1959 agreement relates to the Sudd region and to the construction of the Jonglei Canal, as discussed in the main report. It notes that any increase in downstream flows due to the construction of such projects would be shared equally by the Sudan and Egypt, and that the two parties would also share the costs on this basis. It is noted here that this type of thinking was fashionable at the time, but subsequent developments in environmental knowledge have reduced the validity of the core rationale considerably. A Permanent Joint Technical Commission between the Sudan and Egypt was also formed, under the fourth Article of the agreement. The fifth Article noted that this Commission would provide views on matters of relevance to the Nile to the two Governments, who would negotiate with any other co-riparians after agreeing a *"unified view"* (and it is notable that this has since been scrupulously observed by the two parties). Interestingly, any later claims by the other co-riparians of the Nile which led to reduced downstream allocations would be addressed by the Sudan and Egypt sharing these equally, according to this part of the agreement.

Annex 1 of the Agreement is also of interest, providing for a 'loan' by the Sudan of 1,500 MCM/year of water to Egypt, contingent on Egypt requesting the triggering of this after its review of its planned agricultural programmes. This 'loan' was to cease by November 1977, at the latest.

It is informative to consider the change in allocations to the Sudan between the 1929 and 1959 agreements. As noted previously, the 1929 agreement allocated about 2,300 MCM/year to the Sudan, plus small volumes for perennial pumping schemes. By 1959, the *"acquired right"* of the Sudan had risen to some 4,000 MCM/year, and the additional allocation from the Aswan High Dam/Lake Nasser works brought this to 18,500 MCM/year (i.e. the ratios in flow allocations altered from about 12:1 in favour of Egypt, to 3:1). These flows are considered by some to be rightful allocations to the present day, and are of interest if calculated on a *per capita* basis, using the current populations:

- The present population of the Sudan (40.2 million) is allocated 460 m^3 *per capita*/year, or about 1,260 litres/day (plus limited water supplies from other sources in the country).

- The current population of Egypt (77.5 million) is allocated 716 m^3 *per capita*/year from the Nile system, or approximately 1,960 litres/day.

These allocations may be compared with currently available volumes of about 70 m^3 *per capita*/year in Palestine; 160 m^3 *per capita*/year in Jordan; and 330 m^3 *per capita*/year in Israel (see Chapter 4 of the main report), all of which are well below the level of 'absolute scarcity' set at 500 m^3 *per capita*/year.

2.6 The agreement of 1977 on the Kagera Basin Organization

The 1977 agreement for the establishment of the Organization for the Management and Development of the Kagera River Basin involved Rwanda, Burundi and Tanzania. This body eventually became known as the Kagera Basin Organization (KBO). The KBO was to have a wide-ranging remit, extending to the following according to Article 2 of this agreement (Rwanda/Burundi/Tanzania, 1977):

- the development of water and hydropower;
- the provision of water supplies for mining and industrial operations, drinking, and other needs;
- agriculture and livestock development, forestry and land reclamation;
- mineral exploration and exploitation;
- disease and pest control;
- transport and communications;
- trade and tourism;
- wildlife conservation and development;
- fisheries and aquaculture development;
- industrial development, including fertilizer production and peat exploitation; and
- environmental protection.

The jurisdiction of the KBO was defined as the Kagera River basin as a whole, and both a Commission and a Secretariat were established. The headquarters was established in Kigali, Rwanda, with regional offices in the other States.

Article 19 of the agreement noted that it was open to accession by Uganda, and Uganda duly acceded to the agreement in 1981. The KBO became moribund in the early 1990s prior to the genocide in the region, and was very recently officially wound up.

2.7 The most recent agreements

The most recent agreements pertaining to the Nile basin include a 'Framework for General Co-operation' between Egypt and Ethiopia dating from July 1993; a tripartite agreement between Kenya, Tanzania and Uganda in 1994 on the Lake Victoria Environmental Management Plan; and a Protocol for Sustainable Development of the Lake Victoria basin from late 2003.

