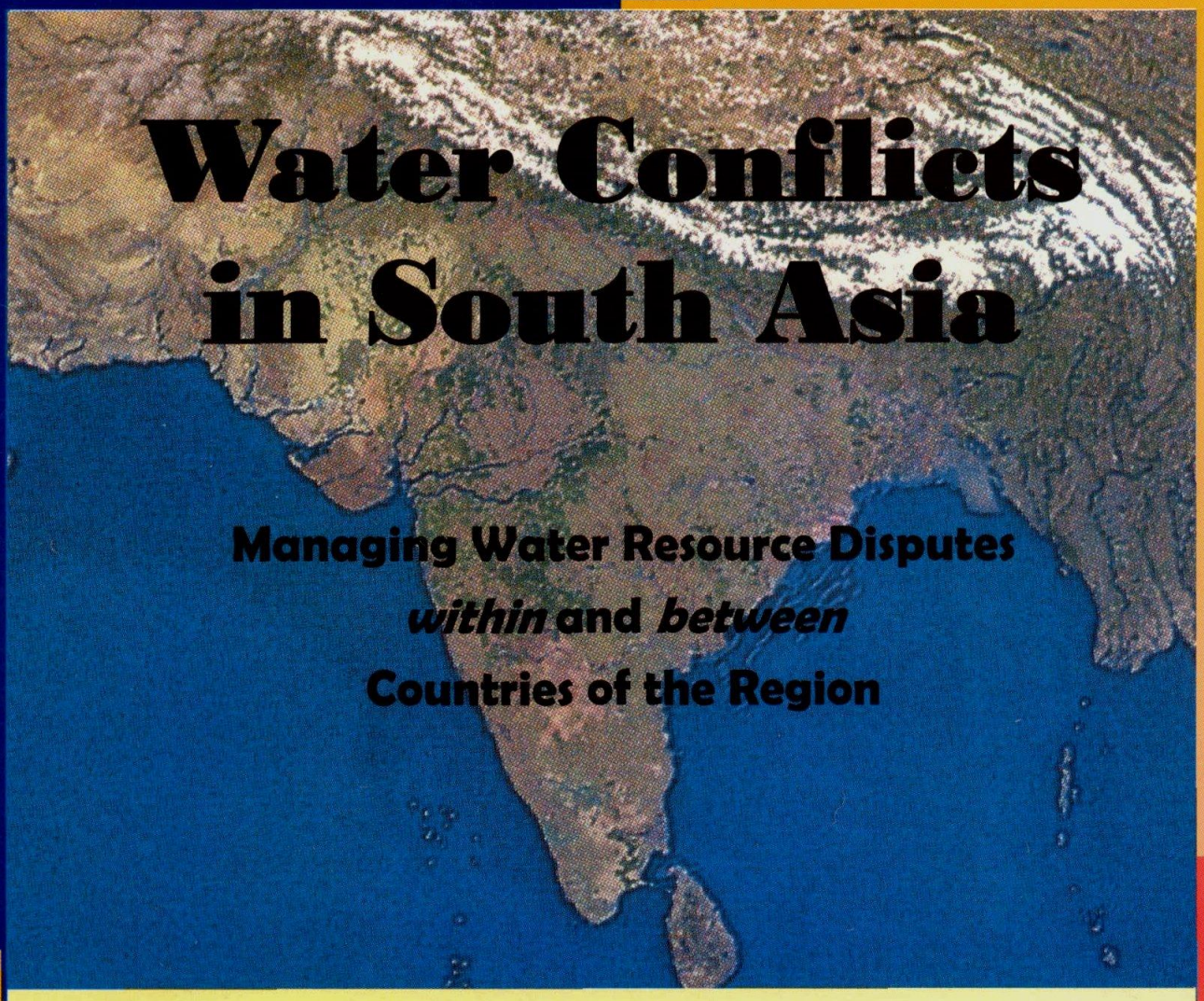

Water Conflicts in South Asia

Managing Water Resource Disputes *within* and *between* Countries of the Region

Coordinated and Edited by

Toufiq A. Siddiqi and Shirin Tahir-Kheli

Project Implemented by
Global Environment and Energy in the 21st Century
and the
School of Advanced International Studies, Johns Hopkins University

Sponsored by the Carnegie Corporation of New York

WATER CONFLICTS IN SOUTH ASIA

Managing Water Resource Disputes *Within* and *Between* Countries of the Region

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Published by GEE-21, Honolulu, Hawaii
August 2004

Cover design and graphics editor: Ulrike Siddiqi

ISBN 0-9759663-1-6

Keywords: Water, Rivers, South Asia, Bangladesh, India, Nepal, Pakistan

Preface

Almost half of South Asia's 1.3 billion people depend on river systems for their water needs. Some of the world's largest rivers lie in this region. They flow across state and provincial boundaries and across national borders, and are frequently a source of tension in the region. When the snow melts in the Himalayas, or during the monsoon season, there is too much water, resulting in frequent floods. At other times, there is too little water available, and intense competition for it arises between countries, and between upstream and downstream provinces or states even within the same country.

In the western part of the sub-continent, the waters of the Indus basin are shared by Pakistan and India. In the north and northeast, the basins of the Ganges, Brahmaputra, and Meghna are shared by India, Nepal, Bhutan, and Bangladesh, and in some areas by China. Although some arrangements presently exist to share the waters between the respective countries, their implementation has not always been satisfactory, and there is a widespread perception that these arrangements could be inadequate in times of increased water scarcity.

There are also disputes within India and within Pakistan regarding the equitable distribution of water between the states or provinces. As the populations of the countries increase, and water availability declines, tensions over water rights are likely to increase as well. In view of this situation, a project on "Water and Security in South Asia" (WASSA), focusing on critical water issues in South Asia, was funded by the Carnegie Corporation of New York, and implemented during the period 2000 – 2004 by Global Environment and Energy in the 21st Century (GEE-21) and the School of Advanced International Studies (SAIS) at Johns Hopkins University.

The Carnegie Corporation of New York identified water availability as a priority area for its Program. In his report to the Board of the Corporation, President Vartan Gregorian pointed out that "Much less heed is being given to the most basic human need ---- water. In 1996, the United Nations Development Programme reported that there were ten countries in the world, largely in Africa, where more than half the population did not have access to potable water. The sharing of water resources has the potential of bringing rival nations together in common cause, just as the manipulation of the water supply by those who control it can lead to conflict and violence, as we already see in the Middle East and could witness in Asia and Africa".

Issues relating to a resource as critical as water can obviously only be negotiated by the various governments themselves. Projects like WASSA could make several important contributions such as:

- Highlight the issues through a regional prism;
- Offer constructive alternatives to conflict in addressing the critical issue of water, whereas governments in the subcontinent have largely tended to focus on these issues in the shadow of conflict;
- Create a joint stake in the solution of issues relating to water through creative thinking on future actions by experts who understand the political world that shapes decisions;
- Deal with questions of trust which influences the entire range of water as well as other important issues in South Asia;

- Create conditions for cooperation through the development of a network of technical experts in positions to make a difference with their respective governments.

Teams consisting of persons from Bangladesh, India, Nepal, and Pakistan have prepared the reports of the WASSA project. Consultants based in South Asia, Japan and the USA provided additional input. The participants met several times during the project in working groups as well as in Workshops for the whole team.

The project work was carried out under the following themes:

- Gaps between water demand and supply;
- Approaches to meeting the gaps;
- Water sharing conflicts within countries and possible solutions;
- Water sharing conflicts between countries and possible solutions;
- Possible impacts of global climate change on water availability;
- Investment requirements for enhancing water supply.

Participants from several organizations (and in one case, two eminent consultants) took the lead on one of the above topics, and provided input in other areas:

- Bangladesh Unnayan Parishad (BUP);
- Economic Development Consultants (EDC), Pakistan;
- Jalsrot Vikas Sanstha (JVS), Nepal;
- Nepal Water Conservation Foundation (NWCF);
- Pakistan Institute for Environment-Development Action Research (PIEDAR);
- Trust for Water, Environment and Development Studies (TWEDS), Bangladesh;
- Water and Power Consultancy Services (I) (WAPCOS), India;
- Dr. M. S. Reddy and Mr. N. V. V. Char, India.

Dr. James E. Nickum (TJK College, Japan), Dr. Murari Lal (India), Dr. Amir Muhammed (Pakistan), Mr. P. B. Shrestha and Dr. H. M. Shrestha (Nepal), and Mr. George Verghese (India) made valuable contributions to individual reports.

Although we have listed the participating organizations above, the views expressed in this and other reports of the WASSA project are those of the individual authors, and not necessarily those of their organizations. In most cases, the views expressed in the Reports reflect those of all the authors of that Report. In a few cases, the authors had differing opinions that have been identified as such.

Distinguished persons with close links to policymakers in the four countries served as Policy Advisors for the project. They are:

- Major-General Mahmud Durrani (Pakistan), former Chairman, Pakistan Ordnance Factories Board;
- Mr. Salman Haidar (India), former Foreign Secretary, Government of India;
- Mr. Farooq Sobhan (Bangladesh), former Foreign Secretary, Bangladesh;
- Ambassador Bhekh Thapa (Nepal), former Ambassador of Nepal to India.

The WASSA Reports were prepared in three volumes, covering the following major themes:

1. Water Demand-Supply Gaps and Approaches to Closing the Gaps;
2. Water Conflicts *within* Countries, and Approaches to resolving them;
3. Water Conflicts *between* Countries, and Approaches to resolving them;

The Reports, and a comprehensive Executive Summary, were presented at Workshops held in Islamabad in February 2003 and in New Delhi in September 2003, and at a Policy Briefing in Washington, D.C. in May 2003.

The present volume incorporates slightly shortened versions of the two Reports dealing with water conflicts *within* and *between* countries. **Section I** deals with conflicts *within* countries arising from the sharing of river waters, and identifies some approaches to addressing these issues. **Section II** addresses river water conflicts *between* countries, and ways in which these can be reduced.

Toufiq A. Siddiqi and Shirin Tahir-Kheli
Project Coordinators and Editors
July 2004

Acknowledgements

We would like to thank the Carnegie Corporation of New York, its President Vartan Gregorian, and Senior Program Officer Stephen Del Rosso for their generous support of the project on "Water and Security in South Asia". We are grateful to all the authors for their cooperation during the lengthy period of three politically tense years in the subcontinent, when travel was particularly difficult. We greatly appreciate the willingness shown by the coordinating authors of each volume --- Dr. M.S. Reddy and Mr. N. V. V. Char for volume 1, Mr. Ayub Qutub for volume 2, and Dr. Umesh Parajuli for volume 3, to incorporate the input received from the project advisers, external reviewers, and from other stakeholders during the project workshops and conferences.

It is a pleasure to thank the policy advisors --- Mr. Farooq Sobhan (Bangladesh), Mr. Salman Haidar (India), Ambassador Bhekh Thapa (Nepal), and Maj.-Gen. (ret.) Mahmud Durrani (Pakistan) for their valuable input and advice throughout the project.

Crucial support during the preparation of the final reports and several Drafts was provided by Ms. Ulrike Siddiqi and Ms. Amy Funk of GEE-21. Dr. Q. K. Ahmad and the staff of Bangladesh Unnayan Parishad made excellent arrangements for the project workshop in Dhaka, as did Mr. Ayub Qutub and the staff of PIEDAR for the Conference in Islamabad. We are grateful to Dr. Thomas Keaney, Ms. Courtney Mata, Ms. Nilofer Afridi-Qazi, and other staff members at FPI/SAIS for organizing so well the Policy Briefing held in Washington, D.C. in May 2003, and to Mr. R. K. Mishra, Prof. Y. K. Alagh, Dr. S. Hashim, and the staff of the Observer Research Foundation for graciously hosting and organizing the Conference in New Delhi in September 2003.

Toufiq A. Siddiqi and Shirin Tahir-Kheli,
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July 2004

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SECTION-I

MANAGING WATER CONFLICTS *WITHIN* SOUTH ASIAN COUNTRIES

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- **Dr. Shirin Tahir-Kheli** was Senior Fellow at the Foreign Policy Institute, the Paul Nitze School of Advanced International Studies, Johns Hopkins University, Washington D.C. during the project. She is currently Special Assistant to the President and Senior Director for Democracy, Human Rights, and International Operations at the National Security Council*. She has previously served as an Alternate Permanent Representative of the United States at the United Nations, with the rank of Ambassador.
  (*The views expressed herein do not necessarily represent those of the U. S. Government).

Introduction

In this Section, we focus on water sharing conflicts within the four South Asian countries that are covered in the WASSA project. The aim was to understand how laws, rights, administrative procedures and customary practices for water sharing within Bangladesh, India, Nepal and Pakistan enhanced or retarded the livelihoods and welfare of water users in various economic sectors across the States, Provinces, or regions of these countries, and what might be undertaken to improve the situation.

The Section is organized into six substantive chapters, starting with a chapter that outlines our approach to the water-security nexus. Next we review the evolving world context of ideas, laws and conventions, and practices from which no country is immune. Specifically, it comprises a survey of the human security debate, water law and rights, and models of integrated river basin management. Administrative procedures and customs across South Asia provide a more immediate context for national water users. Changes or lack of them in water policies and laws, decay or turnaround in management provide the backdrop for a constructive resolution of conflicts.

Equipped with information about the global and national contexts, we addressed the key issues underlying State or provincial conflicts, and conflicts between sectors and users in the South Asian countries. We undertook an analysis of the conflicts and emerge with some lessons and recommendations. For readers seeking more details about sub-national water conflicts, descriptions and different viewpoints are presented in the case studies.

A three-year long process of workshops and sharing of drafts between mainly South Asian water sector researchers went into the preparation of this Section. Although we were not always in agreement amongst ourselves as to what constitutes conflict and security in the context of water sharing between States, provinces, sectors, and people, we sought to bring together the elaborate yet still evolving concepts in both the water and security debates in order to contribute to the development of fresh, and hopefully more useful, perspectives. We feel that the importance of the topic for sustainable development has justified the effort.

1. Approach

Water security in South Asia involves far more than rivers and aquifers flowing across national boundaries, although that is commonly where the discourse on security stops. In this report we argue that security begins at home, or at least on the farm, and that an investigation of the problems of water sharing within countries, at all scales, sheds light on and in many ways directly impacts transnational water sharing issues. It does so in at least two ways – directly and, we hypothesize, by resonating in a "fractal" way, i.e. that problems and their solutions tend to replicate themselves at different levels.

Directly, inter-state or inter-provincial conflicts and differences in interest may play an important role in international conflict negotiation. For example, the 1996 agreement between Bangladesh and India over the sharing of the waters of the Ganges (Ganga) resulted in anxious protests from Uttar Pradesh and Bihar. There was a feeling that some kind of embargo would be imposed on the States in the future to restrict lean season utilization in their jurisdictions in order to maintain a certain minimum flow at Farrakka. Similarly, what may seem a wholly internal conflict between Punjab and Sindh in Pakistan, exacerbated by the recent droughts, takes place against a backdrop of accusation that the Indus Waters Treaty of 1960 favored the Punjab against Sindh.

Due to the salience of water issues between the States or Provinces and the consequent availability of information on them, local conflicts may receive less attention. However, conflicts are common at community scales between users and sectors. In this volume, case studies from South Asia illustrate some of the many kinds of local water-related livelihood issues. Insight into the conditions that have led either to constructive engagement and resolution, or to an impasse could be applied to similar situations that occur across South Asia.

Our other argument, more tentative but if true more profound, is that conflicts are fractal (similar in character at all levels), and that solving local conflicts may in many cases be a more meaningful approach to security than focusing on the international scene. Even if human and water security problems at the local level are not absolutely fractal, addressing them may be the most effective way to reduce tension at higher levels. Indeed, conflicts between larger political entities may often be a way of displacing, denying and projecting more embedded internal differences of interest and power. Conflicts, whether latent or overt, whether of interest, words, or arms, exist between neighbors, no matter how small or big they are. Differences exist, of course – indeed, it seems that conflicts are more likely to be intractable, and even to lead to the shedding of blood, at the local level.

For example, inequities in water availability within watercourses between head, middle and tail end farmers are more acute than imbalances in water supply at provincial or state and canal scales. Subsidized water prices and unaccountable top-down delivery systems make farmers dependent on state irrigation officials, leading to a vicious cycle of bribery, unintended and deliberately induced uncertainty in water supplies, and a further need for individual irrigators to seek special favors from departmental officials. Many maladies,

such as application of excessive water to the fields of those with access and excessive investment in private facilities such as deep tube wells, can be attributed to this problem. Water theft, an indicator and cause of conflict, including subsequent litigation or threat of it, takes up considerable time and energy of irrigation farmers.

In spite of the concerns mentioned above, the attention of policy makers remains focused on inter-provincial (or inter-state) disparities, particularly in India and Pakistan, where large river basins cut across State and Provincial boundaries. Is this because of the closed-door small-numbers decision-making process at the top? Is it due to a lack of appreciation of water supply and demand issues at a local scale? Do local disparities aggravate the perceptions of provincial and state deprivation? Or is the focus on the province and state a deliberate strategy of landlords and their departmental interlocutors to draw attention away from local water equity issues? We address the inter-state and inter-provincial, as well as local sector and user conflicts in some detail, framing the problems in a governance perspective.

It may be, as some say, that the State is too large a unit to do well the little things (be responsive to local conditions) and too small to do well the big things (river basin management or macroeconomic guidance in a global economy). Therefore new methods of governance are called for, at both small and large scales, to allow the state to focus on those areas that it can and must do, remove itself from other arenas, and establish mutually productive linkages with other actors such as civil society and river basin organizations.

2. An Evolving Context

Water resources are renewable but finite. Water is getting scarcer per capita with population growth, while development makes more options potentially available; both underlying trends could exacerbate.the current conflicts. South Asia is not the only region in the world facing water-sharing conflicts, and it is not immune to emerging ideas, laws and conventions, and models and practices for integrated water management in other parts of the world. In this chapter, we first review this evolving circumstance. Next, we look at the more immediate context of national water laws and administration.

2.1. The Human Security Debate

Not so long ago, before the end of the Cold War, it would have seemed strange to include water-sharing conflicts within countries in a project on security. First and foremost, security was a military concern, and between sovereign states. Other forms of security, such as food security and energy security were also related to the state in relationship to possible adversaries. Recently, security of both states and their citizens against terrorism has come to occupy center stage. "Security" remains a contested and evolving concept (Najam, 2001).

Security studies have increasingly included in their ambit the domestic factors that can lead to destabilization of the national government, and promoted a broader idea of *human security,* which considers the "security of people, not just of territory" (Haq, 1997). A link between the two was provided early on by Ullman (1983), who noted that:

> "A threat to national security is an action or sequence of events that threatens drastically and over a relatively brief period of time to degrade the quality of life for the inhabitants of a state, or threatens significantly to narrow the range of policy choices available to the government of a state or to private, non-governmental entities (persons, groups, corporations) within the state".

In the words of Elliott (2001), the human security paradigm "turns the conventional security aphorism – secure states means secure people – on its head."

Myers (1993) characterized human security in a broad sense:

> "... Security applies most at the level of the individual citizen. It amounts to human well-being: not only protection from harm and injury but access to water, food, shelter, health, employment, and other basic requisites that are the due of every person on Earth. It is the collectivity of these citizen needs – overall safety and quality of life – that should figure prominently in the nation's view of security".

The United Nations Development Program (1994) cited four essential characteristics of human security (Nickum and Oya, 2001):

a. It is a *universal* concern, threatening the lives of rich as well as poor;
b. Its various aspects are *interdependent* and their consequences spill over national borders;
c. *Prevention* is preferable to intervention, from pollution to social breakdown to epidemic disease; and
d. It focuses on people's *freedom* to choose.

Suhrke (1999) would add resilience to "sudden crisis-like disruptions" as a characteristic of human security. A lack of resilience may manifest itself as social breakdown or, at the state level, governance or institutional failure (Najam, 2001).

Environmental security, in the sense of protecting individuals and communities from the consequences of environmental decline, is a human security issue. It is the security issue of greatest concern to us here, in particular as it is related to water.

Thomas Homer-Dixon of the University of Toronto (Homer-Dixon and Blitt, 1998) has carried out a large project on the relationship between environmental scarcity and conflict, seeking to identify common physical, economic, and social dynamics in a variety of contexts. His project gathered, evaluated, integrated and disseminated existing data on the possible causal links among population growth, renewable resource scarcities, migration and violent conflict. Pakistan was one of the countries where the case studies were carried out.