The 1993 Framework for Co-operation between Egypt and Ethiopia is a very brief document with generalized text relating to cooperation between the parties (Egypt/Ethiopia, 1993). Articles 4 to 6 pertain specifically to the Nile, however, and state the following:

> *Article 4. The two Parties agree that the issue of the use of the Nile waters shall be worked out in detail through discussions by experts from both sides, on the basis of the rules and principles of international law.*
>
> *Article 5. Each Party shall refrain from engaging in any activity related to the Nile waters that may cause appreciable harm to the interests of the other Party.*
>
> *Article 6. The two Parties agree on the necessity of the conservation and protection of the Nile waters. In this regard, they undertake to consult and cooperate in projects that are mutually advantageous, such as projects that would enhance the volume of flow and reduce the loss of Nile waters through comprehensive and integrated development schemes.*

The tripartite agreement of 1994 on the Lake Victoria Environmental Management Plan (Kenya/Tanzania/Uganda, 1994) had two main components, these involving fisheries management and control of the water hyacinth and other invasive weeds; and the management of water quality and land use (including wetlands). The ongoing programme in this regard is being coordinated by the East African Community, as noted in Section 5.1.2 of the main report.

The Protocol for Sustainable Development of the Lake Victoria basin was signed by representatives of Kenya, Tanzania and Uganda at Arusha on 29 November 2003. This Protocol was established under the Treaty for the Establishment of the East African Community (EAC) dating from 1999, and followed a Partnership Agreement signed by the EAC and various development partners in April 2001. The Protocol contains a number of statements deriving from customary international law on trans-boundary waters, including the three key principles of equitable and reasonable utilization; the prevention of harm; and the need for prior notification (Article 4). It also notes that the three signatory countries will negotiate as a bloc with other parties interested in the waters and their utilization, and this is reminiscent of the 1959 agreement between Egypt and the Sudan. Article 33 of the Pro-

tocol establishes a Lake Victoria Basin Commission with a broad mandate for ensuring the sustainable development of the ecosystem.

Most recently, the NBI Ministers of Water Affairs endorsed the preparation of a hydroelectric project at Rusumo Falls on the Kagera River (WWW, 2005b), and Energy Ministers from Burundi, Rwanda and Tanzania signed a joint *communiqué* for the commencement of project preparations in April 2005. A formal international agreement between the parties appears likely, within the foreseeable future.

3. Historical water-related agreements in the Mekong River basin

3.1 The Mekong Committee, 1947–1978

The United Nations Economic Commission for Asia and the Far East (ECAFE) was created in 1947 in order to assist development in Southeast Asia. In 1952, ECAFE completed a collaborative study with the four lower riparians, in which the Mekong's huge potential for hydroelectric and irrigation development was first identified. In 1955 –56, the US Bureau of Reclamation also addressed the planning and development of the lower Mekong River basin. The joint management of river development was advocated, and the need for the collection of basic data on the river was emphasized.

These two studies and their respective parent organizations offered differing views on the preferred development of the Mekong River. Subsequently, an ECAFE report from 1957 agreed with the view of the US Bureau of Reclamation, thus bridging the previous rivalry (see Hori, 2000). That report noted:

- there was major hydropower potential in the main-stem of the river[2];
- there was a possibility for the expansion of irrigated land;
- the threat of flooding downstream could be minimized; and
- navigation could be developed as far as northern Laos.

The report emphasized the need for the comprehensive development of the river, and the requirement for enhanced cooperation between the co-riparians in order to coordinate efforts for individual projects, as well as for overall basin management. A proposal was made for the establishment of

[2] The main bed of the river throughout its overall course is known in most MRC documents as the 'mainstream'. The term 'main-stem' is preferred here.

an international organization for information exchange between the Basin States, and for the coordination of joint projects. The body tasked with information exchange was envisaged as a possible later permanent agency to coordinate joint management of the Mekong River basin, ECAFE (1957: 64) noting as follows:

> *For this purpose [the development of the Mekong basin] it is necessary to establish an international channel or clearing house for the exchange of information and plans and the co-ordination of projects. The clearing agency may be a working group of experts, a standing committee or a commission, as may be decided by the countries concerned. Ultimately, the process may lead to the signing of a convention and the establishment of a permanent body for the development of the basin.*

In general terms, the riparian Governments of the lower Basin States approved of this, as noted by Schaaf and Fifield (1963: 89):

> *All four riparians spoke in favor. Again in a joint resolution all four of the countries directly affected expressed the wish that 'such studies be continued jointly by the four countries concerned in order to determine with more detail in what measure the various projects concerning hydro-electric power, navigation, irrigation, drainage, and flood-control can be of use to a number of countries'.*

This was the background to the creation of the Mekong Committee, which aimed to *"[p]romote, coordinate, supervise, and control the planning and investigation of water resources development projects in the Lower Mekong Basin"*. On 17 September 1957, the four lower riparians (Thailand, Laos, Cambodia and South Vietnam), signed the Statutes, and the Mekong Committee was born. The focus of its activities was cited as: (i) data collection; (ii) the preparation of an overall plan; (iii) the planning and design of individual projects; (iv) the maintenance of existing projects; and (v) ancillary work (Mekong Secretariat, 1989: 14). The Committee was intended to concentrate on technical and coordination activities, and it was not vested with decision-making powers. However, the representatives in the Committee were to have plenipotentiary powers, and considerable effort was made to try to give the Mekong Committee an independent position, both from the United Nations system and from the member Governments.

Importantly, decisions were to be taken unanimously, and the chairmanship was to rotate among the Member States. No mention was made of the allocation of flows. A River Basin Authority was thus created that was far ahead of the global state of development on thinking on such issues, at that time. However, it may also have been ahead of the development of the over-

all capability in the Mekong Basin, as noted below and in the main report.

Although the Mekong Committee was not vested with any independent decision-making capacity as such, it signed several agreements, including the 'Convention on Power Supply between Thailand and Laos' in 1965 (Mekong Secretariat, 1989: 14). This concerned the sale of hydropower from Thailand to Laos, and was a crucial condition for the building of the first dam of international significance in the Mekong Basin, the Nam Ngum Dam.

Throughout the 1960s, enthusiasm ran high regarding the development potential of the basin. The bulk of the effort during this decade related to the institutionalization of the Committee and the development of a Master Plan for the entire lower Mekong basin. This Plan was finalized in 1970, and contained a 'cascade' of eight main-stem dams in the lower Mekong alone, with a large number of minor dams in the tributaries. In addition, it proposed that six million hectares of land could be irrigated, and a large number of specific projects were suggested. Work commenced shortly thereafter to address elements of this ambitious plan. However, the conflicts in the region (especially the Vietnam War and the emerging Cambodian Civil War after the toppling of President Sihanouk in a *coup d'état*) severely reduced the viability of the Plan as a whole.

In 1975, the four co-riparians set out to refine the Committee's objectives and principles for development in support of the Mekong Plan, through the signature of the Joint Declaration of Principles. This declaration was based on the principle that *"the water resources of the basin – in all phases of the hydrologic cycle – constitute a single natural resource"* (Article III), which should be shared on a "reasonable and equitable" basis (Article IV). This was in turn further defined by twelve Supporting Indicators. The future development of the basin was envisaged to rely on a jointly accepted plan which would both optimize the utilization of the resources, and respect the needs of each individual State. Even by modern standards, these principles are considered to be close to an ideal blueprint for trans-boundary river basin cooperation.

Ironically, the 1975 efforts occurred in the timescale that three of the four co-riparians (Cambodia, Vietnam, and Laos) changed regimes in violent revolutions. Within a few months, the political scene at the regional level changed entirely, with far-reaching consequences for the historical style of cooperation.

3.2 The Interim Mekong Committee

One result of the 1975 revolutions was that the Khmer Rouge came into power in Cambodia. That regime was neither able nor willing to continue the previous cooperation on the Mekong River basin. The remaining three States set up an Interim Mekong Committee in response to this changed set of circumstances. Despite very tense Thai-Vietnamese relations, the Interim Committee commenced its work in 1978, and was fully operational from

1981. The installed Cambodian Government was not internationally recognized and was thus not permitted to join the Interim Mekong Committee, which seriously hampered the effectiveness of the body. As a result, only minor projects (Pre-feasibility and Feasibility Studies, and data collection) were conducted at the time. These were accompanied by water flow measurements, the establishment of flood warning systems, information sharing, enhancement of the understanding of legal issues pertaining to shared water resources, and human capacity building. While the achievements of the Interim Mekong Committee were restricted during this period, the maintenance of cooperation throughout the 1980s assisted in addressing later crises, and in some ways laid a basis for the later negotiations and the 1995 agreement (Öjendal, 2000a).

3.3 The MRC Agreement

Following the end of the Cold War, the solution to the Cambodia conflict, and the subsequent recognition of the Government of Cambodia in 1993, many expected a rapid return to the original status of the Mekong Committee. However, the Thai authorities announced (rather late in the process) that they were not happy with the previous agreement, and wished for it to be renegotiated. Intensive debate ensued (Radosevich, 1996; Makim, 2002), and after three years of negotiations, the MRC Agreement was signed in April 1995. There were substantial changes when compared to the 1957 and 1975 agreements and principles, as follows:

- In line with a preference for Integrated Water Resources Management (IWRM), the MRC Agreement covers not only water allocation, but also *'irrigation, hydropower, navigation, flood control, fisheries, timber floating, recreation and tourism, in order to optimize the multiple use and mutual benefits for all riparians…'* (Article 1).