Homer-Dixon's main findings (Gizewski and Homer-Dixon, 1998) may be paraphrased as follows:

> Direct linkages between environmental scarcity, such as a shortage of fresh water, and conflict are difficult to establish. Scarcity is most likely to produce conflict indirectly, by generating conditions such as poverty, ethnic and religious tensions, and migration that lead to instability. Contextual factors such as the nature of the economic system, levels of education, ethnic cleavages, class divisions, technological and infrastructural capacity, and political legitimacy determine the strength of the linkage between environmental scarcity and destabilizing conditions, as well as the potential for violence.
>
> Powerful groups often take advantage of environmental scarcity to capture valuable resources such as water, reinforcing their power and pushing already marginal groups further into the ecological margins. Both the environment and society as a whole become less secure and less capable of adapting to scarcity by either using resources more efficiently or by decoupling themselves from their dependence on local resources.
>
> Poor countries are often under-endowed institutionally, with undeveloped markets, incompetent or corrupt governments, and minimal capacity to carry out research on local conditions necessary for escaping the scarcity trap. A failure in

social and economic adaptation to environmental scarcity is likely to lead to choke off economic development, weaken the state, and push migrants to other areas, including ill-prepared urban centers and other countries. These factors can give rise to ethnic conflicts, insurgencies and coups, although they are rarely a direct cause of international conflict.

Although inter-state conflict has occurred over non-renewables such as oil and strategic minerals, scarcities of renewable resources rarely cause "resource wars" among states. There are two reasons for this difference. First, in general, states cannot easily or quickly convert renewable resources into assets that significantly augment their power. Second, the very countries that are most dependent on renewable resources, and that are therefore most motivated to seize resources from their neighbors, also tend to be poor, which lessens their capability for aggression.

There is a reasonably plausible scenario linking domestic turmoil and international conflict, however. Civil violence within states can affect external trade relations, cause refugee flows, and produce humanitarian disasters that call upon the military and financial resources of developed countries and international organizations. Moreover, states destabilized by environmental stress may fragment as they become enfeebled, and peripheral regions are seized by renegade authorities and warlords. States might avoid fragmentation by becoming more authoritarian, intolerant of opposition, and militarized. Such regimes, however, sometimes abuse human rights and try to divert attention from domestic grievances by threatening neighboring states.

Wolf (1999) is the other main empirical researcher on transboundary freshwater disputes. His findings differ substantially from those of Homer-Dixon. One of the few common points is that conflict and turmoil related to river water are more often internal than international. The main findings of Wolf (2001) may be paraphrased as follows:

While the potential for paralyzing disputes is especially high in trans-national basins, the record of violence is actually greater within a nation's boundaries. Tensions have spilled into violence on occasion, generally among ethnic, religious or tribal groups, water use sectors, or states/provinces. While disputes can and do occur at the sub-national level, the human security issue is subtler and more pervasive than violent conflict.

History is rich with examples of how water has become a catalyst to dialogue and cooperation, even among especially contentious riparians. Violence over water seems neither strategically rational, nor hydrologically effective, nor economically viable. Shared interests along a waterway seem to consistently outweigh water's conflict-inducing characteristics. Furthermore, once cooperative water regimes are established through treaty, they turn out to be impressively resilient over time, even between hostile riparians, and even while conflict is waged over other issues.

> The challenge is to get ahead of the 'crisis curve' to help develop institutional capacity and a culture of cooperation in advance of costly, time consuming crises that in turn threaten lives, regional stability and ecosystem health. One productive approach has been to examine the benefits in a basin from a multi-resource perspective. This has required riparians to get past looking at water as a commodity to be divided and to develop instead an approach that equitably allocates not the water, but the benefits derived there from.

How can one assign significance to the various dimensions of water related insecurities in view of the sharp debate? One simple measure of water-related insecurity could be the extent of death and disease that could be attributed to a particular factor. By this measure, contaminated water supplies would win hands down as by far the leading cause of insecurity. Worldwide, nearly two million children die each year from diarrhea (over the last decade as many as all war casualties since WWII) mainly in the slums and villages of the South (Water Supply and Sanitation Collaborative Council, Geneva 2002). However, these casualties are not usually the intentional result of conflicts. (Rarely, water sources may be intentionally poisoned). Even human security studies focus on something narrower.

There is agreement that wars over river water between upstream and downstream countries are extremely rare, historically. Moreover, in the twenty first Century, they are likely only in a narrow set of circumstances: The downstream country must be highly dependent on the water for its national well-being, the upstream country must be able to restrict the river's flow, there must be a history of antagonism between the two countries, and, most important, the downstream country must be militarily much stronger than the upstream country.

There is also agreement that conflict and turmoil related to river water is more often internal than international. Particular attention has been given in recent years to the relocation of large numbers of often already marginalized people from the sites of dams and other major water projects. Many other important dimensions of internal conflicts remain to be empirically researched.

2.2. Water Law and Conventions

A number of legal doctrines have evolved internationally for surface and, to a lesser extent, for ground water use rights (United Nations, 1970). These doctrines can apply to individuals, provinces or countries, although the specific terminology varies according to scale.

Sub-national water rights doctrines

At a sub-national level, water rights tend to be tied either to the land or to the time of initial use. In the United States, these are called "riparian" and "prior appropriation" (or "appropriative") doctrines respectively, and the relative importance of each varies from state to state. Some states, such as Texas, adhere to both in an uneasy compromise.

The riparian doctrine originates in the common law of water-rich England, and is most common in the humid eastern states. Under this doctrine, the owner of land contiguous to a stream has use rights over its water. In its basic form, consumptive use is excluded: the owner is obligated to return water of comparable quantity and quality to the source. Over time, "reasonable use" modifications have often been allowed for consumptive uses such as irrigation. This doctrine often involves little monitoring or other intervention by third parties such as government, aside from dispute resolution.

The prior appropriation doctrine originated in the mining communities of the arid American west, where water often had to be diverted long distances from its source, and rarely returned. This doctrine accords the users of water rights in the order in which the water was originally withdrawn from the source. In principle, the water has to be put to "beneficial use" to retain the right, but this provision is rarely enforced. Appropriative rights require monitoring and measurement, often by an irrigation district.

Two other doctrines that have evolved are those of the "equitable division of benefits" and the "public interest". In the United States, for example, the equitable division of interests doctrine was proclaimed by the Supreme Court in *Kansas v. Colorado* (1907) for inter-state waters, although in the end, the waters in that specific controversy were allocated by an inter-state compact of 1949 (Sherow, 1990).

In India, a quasi-federal country, 'the community of interest theory' has been proposed recently in which the basin is considered as a single economic unit irrespective of State boundaries, and waters are vested in the community of co-riparian States, to be utilized to the maximum benefit of all in an integrated manner. This is an idealistic approach. However, it could be a solution in situations where inter-state disputes have been difficult to resolve due to water being a 'State subject'. Empowering the central government, as this theory suggests, could ensure an integrated development of the basin through mechanisms such as River Basin Organizations.

Recently, a "public interest" doctrine has evolved in the United States, primarily to block diversions from water bodies when they cause significant harm to local residents or ecosystems. In particular, the city of Los Angeles was denied the right to deplete Mono Lake. This doctrine requires intervention by a third party with strong enforcement capability.

International water rights doctrines

The earliest legal precedents for settlements of river disputes relate to navigational rights in Europe during the seventeenth century. It was only in the nineteenth century, however, when dams were built for storage and diversion of water for irrigation, hydropower, and other uses that formal international cooperation for settling water-sharing conflicts between nations emerged. From the case laws or compacts of these disputes several water-sharing theories have emerged over the years (Guhan, 1993). Basically, four different doctrines have evolved:

1. Internationally, the doctrine of absolute sovereignty combines the worst features of riparian and prior appropriation doctrines, by claiming a right to consumptive use based on location. Historically, this took its most notorious form in the Harmon Doctrine, named after an 1895 opinion given by Attorney General Harmon of the USA on the Rio Grande River dispute between the USA and Mexico. In this opinion, the United States denied that it had any obligation to guarantee stream flow to downstream Mexico, even from return discharges. H. A. Smith, an expert on this subject, had observed that 'the doctrine of absolute supremacy of the territorial sovereign is essentially anarchic...permitting every state to inflict irreparable injury upon its neighbors without being amenable to any control save the threat of war'. In practice, the Harmon Doctrine is less a doctrine than a hegemonic declaration, and has little legitimacy in international law or even subsequent actual practice. In 1907, the Supreme Court denied the state of Colorado's assertion of the Harmon Doctrine in its appropriation of the Arkansas River, shared with downstream Kansas (Sherow, 1990).

2. The second doctrine called the 'territorial integrity theory' or 'the natural water flow theory' entitles every lower riparian to the natural flow of the river without any interference from the upper riparian. Such interference is considered a violation of the territorial integrity of the lower riparian of which the river is a constituent. This theory is the antithesis of the first theory, and was advanced by Egypt in regard to the dispute with Sudan on the Nile water sharing conflict. According to Ferber (Guhan, 1993), 'The Harmon doctrine and Natural Flow theory are both grounded in an individualistic and anarchical conception of international law in which personal and egoistic principles are raised to the level of guiding principles and no solutions are offered for the conflicting interests of upper and lower riparian'.

3. The third doctrine is that of historical use, which basically means "first in time, first in right". This accords the first user of water a priority right whether or not his land is contiguous to the stream, or downstream from other users. Between nations or provinces, this corresponds to prior appropriation rights. Where, as in the case of Egypt, the downstream riparian is also the earliest user, historical use doctrine coincides with the natural flow theory.

4. Finally, there is the principle of 'equitable distribution' or 'equitable utilization', which regards a river or ground water basin as an indivisible unit to be developed for the benefit of the maximum number of people regardless of territorial boundaries. The criterion formulated considers legal, factual, socio-economic, development, etc, for a settlement by mutual agreement among the concerned parties. The 37 Articles of the 'Helsinki Rules' 1996 (GOI, NCIWRDP 1999), have evolved around this theory. Apart from the Article on 'Equitable Utilization of the Waters of the International Drainage Basin' the dispute settlement mechanism recommends voluntary processes before resorting to judicial settlement. A milder version of this principle is recognition by each user not to harm the uses of others.

> The Helsinki Rules have incorporated the notion of "prior appropriation". Taking it in an absolute sense, the application of this notion would mean the predominance of the obligation not to cause injury to other riparian by interfering with existing uses. However, the Helsinki Rules treat prior appropriation as one element in determining equitable utilization, and not as a freestanding obligation protecting the *status quo*, which may not necessarily be reflective of equitable utilization (Salman and Uprety, 2002).

The Helsinki Rules do not have the status of International Law. The United Nations has discussed and approved draft regulations pertaining to the 'Non Navigational uses of International Watercourses'. The Framework Convention adopted by the UN General Assembly in May 1997 (UN, 1997), is awaiting ratification by member states.

The UN Convention on the Law of the Non-Navigational Uses of International Watercourses is a framework convention that aims at ensuring the utilization, development, conservation, management and protection of international watercourses. It promotes their optimal and sustainable utilization for present and future generations. The Convention defines the term "watercourse" to include both surface water and ground water that is connected to the surface water. It lays down certain factors and circumstances that should be taken into account for determining equitable and reasonable utilization. The Convention also deals with the obligation not to cause significant harm, and requires the watercourse states to take all appropriate measures to prevent the causing of significant harm to other watercourse states. A close reading of the Articles 5, 6 and 7 of the Convention lead Salman and Uprety (2002) to conclude that the obligation not to cause harm has indeed been subordinated to the principle of equitable and reasonable utilization.

Bangladesh and Nepal have voted for the Convention. India and Pakistan have abstained for different reasons. Pakistan indicated it had reservations with regard to the inclusion of ground water, the obligation not to cause significant harm, and protection and preservation of the marine environment. India had reservations with regard to watercourse agreements, equitable and reasonable utilization and participation, non-discrimination and settlement of disputes.

One significant difference between the factors to be taken into account for equitable and reasonable utilization of an international watercourse under the UN Convention 1997 and the Helsinki Rules 1966 from which the former are largely derived is the deletion of compensation as a means of adjusting conflict among users. This is perhaps due to the fact that international trade in water is still anathema for most developing countries.

Another emerging feature in the codification of international water law is the increasing importance being given to the environment. A noteworthy resolution of the Institute of International Law is on the pollution of rivers and lakes (Athens, 1979). The resolution subjects the states' right to exploit their own resources to the duty to ensure that their activities cause no pollution in the waters of international rivers and lakes beyond their

boundaries. In 1997 at Salzburg (Austria) the Institute of International Law adopted three resolutions that deal with the environment. The term "environment" is defined to include "abiotic and biotic natural resources, in particular, air, water, soil, fauna and flora, as well as the interaction between these factors". This wide definition subjects all uses of international watercourses to environmental law rules under international law.

Articles 6 and 9 of the first resolution emphasize the need that actions of the states "entail no harmful consequences" and that the state whose activity might be linked with damage to the environment should ensure that "such damage does not arise". However, it should be added that such prohibition is not absolute, as it applies only to serious damage, or damage that affects the possibility of utilization by other riparians. The International Law Association, which developed the Helsinki Rules 1996, is also cognizant of environmental concerns. The rules devote a separate chapter to pollution.

International law has also re-discovered traditional water rights. In a landmark 1997 ruling, the International Court of Justice highlighted some fundamental legal issues. The existing law was to be made "more international" and more ecological, for example, by introducing the concept of "custodianship" or the "right of future generations" to natural resources. Both concepts exist in traditional laws on water practiced by indigenous peoples.

An important institutional difference between these doctrines is that the riparian and appropriationist ones imply decentralized decision making and private ownership or use rights to water, while equitable distribution within countries often is more likely to be associated with state ownership of waters. The countries in South Asia with a British colonial legacy (Bangladesh, India, Pakistan) continue to operate under the principles laid out in the 1873 Canal and Drainage Act (Nasir, 1993). Under this Act, the state has proprietary rights to water, while the provinces have use rights over surface flows for purposes of irrigation, navigation and drainage. Perhaps reflecting British riparian doctrine, it also prohibits the sale or subletting of water, leaving a legacy of rigid top-down allocation, especially in arid parts of South Asia.

In inter-provincial (inter-state) allocations, it is common to establish quotas or water sharing formulas, either by treaty (Colorado River, USA) or under centralized government administration (Yellow River, China; Indus Basin, Pakistan). To be effective, however, this "non-doctrine," like the doctrines listed above, requires a governance structure for monitoring and distribution that is trusted by the parties concerned. If there is no trust, even scientifically rational allocations, faithfully executed, will not diminish water conflicts.

2.3. Models of Integrated River Basin Management

What is integrated river basin management (RBM)? What is new in RBM? The answers to these two questions can help in providing a perspective to the evolving world context.

Integrated river basin management systems bring fragmented water uses and users together. They create a framework that deals with an entire basin or sub-basin, not just a single water use or administrative jurisdiction. A river basin is defined by a system of waters, both ground and surface, flowing to a common terminus. RBM integrates this system of waters with its social, economic and political context (Svendsen, 2001). Basin units cut across administrative divisions. This is their strength and their challenge.

There are two archetypal organizational models for implementing RBM. The first is the authority model, in which a single unified organization is empowered to make decisions. The second is the coordinative model, in which existing administrative units work together to cover the entire river basin or sub-basin. While new institutional structures may be created, the bulk of the routine work is done by existing organizations. A particular variant of the coordinative model is the bargaining arena, in which the controlling authority delegates planning and implementation to stakeholders within broad parameters, while retaining monitoring functions and binding authority of last resort.

The strength of the authority model is that its operational span of control coincides with the boundaries of the basin, internalizing upstream and downstream conflicts, and concentrating decision-making authority needed to resolve disagreements. The disadvantages are that the water authority is isolated from relevant policy sectors such as agriculture, the environment, and the economy. Authority is centralized, excluding broad-based stakeholder representation and accountability.

The coordinative model addresses some of the weaknesses. The linkages between water and other sectors provide a strong basis for transferring policies into action. It is also compatible with the decentralization of responsibilities. On the other hand, decision-making can be cumbersome, costs of coordination may be high, and political changes in participating jurisdictions can upset agreements.

These two models represent extreme situations, which specific examples often blend. Outside the WASSA region, there are a few examples of trans-boundary institutions based on river basins that may provide some indications of hopeful directions, as well as limitations of similar institutions within the South Asian countries. Nearly all of these are in economically developed countries, which may or may not limit their replicability in the region. These examples include the Rhine Commission (Bernauer 1997) and the International Joint Commission for the Great Lakes (Munton and Castle 1992), which have historically found some success with non-binding cooperative approaches among key insiders, notably governments, but have faced pressures to open up their decision-making to important stakeholders within civil society as the problems they confront have become more complex (Nickum 1999).

A rapidly evolving effort in a water scarce region is that of the Murray-Darling Ministerial Council, a cooperative Ministerial Council comprising representatives of the four involved states and the federal government that sets policy, while an authority-like Murray-Darling Commission supports and executes the council's decisions. Its effectiveness depends on cooperation and support among the governments of the

participating administrations, each of which has different water policies, allocation procedures, and level of maturity of its water economy. Key components of the Murray-Darling approach are the 1993 Murray-Darling Basin Agreement that established new organizations at political, bureaucratic, and community levels to enable "the river and its tributaries [to] be looked on as one." and a Natural Resources Management Strategy.

Community participation and effective monitoring are critical elements of the Murray-Darling experience, but they are not in themselves adequate to overcome "irreconcilable claims," especially between upstream and downstream, and between established and new users (Pigram, 2000). Markets in water rights are well established within river valleys within individual states. Efforts are underway to allow water trading between states (Murray-Darling Basin Commission 2002). One major hurdle confronting the establishment of an inter-state water market is the need to obtain consensus among council members when different political parties are in power, especially when they differ between the federal and state levels (Chatterton and Chatterton 2001).

Can these examples from high-income countries be applied to South Asia? The TVA model may be successful in developing water resources in developing countries, but has a chequered record in management. For example, Sri Lanka is struggling to transform the Mahaweli Authority into a basin management agency after initial success in water resources development. Current attempts to use the Murray-Darling model in Vietnam and China are encountering fundamental problems.

RBM in developing countries has to take into account the following realities:

- Dense populations live in upper catchments and require access to water along with downstream urban populations;
- Water use is widely dispersed rather than concentrated and easily controlled;
- Administrative capacity to monitor and enforce regulations and standards is limited;
- Governance mechanisms to assign rights and regulate and enforce agreements and contracts are weak;
- Technical capacity to measure and monitor basin hydrology is limited;
- Civil society groups are not structured into associations needed to represent stakeholder interests in water;
- Pressures for transparency in public decision-making and regulation, including independent, investigative media, are not strong.

These factors preclude the wholesale importation of developed country models. However, adaptive RBM strategies can be potentially rewarding in terms of more productive use of water, mitigation of past environmental damage, and re-direction of water to uses the society values most highly.

2.4. Water Laws and Administration in South Asia

Water Laws and Administration in Pakistan

Pakistan is a largely semi-arid country that relies on irrigation for more than 90% of its food and fiber. The overlay in **Figure 1** of the Indus Basin irrigation system on the map of population densities across the districts of the country makes clear the degree of dependence on irrigation.

Pakistan has a federal system of government. In its Constitution, a Council of Common Interests is prescribed to formulate and regulate policies for matters in Part II of the Federal Legislative List, such as railways, mineral oil, natural gas, and the water & power development authority. The Federal Ministry of Water and Power is responsible for water sector policy formulation. The Water and Power Development Authority (WAPDA), an autonomous agency of the Federal Ministry, has been responsible for the development of water resources, including main dams, barrages, link canals, public tubewells and drainage projects, across the country. The barrages, link canals, tubewells and drainage schemes are handed over to provincial irrigation departments for operation and maintenance. However, WAPDA retains the management of the multipurpose reservoirs on the Indus and its tributaries, and operates them in consultation with the Indus River System Authority (IRSA) and provincial irrigation departments (PIDs) according to the water rights and seasonal allocations of the provinces.

The Indus River System Authority (IRSA) was established under the orders of the President of Pakistan on December 10, 1992 with headquarters at Lahore. It was intended to act as a forum of the provinces for the implementation of the 1991 Indus water accord. To a certain extent, it has not realized its original purpose as a mechanism for decentralized inter-provincial bargaining and coordination. In 1994, the Ministry of Water and Power and WAPDA reverted to allocations on the basis of historical use, rather than the accord. IRSA was dissolved in 1998, after the then Prime Minister announced controversial plans to build the Kalabagh Dam on the Indus River over the objections of NWFP and Sindh. The IRSA was revived in 1999, but as an agency attached to the Federal Ministry of Water and Power, with headquarters in Islamabad. In effect, it has been reduced from an autonomous inter-provincial bargaining arena to an executive agency for short-term operational decision-making.

The three on-line reservoirs at Tarbela, Mangla and Chashma and inter-river link canals are the key structural facilities for Indus Basin water management. Dams in Pakistan are used to store peak (*Kharif*) flow for use in the dry (*Rabi*) season; they do not provide storage from one year to the next. 84% of annual flows occur during the *Kharif*, but only 64% of canal withdrawals take place during that period. During the *Rabi*, there are only 16% of annual flows, but 36% of canal withdrawals – the three reservoirs serve to supply the 20% differential to all provinces of Pakistan.