- The entire MRC Agreement is based on, and emphasizes repeatedly, the concepts of 'sustainable development',[3] and 'environmental and ecological balance' (Article 3).

- The previous *de facto* veto right was abolished, reducing upstream commitments in hard terms. The right to veto was replaced by three levels of restrictions pertaining to various circumstances. Interventions require notification, prior consultation, and agreement by the Joint Committee.

3 The formal name of the agreement is: 'Agreement on the cooperation for the sustainable development of the Mekong River Basin.'

- The only distinct level of restriction – agreement by the Joint Committee – refers to inter-basin transfers in the 'dry season'. This can be done without agreement, however, if there is a 'surplus' in the system as a whole (Article 5). These two concepts – 'dry season' and 'surplus' – were never defined in the original agreement, and this has led to protracted negotiations since that time.

- Natural minimum and maximum flows are protected, so as to prevent saltwater intrusion and to preserve the natural flow regime around the Ton Le Sap (Article 6).

Flows and water allocation are not mentioned in quantitative terms in the MRC Agreement, but all potential difficulties are addressed by Article 26, which nicely sums up the unresolved issues at the time:

> *The Joint Committee shall prepare and propose for approval of the Council, inter alia, Rules for Water Utilisation and Inter-Basin Diversions pursuant to Articles 5 and 6, including but not limited to 1) establishing the time frame for the wet and dry seasons; 2) establishing the location of hydrological stations, and determining and maintaining the flow level requirements at each station; 3) setting out criteria for determining surplus quantities of water during the dry season on the mainstream; 4) improving upon the mechanism to monitor intra-basin use; and 5) setting up a mechanism to monitor diversions from the mainstream.*

In all, the 1995 agreement returned power to the individual riparian States away from a regional regime, and repositioned power upstream in the overall basin. At the same time it increased the demands on the sustainable utilization of the river's resources, the institutional capacity of the Secretariat, and the 'soft' demands on policy harmonization. The consequence of this, and even more directly of Article 26, was that a number of programmes were initiated under the new Mekong River Commission, and particularly under its somewhat massive Secretariat. Radosevich (1996: 263) summed up the optimistic viewpoint which prevailed amongst many commentators after the signature of the 1995 agreement, noting the following:

> *[The MRC as] the latest chapter in the effort to harness the mighty Mekong River attests to the proposition that the 'Mekong spirit of cooperation' will continue to be a model among multinational efforts in international river basin development.*

Annex 2. Details of the Ranking/Banding Procedures

Introductory Note: This Annex provides details of the ranking and banding procedures used in the generation of data for the Inter-SEDE model, discussed at Section 7.1 of the present report. The data shown here are derived from the sources used to generate Tables 7, 14, 15 and 24 in the main report, and the analysis shown here ranks each of the 23 indicators for all 21 co-riparians of the Jordan, Kagera/Nile, and Mekong River basins. These data were then used as an output to derive Tables 25–27 of the main report. For each indicator shown below, a very brief summary is given as to why the ranking runs in the direction shown. Where no data (ND) are available, the riparian is assessed subjectively for its location in the ranking/banding procedure, based on the authors' knowledge and experience of the basins. The assigned bands are shown below each of the following Tables.

1. Security: Military expenditure per capita. [High expenditure indicates a tendency towards greater securitisation].

Country	Military Expenditure *per capita* (US$)	Band
Israel	1,452	5
Jordan	254	5
Lebanon	141	5
Vietnam	78	5
China	51	5
Syria	46	4
Eritrea	33.1	4
Egypt	31.5	4
Thailand	27	4
Laos	18	4
Sudan	14.6	3
Cambodia	8	3
Uganda	6.2	3
Burundi	6.1	3
Rwanda	5.9	3
Kenya	5.2	3
Ethiopia	4.6	2
DRC	1.56	2
Myanmar	0.9	1
Tanzania	0.56	1
Palestine	ND [low]	1

Bands: >50; 15–50; 5–15; 1–5; <1

2. Security: Military expenditure as a percentage of Gross Domestic Product [High expenditure indicates a tendency towards greater securitisation].

Country	Military Expenditure (% of GDP)	Band
Jordan	14.6	5
Eritrea	13.4	5
Israel	8.7	5
Burundi	6.0	5
Syria	5.9	5
Ethiopia	4.6	4
China	4.3	4
Egypt	3.4	4
Rwanda	3.2	4
Lebanon	3.1	4
Sudan	3.0	3
Cambodia	3.0	3
Vietnam	2.5	3
Uganda	2.2	3
Myanmar	2.1	3
Thailand	1.8	2
DRC	1.5	2
Kenya	1.3	2
Laos	0.5	1
Tanzania	0.2	1
Palestine	ND [low]	1

Bands: >5; 3.1–5.0; 2.0–3.0; 1.0–2.0; <1.0

3. Security: Water availability/use. [High availability/use of water defuses a tendency towards greater securitisation, in relation to water resources].

Country	Water Availability/Use (m^3/cap/yr)	Band
Laos	**63,184**	**1**
Cambodia	36,333	1
DRC	25.183	1
Myanmar	21,898	1
Vietnam	11,406	1
Thailand	6,527	2
Uganda	2,833	3
Tanzania	2,591	3
China	2,258	3
Sudan	2,074	3
Ethiopia	1,749	3
Eritrea	1,722	3
Lebanon	1,160	3
Kenya	985	4
Syria	945–1,600	3
Egypt	859	4
Rwanda	683	4
Burundi	566	4
Israel	331	5
Jordan	157	5
Palestine	72	5

Bands: <500; 500–1,000; 1,000–5,000; 5,000–10,000; >10,000

4. Security: Water dependency ratio. [A high ratio promotes a tendency towards greater securitisation, as concerns exist over water 'imported' from elsewhere].

Country	Water Dependency Ratio (%)	Band
Egypt	96.9	5
Syria	80.3	5
Sudan	76.9	5
Palestine	75	5
Cambodia	74.7	5
Vietnam	58.9	4
Eritrea	55.6	4
Israel	55.1	4
Thailand	48.8	4
Laos	42.9	3
Uganda	40.9	3
Kenya	33.1	3
DRC	29.9	3
Jordan	22.7	2
Myanmar	15.8	2
Tanzania	9.9	2
Lebanon	0.8	1
China	0.61	1
Burundi	0	1
Rwanda	0	1
Ethiopia	0	1

Bands: >70; 45–70; 25–45; 9–25; <9

5. Security: Water-related agreements. [Significant numbers of agreements reduce a tendency towards greater securitisation, as these enhance the reliability of supply].

Country	Water-related agreements	Band
Cambodia	Significant	1
Laos	Significant	1
Thailand	Significant	1
Vietnam	Significant	1
Egypt	Mostly bilateral	2
Sudan	Mostly bilateral	2
Kenya	Few	3
China	Few	3
Tanzania	Few	3
Uganda	Few	3
Lebanon	Few; bilateral	3
Syria	Few; bilateral	3
Israel	Few; bilateral	3
Palestine	Few; bilateral	3
Jordan	Few; bilateral	3
DRC	Very few	4
Ethiopia	Very few	4
Eritrea	Very few	4
Burundi	Very few	4
Rwanda	Very few	4
Myanmar	None	5

Bands: Qualitative, as shown above.

6. Security: Intra-basin cooperation. [High levels of cooperation reduce a tendency towards greater securitisation].

Country	Intra-basin Cooperation	Band
Cambodia	Major	1
Laos	Major	1
Thailand	Major	1
Vietnam	Major	1
Tanzania	Moderate	2
Uganda	Moderate	2
Kenya	Some initiatives	3
Sudan	Some initiatives	3
Egypt	Some initiatives	3
Burundi	Minor	4
Rwanda	Minor	4
DRC	Minor	4
Ethiopia	Minor	4
Eritrea	Minor	4
China	Minor	4
Lebanon	Minor	4
Syria	Minor	4
Israel	Minor	4
Palestine	Minor	4
Jordan	Minor	4
Myanmar	None	5

Bands: Qualitative, as shown above.