The allocation of reservoir water shared by provinces is centralized, using 'suggested criteria' established on a 10-day basis. Before start of a season-*Rabi* (low flow October 1-

March 31; Reservoir draw-down) or *Khârif* (High flow April 1- September 30; Reservoir draw down April-June; Filling July-August; draw down in September), IRSA prepares and circulates to all concerned "Suggested Operation Criteria" for the three online reservoirs. The seasonal operating criteria provide an envelope of maximum and minimum Rule Curves, which provide guidelines for operation. The Suggested Criteria are evolved on a 10-day basis, using the following considerations (Ahmad and Chaudhry, 1988):

- Anticipated seasonal inflow for the coming season is forecast on the basis of inflows of the existing season by statistical study of the historical data;
- Reservoir elevation on the last day of the outgoing season;
- Present day maximum canal uses during the season, if possible to be met out of anticipated availability, else reduced uses are provided;
- Flood routing during July and early August to the extent possible;
- To reserve reasonable storage (1.0 to 1.5 MAF) in the Tarbela reservoir towards the end of *Rabi* season for utilization in early *Kharif* (April-June sowing period);
- In the criteria for the *Kharif* season to ensure filling of the three on-line reservoirs by the end of August. In September, some stored water is generally utilized in maturing *Kharif* crops; and
- To take care of the specific O&M requirements of Tarbela, Mangla and Chashma or any occasional requirements.

The anticipated seasonal system operation for the Tarbela and Mangla reservoirs, and seasonal water availability, are reflected in a forecast bulletin attached with the criteria. Based on their anticipated shares, the provinces plan their canal use on a 10-day basis subject to variations in the forecast. The Chashma Barrage is the regulation point for the Tarbela Command Canals, except the Thal canal and other canals that take off above rim-stations, like the Swat and Warsak canals.

During the droughts of 2001 and 2002, IRSA failed to generate consensus over water allocation. Demonstrations in Sindh induced the President/Chief Executive (CE) to override its decisions. Technically, the resolution of such conflicts is a matter for the Council of Common Interests (CCI), but since it was inactive, the CE dealt with the problem at the apex. Subsequently, provinces have directly approached the Secretariat of the Chief Executive, much to the apprehension of IRSA. Further demonstrating a declining trust in IRSA's ability to ensure that its decisions are implemented, the government of Sindh decided to send inspectors to upcountry reservoirs to check storage and diversions in person. Increasingly during 2002, critical decisions were taken in the CE secretariat in consultation with provincial governors. In 2003, the situation changed again with the transfer of executive responsibilities by the President to elected governments at the Federal and provincial levels. However, it is not yet clear how water sector decision-making will take place in this set up.

One structural feature of decision-making may persist. Pakistan relies on irrigation for 90% of its food and fiber production, and irrigation is the predominant user of water. However, a broad division of responsibilities between irrigation and agriculture starts at

the federal apex, with two separate ministries for water and for agriculture, and runs through the sector down to the farm. The provincial irrigation departments are responsible for the upkeep of barrages, main canals, drainage and flood works, assessment of water charges and resolution of conflicts among users. Provincial agriculture departments are responsible for agriculture research and extension, while their On-Farm Water Management (OFWM) directorates carry out watercourse lining and land leveling for enhanced water delivery and application efficiencies.

With strong coercive power under Sections 33 and 68 of the Canal and Drainage Acts (1873 - 79), the Canal Officers of the Irrigation Department can fine and jail individual irrigators and even entire irrigation communities for '*Warashikni*' (breaking the water turn) and related offenses. However, the system has come under a great deal of stress. On September 8, 2001 the government announced a major re-examination of the existing provincial irrigation departments. With *abiana* (water rent) collections in the North West Frontier Province (NWFP) recovering 38% and in Punjab only 32% of just the current operating and maintenance (O&M) costs, some things have to change.

A new option has become feasible with the introduction of district governments in Pakistan. Already, OFWM officials are looking to district *Nazims* (elected representatives) to support proposals for the leveling of rough land, and for watercourse lining. It may be possible to access the poverty alleviation funds through the district governments. However, the district government system is new and will need to establish a demonstrated capacity for conflict resolution and for establishing a support system for the operation and maintenance of irrigation.

A legal basis exists since 1997 in the form of provincial Irrigation and Drainage Acts (e.g. Government of Balochistan, 1997) for participatory farmer management of minor canals and distributaries. However, after five years of social mobilization under projects funded by the World Bank and other donors, Farmers Organizations have been established only in some pilot areas.

Parallel to the official discourse, a stream of literature is emerging in political geography on water laws, social power and geographically differentiated impact. For example, through critical legal analysis of the Canal and Drainage Act (1873), Mustafa (2001) reveals that the balance of legal rights enshrined in the Act is heavily in favor of the state as opposed to water users. Indeed, it lends itself to differential enforcement because of its insensitivity to issues of social power.

Mustafa then goes on to demonstrate the significant difference in practice between the registration of *tawan* (collective fine on water users along a watercourse for *moga* tampering) cases in different areas of Sidhnai and Shorkot sub-divisions of the Haveli Canal Circle, Punjab, Pakistan. Tracts dominated by large landlords have few cases of collective fine registered against them, "simply because the local irrigation staff would not dare report *moga* tampering by a powerful person". It is not the case that there is less water theft in these tracts. Section 68 cases (involving water thefts by individuals), show no such variance between large landlord dominated and small farmer tracts. In fact, large

landlords may have them registered against recalcitrant neighbors, or farmers may genuinely have complaints against each other (Mustafa, 2001).

However, in this era of global information, water users and vulnerable populations now are much more likely to suggest social explanations than naturalistic or fatalistic explanations for their differential access to irrigation water and vulnerability to flood hazards (Mustafa, 2002). Illiterate small farmers in four villages of Punjab are acutely aware of the political manipulation behind levee breaches.

Water Laws and Administration in India

The river basins of central and southern India shown in **Figure 2** illustrate the inter-state nature of its rivers. It is not surprising that the framers of the Indian constitution drew up very specific laws and provisions governing the development and management of the country's water resources. During the last five decades, the changes in these laws and provisions, under the quasi-federal system of governance (Union of States) have been complex. Some details are provided in Part II of this Study. Basically, 'water ' is a State subject, with the Union's role limited to the Inter-state Rivers. However, the process of planning permissions allows the Union Government to have an effective veto in large State water projects.

A National Water Policy (NWP) for India was defined only in the year 1987 (GOI, 1987b), forty years after India attained independence, and many of the policies contained therein still need to be implemented. The need for a NWP was stated as "Water is a scarce and precious national resource to be planned, developed and conserved as such, and on an integrated and environmentally sound basis, keeping in view the needs of the States concerned". This policy was approved by the 'National Water Resources Council' (NWRC) in the meeting held in 1987 under the chairmanship of the Prime Minister of India with participation by the Chief Ministers of the States and Administrators of Union Territories as members (GOI, NICWRDP, 1999). The NWRC is an apex body with the mandate to evolve NWP for the development and use of water resources in conformity with national interests.

The policy document (GOI, 1987b) deals with a wide range of water issues in its 21 sections. Section 7 highlights the 'Ground water Development' issues of over-exploitation, conjunctive use of surface and ground water, and the need for regulations that are relevant to Ground Water Resources; Section 8 recommends 'priorities in Water allocation' as (i) Drinking water (ii) Irrigation (iii) Hydropower (iv) Navigation, and (v) Industrial use.

The policy suggests that the "Drinking water needs of human beings and animals should be the first charge on any available water". It further says, "Irrigation and multi-purpose projects should invariably include a drinking water component wherever there is no alternative source of drinking water". With regard to irrigation, the policy document states, "There should be a close integration of water-use and land-use policies. Water

allocation in an irrigation system should be done with due regard to equity and social justice".

Since the adoption of the National Water Policy 1987, many developments in the water sector at the national level have necessitated its revision. A revised National Water Policy 2002 was approved by the National Water Resources Council on April 1, 2002. The following are some of the highlights of this policy:

Water allocation priorities:

- Drinking water
- Irrigation
- Hydropower
- Ecology
- Agro-industries and non-agricultural uses
- Navigation and other uses

However, priorities can be modified or added to, if warranted by considerations that are specific to an area or region.

Institutional Mechanisms

Appropriate river basin organizations should be established for the planned development and management of a river basin as a whole, or of sub-basins, where necessary. Special multi-disciplinary units should be set up to prepare comprehensive plans, taking into account not only the needs of irrigation, but also harmonizing various other water uses. This will ensure that the available water resources are determined and put to optimum use, having regard to existing agreements or awards of Tribunals under the relevant laws. The scope and powers of the river basin organizations shall be decided by the basin states themselves.

No details of sharing of waters between states are discussed in the policy. However, an official level Working Group has been set up under the chairmanship of the Chairman of the Central Water Commission, with representatives of eight states to work out the draft Guidelines. It is expected that these policy Guidelines, when finalized, would expedite resolution of inter-state water disputes. The broad objective of the guidelines governing the allocation of water is defined as "Developing the waters of Inter-State River for the betterment of the population of the co-basin States/Union Territories to the extent such developments are not detrimental to the interests of other co-basin states."

Water Laws and Administration in Nepal

Nepal is a water-rich country with more than 9,000 m^3 of fresh water resources per capita. **Figure 3** shows the six major river basins of Nepal that drain down from the Himalayas. Although Nepal does not have the historical legacy of the 1873 Canal and Drainage Act to struggle against, its rights system is quite similar, as provided for in very recent legislation. The Water Resources Act, 2049, provides that all water resources in

Nepal, whether surface, underground or atmospheric, belong to the state. Anyone who uses water should have a license, except in certain cases such as for personal domestic use, irrigation by informal groups, cottage industries, or water mills. Priority of water use goes to drinking and household uses while irrigation and other agricultural uses rank second, and hydropower third. Except for hydropower, water use licenses are to be obtained from the District Water Resources Committee, chaired by the Chief District Officer.

Because there is a proliferation of sector-based committees overseeing water use, it is easily foreseeable that there will be a need for an inter-sectoral conflict resolution mechanism to allow for effective planning.

Supplementing this act, the Local Self-Governance Act, 2055 (1998), empowers local authorities with certain ownership rights over natural resources within their territory. Public water bodies in their domain such as ponds and wells that do not belong to the government in Kathmandu, and which are not owned by the District Development Committee, are the property of one of the 3913 village development committees (VDC). Similar provisions apply to the 58 municipalities in Nepal. The VDC has the right to tax the use of natural resources within its domain. While there appears to be no explicit provision for individual or transferable rights, recognition is given to the need to involve and empower beneficiary farmers in an irrigation system.

Water Laws and Administration in Bangladesh

Bangladesh is another water-rich country with more than 9,500 m^3 of freshwater resources per capita. The river basins of Bangladesh are shown in **Figure 4**. The National Water Policy (NWPo), formulated in January 1999 (GOB, 1999) makes a firm commitment to a more equitable allocation of water rights and sharing among the different water using sectors. In recognition of the water requirements for open water fish and fishing community, specific clauses (given below) have been included in the NWPo:

- *Natural water bodies such as beels, haors and baors will be preserved for maintaining the aquatic environment and facilitating drainage.*
- *Water bodies like baors, haors, beels, roadside borrow pits etc. will, as far as possible, be reserved for fish production and development. Perennial links of these water bodies with the rivers will also be properly maintained.*
- *Water development plans will not interrupt fish movement and will make adequate provisions in control structures for allowing fish migration and breeding.*

The National Water Management Plan (NWMP), nearing completion, stipulates that 'water structures should be so designed and operated that there are no major obstacles or danger points on fish migration routes' (WRPO, 2002). The NWMP also recommends that fish passes or gates be included in all regulators, and be kept open as far as possible,

but especially in the key migration months. Strategies for fish and fisheries management are to be agreed to at local levels, so that potential land or water use conflicts (especially with the farmers) are avoided, or at least minimized. The basic premise is that there has to be a symbiotic balance between the two interest groups: the fishers and the farmers – who need water at different times and in different quantities.

Figure 1:

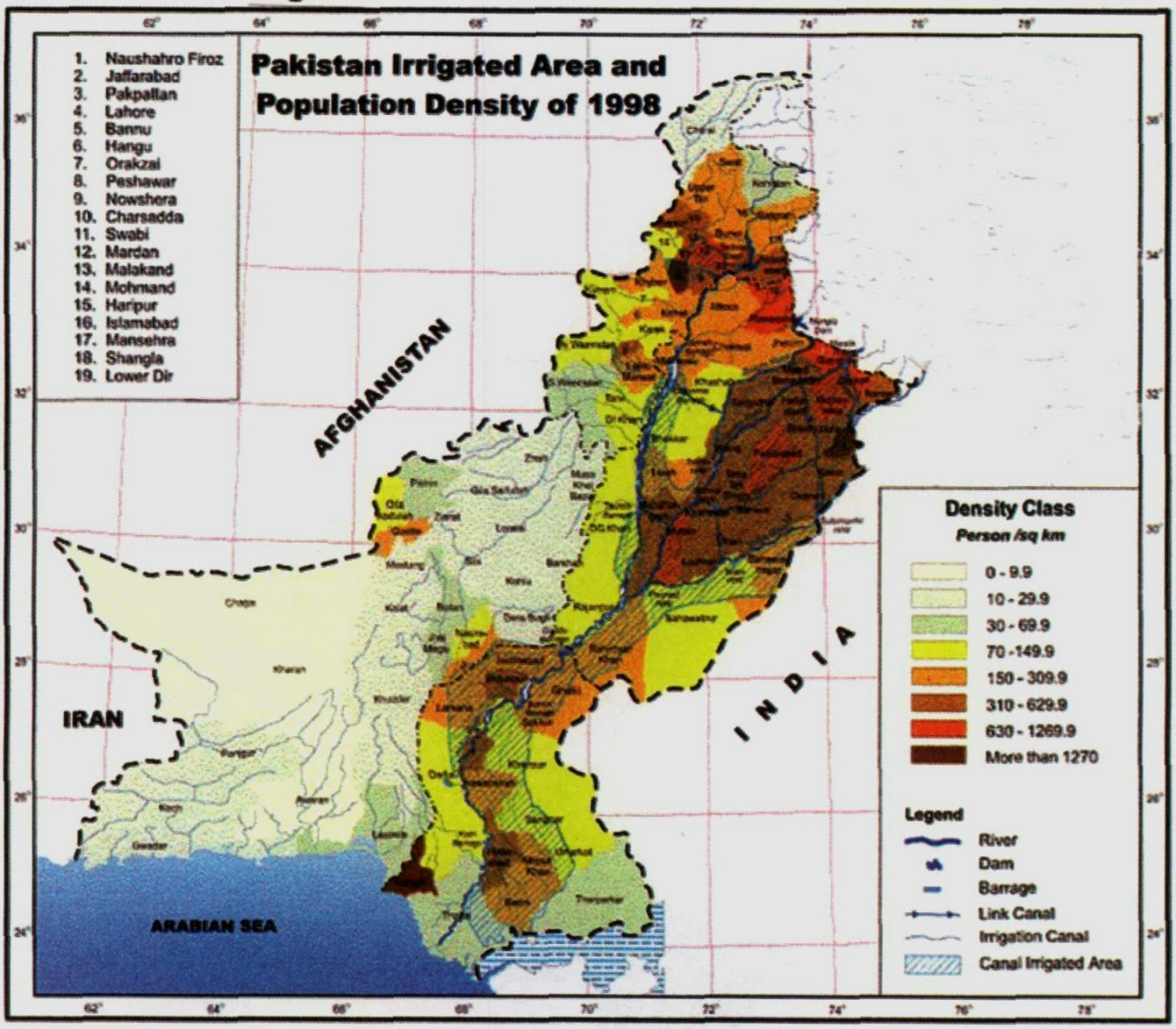


Figure 2

RIVER BASINS OF CENTRAL AND SOUTHERN INDIA

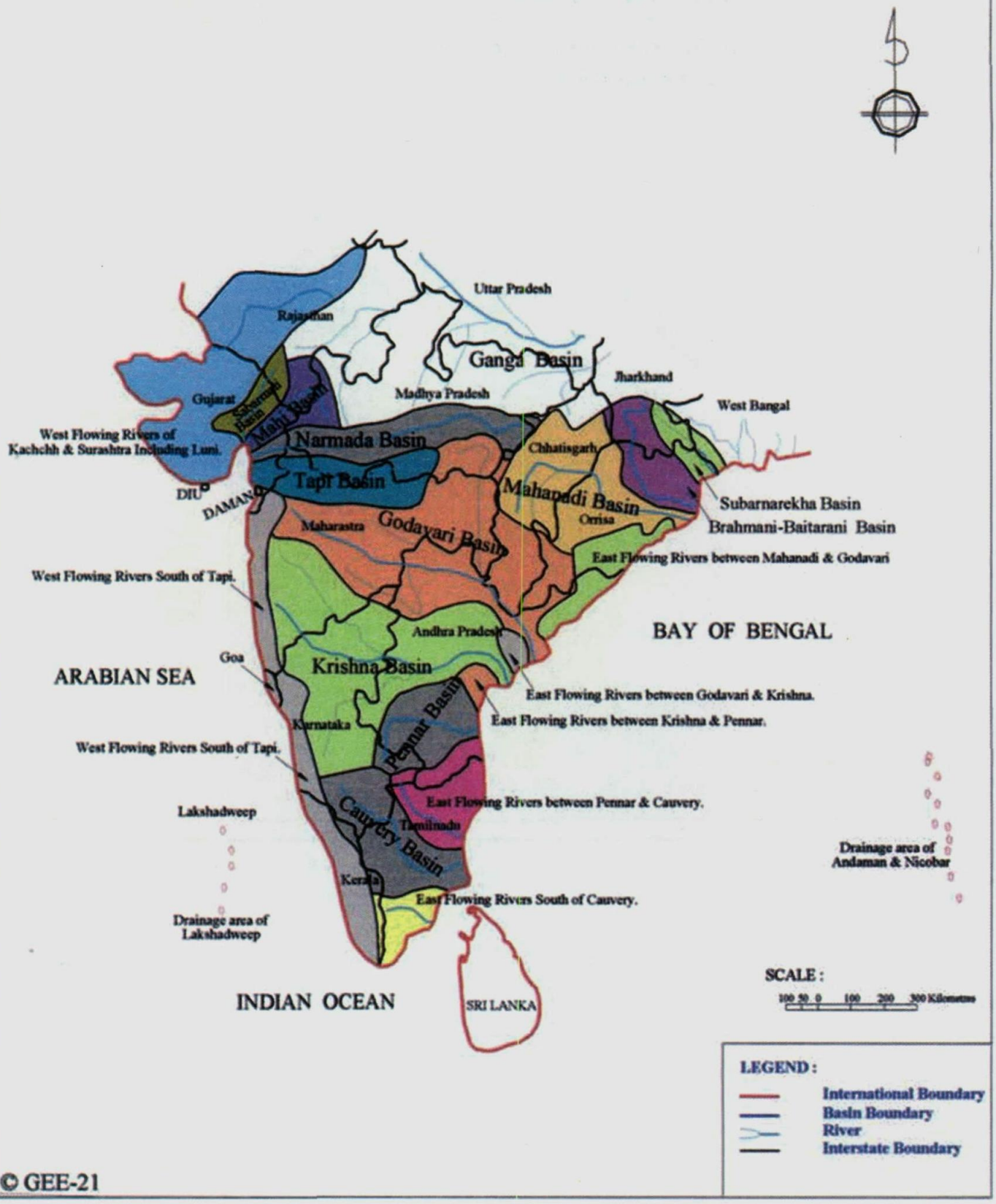
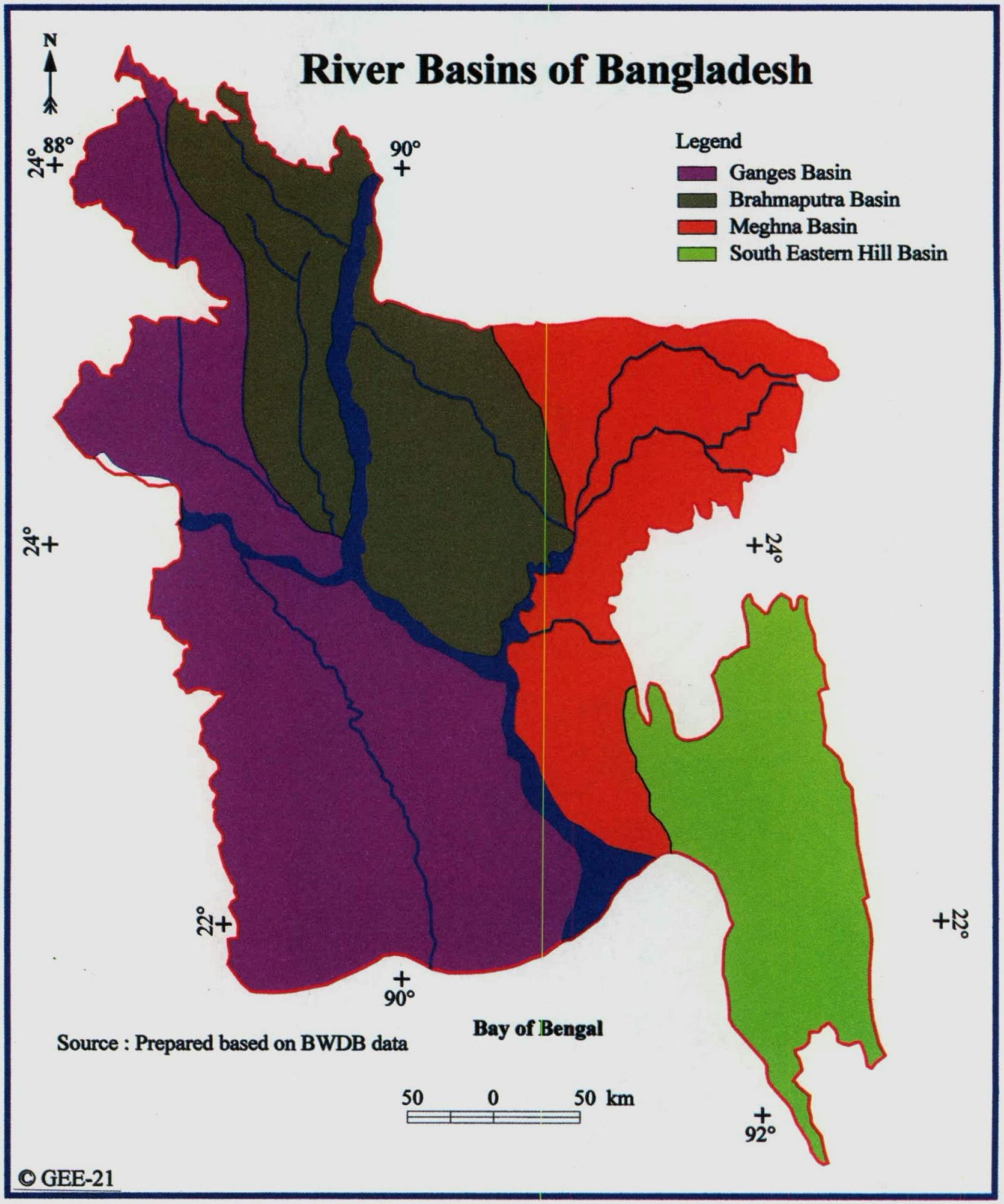


Figure 3:


RIVER BASINS OF NEPAL
International Boundary
PITHORAGARH
Kamali
Bheri
MAHENDRANAGAR
Babai
NEPALGANJ
Sarda
Rapti
KALIGANDAKI
Marsyandi
Modi Seti
Seti
POKHARA
SETI
BURIGANDAK
CHINA
(TIBET)
NEPAL
KATHMANDU
Sun Kosi
Arun
Tamur
Dhankula
Kankai
Dharan
Birang
Rapti
UTTAR PRADESH
LUCKNOW
Ghaghara
Little Rapti
Burhi Gandak
Bagmati
Kamla
Kosi
BIHAR
INDIA
Sone
PATNA
GANGA
BHAGALPUR
© GEE-21

Figure 4:


River Basins of Bangladesh
N
88°
90°
24°
22°
92°
Legend
Ganges Basin
Brahmaputra Basin
Meghna Basin
South Eastern Hill Basin
Bay of Bengal
Source : Prepared based on BWDB data
50 0 50 km
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RIVER BASIN ORGANIZATION (RBO)

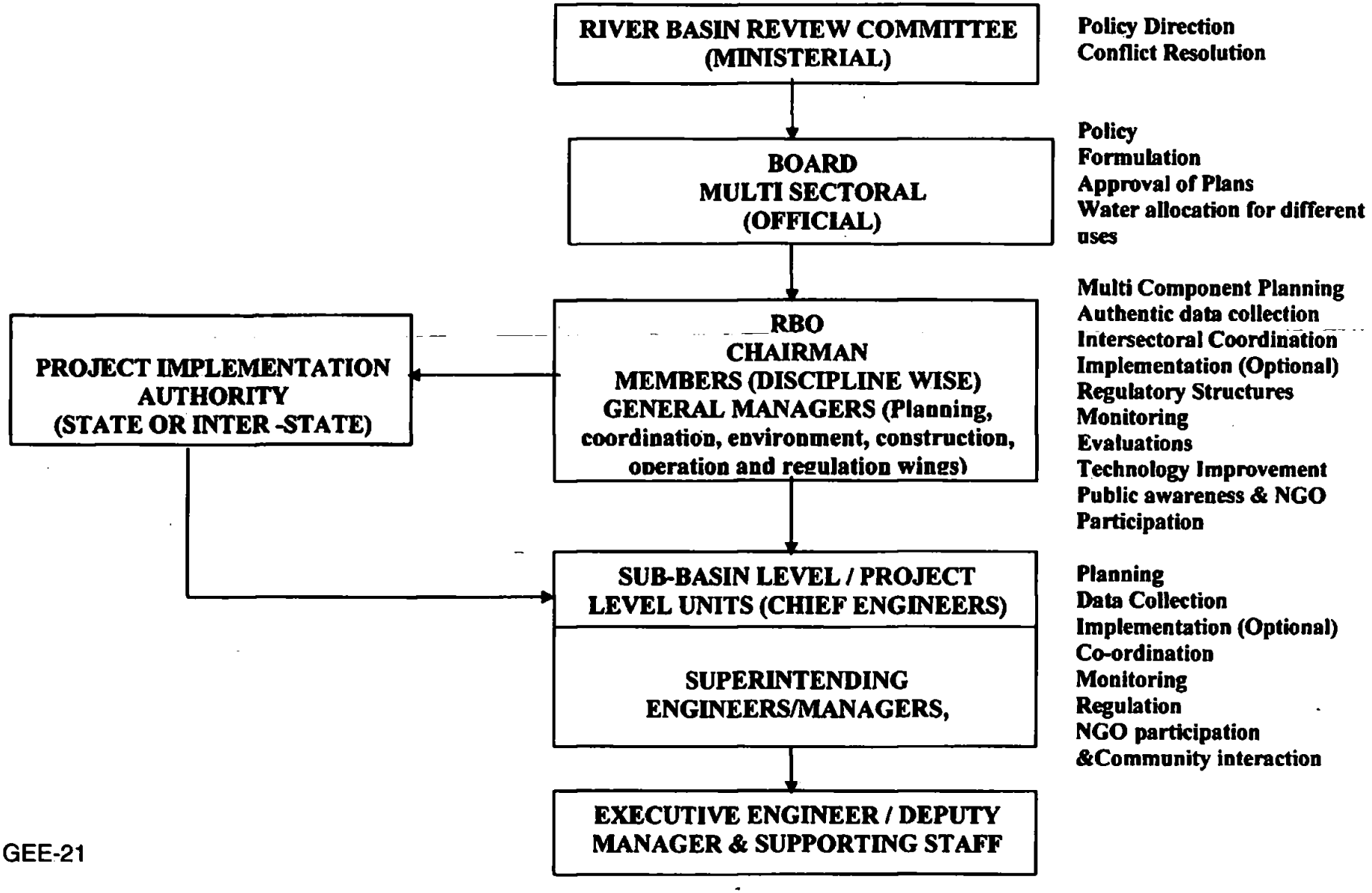


Figure 6: Linkages between planning nodes across sectors in the Bargaining Arena model.

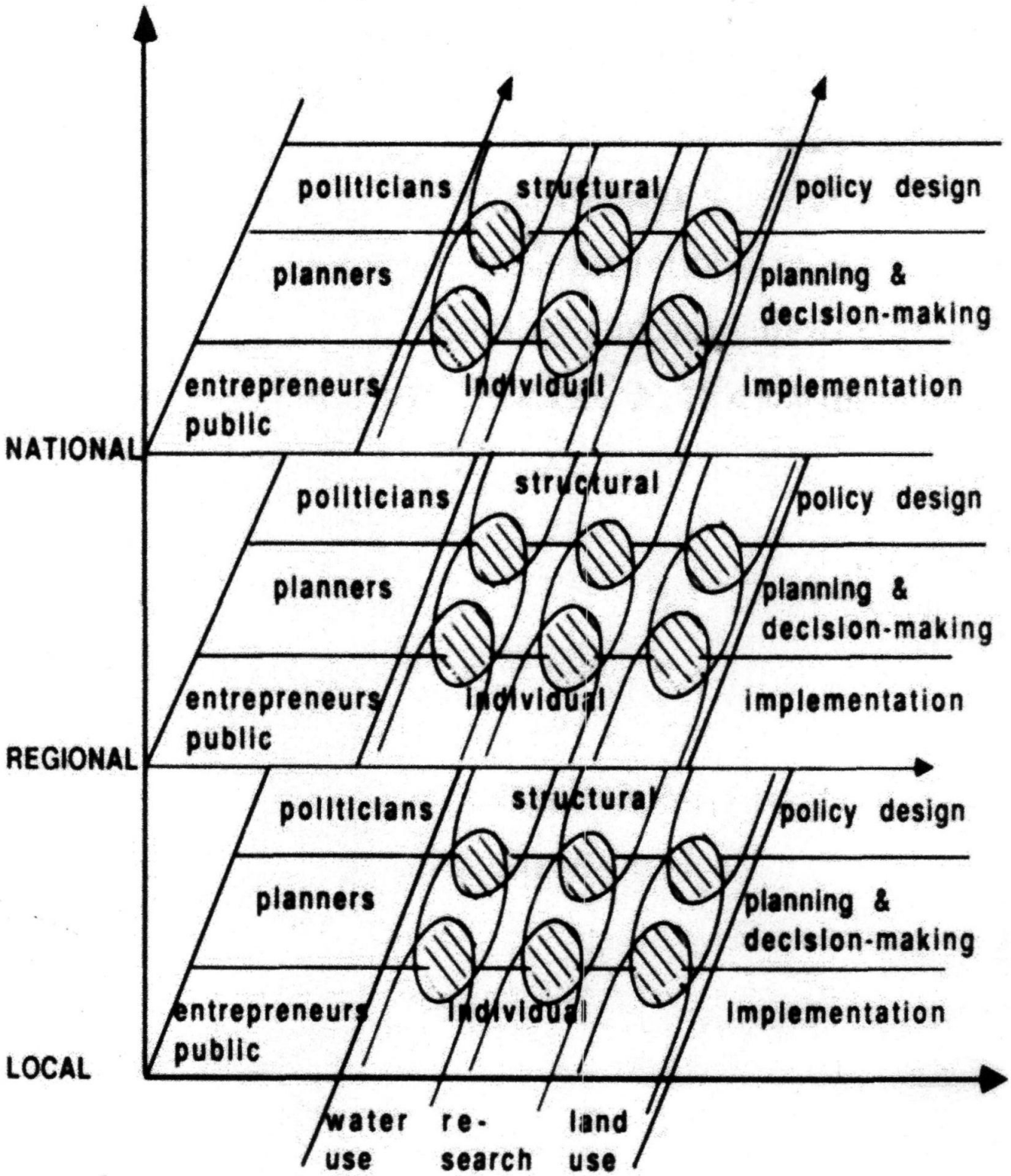
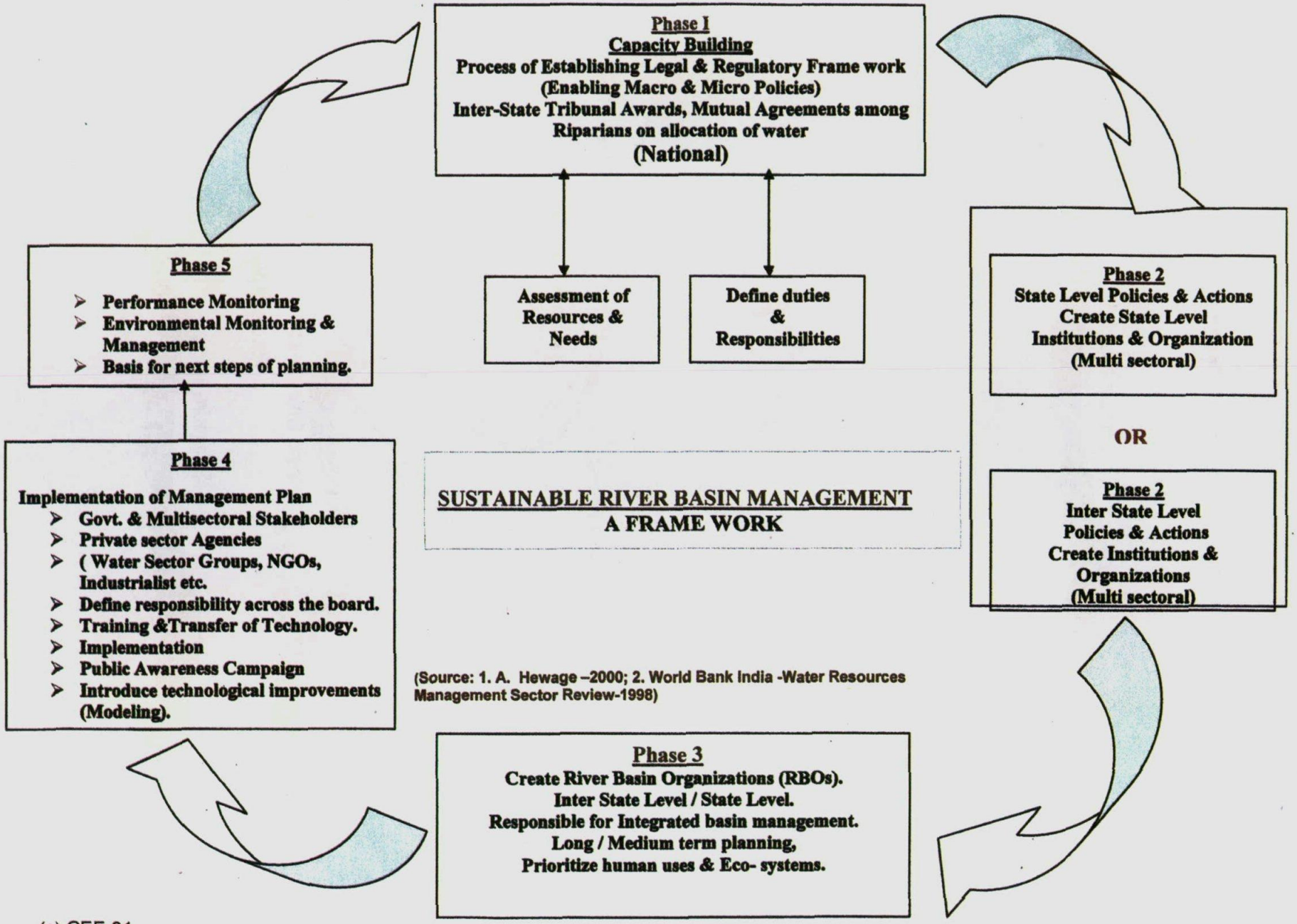


Figure 7: Suggested framework for a River Basin Organization.



(Source: 1. A. Hewage –2000; 2. World Bank India -Water Resources Management Sector Review-1998)

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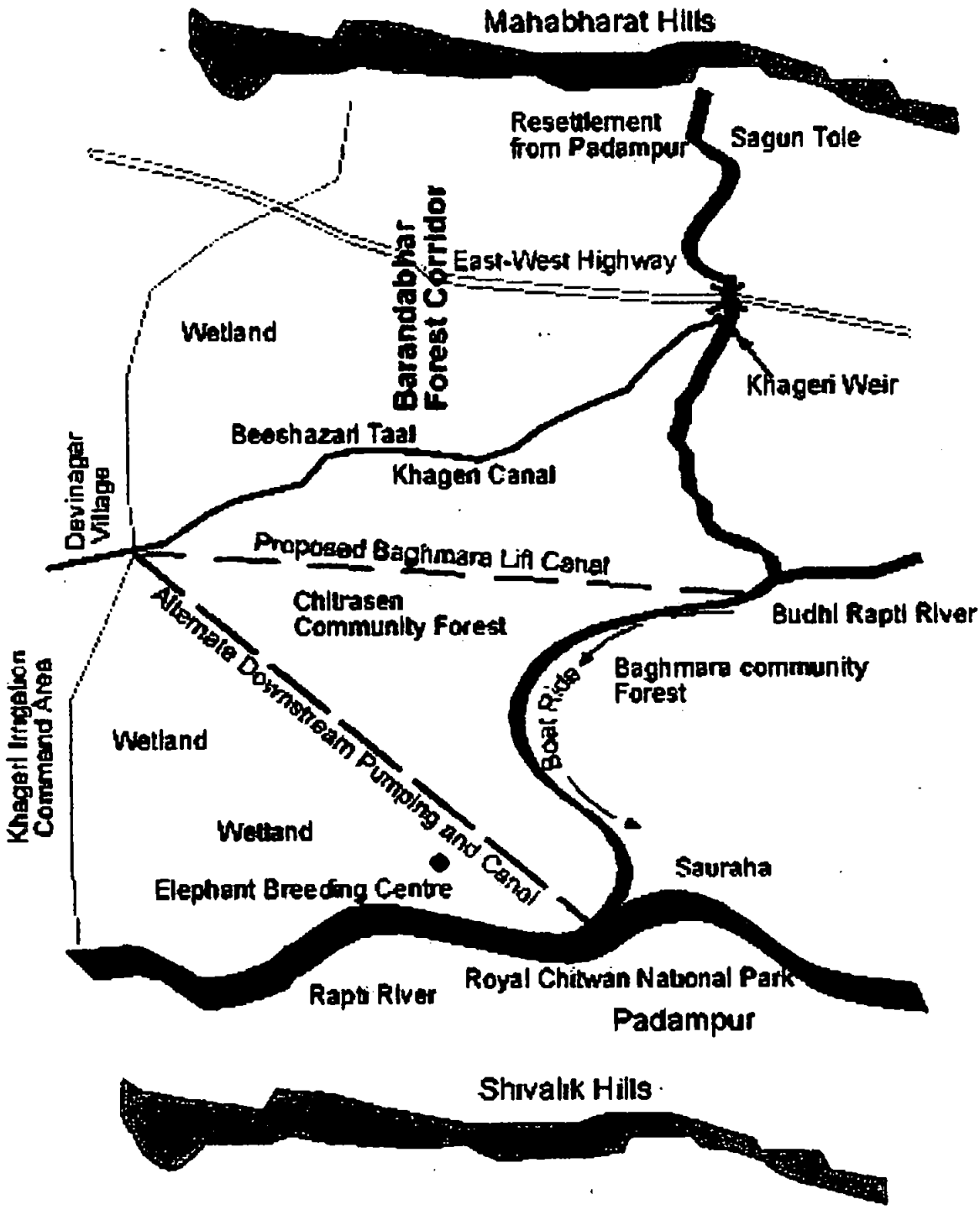
Figure 8 : Water and Community Conflicts



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3. Conflicts at the State and Provincial Levels

In this chapter, we review the existing conflicts between the provinces and States of Pakistan and India. They mostly occur where river basins cut across provincial or state boundaries, though there are also cases involving inter-basin transfers and non-riparian beneficiaries. The key elements of these inter-state conflicts are extracted from the Case Studies in Part II of this Volume. They are listed in Table 1 below.

Table 1: Key Water Sharing Conflicts between States or Provinces

Basin or Dam	Parties to the Conflict	Nature of Conflict	Current Status/ Mediators
1. Indus – Pakistan	Punjab, Sindh	Water sharing	Continuing. IRSA and CE secretariat
Indus (Eastern Rivers) – India: Ravi-Beas	Haryana, Punjab, Rajasthan, Delhi	Water sharing	Ravi-Beas Tribunal Continues.
Ganga Sub -Basins:			
3.1 Yamuna	Delhi, Haryana, Himachal, Rajasthan, Uttaranchal	Water sharing	Agreement reached in May 1994, Upper Yamuna Board monitors.
3.2 Sone	Bihar, Madhya Pradesh, Uttar Pradesh	Assessment of basin yields	Conflict continues.
3.3 Damodar	Jharkhand, West Bengal, Union Government	Submergence of uplands and coal mining areas; flood control benefit not fully realized	Impasse in further development.
3.4 Upper Ganga including Ramaganga	Uttaranchal and Uttar Pradesh	Potential conflict on storage dam projects owing to the submergence and irrigated tracts in now different States	Ganga Management Organization to be set up.
4. Barak	Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura	No progress on multipurpose project, owing to divergence in submergence costs, and benefits	-
5. Narmada	Gujarat, Maharashtra, Madhya Pradesh, Rajasthan	Conflict between affected people and States	In public interest litigation filed by NGO, Supreme Court (Oct. 2000) has allowed construction of dam, subject to provisos.
6. Godavari	Andhra Pradesh, Karnataka, Orissa, Madhya Pradesh, Maharashtra	Conflict resolved in 1980 after twenty plus years.	Mutual negotiations, bilateral and trilateral agreements among the five parties, ratified by Tribunal.