7. Security: Geopolitical/Governmental stability. [High stability reduces a tendency towards greater securitisation].

Country	Geopolitical/Governmental Stability	Band
China	Stable	1
Thailand	Stable	1
Vietnam	Stable	1
Tanzania	Somewhat stable	2
Uganda	Somewhat stable	2
Syria	Moderate	3
Israel	Moderate	3
Jordan	Moderate	3
Kenya	Moderate	3
Egypt	Moderate	3
Laos	Moderate	3
Lebanon	Low	4
Palestine	Low	4
DRC	Low	4
Ethiopia	Low	4
Eritrea	Low	4
Sudan	Low	4
Myanmar	Low	4
Cambodia	Low	4
Rwanda	Unstable	5
Burundi	Unstable	5

Bands: Qualitative, as shown above.

8. Security: Immigration/emigration. [High immigration/emigration enhances a tendency towards greater securitisation, due to uncertainty].

Country	Immigration/Emigration	Band
Burundi	Massive	5
Rwanda	Massive	5
Palestine	Very high	4
Lebanon	High	3
Jordan	High	3
DRC	High	3
Sudan	High	3
Israel	Moderate	2
Ethiopia	Moderate	2
Eritrea	Moderate	2
Tanzania	Minor	1
Uganda	Minor	1
Myanmar	Low	1
Cambodia	Low	1
China	Low	1
Laos	Low	1
Thailand	Low	1
Vietnam	Low	1
Syria	Low	1
Kenya	Low	1
Egypt	Low	1

Bands: Qualitative, as shown above.

9. Security: Regional integration. [High levels of integration reduce a tendency towards greater securitisation, decreasing competition between States].

Country	Regional Integration	Band
Kenya	High	1
Thailand	H	1
Cambodia	Significant	2
China	S	2
Laos	S	2
Vietnam	S	2
Sudan	Moderate	3
Egypt	Mo	3
Tanzania	Mo	3
Uganda	Mo	3
Burundi	Low	4
Rwanda	L	4
DRC	L	4
Ethiopia	L	4
Eritrea	L	4
Lebanon	L	4
Syria	L	4
Palestine	L	4
Jordan	L	4
Israel	Very low	5
Myanmar	Very low	5

Bands:

10. Economic Development: GDP *per capita*. [High GDP suggests poverty-related concerns are less important as drivers].

Country	GDP *per capita* (PPP, US$)	Band
Israel	20,800	1
Thailand	8,100	2
China	5,600	2
Lebanon	5,000	2
Jordan	4,500	3
Egypt	4,200	3
Syria	3,400	3
Vietnam	2,700	3
Cambodia	2,000	3
Sudan	1,900	4
Laos	1,900	4
Myanmar	1,700	4
Uganda	1,500	4
Rwanda	1,300	4
Kenya	1,100	4
Eritrea	900	5
Ethiopia	800	5
Palestine	725	5
Tanzania	700	5
DRC	700	5
Burundi	600	5

Bands: >10,000; 5,000–10,000; 2,000–5,000; 1,000–2,000; <1,000

11. Economic Development: Population below the poverty line (US$2/day). [Low populations below the poverty line suggest poverty-related concerns are less important as drivers].

Country	Population below poverty line (%)	Band
Burundi	68	5
Palestine	67	5
Rwanda	60	5
DRC	ND [assumed as 50]	5
Kenya	50	5
Ethiopia	50	5
Eritrea	50	5
Cambodia	40	4
Sudan	40	4
Laos	40	4
Tanzania	36	3
Uganda	35	3
Jordan	30	3
Vietnam	29	2
Lebanon	28	2
Myanmar	25	2
Syria	20	2
Israel	18	1
Egypt	17	1
China	10	1
Thailand	10	1

Bands: 0–19; 20–29; 30–39; 40–49; 50 or more

12. Economic Development: Life expectancy at birth. [A high life expectancy indicates reduced poverty, and suggests poverty-related concerns are less important as drivers].

Country	Life expectancy at birth	Band
Israel	77/82	1
Jordan	76/81	1
China	71/74	1
Palestine	71/74	1
Lebanon	70/75	1
Thailand	70/74	1
Syria	69/71	2
Egypt	68/74	2
Vietnam	68/74	2
Myanmar	58/64	3
Cambodia	57/61	3
Sudan	57/60	3
Laos	53/57	4
Eritrea	51/53	4
Uganda	51/52	4
Kenya	49/47	5
Ethiopia	48/50	5
DRC	47/51	5
Rwanda	46/48	5
Tanzania	45/46	5
Burundi	43/44	5

Bands: <50; 51–55; 56–60; 60–69; 70 or more (men)

13. Economic Development: Infant mortality rate. [A low mortality rate is indicative of a raised standard of living and suggests poverty-related concerns are less important as drivers].