7. Krishna	Andhra, Karnataka, Maharashtra	Alamatti dam, Telugu Ganga Project and other water sharing issues	Tribunal award due for review in 2000. Review tribunal being set up.
8. Cauvery	Karnataka, Kerala, Pondicherry, Tamil Nadu	Water sharing	Cauvery Authority has been set up and is functioning. The final award of the Tribunal is awaited.
9. Pennar	Andhra Pradesh, Karnataka	1892 Agreement reopened on grounds of improvement to tanks, unauthorized diversions	Legal recourse initiated by a State.
10.Brahmani-Baitarani	Jharkhand, Orissa, Madhya Pradesh	No conflicts owing surplus water flows	-
11. Subernarekha	Bihar, Jharkand, Orissa, West Bengal	Inter State water agreements negotiated since 1964.	-
12. Mahi	Gujarat, Madhya Pradesh, Rajasthan	-	Project specific agreements have worked well.
13. Tapi	Gujarat, Maharashtra, Madhya Pradesh	-	Project agreements and Interstate Control Board has worked to common benefit.
14. Mulla Periyar Dam	Kerala, Tamil Nadu	Dam safety, submergence of reserve forest land and wildlife sanctuary	Supreme Court has directed establishment of Experts Committee.

A brief description of these conflicts is provided below, while narratives on the history of the disputes may be found in Chapter7 (the Case Studies):

1. The Water Accord 1991, a non-doctrinal water sharing formula, provides the basis for water allocation in the Indus Basin of Pakistan. However, the debate continues regarding the sharing of shortages in drought years, mainly between Punjab and Sindh provinces. The arguments made by the two sides may be read as varying interpretations of the principles of rational and equitable utilization, prior appropriation and the need to reserve water for nature and essential ecosystem functions.

2. In the Ravi, Beas and Sutlej rivers of the Indus system in India, the assessment of excess flows (over and above the already allocated flows to the states under past agreements) and its sharing among the states remains a bone of contention. The Ravi-Beas Tribunal has not been able to resolve the issue so far. Even court orders are not honored. There is an impasse.

3. The current situation in the Ganga Sub-basins is as follows:

    a. In spite of a negotiated settlement on sharing of the flows in the Yamuna, the irrigation needs of the states have conflicted with the water supply needs of Delhi City resulting in frequent interventions by the courts. The Upper Yamuna Board set up to monitor the implementation of the agreement has made efforts to resolve the issues;

    b. The Chambal Control Board resolves inter-state issues informally since the tacit informal understanding with one of the party states (the lower riparian) has not been formalized;

    c. The assessment of 75% water availability in the Sone river basin has not been settled since one of the states is procrastinating in accepting the assessments made by the Sone River Commission;

    d. The planned Damodar Valley projects could only be partially implemented due to submergence problems. The priority given to irrigation or power creates frequent conflicts (in the years of short storage in the reservoirs) among the party states resulting in less than optimal benefits. Uncompleted projects have further reduced the benefits; and

    e. The Upper Ganga now falls under the control of the newly formed state of Uttaranchal. Disputes about sharing the benefits and costs of existing projects and in the implementation of new projects have surfaced.

4. In the Brahmaputra basin, which is the most water-rich basin in India, even though there is no water sharing conflict between states, mega projects planned in the upper reaches of the river have either been scaled down or re-designed as smaller cascade development schemes due to submergence problems and disputes in sharing of benefits.

5. In the Barak river, the Tipaimukh high dam project which is envisaged to provide hydropower, flood control and irrigation benefits has not made much progress due to lack of agreement amongst the riparian states on the issues of reservoir submergence areas and the sharing of benefits.

6. The Narmada river dispute is the most visible in India, as well as internationally. A tribunal award resolved the initial issue of water sharing. However, the height of dam, benefit sharing and the mode of settlement of project-affected people caused serious difficulties in implementation, particularly of the Sardar Sarovar dam (the terminal dam on the river). Project-affected people agitated under the banner of the dedicated NGO - The Narmada Bachao Andolan (NBA). The NBA followed up by Public Interest Litigation (PIL) in the Supreme Court. The NBA questioned the benefits claimed from the major projects, challenged the resettlement and rehabilitation packages for project affected people of the

reservoir submergence and canal affected zones and its implementation. It also rejected the environmental impact assessments made and the remedial actions taken by the project authorities. This challenge created worldwide attention to the major development activity planned in the valley. The Supreme Court also deliberated on this issue for several years but finally upheld the Tribunal Award and allowed the construction to proceed, subject to conditions. The Court introduced a mechanism to monitor the progress of resettlement pari-passu with the raising of the height of the dam through a Grievance Redress Cell in each of the party states.

7. The Krishna Water Disputes Tribunal Award was to come up for review in May 2000. However, a few years before the review of the Tribunal Award became due, efforts made by the upper riparian state Karnataka to reallocate its share of water in the river and raise the height of the Alamatti dam by increasing the FRL through modification of gate height was raised in the Supreme court. A Five Member constitutional bench heard the original suits of both the States and delivered its judgement on 24th April 2000, restricting the height of the Alamatti dam, subject to certain provisos. Karnataka has sought court's intervention to stop all new projects on the river by the lower riparian Andhra Pradesh, till the water sharing issue is resolved again. The Government of India has approved the process to establish a Review Tribunal.

8. The Cauvery river water dispute is about inadequate flows in the river to meet the demands of all the party states. Though technical solutions are put forth to share the distress, political expediency is creating hurdles.

9. In the Pennar basin, improvement/ rehabilitation of tanks on the basis of old agreements proposed by one state without approval between the states are questioned legally in the courts.

10. In the Brahmani- Baitarani basin, there are no disputes since the basin has surplus flows.

11. In the Subernarekha basin projects are undertaken by mutual agreements since the benefits and costs to be shared have been well defined.

12. In the Mahi basin, several negotiated project-specific agreements have worked smoothly due to clear understanding on the sharing of water, sharing of costs of land acquisition, resettlement and rehabilitation, and the sharing of benefits.

13. An Inter-State Control Board for the Tapi basin implements joint projects efficiently and speedily, as several project specific agreements on sharing of waters, costs and benefits have been put in place.

14. The Mulla Periyar Dam is a part of an old (1885-1897) water transfer scheme on the west flowing Periyar river. The submergence of reserve forest and Elephant Wild Life sanctuary are the grounds for objecting to rehabilitation of the dam and raising its conservation storage level. Legal recourse has not yielded the desired results so far.

Even from this summary, it is apparent that "water sharing conflicts" encompass a range of issues in addition to the allocation of water. These include:

- Conflicts over data --- for example, the Government of Sindh has recently decided to send its inspectors to Chashma reservoir to validate the discharge data provided by WAPDA (a federal agency);
- Conflicts over interest --- for example, between timing of releases from the Rihand Dam for hydropower needs in UP and for irrigation in Bihar;
- Conflicts over values --- for example, over reserve forest lands and wildlife sanctuaries in Kerala that could be submerged with the full operation of a dam; and
- Conflicts over relationships --- for example, over costs of submergence in Uttaranchal, and benefits from irrigation in UP, now that the two are separate States.

Another feature is the variety of instruments used for conflict resolution, ranging across judicial, semi-judicial, administrative, semi-autonomous and political branches of government, and comprising regular courts, special tribunals, control boards, river basin authorities, development corporations, ministerial and expert committees and sub-committees, and meetings of apex political leadership.

A common factor in these conflicts is their long duration.

4. Local and Sub-Regional Conflicts

Water security can be as crucial an issue at the local and sub-regional level as at the inter-state or inter-provincial and international scales, even though narratives of water conflicts between countries and provinces tend to get more publicity. First, there are the multiple impacts of large development projects. Inter-basin transfers of water, for example, affect household security, village security and valley security. Second, the interplay between 'street-level' bureaucrats, markets, and social solidarity may bear fruit in a constructive engagement or lead to incoherent violence.

In India, a social mobilization program for participatory irrigation management has made significant progress after initial teething troubles. The legal bottlenecks in promoting the involvement of farmers have been removed and certain basic policy measures introduced. As a result, about 23,626 water users associations (PC, 2001) are functioning successfully in 14 States (2002). The pace of establishing these WUAs will be further accelerated during the 10^{th} Plan (2002-07) to cover an additional 10 million hectares. However, the scaling up of such activities will eventually lead to a situation where conflicts and incompatibilities along an upstream-downstream dimension will emerge. The practical experiences in handling such challenges are limited.

A rare attempt to establish "river parliaments" in parts of India represents one interesting example (Agarwal and Narain, 1999). As a result of the combined efforts of villagers and an NGO in a part of dry Rajasthan from the mid 1980s onwards, a dry and seasonal river was brought back to life through the building of almost 2500 rainwater harvesting structures. With water gradually coming back in the river from 1990 onwards, the interest of the government was revived. Since rivers are legally the property of government, it appeared as if government would take over control of the fruits of the efforts of the communities along the river. Only vigilant mobilization made it possible to form a "river parliament" in 1999 as an association of all the villages along the river course. The parliament has set rules and regulations for river management, which include restrictions on the type of crops that can be grown in the basin.

These successes are matched by portrayals of pervasive local and sub-regional conflicts across India. Box 1 lists the section and sub-section heads of two published papers by researchers from the Madras Institute of Development Studies at Chennai:

Box 1: Local and Sub-regional Water Conflicts in Tamil Nadu, India

Groundwater Conflicts

Conflicts in the use of groundwater in rural areas:
- Conflicts owing to fragmented ownership of a well
- Conflicts between well owners
- Conflicts between water sellers and purchasers
- Conflicts emerging in surface systems due to increased groundwater use

Conflicts arising out of industrial and urban water needs:
- Conflicts due to increasing urban water needs
- Conflicts due to environmental damage

Conflicts over Water Supply

Debates over Inter-basin Diversions
Conflicts between Municipalities and State Government:
- Conflicts regarding contributions to irrigation benefits
- Conflicts regarding water charges

Conflicts between Urban People and the Municipality regarding Water Tax

Water Conflicts between Farmers and State Government
Conflicts over Industrial Water Supply

An average watercourse in irrigated Pakistan has about 30 percent head-end farmers expropriating 70 percent of the water, and the conflict between them and tail-end farmers is pervasive across much of the irrigated Indus Basin. Warabundi (water turn) disputes may linger on for years between neighboring farmers. It is common for cases to be decided and for the decision to be reverted upon appeal at successive levels of bureaucracy in the irrigation department. Yet, it would be a mistake to assume that water sharing is the only or dominant cause of conflict in the irrigated Indus Basin. Damage to downstream ecosystems from discharge of saline effluents and the run-off of chemicals used in high-input agriculture is emerging as a significant threat to livelihoods. The depletion of ground water, especially outside the Indus Basin, is another source of local tensions that sharpen into conflict and violence at times and places.

Some cases of sub-regional and local conflicts in Pakistan, India, Bangladesh and Nepal are illustrated in Table 2.

Table 2. Examples of Local and Sub-regional Conflicts

Country, Area	Stakeholders	Nature of Conflict	Status
Pakistan, Irrigated Indus Basin	Head, middle and tail end farmers on *Sirkari* watercourses	Warabandi (water turn); Water theft (obstruction, breaches, pipes, *moga* tampering, and so on)	Pervasive.
Pakistan, Manchhar Lake	Fishers, upstream rice farmers, government	Saline effluent from outfall drain has damaged lake and fisheries	Project to extend outfall drain to the sea may mitigate the damage.
India: Alwar district, Rajasthan	Tarun Bharat Sangh, a NGO & 500 villages communities; Government	Rights over dried up river that was revived by community investment in 2500 rainwater harvesting structures	On-going: "River parliament" of riparians has established rules & regulations for river management.
Bangladesh: Sylhet haors, Kawadighi Haor	Farmers, irrigation and flood protection managers, fishermen	Reduction in fish habitats, populations, and diversity owing to conversion of wetlands to farmlands. Need for rapid drainage of water at start of winter rice cultivation	Constructive engagement. Experimental fish pass allows fish migration and breeding. Potential for scaling up under the National Water Management Plan.
Bangladesh: Coastal Cox's Bazar	Shrimp industry, rice farmers	Land and water use conflicts as powerful shrimp industry inundates coastal ponds with saline water and aggravates soil salinity, delaying drainage and farmers' access to rice seedling beds	Impasse; Unless industry shifts to fresh water prawns, which also have an export market and which can be farmed in rotation with winter rice, and land use zoning is enforced.
Nepal, Melamchi river basin and Kathmandu	Rural and Urban users, Municipalities, Development Bank	Project to augment city water supply by inter-basin transfer via 27 km long tunnel through mountains has environmental impacts	Melamchi project under progress with ADB assistance. No major project in hand to reduce leakages that equal 40% of city water supply.
Nepal: Chitwan valley, Khageri Irrigation Project and Baghmara Forest community on the edge of Chiltan National Park	Managers of community owned irrigation systems, Community forest groups as eco-tourism operators	Proposal for lift irrigation that would dry up the local stream used for lucrative canoe rides and deplete biodiversity	Constructive engagement with potential for conservation and development – slightly longer irrigation canal from main river that maintains flows in stream.

Local conflict is confined both within a hydrological and an administrative unit, while a sub-regional conflict extends across hydrological units, but not the relevant administrative unit. Purely local conflict is obviously more common, but which is more critical? We do not have an empirical answer, but a concept of conflict-intensity can be fleshed out for geographical scale, using for example, Maslow's famous theory of the hierarchy of human needs (Maslow, 1954). Broadly, the group of basic needs (for air, water, and food) has first priority till fulfilled. Security needs (for shelter, safety, health, etc.) have next priority. When these have been met, social or relationship needs predominate until they are satisfied. Finally, ego and self-actualization needs emerge and they have no limits. It is possible to map a hierarchy of security needs into this broader hierarchy of all needs.

In Table 3 below, we present examples of intentioned insecurities generated by water conflicts at sub-national scales. They are tabulated against the hierarchy of human needs for security.

Table 3. Sub-National Water Sharing Related Insecurities

Hierarchy of Needs (Security Needs)	**Recent Examples of the Means of Insecurity**
Basic Needs (Livelihoods)	Disruption of rice farmers livelihoods by salinization of coastal ghers at Cox's Bazar by the shrimp industry (Bangladesh)
Security Needs (Physical Security)	Submergence of homes (shelter) in the head ponds of Tehri and Narmada dams, (India)
Social Needs (Network Security)	Severance of human settlements by irrigation infrastructure in the Chashma Right Bank Canal Command, Pakistan (2001)
Ego Needs (Identity Security)	Protests by politicians and farmers associations in Sindh against planned Thal Canal, Punjab, Pakistan (2002)

The suggestion here is that, while local disputes may be sharper, their underlying needs can also be met more readily. Stomachs can be filled, houses can be provided, and even bridges built to hamlets on the other side of the canal. On the other hand, the ego needs of some politicians appear to have no upper limit. We will revisit this finding in the recommendation to start small and to build upwards.

5. Analyses and Lessons

What lessons can be learnt from the experiences of water conflicts within South Asian countries, in the human security perspective? One of South Asia's most striking characteristics is its physical diversity, especially the variation in water availability. Many of the water problems faced by the neighboring countries are very different. For example, in Pakistan agriculture consumes 97% of the water, while in Nepal the urban demand of Kathmandu is a dominant issue in the intra-country context. In Bangladesh, the key conflicts appear between farmers, fishers and aquaculturists. In spite of this, the South Asian countries have many experiences in common, partly owing to overlapping civilizations and cultures, partly to shared low levels of economic and human development, and partly to a similar heritage of laws, especially the Canal and Drainage Acts. Even in these aspects, however, there are growing differences, especially as their patterns of governance have diverged. In this chapter, we analyze and draw lessons from these diverse and common experiences of provincial (state), sub-regional and local conflicts.

5.1. Varying Nature and Origin of Conflicts

In Chapter 3, four conceptual categories of conflicts were recognized - conflicts over data, over interests, over values and over relationships. Water-sharing conflicts within the countries of South Asia can indeed be classified in this manner, but most actual cases combine two or more dimensions. In the India Case Study presented in Part II of this Study, a set of proximate causes of conflicts (technical and non-technical), in river water sharing have been identified:

- Disagreement on water availability, especially during lean seasons;
- Disagreement on the basic hydrological data and the actual present utilization of water;
- Lack of openness and transparency in exchange of data/information;
- Disagreement on the present and future water requirements for various uses and the basis thereof;
- Differences in approach to planning, design, construction, and operation of joint projects on trans-boundary rivers;
- Different interpretation of operative clauses and sub-clauses in existing Agreements, Treaties, and tribunal awards;
- Disagreement on riparian rights and basis thereof;
- Disagreement on the basis and modalities of water sharing;
- Lack of institutional arrangements for implementing the Agreements or tribunal awards;
- Violation of agreements by one party or the other; and
- Rigid political or administrative positions.

It has been noted that as the dispute progresses, the technical and non-technical categories get so intertwined that they cannot be separated and resolved on technical merit alone.

In the following sub-sections, we explore the origins and character of conflicts in a manner that could lead directly to possible solutions, if any. It entails identifying the primary determinants of conflicts that could be addressed at institutional, policy and program levels.

Scarcity

Is scarcity a primary determinant of conflict? There are strong indications that inter-state conflicts in India are more severe and complex when the available water is scarce. Such scarcity could exist in current per capita terms or as a function of the degree of closure of the basin (the percentage of surface water utilized). It could be perceived scarcity in relation to climatic and other risks, or in terms of the demand-supply gap generated by the envisaged development pathway. Indeed, conflicts are relatively more complex to resolve in the six river basins of India that are relatively water-poor, have higher degrees of closure, and are more vulnerable to climatic variability.

Pakistan has changed over the past 50 years from a relatively water-rich country to one with little new water to spare for a growing population. Pakistan stands nearly alone among the world's nations in having developed its water nearly entirely for agriculture, with only 3% for other uses. Per capita water availability is falling towards the 1000 m^3 level, which is the commonly accepted index for a water-stress condition. A three-year drought from 1999 through 2001 has severely tested the limits of current supply and delivery facilities, especially outside the Indus Basin. Under these circumstances, one might expect tensions to increase over water and food supply. Indeed, water scarcity was a high profile national issue during the drought years, and a number of mega-water projects were launched to augment supplies.

On the other hand, we have documented a number of conflicts where scarcity is not the issue. For example, cases of submergence and re-settlement are related to an excess of water. In Bangladesh, scarcity is limited to the lean season flow months of March and April, but intense conflict occurs in November and December, when farmers need rapid drainage to plant rice and fishers need to protect their fish stocks. Environmental degradation, such as caused by the drainage of saline or chemical effluents into Manchhar Lake in Pakistan, may generate conflict even where water is abundant. Thus scarcity is not necessary for conflicts to occur.

We have also documented a case of extreme water scarcity leading to collaborative action for water harvesting across 500 villages. The drying up of a river is an extreme situation. Its resurrection by investment in rainwater harvesting structures and cropping pattern control is an equally strong demonstration that scarcity is not a sufficient condition for conflict to occur. Sometimes a severe challenge provokes a creative response, and sound leadership helps the stakeholders accomplish huge tasks through mutual cooperation.

Technical: characteristics of rivers and aquifers, specific kinds of human demands

Are there technical characteristics of river basins and aquifers that make conflicts more complex to resolve or alternatively allow resolution with gains for all stakeholders?

Michel (1967) has documented a notable example at the international scale. The geomorphologic feature that made feasible inter-basin transfers from Western to Eastern Indus Rivers also made possible the partitioning of the Indus Rivers between Pakistan and India. Once the waters were divided, conflict was reduced between the two otherwise hostile neighbors.

On the other hand, development options can exacerbate conflict. Large dams are feasible in its upstream reaches of the Indus to further regulate its flow. This technical potential foreshadows the conflicts between the provinces of Pakistan, owing to perceived unequal distribution of potential benefits and costs. NWFP fears the submergence of cultivated and other lands, and the displacement of people. Sindh perceives that further reduction in freshwater flows to the coastal mangroves will accelerate the degradation of this ecosystem and extend seawater intrusion further inland. Punjab on the other hand, sees a need for expanding cultivation and more assured surface supplies to existing cultivated areas, to control the draw down of ground water and the threat of saline water intrusion into fresh ground water zones.

It is not possible to divide the waters of Ganga-Brahmaputra-Meghna (GBM) -GBM among the riparian countries of the region and within the provinces/states of each country. The GBM waters have not been allocated to each state/ province within each country, though the demand for such allocation exists in India. It seems that grandiose plans, for example, for inter-basin transfers through national water carriers, national water grids, garland canals and so on provide materials for debates and may distract attention from the real issues, but rarely cause conflict in the strict sense (Verghese, 1999).

Demand side characteristics have a similar potential for aggravating or mitigating conflict. For example, different kinds of industry and levels of internal recycling have varying demands for water and effects on national water quality, while growing megalopolises can render rivers unusable downstream by using them as drains for untreated sewage. Changes in consumption habits and broadening of markets, especially with globalization, can affect water use. Thus over-consumption by rich consumers in the world markets may contribute to environmental degradation and local conflict. We have documented such a case in the production of Tiger Shrimp that is grown under saline conditions in the coastal areas of Bangladesh. Almost all the production is exported to the European Union, Japan and the United States. With intensified commercial production by a minority of shrimp producers, the coastal polders have become increasingly saline and unfit for rice cultivation by the majority of small farmers. A shift in consumer preference in favor of Giant Prawn that is reared in freshwater could mitigate the conflict. Consumer education could be the strategic response in a number of other water conflict situations also.

Political

It is a fairly common assumption that political positions harden and disputes become more complex, entangled and difficult to resolve the longer a conflict is allowed to fester. We cannot restate this with the force of an axiom. However, this Report does document

the case of the Cauvery Water Dispute that has become highly litigious and hostile after a long period of negotiations.

Negotiations started in 1968 between Karnataka and Tamil Nadu with the Government of India acting as a mediator, well prior to the expiry of the 50 years period of validity of 1924 Cauvery water sharing agreement. However, the efforts did not result in a solution. The Cauvery Waters Dispute Tribunal was set up on the directions of the Supreme Court in 1990. The tribunal did emerge with an interim relief award in 1991, but Karnataka contested this. Thereafter, the constitutional authority (the tribunal), the apex judicial authority (the Supreme Court) and the highest executive authority in India (the Prime Minister) have been periodically engaged in dispute resolution. On the public side, a wide range of actors, including farmers and matinee idols of the film world in Tamil Nadu and Karnataka, have joined the chorus of protests. Political expediency in both States has become the driving force in perpetuating the dispute.

Institutional, legal, and informational inadequacies

Institutional, legal and informational deficiencies contribute to the aggravation of conflict to a degree. We have noted several examples of the undermining of bargaining arenas, such as tribunals and the IRSA. Ground water is being over-drawn in several regions of South Asia, but effective legislation to control unsustainable use has not emerged. At the operational level, there remain deficiencies in monitoring and measuring flows in the main reservoirs in real-time and at any time at the community watercourse level. This inter-locking triad of institutional, legal and operational deficiencies does certainly make "objective" decision-making difficult.

In India, for example, there is no policy on allocation of ground water resources in each basin to the basin states. Overexploitation in many basins has caused serious salinity and other related problems. A Ground Water Regulation Bill, based on a Model Bill circulated by the Central Government, is now being evolved by all states for enforcement. Tribunal awards and negotiated agreements on surface water sharing of rivers have not yet taken into account the ground water resources available in each basin for equitable distribution among riparian states.

Demand management is still not in force in most irrigation commands in South Asia though it is acknowledged as essential for water conservation and for ensuring equity in distribution of water among users, particularly in the canal commands. A demand management approach supported by appropriate tools could mitigate many local conflicts in the region.

5.2. The Political Structure

Among the four countries in our Study, two are water-rich (Bangladesh and Nepal) with more than 9,000 m^3 of freshwater resources per capita. The other two (India and Pakistan) are water-short with less than 2000 m^3 of freshwater per capita. It so happens that the water-rich countries of South Asia have unitary forms of government, while the water-short countries have Federal or quasi-Federal forms of government. There is no necessary

correlation, as a slightly larger sample of countries demonstrates. Large countries, like the USA, may have water-rich and water-short regions. This is shown in Table 4.

Table 4. Freshwater Resources and Governance

	Unitary	**Federal**
Water rich	UK, France, Nepal, Bangladesh	Canada, Germany, USA (Eastern part)
Water short	South Korea	Australia, India, Pakistan, USA (Western part)

Does political structure make a difference? Does the Constitution of a country affect the nature of conflicts, the way they are addressed, and the range of possible solutions? In particular, is conflict more likely to occur between sub-national units (states, provinces) in a federal system or a centralized system? Amongst the countries studied here, India is the most federal, Pakistan is federal in form but not always in practice, and Nepal and Bangladesh are central.

The experience elsewhere has been that centralized states such as France and the United Kingdom (excluding Scotland) have been able to develop privatized river basin authorities that, it is hoped, operate in a de-politicized way across administrative boundaries. In other cases, centralized states attempt to allocate waters from a central agency (such as IRSA) according to nominal quotas, but often by de facto fiat. Federal systems appear to require the maintenance of administrative boundaries as a unit of decision-making, necessitating instruments such as inter-state compacts that are comparable to international ones, with the federal government as a sometimes relatively weak go-between and enforcer.

The situation is particularly difficult in Pakistan, where the central government has frequently pre-empted provincial authorities, severely attenuating the ability or desire of provinces to make and observe long-term commitments to each other.

In India also, the re-organizations of states on linguistic lines and due to political considerations have opened up new water disputes between states. This could hamper development activities in the newly created states of Uttaranchal, Jharkhand and Chattisgarh and also open up new water disputes. By contrast, in Nepal and Bangladesh, at this point, the main conflicts appear to be inter-sectoral, and not between upstream – downstream users.

5.3. Technical Versus Democratic Approaches: Problems With Both

Both the technical and the democratic approaches have their strengths and weaknesses. It is best to try to find a working synthesis. A technically informed democracy is necessary, but it may not be sufficient.

The classical technical approach finds few defenders these days, except among experts and those dependent upon their largesse. The cited limitations are legion:

(1) Technical solutions do not solve problems that are obvious to stakeholders, and are notoriously subject to the law of unintended consequences;
(2) Experts may seek to optimize objectives that not all stakeholders agree to in practice (e.g., equity, system-wide efficiency);
(3) Information is always incomplete, especially on conditions at the field level;
(4) Decisions are often based on a consensus amongst specialists who have professional or political or regional biases or an economic stake in certain kinds of outcomes (e.g., engineering works);
(5) The decision-making process in an "experts know best" system is usually far from transparent, leaving the door open to corruption;
(6) Opposing views by local interests and others are commonly dismissed as uninformed or politically motivated, or both;
(7) Judicial reviews requires judges to have a high technical capacity and objectivity – where these are missing or compromised, such reviews lack credibility; and
(8) Since resort to courts is time- and money consuming, with uncertain results, its primary function to litigants is as a threat to potential defendants.

In Pakistan, technical authorities have taken decisions on Indus River allocations with waning credibility. As noted, there was a disturbing trend to move in the opposite direction from democracy and decentralization in making emergency allocations during the 2000 - 2002 drought. As long as emergency responses remain strictly for extraordinary situations, they may not set an unhealthy precedent. Yet, the failure to evolve coordinating mechanisms among the provinces or other mechanisms to solve allocation problems at lower levels is not a hopeful indicator.

Because of recent revolutions in communications and "retail politics," democratic decision-making, based on or manipulating popular perceptions, is becoming more common across the world. Democracy tends to check flagrant abuses of power, and makes politicians and bureaucrats more sensitive to needs and perceptions of the people. It also allows the growth of civil society (social capital) that can provide valuable horizontal linkages and assume much of societal governance.

Nonetheless, democracy has a number of notable limitations: (1) The masses don't always trust the experts, even when they should; (2) The dominant discourse can be swayed by "Us-versus-them" arguments, demonizing the other (demagoguery); and (3) Issue linkages may make it difficult to isolate and deal with sectoral problems (such as water allocation) – e.g., economic, military, or cultural clashes produce a climate of distrust that makes "concessions" on water impossible.

During the Wrap Up Conference for this Study in February 2003 at Islamabad, a senior technical expert and a politician provided illuminating insights on the relative roles of experts and politicians in a constructive engagement. Both had participated in the process

of the Indus Water Accord of 1991. Engineer Khalid Mohtadullah, then Member, Water, WAPDA, said that agreement on the accord would not have been reached if the politicians had not been provided an interactive tool in the shape of the Water Sector Investment Plan of 1990. This allowed them to game various development scenarios for their respective provinces. Mr. Shah Mahmood Qureshi, MNA, then Punjab Minister for Planning, said the only reason for the validity of the Water Accord more than a decade after it was entered into was that politicians from all four provincial governments had signed off on it.

The empirical studies of Wolf (2001) and others at a global scale support the contention about the tremendous resilience of accords entered into and institutions established during windows of opportunity. He argues that the challenge is to get ahead of the "crisis curve", to develop institutional capacity and a culture of cooperation in advance of costly, time-consuming crises that in turn threaten lives, social stability and ecosystem health.

5.4. The Interaction of Scales: Fractals and Bargaining Models

We propose the hypothesis that conflicts are "fractal," i.e. similar in character at different scales, but likely to be more severe at the local level. Sometimes this leads to adverse effects on conflicts at higher scales. In many cases, if conflicts are effectively addressed at the local level, it may mitigate conflict at higher levels.

In negotiating with the Federal Government and Sindh over the allocation of floodwater canals, for example, the Government of Punjab must keep in mind the disparate interests of farmers in Southern Punjab and prospective settlers in Thal. The recently sanctioned mega-projects for floodwater canals in Punjab, Sindh and Balochistan will operate only 70 days in the year, allowing seasonal cultivation. However, the seepage from these canals and their command areas will augment saline discharge downstream, particularly in Rahim Yar Khan district.

Whether or not the character of water sharing conflicts is fully fractal (replicated at all scales), it may be possible to trace linkages from very local issues to bargaining positions and conflicts on very large-scales. As the U.S. Congressman Tip O'Neill was fond of saying "All politics is local." Or, as Robert Putnam has pointed out (Putnam, 1992) those who negotiate across borders must simultaneously negotiate and form supporting coalitions internally. In negotiating with Bangladesh over the allocation of the Ganga (Ganges), the central Indian government had to take into consideration the disparate interests of Uttar Pradesh, Bihar and West Bengal. Dipak Gyawali (1998), for example, claims that the "continued withdrawal of Ganga waters by upper riparian states such as UP would be a threat to Bihar's own construction-focused water establishment and its ambitions towards new deployments of ... technologies". West Bengal supports diversions from the Farakka to oblige those who have an interest in maintaining the existing silt-prone harbor facilities.

It is equally feasible that local conflicts may be displaced upwards. In Sindh, water applications per acre are well in excess of those in the Punjab, due in part to the

predominance of large absentee head-ender landlords in Sindh who have little incentive to apply water sparingly or to give much thought to ensuring that allocated water flows to politically less potent tail-enders. Instead of addressing the problems of efficient use and equity of distribution, it is easier to rail against diversions of the Indus in the Punjab or even call for a revisiting of the Indus Waters Treaty with India.

5.5. Inter-sectoral Conflicts

Inter-sectoral conflicts tend to be more salient at local levels. However, in Bangladesh and Nepal, they may take precedence over upstream – downstream and inter-basin conflicts, even in discourse at the national level. In analyzing the conundrum of inter-sectoral conflicts, Gyawali sees three proclivities at work: that of the profit-inclined market (for example, shrimp and rice farmers), that of egalitarian conservation efforts (preserving the habitats), and that of a regulatory solidarity that can adjudicate between the conflicting claims (the government mechanism). How a balance is struck really depends upon the perception of fairness regarding the regulatory body, the space for dialogue between contending claims, and the innovative ways of transcending the impasse that it can bring forth from the discourse.

If the government mechanism is seen as leaning too heavily on the side of the profit makers, conflict and impasse is inevitable. If it is able to bring forth a solution that fully pleases no one but partially is something no one can ignore, an impasse may be avoided and a "circle of improvement"[i] may be initiated.

5.6. Proper Valuation of Water, or Valuing the Service of Delivering Water?

The proper valuation of water, and the allocation and enforcement of water rights, may reduce the contested space, but faces a number of conceptual and practical difficulties. A transparent pricing of water is possible where there is a documented economy with a fair and just adjudicator. It is not possible where the economy is informal and the regulatory bureaucracy essentially rent-seeking. Several issues of valuation come up for consideration, when one looks at water within the broader social context.

There is a difference in valuing water and valuing the service of delivering water. The former is difficult because of multiple reasons, the most crucial of which are the different properties of water that is put to different uses. Some of them are of such symbolic importance that attempting to place a price on them would be considered sacrilegious. For example, water at a religious site would be considered holy (bathing ghats near temples) and would require certain properties of flow to be maintained. It cannot be substituted by tanker-supplied water. The latter is easier to measure, allocate and hence price to the satisfaction of all. Therefore the debate over water tariff would be quite different if it was seen as price hike of water on the one hand, and on the other, admitting that water is a "human rights" subject of egalitarian concern, but that the delivery of water has a cost associated with it that needs to be met.

5.7. Mechanisms and Principles Used in Addressing Conflicts

Several mechanisms and principles have been adopted and applied in South Asia for dispute settlement. Some have yielded excellent results, while others have caused continuing rancor and legal battles in the courts. The following is a broad categorization of these instruments:

a. Negotiations [for example through Standing Committee on Inter-State issues, MOWR, India];
b. Tribunals [India, Pakistan];
c. Formulas for sharing excesses and shortages [Indus Basin Water Accord, 1991];
d. Equitable distribution [Ganges];
e. Benefit sharing as opposed to water sharing [Rajasthan, a non-riparian beneficiary of Narmada].

The principles of equitable distribution of water availability assessed at agreed locations on the main river or its tributaries (on 75% dependability or average availability) have been generally followed in the Inter-state water disputes. The Helsinki Rules on equitable distribution (GOI, 1999) and now the UN Law on Non - Navigational Uses of International Watercourses are widely referred to (UN, 1997). However detailed authoritative guidelines for the application of the "equitable and reasonable utilization" principle are yet to emerge in South Asian countries. Efforts are at hand in India to evolve such guidelines. The National Water Board under the National Water Resources Council, in its meeting held in August 2002, decided to constitute a Working Group chaired by the Chairman of the Central Water Board. It is expected that these policy guidelines, when finalized, would expedite resolution of interstate water disputes.

In South Asia, ground water resources have generally not been taken into account in the assessment of basins' water resources for distribution or sharing among the riparian provinces or States. However, each State within an Inter-state basin has the right to use the ground water resources for beneficial purposes. The law on ground water is still evolving. In India, Authorities are in the process of being established in the States on the basis of guidelines prescribed by the Central Government, which has established the Central Ground Water Authority.

A change of State boundaries due to the re-organization of States is an issue particular to India. It has brought even past agreements in dispute (Mohile, 2000), and resulted in the establishment of additional Tribunals to settle the sharing arrangements.

Specific trans-basin diversions are permitted in provincial or Inter-state Agreements and Tribunal Awards, but not as a general rule. Each basin State is free to use the Inter-state basin water allocated to it in a general sharing arrangement, or on specific projects, and regulate within its boundaries, to enjoy the benefits of that water within that State in a manner not inconsistent with the specific agreements or orders of the Tribunal or the Agreement. Invariably, a formula is specified for sharing of excesses or shortages in any

water year over the allocated shares. The percentages of return flows are usually also accounted for in working out water assessments and sharing.

Non-riparian States have been allocated water for utilization for drinking water, irrigation, and other beneficial uses on the basis of Agreements of the riparian States considering the established water shortages and hardship in such States or towns or cities. A review period for Water Accords, Tribunal Awards or Agreements is usually specified.

5.8. The Settlement Process

An appreciation of how, in the past, the settlement process has worked in India is given below.

Over 125 Agreements have been evolved on the sharing of Inter-state River waters or on specific projects. All these agreements have used the negotiation route, with the Central Government playing the pivotal role under the Constitutional Laws, Acts, and Statutory Rules. Most of these Agreements have worked well since they were done with the willing consent of the Party States to the Inter-state Basin.

Inter-state statutory organizations for specific projects or basins have been set up under the Central Government with the participation of the basin States and beneficiary States with defined roles (Char, 2000). These have been set up either by mutual agreements or under the direction of the Tribunal Awards. Inter-state organizations have also been set up by mutual agreement of only two States without Central Government participation. The dispute settlement mechanism prescribed under Article 262 of the Constitution has been used under specific reference(s) made by the States for settlement of disputes under the provisions of the Inter-state Water Disputes (ISWD) Act. The Tribunals have taken a long period to settle the disputes referred to them, and some have been unable to give the Award for over ten years for various reasons.

Even after Awards were given, the issue of people affected by the project, and non - consultation with the Stakeholders in the planning process, has stalled implementation. This has resulted in the Supreme Court intervening in the Public Interest Litigations (PILs) filed by the NGOs and affected Parties. The States reopened even settled issues such as the height of the dam (Char, 2000). Scheduled resettlement and rehabilitation plans are delayed or interrupted by the States where major part of the submergence falls, even though the Tribunal has given specific instructions to follow. The Tribunal has not suggested corrective steps in such cases and the Implementation Mechanisms set up under the direction of the Tribunal have lacked adequate powers.

The setting of a date for the reopening for review of the water sharing awards given by the Tribunal has opened up a race among the States to implement projects in a haphazard way to establish prescriptive water rights on the particular date. This has led to overreaching project-agreed provisions of storage, resulting in serious disputes between States. This has led to litigation being filed by the aggrieved Parties in the Supreme Court for adjudication.

Water being a 'State Subject' the role of the Central Government in India is limited. Modifications in the Statuary provisions have been debated, but no tangible solutions have been possible.

It is increasingly being recognized that maintaining a certain minimum flow in the rivers during the lean season months for ecological considerations is necessary, and provisions have been made for the same in the new agreement (Upper Yamuna) and treaty (Mahakali Treaty) signed in recent years.

Since most of the river basins of India are Inter-state in character, the Central Organizations viz., the Planning Commission and the Ministry of Water Resources with its technical attached organization, the Central Water Commission, have exercised a very well set schedule of techno-economic clearance guidelines in approving the Inter-state projects planned by the States for implementation under the Five Year Plans. This procedure has been institutionalized, even though it is time consuming. This route of clearance ensures that projects on the Inter-state rivers are not taken up without an agreement on water sharing in general, or project specific sharing in particular, of the waters of the river basin. There is a loophole in this, since the clearance is required only if the State wants Central Plan funding for the project. Otherwise, the State can go ahead with the project if funds are not a constraint. In that case, the aggrieved States can seek judicial intervention to stop the project.

5.9. Implementation Problems

River water sharing conflicts are frequently more emotional than technical, and not always based on needs. In India, water is one of the three most emotional issues --- the other two being religion and language. The likelihood of success in resolving such conflicts depends on the particular situation.

The political system of India is based on a multi-party democracy. Every political party gives a top slot to water resources development in its election manifesto. Almost every candidate contesting the elections promises a water project to his constituents. The actual availability of water is immaterial to the promises made. Non-availability can always be attributed to someone upstream, who can be shown as having appropriated all the water, thereby setting up a conflict. Water is an easily exploitable expedient in electoral politics.

The potential for conflict has always existed historically. However, immediately after independence (1947), the resultant euphoria, nationalist fervor and the quality of political leadership facilitated negotiations, and the many agreements on water sharing in a spirit of mutual accommodation and in the national interest are evidence of this spirit. Over the years, this spirit has changed to rigid postures. State level leaders argue that the national interest is synonymous with State interest, and vice versa. The downstream States have pleaded, and even the Tribunals have conceded, that ground water should not be a part of the water resource sharing arrangement - a technically non-sustainable plea.

Even though every political leader concedes in private that river water development should be the National Government's responsibility, the same leaders take a diametrically opposite stand in public -"Water is a State property and the Center should not interfere". Every leader swears by Integrated Water Resources Management in private, while stating in public "Give us our share (meaning all the water demanded). We know best what to do." Given the political environment, the River Basin Organizations, which could have really put basin planning, development and management on the optimal path have not been made operational, for reasons that are never clearly stated.

Negotiations are an important and basic technique of the alternate dispute resolution procedure, but are proving less and less acceptable as a means of providing solutions to water sharing. Currently, even the Tribunal Awards, which have the backing of the Constitution, are floundering in the face of interminable interpretations and legal court battles.

5.10. Changing Conditions and the Nature of Water Conflicts

Globalization and the WTO

Crow (1998) argues for new forms of water cooperation across South Asian borders. In addition to diplomatic negotiations, which are limited to bilateral barter between governments, he suggests that monetization of benefits with corporate sector participation could make cooperation easier and increase the range of issues that could be negotiated. International and inter-state trade in water yet remains anathema for most developing countries and provinces owing to insecurities over sovereignty and autonomy. However, as world trade in commodities has doubled from three trillion dollars to more than six trillion dollars during the last decade, it is clear that countries are trading water more and more, mostly in the guise of trade in food items and agriculture raw materials. One ton of grain requires on average a thousand tons of water to produce.

WTO agreements have a number of implications for water security. The most obvious include the greater range of options for meeting national food security targets while adopting cropping patterns that are responsive to international comparative advantage as well as agro-ecological sustainability in each region of the country. The risks include heightened exposure to price fluctuations in world grain and other agriculture commodity markets for farmers that already suffer owing to the inevitable lag in any production response to national gluts and shortages.