Country	Infant mortality rate	Band
Israel	7.0	1
Jordan	17.3	2
Thailand	20	2
Palestine	20.8	2
China	24	2
Lebanon	24.5	2
Vietnam	26	3
Syria	29.5	3
Egypt	32.6	3
Kenya	61.5	4
Sudan	62.5	4
Myanmar	67	4
Uganda	67.8	4
Burundi	69.3	4
Cambodia	71	5
Eritrea	74.9	5
Laos	85	5
Rwanda	91.2	5
DRC	92.9	5
Ethiopia	95.3	5
Tanzania	98.5	5

Bands: <10; 11–25; 26–50; 51–70; >70

14. Economic Development: Literacy rate. [A high literacy rate is indicative of a raised standard of living and suggests poverty-related concerns are less important as drivers].

Country	Literacy rate	Band
Israel	97/94	1
Jordan	96/86	1
Thailand	95/90	1
China	95/86	1
Vietnam	94/87	2
Lebanon	93/82	2
Kenya	91/80	2
Syria	90/64	2
Myanmar	89/81	3
Palestine	Estimated position	3
Tanzania	86/71	3
Cambodia	85/64	3
Uganda	79/60	4
Laos	77/55	4
Rwanda	76/65	4
DRC	76/51	4
Sudan	72/51	4
Eritrea	70/48	4
Egypt	68/47	5
Burundi	58/45	5
Ethiopia	50/35	5

Bands: 50–69; 70–79; 80–89; 90–94; >95 (men)

15. Economic Development: Energy use *per capita*. [A high *per capita* use of energy is indicative of a raised standard of living and suggests poverty-related concerns are less important as drivers].

Country	Energy use (kWh *per capita*/year)	Band
Israel	6,103	1
Lebanon	2,254	2
Syria	1,318	2
Jordan	1,232	2
Egypt	975	3
Palestine	700 [estimate]	3
Thailand	642	3
Laos	484	4
Vietnam	372	4
Kenya	128	4
China	125	4
Myanmar	81	5
Tanzania	69.8	5
DRC	69	5
Sudan	60	5
Uganda	51.4	5
Eritrea	50	5
Ethiopia	27	5
Rwanda	23.1	5
Burundi	21.6	5
Cambodia	7	5

Bands: >2,500; 1,000–2,500; 500–1,000; 100–500; <100

16. Economic Development: Agriculture as a percentage of Gross Domestic Product. [A low dependence on [subsistence] agriculture is indicative of a raised standard of living and suggests poverty-related concerns are less important as drivers].

Country	Agriculture as % of GDP	Band
Myanmar	57	5
DRC	55	5
Laos	50	5
Burundi	48	4
Ethiopia	47	4
Tanzania	43	4
Rwanda	41	4
Sudan	39	3
Uganda	36	3
Cambodia	35	3
Syria	25	3
Vietnam	22	3
Kenya	19	2
Egypt	17	2
China	14	2
Eritrea	12	2
Lebanon	12	2
Thailand	9	1
Palestine	9	1
Israel	2.8	1
Jordan	2.4	1

Bands: 50 or over; 40–50; 20–40; 10–20; <10

17. Economic Development: Industry as a percentage of Gross Domestic Product. [High industrial development is indicative of a raised standard of living and suggests poverty-related concerns are less important as drivers].

Country	Industry as % of GDP	Band
China	53	1
Thailand	44	2
Vietnam	40	2
Israel	38	2
Egypt	33	3
Syria	31	3
Cambodia	30	3
Palestine	28	3
Laos	27	3
Jordan	26	3
Eritrea	26	3
Uganda	21	4
Lebanon	21	4
Rwanda	21	4
Sudan	20	4
Burundi	19	4
Kenya	18	4
Tanzania	17	4
Ethiopia	12	5
DRC	11	5
Myanmar	9	5

Bands: 01–5; 16–25; 26–35; 36–50; >50

18. Economic Development: Water availability and use. [A high level of water availability and use is indicative of the potential for significant economic improvements].