The nature of urban water demand can also change much more rapidly under conditions of globalization than planners conventionally envisage. At the height of the carpet and garment export boom, for example, Kathmandu experienced severe water shortage as most carpet washing and garment industries were located in the valley. Given the downturn in these industries, the crunch has not been as bad. If there were a shift in the economy and, say, more north Indian tourists started visiting the hills to beat the summer heat in the plains, the nature of the demand on water would change significantly, to one favoring swimming pools and water parks. While it makes sense to locate such industries where there is surplus of water, the overall economics of building infrastructure

discourages such efforts. Hence there is potential for inter-sectoral conflicts even within urban areas.

In none of the 30 agreements drawn up by the World Trade Organization (WTO) is there any explicit mention of water. Yet the commercial sectors associated with water (provision, distribution, management and so on) will no doubt be affected by multilateral commercial regulations, particularly those laid down by the GATS, the General Agreement on Trade in Services. In principle, public services are not covered by the agreement if member states wish to protect them. In practice, the influence of GATS on economic activities related to water could be huge, as its coverage extends to 12 categories of services, including environment, energy and distribution. Once a state decides to open up its water market to competition, it relinquishes the option of reversing the situation. On the other hand, it will be difficult to evaluate the full effects of liberalization in the short term.

Changes in Economic Structure

The urban growth rate in South Asia, as in other developing regions, is much higher than the rate in rural areas, both in terms of population and economic development. As a result, the demand for new supplies of water is a crucial aspect of urban politics within the national scheme of things. Because information regarding choice of technology and the implied resource allocation is known better in urban areas (and within the small bureaucratic coterie that makes these decisions) than in rural areas, the decisions are often biased against the rural areas. Hence there is a water conflict regarding the transfer of water from rural to urban areas that is reactive rather than pro-active between urban areas and their rural hinterlands.

A significant example is the Melamchi project, which envisages transferring water from this river north of Kathmandu to the capital city through a 27km tunnel, in the process affecting rice production as well as small scale power generation in the Melamchi valley downstream of the intake. It is a multi-year, multi-donor project that has the potential of pitting the capital city against the villages not only in the Melamchi valley, but also in other areas of Nepal (Moench, 1999). This is because the project would soak up most of the Government resources that could be spent in the water supply sector, i.e. the development agency loan will have to be paid by the whole country (including lack of availability of more development loans), when the benefits are only going to accrue to Kathmandu. The nascent activism against such projects is centered around equity issues as well as those of conservation: in a scenario where urban water supply leakage can exceed 40%, would it not be better to plug the losses than to create new supplies?

Recognition of poverty and gender issues

South Asia's poorest people – especially women – are the hardest hit by the sharpening scarcity of water and the lack of sanitation. Almost certainly it is the poorest that comprise the 11% of South Asian population without access to safe drinking water, while the 63% without access to sanitation are largely the poor along with the lower-middle income group (HDSA, 2002). Where the poor do get access to safe drinking water, it is frequently at a price many times more than their rich brethren pay.

In most rural areas of South Asia, women make a significant contribution to planting and caring for crops and livestock, and throughout South Asia, women have the primary responsibility for cooking food and fetching water. For millions of women in the region, fetching water is a strenuous daily chore. In many arid and semi-arid zones, women may spend a significant proportion of their time fetching and carrying water. For example, in Tharparkar, Sindh, many women and girls walk for hours every day to fetch water for their family needs. This burden gives rise to chronic health problems. The Thardeep Rural Development Program (TRDP) and other NGOs are promoting rainwater storage tanks. Where the program has not yet reached or when the tanks dry up, Thari women queue at the wells for hours, often setting off in the middle of the night in order to save time on queuing. After such energy sapping, time consuming activity, there is little scope for school and vocational training, and for personal development and economic independence. Yet, as noted by TRDP, a prolonged drought may reduce both the utility of, and the paying capacity for, domestic water storage tanks (TRDP, 2001).

The lack of private sanitation can be an acute problem, especially for women and girls who live in poor and overcrowded urban neighborhoods or in large villages. Many millions of women have to wait until after dark before going out to defecate. Many bathe themselves and wash their clothes in canal and rivers – upstream from their own latrines but downstream from the many other sewage outlets discharging into the waterways of South Asian cities and villages.

What is common to most such situations across South Asia is the absence of women from water and sanitation management forums. Thus the 'conflict' is doubly suppressed by cultural acceptance and women's lack of voice. Some progressive projects, including the second phase of the Punjab (Pakistan) rural water supply and sanitation project, are seeking to make a change. For excellence in the pilot phase of the project, the President of the Asian Development Bank has given awards to a woman president of a village community organization and a women community motivator, who supported the formation of the village water and sanitation committee not dominated by male office bearers (ADB, 2002).

Other issues that should be addressed

A number of issues are inadequately covered, both in this study, and more generally in the development of policies in South Asian countries. These include traditional water rights, ground water, and the environment.

Traditional Water Rights:

There is little generalized knowledge about the role that traditional water systems and rights play in aggravating or mitigating conflicts in South Asia at the current moment in history. The few case studies that exist display an intricate connection.

In Nepal, for example, many traditional systems such as ponds, *dhungey dharos* (stonewater spouts), or Raj Kulos are becoming defunct or deteriorating under the impact of modernization. The religious bathing *ghats* have also suffered a similar fate, and many traditional structures have been severely encroached upon. However, with the assertion of rights over public space through what is known as identity politics, groups have begun to take initiatives to reclaim the public space back. This has meant a more pleasant environment but has also at the same time created the space for unpleasant conflicts as this assertion takes place. The traditional ponds of Kathmandu and the pollution of rivers in bathing *ghats* are such sites of activism and conflicts at very local levels.

Ground water:

Ground water depletion and contamination are well known physical phenomena in specific basins of South Asia. For example, the water table is dropping by as much as six feet per annum in parts of the Quetta Valley, and the discharge of tannery wastes is poisoning the ground water near Kasur, Pakistan. As fresh ground water is drawn down through increasingly deep and powerful pumps, saline water intrusion is a looming threat for agriculture and drinking water supplies in other inland and coastal regions.

Arsenic in ground water drinking supplies is recognized as a major threat to human health in Bangladesh. It is also acknowledged that across South Asia laws and regulations governing the use of ground water are less developed and weakly enforced compared to those for surface water. What are the conflicts that arise, how are they resolved, and what are the implications for policy? Janakarajan (1999) notes at the conclusion of his able survey of conflicts over ground water in Tamil Nadu that accountability is at the core of addressing problems of overexploitation, that it is of paramount importance to devise legal measures that enforce the polluter pays principle (PPP). The questions remain, accountability to who and how, and how to enforce the PPP? These are open issues that call for systematic and experiential learning.

Environment:

With the growth of modern lifestyles and industries, watercourses are increasingly used as drainage outlets. Often, the use of the "flushing" property of water impinges and overwhelms the "life support" function of water, such as sustaining aquatic, terrestrial and human life, through degradation of the water body. There have been conflicts across South Asia related to pollution by factories and even municipalities. There are an increasing number of scientific studies assessing degradation in ecosystem functions, loss of fisheries and other living resources, and impacts on the health of downstream users. How are these conflicts articulated, mediated and perhaps resolved? A great deal more needs to be learnt from the emerging best practices in the region and outside.

6. Recommendations

The preceding chapters have shown that the water crisis in South Asia is mainly a crisis of governance, and not mainly one of scarcity, we make recommendations for policy reform and institutional development. There is also scope for innovation and its diffusion, but such technical changes should take place within a rights-based approach that seeks to include rather than further marginalize the poor.

6.1. Getting Ahead of the "Crisis Curve" within Countries

Procrastination in settling water disputes does not pay. The challenge for South Asian countries is to get ahead of the crisis curve, to develop institutional capacity and a culture of cooperation among central and provincial governments, sectors and users in advance of costly, time-consuming crises that in turn threaten livelihoods, economic stability and ecosystem integrity.

In all four countries, getting ahead of the crisis curve entails de-politicizing water conflicts, taking advantage of the strengths of democratic institutions, while containing their weaknesses. There are four possible routes to achieving institutionalized cooperation:

- Strengthening existing institutions and conflict resolution mechanisms;
- Establishing bargaining arenas for settlement of disputes between state or provincial governments and for subsequent management of water resources;
- Establishing integrated river basin (sub-basin) management;
- Establishing economic cooperation forums for water negotiations and management.

The four routes, like the channels of a braided river, are not mutually exclusive but distinct. The choice or blend that is appropriate depends as much on the vision of the leadership in each country as on the traditions and past forms of governance and management culture.

Strengthening Existing Institutions and Mechanisms

The existing institutions in South Asia for settlements of water disputes consist largely of courts, special tribunals, river control boards and water development authorities, other forms of departmental administration, alternate dispute resolution mechanisms such as negotiations and mutual discussions, and political caucus. The instruments are judicial and semi-judicial awards, administrative decisions, and inter-governmental accords. They are basically various types of hierarchical organizational structures characterized by conventional top-down decision-making. As such, this route may be called the continued centralization model.

In India, for many years after independence, the process of negotiations was successful in conflict resolution in many cases. However, in recent years, negotiations have not met

with much success. Currently, even the Tribunal awards, which have the backing of the Constitution, are floundering in the face of interminable interpretations and legal court battles. Still, given the country's present political system, adjudication by tribunals appears to be the best mechanism for solving inter-state water sharing disputes, if these cannot be settled through negotiations, with or without assistance from the Central Government within a reasonable time frame. The mechanics can be streamlined, as shown in **Figure 5**.

In Pakistan, the Balochistan Ground Water Rights Administration Ordinance (1978) is another top-down legislation that empowers the Governor or Chief Minister of the province as the sole authority to give permission for sinking a new tube well. This concentration of sanctioning authority has not acted as a restraint to ground water mining in this water-scarce province. In fact, giving the permission to bore a new tube well has become a form of political patronage.

Establishing Bargaining Arenas

The essence of the Bargaining Arena (BA) model is that it represents a compromise between the extreme of top-down decision-making mentioned above and the other extreme of bottom-up voluntary cooperation, as illustrated by the Alwar villagers' "river parliament". The model consists of two types of actors: the central authority and interest groups represented in the bargaining arena. There are important differences between direct government regulatory intervention, voluntary cooperation and the bargaining arena model. In the first case, there is only a direct link between the controlling authority and each stakeholder; in the second case, there is no outside controlling authority. In the BA model, the central authority has enforcement power that is needed at different stages, to get the stakeholders to make plans and to implement them. In the case of lapse or default, the controlling authority has binding powers. The controlling authority uses the BA model instead of direct regulation, because the stakeholders know more about the situation on the ground, and how to minimize bureaucracy and political decision-making. **Figure 6** illustrates the linkage between planning nodes across sectors and levels in the BA concept.

In Pakistan, the Indus River System Authority (IRSA) was set up in 1992 as a bargaining arena between provinces to implement the Water Accord of 1991. It has had a turbulent history only because on three separate occasions, the controlling authority decided to over rule or by-pass IRSA for short-term reasons. The fact that IRSA has survived its first decade through periods of political expediency and emergency related to drought conditions, however, speaks for the basically robust nature of such an arrangement.

Similarly, some of the local level conflicts in Nepal, such as those brought to the fore with the revival of traditional systems, can be managed at the local level through decentralization or devolution. Higher-level State institutions can be maintained as courts of last resorts rather than parties to the conflict.

Establishing Integrated River Basin (Sub-Basin) Management

As noted in Chapter 2, there are two archetypes of river basin management, the authority model and the coordinative model. The authority model has the same features of hierarchical top-down decision-making as discussed in the first approach above. The coordinative model reverses the bargaining arena concept. A cooperative body of Federal and provincial governments is established at the apex to set policy, while an authority or commission supports and executes the council's decisions. In so far as it is the operational aspects of river basin management that require quick decision-making, this arrangement makes sense. The Murray-Darling model is an example of a consultative ministerial council with oversight of a commission with executive authority. However, to work well, such a river basin governance model requires a mature and serious political culture.

In India, even though the River Board Act is a statute, its use for the purpose of Basin planning of Inter-state Rivers has not materialized due to the very nature of the Act being advisory. Even after the water allocations among or between the States for Inter-state rivers are made, the planning process for integrated development of the river basin with due regard to all sectors of water needs has not matured. Several recommendations in this regard need to be acted upon.

River Basin Organizations (RBO) should be set up for ensuring integrated development of River Basins. The National Commission for Integrated Water Resources Development Plan (1999), which had also gone into the various legal and institutional frameworks in India, recommended the enactment of a new "Inter-State Rivers and River Valleys (Integrated and Participatory Management) Act" under Entry 56. The recommendations of the NCIWRP are under consideration by the Government. This Act needs to be taken up for enactment in the light of the revised ISWD Act, 2001, taking due cognizance of the participation of stakeholders.

A Framework for a River Basin Organization is given in **Figure 7**, which envisages a phased process to achieve integrated basin development. These phases comprise a legal and regulatory framework, State level and Inter-state organizations, and implementation and monitoring. Such RBOs could also be involved with negotiation of Inter-state water disputes, before the dispute is referred to the Tribunal for adjudication. There could be no bar on the Union Government setting up multi-disciplinary RBOs by an executive order. To start with, RBOs may collect and analyze data and prepare plans for Integrated River Basin Development for optimal utilization of the water with appropriate sectoral allocations. In the next phase, RBOs could assist the tribunals, and finally, they could be authorized to monitor the implementation of development plans by the State RBOs.

Establishing Economic Cooperation Forums For Water Negotiations And Management

Crow (1998) has argued that the valuation of water resources enables a simpler, more open assessment of international exchanges than is possible with the existing forms of diplomatic 'barter'. The arguments for including new actors from the private sector and for creating new spaces for water agreements holds with equal force at state, provincial, and local levels. While negotiations on water sharing are limited to cases where there is a

double coincidence of wants, benefit sharing on a monetized basis can extend cooperation to include unevenly represented interests.

The approach may be illustrated with a case from Pakistan. Ahmed and Kutcher (1992) argue that water can be profitably traded between water surplus and water short agro-ecological zones in Punjab and Sindh, now that the Water Accord has established the shares of the provinces.

Ground water, according to Indian Law, is defined in terms of the Indian Easements Act (GOI, 1882), under which the ownership of land carries with it the ownership of the ground water under it. As a result, this huge resource is not regulated due to political problems and the legal problem of easement rights. The Supreme Court has directed the Ministry of Environment and Forests to set up the Central Ground Water Authority and frame rules for the regulation of ground water. The Authority has been set up and the draft "Environment Protection Rules for Development and Protection of Ground Water" have been framed and circulated to the States for immediate action.

State Governments need to act expeditiously on the Rules. Legal remedies have to be found for priority allocation of ground water to meet drinking water needs, and to prevent over - extraction for other uses. In a fast changing scenario, where the committed irrigation releases may have to be diverted to different needs like drinking water, industry, environment, etc., with better economic value and opportunity costs, the existing user may be given a 'limited legal right' to the transfer of such right, temporarily or permanently, to another user who may be prepared to pay more for such use.

6.2. Getting More Crop Per Drop

There is still considerable scope worldwide, and especially in South Asia, for producing more grain with less water. The International Water Management Institute (Molden et al., 2001) applies water accounting procedures to bear on the productivity of various uses of water in a basin. The strategy is to realize real water savings and to produce more agriculture output with the same amount of available water. As against (a fairly optimistic) base scenario that requires a 29% increase in the world's irrigated area and a yield increase of 38% over a 30-year period (1995-2025), the more crop per drop scenario envisages a 76% yield increase to meet the world's food and nutrition requirements.

In the specific case of India, an approximate doubling of yields from 2.7 t/ha to 4.7 t/ha would eliminate the need to divert or draw up more water for irrigation than at present. The key measures include changing to new crop varieties, switching from high water – consuming crops to crops with higher economic productivity per unit water, precision irrigation that reduces non-beneficial evaporation, better timing of supplies to reduce crop stress, and improved non-water inputs that work in association with irrigation (Molden 2001).

Pakistan, with wheat yields averaging 2.3 t/ha, can go a long way to improving yields per unit land and water by rationalizing water allocations across canal commands within provinces according to (Hussain et al., 2000). Irrigated wheat yields vary from 0.5 t/ha to 5.4 t/ha across a random sample of 1,220 farms located in 14 canal commands of the lower Indus Basin in Sindh. The authors argue that shortage of irrigation water in some canal commands and poor land quality in others are the two fundamental constraints. The marginal productivity of irrigation water varies significantly and immediate productivity gains could be achieved by effective reallocation of water across canal commands.

Another way to improve water productivity is to shift emphasis from large-scale development of water resources to more local-centered management of existing supplies. In principle, lining distributaries and watercourses could save about 10 MAF. Experiences in lining watercourses with bricks over the past few years have not proven effective, however, as they leak. New lining materials may show more promise, but only if they are accepted and installed by the community.

Much water can be saved through the modest leveling of farms and change in irrigation practice from flood to furrow irrigation. Tube well irrigation could be combined with low-head sprinkler and trickle systems. Investment in farmer education for water saving would almost certainly yield high returns, especially if combined with improvements in conveyance systems to ensure timely and predictable deliveries. To be fully effective, a number of these improvements, especially those that bring water to the farm, require organization and mobilization of the irrigation community.

Sugar cane is a water intensive crop. Is it the right crop for largely arid and semi-arid Pakistan, especially when sugar can be imported at lower prices from countries with climates more conducive to higher productivity? This is a question that the economic and agriculture sector policy makers need to address.

6.3. Focusing on the End-user

Apply empowering technologies

Local reservoirs and village tanks are an integral part of some irrigated South Asian landscapes. They are an essential part of the survival strategy for farmers and households in semi-arid rain-fed regions. Surface and ground reservoirs can increase the options for irrigation and drinking water for farmers and households in perennial canal irrigated zones with suitable soil and ground water conditions. Unlike large reservoirs on rivers that will inevitably silt up over time, local ponds can be de-silted and ground water recharged and used in perpetuity. A vision of dispersed and reliable local surface and underground storages needs to replace the dream of large dams and reservoirs.

Modern communication technologies also show much promise for improving the quality of information to communities as well as to system operators. For example, the installation of automatic gauges with computerized telecommunication linkages at critical locations such as reservoirs, barrages and points of release along major canals can enable monitoring of real-time data. The widespread use of satellite communication systems

and relatively inexpensive reception systems can also allow this information to be shared with parties throughout the command area, allowing them to provide superior mass supervision of water releasers, and to make wiser cropping and watering decisions.

Build Capacities of Water Users Organizations

South Asia has at least three decades of experience with single - purpose water user associations. The results have not been to the level of initial expectations. We suggest that the problem is with the approach adopted.

Until the Mona experiments by Lowdermilk et al. (1978), Pakistani national policy makers were not aware that watercourse losses far exceeded the total amount of water stored at the just completed Tarbela dam. The low cost physical solution was brick lining of the watercourses. A notional level of farmer involvement was sought, mainly to reduce the burden on the provincial exchequer, and to make the program more palatable to donors. The watercourses of influential farmers in single Biradari situations were targeted. After three decades of effort, the head sections of around one-third of the watercourses in the Indus Basin have been lined. Already, the cracks in the brick lining and a dried under-bed have meant that losses in many watercourses have reverted to the situation before lining. The large farmers have often found that they could not exclude the cattle of the poor from wallowing in the watercourse and damaging the berms. Without social cohesion, farmers in their individual interest are also prone to making unauthorized outlets at night, further destroying the lining.

Direct assistance to the target communities had the charm of tangible results in a defined time frame. However, it led to the common error of a one-sided focus on project objectives. It meant that not enough attention was given to the requirements of the implementing community, and to its operational context. The risk that project results would not be sustained was naturally high.

It is argued that attention should shift to building the capacities of the involved farmers' organizations, to strengthening the relations between local organizations, and embedding of specific project activities within these organizations. In addition to specific programs and projects, intermediate development support organizations would also become a focus of such an approach.

Some elements of capacity building for local irrigation management are:

- Enhancing the skills of individual farmers in water measurement, record keeping, and communications, perhaps changing their passive and defeatist attitudes in the process of empowering them with such skills;
- Irrigation farmers may be profit-maximizing individuals, but they are not necessarily bound together in an organization for the management of a common water supply. Strengthening farmers' organizations through the discipline of regular meetings, emerging rules and guidelines for governance, and rising savings for water management, is a strategic investment. Key tools

include problem visualization and conflict resolution skills. Community animators with these skills should be identified and empowered;

- Finally, it is essential to create networks of co-operation between different farmers' organizations, and enhance co-ordination among their activities in order to scale up water management programs and to sustain their impacts.

Human and institutional development efforts should also focus on intermediate organizations, such as local government, co-operatives, industry and professional associations, training institutes, intermediating NGOs, community organizations and interest groups that provide support to farmers' organizations.