Country	Water Availability/Use (m^3/cap/yr)	Band
Laos	63,184	5
Cambodia	36,333	5
DRC	25.183	5
Myanmar	21,898	5
Vietnam	11,406	5
Thailand	6,527	4
Uganda	2,833	3
Tanzania	2,591	3
China	2,258	3
Sudan	2,074	3
Ethiopia	1,749	3
Eritrea	1,722	3
Lebanon	1,160	3
Kenya	985	2
Syria	945–1,600	3
Egypt	859	2
Rwanda	683	2
Burundi	566	2
Israel	331	1
Jordan	157	1
Palestine	72	1

Bands: <500; 500–1,000; 1,000–5,000; 5,000–10,000; >10,000

19. Environment: The importance of the flow regime. [A high reliance on the flow regime indicates the importance of environmental factors in a basin].

Country	Importance of flow regime	Band
Cambodia	Critical	5
Vietnam	Critical	5
Thailand	High	4
Israel	High	4
Sudan	Moderate	3
Egypt	Moderate	3
China	Moderate	3
Laos	Moderate	3
Syria	Minor	2
Palestine	Minor	2
Jordan	Minor	2
Tanzania	Minor	2
Uganda	Minor	2
Kenya	Minor	2
Myanmar	Minor	2
Lebanon	Low	1
Burundi	Low	1
Rwanda	Low	1
DRC	Low	1
Ethiopia	Low	1
Eritrea	Low	1

Bands: Qualitative, as shown above.

20. Environment: Water quality. [Adversely impacted water quality indicates the importance of environmental factors in a basin].

Country	Water quality index	Band
Palestine	Major problems	1
Jordan	Major problems	1
Ethiopia	Major problems	1
Eritrea	Major problems	1
Syria	Moderate problems	2
Israel	Moderate problems	2
Burundi	Moderate problems	2
Rwanda	Moderate problems	2
Tanzania	Moderate problems	2
Uganda	Moderate problems	2
Kenya	Moderate problems	2
Sudan	Moderate problems	2
Egypt	Moderate problems	2
Lebanon	Minor problems	3
DRC	Minor problems	3
Cambodia	Good but declining	4
Vietnam	Good but declining	4
Myanmar	Good	5
China	Good	5
Laos	Good	5
Thailand	Good	5

Bands: Qualitative, as shown above.

21. Environment: The importance of environmental flows (base flows) in rivers. [A high importance of base flows indicates the importance of environmental factors in a basin].

Country	Environmental flows (base flows)	Band
Cambodia	Critically important	5
Vietnam	Critically important	5
Laos	Important	4
Thailand	Important	4
Burundi	Partly addressed	2
Rwanda	Partly addressed	2
Tanzania	Partly addressed	2
Uganda	Partly addressed	2
Lebanon	Not addressed	1
Syria	Not addressed	1
Israel	Not addressed	1
Palestine	Not addressed	1
Jordan	Not addressed	1
DRC	Not addressed	1
Kenya	Not addressed	1
Ethiopia	Not addressed	1
Eritrea	Not addressed	1
Sudan	Not addressed	1
Egypt	Not addressed	1
Myanmar	Not addressed	1
China	Not addressed	1

Bands: Qualitative, as shown above.

22. Environment: The sustainability of water use. [A high level of sustainable use indicates that environmental factors are important to the administration].

Country	Sustainability of water use	Band
Myanmar	Very high	5
Cambodia	High	4
Lebanon	Moderate	3
Syria	Moderate	3
Burundi	Moderate	3
DRC	Moderate	3
Sudan	Moderate	3
Laos	Moderate	3
Thailand	Moderate	3
Vietnam	Moderate	3
Rwanda	Low	2
Tanzania	Low	2
Uganda	Low	2
Egypt	Low	2
Kenya	Low	2
Ethiopia	Low	2
Eritrea	Low	2
China	Low	2
Israel	Very low	1
Palestine	Very low	1
Jordan	Very low	1

Bands: Qualitative, as shown above.

23. Environment: Biodiversity. [A high biodiversity indicates the importance of environmental factors in a basin].

Country	Biodiversity	Band
Vietnam	Very high	5
Cambodia	Very high	5
Myanmar	Very high	5
Rwanda	High	4
Tanzania	High	4
Uganda	High	4
Kenya	High	4
Sudan	High	4
Laos	High	4
China	Significant	3
Thailand	Significant	3
Lebanon	Moderate	2
Syria	Moderate	2
Burundi	Moderate	2
DRC	Moderate	2
Ethiopia	Moderate	2
Israel	Low	1
Jordan	Low	1
Eritrea	Low	1
Egypt	Low	1
Palestine	Very low	1

Bands: Qualitative, as shown above.