How would this approach help solve, for example, Pakistan's "big" irrigation problems? Assume that a decade of concerted effort could result in the transfer of all 3,000 distributaries to effective and efficient Farmers' Organizations that collect abiana (water rent), maintain local infrastructure, and pass on 40 – 60 % of enhanced water charges to Area Water Boards. The Provincial Governments could anticipate receiving enough revenue for proper operations and maintenance of major irrigation infrastructure as well as make provisions for trunk drainage. Management change would be more practical and feasible for provincial irrigation departments with mandates focused on trunk infrastructure.

Farmers would pay more for water, but less to officials as bribes. It is an open question whether their net outlay would be greater or smaller. Certainly, the time that farmers spend in defending against charges of breach of irrigation rules or in seeking redress would be much reduced. Higher water price would be an incentive for technical innovation, such as investment in low head sprinkler or drip irrigation based on tube well water stored in a tank at modest height. Higher price would also be an incentive for institutional innovation, such as water trading, and will provide an incentive for crop substitution towards lower delta crops.

All three sets of innovations will reduce the total demand for canal supplies. They also imply more timely application of water in relation to plant needs, and should boost rather than restrain the growth in productivity. A reduced demand for water across the Indus Basin will ease much of the intensity of inter-provincial water allocation disputes. It will also reduce the drainage burden and the emerging provincial disputes due to trans-provincial flows of saline effluents.

Address Inequities of Landholding Where Needed

Some regions of South Asia have experienced effective land reforms, while others have not. Equity in access to land, water and other natural resources is important for sustainable use. It is also necessary for successful innovation diffusion, as the following example from Pakistan demonstrates.

In NWFP, where most of the clientele of the On-Farm Water Management Program are small owner-farmers, it has been possible to collect up-front the farmers' contribution for the renovation of common watercourses and 96 per cent of the amount due has been

recovered. On the other hand, in Sindh, with skewed landholdings, large farmers have captured the program and only 20 per cent of the amounts due have been recovered (Halcrow, 1996).

A one-time land reform may not be enough if economic processes cause sharp inequities to emerge again. In Bangladesh, the conflict in water sharing between farmers and fishermen can be addressed through policies of social equity, enforcement of committed programs, and genuine participation of people at the grassroots level. A clarification of farmers' rights and community empowerment for their enforcement is a prerequisite for effective land use zoning control of shrimp cultivation in the Southwestern coastal zones.

Reduce Subsidies

Subsidies, resource capture by the elites, the decay of government departments and local conflicts owing actual and perceived inequities in resource allocations and the application of rules, are interlinked phenomena. As Mustafa (2001) has shown for Sidhnai in Pakistani Punjab, *tawan* (collective fine) for stealing irrigation water is seldom enforced in the tracts of land dominated by large landlords, who already enjoy highly subsidized canal water supplies. The first step in departmental reforms and rules - based water management should be to phase out subsidies. It is necessary to collect at least enough to cover the O&M costs of service delivery. Proper pricing will generate the consumer demand for departmental reform and reductions in unnecessary overhead costs.

Provide a Responsive Delivery System

Improved metering systems can make volumetric charges for water more feasible, while providing reassurance to irrigators that they are receiving their water in appropriate quantities at the right time. Communications systems combined with adequate metering and charging systems, should also facilitate wider adoption of demand-driven water release systems. In all of these ways, new technologies linked to information systems can help more clearly define enforceable rights and improve trust. It is important, however, to avoid as much as possible the appropriation of new information systems by rent seekers and to span the digital divide. It is also necessary to promote the adoption of simple technologies that empower irrigators, even those who are semi-literate.

Ensure the Participation of End Users

User participation is a mantra often repeated, and equally often forgotten. In fact, user participation is essential from the beginning, such as in the design phase of projects. It is equally important for project implementers to be sensitive to variations in local conditions.

Agitated NGOs have asked for an inspection under Asian Development Bank rules of the Chashma Right Bank Canal project in Dera Ghazi Khan, Pakistan, owing to the alleged violation of the Bank's rules for the re-settlement of displaced persons. In fact, flooding and displacement would not have arisen as issues if the designers had consulted the local

farmers on the alignment of the canal. A feasible alignment cutting through slightly higher ground would have saved a tract of land west of the canal from being flooded and causing loss of life in the first year of its operation.

6.4. Establishing a Rights-Based Approach

A clear and enforceable specification of water rights will, in principle, improve water use efficiency by creating strong incentives aligning the generation of surplus with its distribution. Because of pervasive rent seeking, built up over time, there is likely to be resistance to clarity of water rights, especially at the lower levels, but that is precisely where the efficiency gains (and therefore the reduction of conflict at both lower and higher levels) are likely to be achieved. To be fully effective, water rights must include transferability.

Three countries in this Study struggle with the rigidities of the colonial 1873 Act that emphasizes central ownership, a top-down approach, and non-transferability. The only doctrine of the major ones that allows transferability is appropriationist or historical rights. Clearly, transferability (marketability) requires the costly commitment of resources – e.g., to improved metering, monitoring, registration and enforcement mechanisms – as well as the overcoming of asymmetric power relations between zamindars (land owners), corrupt local officials, and already entitled but under-served end users.

Water resources development has been seen in the past decades as a state-led venture, where many of the losers (oustees, people whose water would be transferred to urban areas etc.) had their rights forcibly taken away by the State using its right of acquisition for what it claimed was the greater good. Often the level of state compensation was seen as grossly unfair. In many cases, a market-based solution (with the state acting as a fair adjudicator) would alleviate many of the conflicts, for two reasons. One, a market-negotiated compensation is less coercive than state acquisition. Two, preserving the State as an adjudicator instead of an adversary in acquisition, keeps the hope alive that a fair deal can be achieved, and hence prevents conflicts from acquiring the status of an impasse.

6.5. Building Capacity by Providing Information and Building Trust

We have demonstrated how the non-disclosure of hydrological data, or the absence or inconsistency of data, on security or other grounds, decreases security by lowering trust and rendering verifiability difficult. Indeed, data is not just a source but a major category of conflict.

Much of the distrust in water conflicts stems from distrust of institutions that collect data, especially if these institutions themselves are a party to the conflict. Issues of pollution or demand forecasting or other aspects of "data" could become resources for the resolution of conflicts if they have been sufficiently "pluralized", i.e. they are collected and verified by multiple actors (which is also good science) at various scales. Only consensus

generated through such a process, rather than from single-mission outfits using monopoly power, will inspire faith in their veracity. This applies to local as well as inter-state conflicts.

Even with disclosure, it may be difficult to generate trust. Water users tend to consider first their own "needs," defined in terms of recent use or future plans Sometimes this can be part of competitive status seeking, such as among the Zamindars (landlords) of Sindh cited in IBRD 1996. Consideration of the rights of others requires agreement on what the basis of the rights is, and to accept the legitimacy of formal rights systems as opposed to informal ("water mafia") ones.

In the absence of clear and agreed upon rights, especially over risk bearing in abnormal years and seasons, open information by itself may not reduce conflict, but become an instrument for political bargaining. Even with agreement, there is a need on the part of users, who often operate with different languages (both national and technical), to understand the limitations on information, which inevitably has certain "biases" due to the exigencies of measurement etc. It is often imperative to recognize that we do not have absolute information about the hydrological cycle or the nature of all uses, and that the situation will only become more complex in the future, without ever achieving "perfect" information.

Agreements that seem to specify allocations quite precisely often in practice are based on imperfect, or even manufactured, information. The Colorado River allocations among lower states were based on the available short hydrological record, which turned out to be a very wet period – hence the first-mover (California) was able to develop an absolute amount that was above its intended relative share. At Lake Biwa, downstream prefectures were given a right to withdraw water in both height terms and lake level, without an indication as to how to resolve probable conflicts between them.

Despite all these problems of information, more open information would appear to be a necessary condition for improved trust, by leading to improvements in the quality of both further information and the nature of the discourse among stakeholders. Hence, mechanisms need to be worked out that can work with imperfect information and uncertainty while reducing the possibility of opportunism by all parties. This is easier said than done, but it is critical to try to operationalize such "governance structures" and adapt them to changing circumstances (but not to political winds).

Agreements often deliberately or incidentally distort critical information, notably on available water. It is therefore necessary to find ways to build in resilience and adaptability to new or revised information.

6.6. Relying more on non-governmental approaches

The Alwar, Rajasthan river parliament is an exceptional example of voluntary cooperation that spans 500 villages. Smaller examples of such cooperation can be found at a number of places in South Asia. We do not think that such heroic arrangements are

durable or that they could be replicated widely. Yet, it is important to recognize and even develop such social capital that may contest issues and then cooperate with government in better water management. The alternative to water rights and rules established after contest is not "no conflict", but hidden conflict.

6.7. Giving safe drinking water top priority

More than a hundred million people in South Asia – all poor and the majority of them women and girls - lack access to safe drinking water. Several hundred million lack access to sanitation. As a result, millions suffer illness and premature death from water borne diseases each year. All four countries face formidable financing challenges in raising resources for meeting the Millennium Development Goal (MDG) for safe water and none appear to be on target so far.

Meeting the MDG and WSSD goals for access to safe water and sanitation will require accurate assessments of regional and local situations of water and of the poor; sound strategies for preventive and promotional hygiene education; enhanced capacities for extension of appropriate technologies; and engagement of the private sector in hardware provision at affordable prices. Above all, meeting the goals requires vision, political will and national, provincial, corporate and community leadership.

In Bangladesh, in recognition of arsenic as a major threat in the water sector, urgent rethinking is essential for the supply of safe domestic water throughout the country. While waiting for detailed analytical studies, options should be explored for alternate or mitigating actions like cheaper arsenic removal kits, boiling surface water from ponds, rainwater harvesting or extracting ground water from deeper aquifers. A long-term sustainable strategy for conjunctive use of surface water and ground water will have to be worked out.

7. Case Studies

This Chapter includes case studies illustrating water-related issues in Pakistan, India, Bangladesh, and Nepal.

7.1. Inter-Provincial Water Conflicts in Pakistan

Only 3% of the water in the country is used in industry, so the sharing problems are predominantly within the agricultural or environmental domains. Of the four Provinces in Pakistan, the water conflicts are particularly salient between the Indus upstream province of Punjab and the downstream Sindh. Before discussing the conflicts between those two provinces more extensively, we shall describe the situation of the other two provinces.

The Northwest Frontier Province (NWFP) is located at the headwaters of the Indus and its right bank tributaries, thus ensuring that water sharing is not as urgent an issue for NWFP as for the other provinces.

Balochistan is currently not able to fully utilize its allocated share of water (allocation 3.87 MAF, of which 0.821 MAF is unutilized) until it expands its current crop cultivation by the development of the Pat and Kirthar Feeder command area and beyond. Amid accusations in the Press that Sindh is stealing water from Balochistan, the Balochistan government had approached the Sindh government for payment of Rs. 7 billion as compensation for utilizing its share of water by the latter, which it could not use for want of carrying capacity.

Various options are being considered to permit absorption of the current allocation, including taking off a Kachhi canal from the Indus river to use floodwater during the season. The province's share in flood season water is 12 % (equivalent to 2.5 MAF). It would irrigate another 0.151 million acres of land.

An extensive review of the conflict between Sindh and Punjab helps to demonstrate a number of features of conflict that may have more universal applicability. Interviews and newspaper articles during the recent drought crisis have been put together to present the "Sindhi viewpoint".

The Viewpoint of Sindh [1]

In 1901-03 the Indian Irrigation Commission sought to discover a method by which irrigation schemes in the subcontinent could be completed without detriment to either upper or lower riparians (Kazi, 2000). Unfortunately, it did not really succeed in finding such a method, nor, at least in the perception of the Sindh, has anyone else since then. Underlying this attitude is a pervasive and mutually reinforcing lack of trust between Sindh and Punjab over their use of the water of the Indus. Sindh sees itself as the risk-

[1] *This section relies heavily on Abrar H. A. Kazi (2000).*

bearing party: in times of drought, it gets too little water from upstream, while in times of flood it gets too much.

Right of assent (veto)

In principle, Sindh has a strong position, as the policy established by the 1901-03 Commission gives it the power of consent over upstream diversions from the Indus. This policy was reaffirmed by the Government of India Act of 1919, which required that all irrigation projects concerning more than one province be referred to the Governor General for his decision based on the provisions of the commission report. Since then, Sindh has repeatedly lodged strong objections to any diversion of water from the Indus or to changes in the river regime through installations such as storage projects that might lead to increased withdrawal of water for the Punjab at the cost of availability downstream. Despite its nominal rights, however, Sindh has never gotten what it sees as due consideration in water related matters, while Punjab has acquired the reputation of being the "Fair-haired boy" of successive administrations over the past century or more, from British India to post-British Pakistan.

Under the British administration, a number of massive irrigation works were constructed in the Punjab without regard to the consequent harm to user rights of downstream Indus riparians. These works included the Sutlej Valley Project comprising of four barrages, the Upper and Lower Bari Doab Canal, and the Triple Valley canal project. In contrast, only one major irrigation project, the Sukkur barrage, was completed in Sindh.

Politicization

Sindh sees this discriminatory attitude in water development schemes as continuing to the present day. On 30 August 2000, they received support for their position for the first time from the highest levels, as the Chief Executive, General Pervez Musharraf, said in a public address that Sindh had suffered injustice in the availability of irrigation water. Until then, complaints by Sindh over water shortages had tended to be dismissed as unfounded posturing by nationalist Sindhi leaders.

Historical use

It has been argued that the water storage network after creation of Pakistan benefited Sindh far more than any other province, and an impression is being created that Sindh was devoid of irrigation improvements until the construction of the first controlled irrigation system (Sukkur Barrage) in the province in 1932. The fact, however, is that as early as 1851, Sindh had a firm canal department. It began restoring the Begari Canal above Sukkur in 1852-53 and the Fuleli canal below Hyderabad in 1856 (Kazi, 2000). The eastern Nara Canal was improved and a cut made through Rohri Bridge in 1863. Thus, the framework for the irrigation system in Sindh now under command of the Gudu, Sukkur and Kotri barrages already existed, primarily on an inundation basis. By 1900, Sindh possessed no less than 7441 miles of canals, commanding 9.5 million acres, and was actually irrigating some 2.5 to 2.7 million acres per year. At that time the Punjab was irrigating over 4.6 million acres from perennial canals, plus another million on an inundation basis.

When the British administration began extensive irrigation development work in Punjab, without taking into consideration the recommendations of the Indian Irrigation Commission, apprehensions developed among Sindh's farmers regarding shortage of water in its inundation canal system. In order to riposte this irrigation development work in Punjab, Dr, Summers, Superintending Engineer in Sindh, obtained permission to make an extensive survey for a canal from Rohri in 1904. His investigations revealed in 1906 that three weirs were needed across the Indus at Mithan Kot (site of present Gudu Barrage), Sukkur and Kotri, to save the economy of this tract. The Sukkur site was to get first priority.

Expert judgment vs popular opinion

Dr. Summers submitted his Rohri canal proposal in 1910. A barrage across the Indus upstream of Sukkur, with the Rohri canal on the left and one canal at the right bank, were proposed to serve a gross command area of 6.2 million acres. Later, to reduce the expense, Dr, Summers modified his proposal to include a barrage and the Rohri canal only. A high-powered technical committee, which examined the scheme in London, expressed the view that the project would not be productive, as there would be no marked effect on the inundation canals due to higher withdrawal in the Punjab area.

A sense of deprivation developed among the people of Sindh and a loud clamor for regular supplies began in the province. The Bombay government reacted to the growing public unrest, and the Sukkur barrage project was resubmitted to the Secretary of State for India in London in December 1920, and received its preliminary approval from him in June 1921 and its final sanction in April 1923. Thus a long struggle by the people of Sindh to obtain a perennial irrigation system was finally rewarded by authorization of the largest scheme yet undertaken in India, or for that matter, anywhere in the world.

It is worthwhile to note the remarks of Sir Thomas Ward, the then Inspector- General of Irrigation, India, regarding-the Sukkur barrage project in 1920: "It is logical to assume that the abstraction of water from tributaries of the Indus must necessarily diminish the volume passing through Sukkur and it will obviously be necessary once construction commences on the Sukkur barrage scheme, for any future projects put forward by the Punjab to be very carefully examined in relation to the possible effect for further withdrawals from the tributaries of Indus upon the rights to irrigation from Sukkur barrage canals in Sindh".

Upon learning of the Secretary of State's sanction of the Sukkur barrage project in April 1923, the Government of Punjab entered its protest regarding the restriction of further withdrawals from both the Indus and the upstream tributaries. The Bombay government strongly objected to this attitude of the Punjab government, and complained that they had not been consulted when the Sutlej Valley Project was under consideration, and feared that the supplies available at Sukkur would be considerably less than those on which the Sukkur barrage project had been framed.

Conflict over seasonal allocations

With the construction of the Sukkur barrage in January 1932, the conflict over the waters of the Indus River between Sindh and Punjab become explicit rather than implicit. It had been assumed that once the perennial barrage controlled irrigation was introduced into Punjab and Sindh, the only problem in the Indus basin would involve the allocation of water supplies for the Rabi crops. A consideration of the agricultural cycle shows that it was not quite so simple.

The traditional division of agricultural and irrigation year into the *Kharif* period (1st April to 30th September) and the *Rabi* period (1st October to 31st March) has to be disaggregated into a division among the Kharif sowing period (April through August), the *Kharif* maturing and Rabi sowing period (September to mid December) and the *Rabi* maturing period (Mid December through March). The critical irrigation phases overlap the second and third period and the third and first periods. This analysis, though complicated, is necessary in order to explain why the critical phases in the irrigation of the Indus basin do not fall into the *Rabi* season as one might anticipate.

Coordination costs of centralized allocation

By the year 1935, the Indus basin irrigation system had become so completely integrated that no fewer than six parties had to be consulted before any new withdrawals could be authorized anywhere (Mitchell, 1967). After the creation of Pakistan, of course, the number of parties was lower, but the irrigation water distribution system became even more complex. The Indus flows through more than one administrative unit, but there is no statutory law on water rights. Instead, so called equitable water distribution in shape of the debatable Indus water appointment accord has been enforced by the central government. It has done so under its executive powers to impose its decisions on all provinces.

The most vulnerable areas in Sindh

Sindh has argued that it requires adequate water beyond irrigation purposes to maintain its estuarial mangroves, and to preserve the vitality of the silt-dependent Katcho region.

The Viewpoint of Punjab

Allocation: historic and according to the Accord

Punjab argues that the stance of Sindh amounts to opening a Pandora's box of water disputes. First, by not providing the water to link canals, Bahawalpur, Bahawalnagar and Rahim Yar Khan districts will go dry and consequently barren. Non-operation of the Chashma-Jhelum (C-J) link canal and its closure is a principal demand by Sindh to meet Sindh water shortages, and in fact to condone excessive and wasteful use of river waters by Sindh. It may be recalled that the Tarbela Dam, along with C-J and T-P link canals, were constructed under the Indus Waters Treaty. Second, by not conserving the part of

summer water in Mangla and Tarbela, the system will have much worse shortages for winter crops (Rabi). For instance, the Sindh experts contested the need to store 13-14 Maf water during the summer of 2000.

During the winter of 2001-02, there was a 40% shortage of water for Rabi crops. What would have happened had this water not been stored is anybody's guess. Moreover, water stored in the two reservoirs is distributed among the provinces. As far as allocations, mentioned by the reformers, are concerned they were made on the condition that new reservoirs are distributed among the provinces and would create additional water by preserving excessive supplies in summer and preventing them from flowing into the sea. In fact, any interpretation of the Accord to provide relief in shortage periods to one province by aggravating shortages in another province, or to assign equal priority, would be against the spirit of the agreement and would destroy it (Fatehullah Khan, 2000).

In 1991, Punjab made sacrifices in taking far less than its due share in additional supplies to facilitate the Accord. Without new reservoirs, the Accord would have hardly any value and use. The status-quo option is an indication of stagnation and looming famine condition, because the capacity of the existing reservoirs is declining due to silting. The construction of new river storage for conserving about 38 maf of the surplus flood supplies was the cornerstone of the Accord.

The objective of the Accord was to generate additional irrigation supplies to offset the loss of capacity of the existing dams, Tarbela, Mangla and Chashma, for cheap hydropower development and for major agricultural development. Sindhi farmers are receiving almost double the canal water when compared to Punjab farmers:

- For every cropped acre, Sindh received 3.8 ft of canal water against 2.18 ft for Punjab;

- Canals in Sindh have water allowances (a measure to gauge irrigation water) vastly larger than Punjab Canal, leading to large wastage and heavy water-logging. Punjab has more than double the cropped area when compared to Sindh, while the supplies through the canals are only marginally higher (up to 20%). Punjab produces 75% of Pakistan's wheat, 75% of its cotton, and 45% of the rice while Sindh produces 15% of wheat, 20% of cotton and 45% of rice;

- Punjab has a far higher productivity per unit of canal water. Sindhi experts usually refer to the availability of ground water that could be a substitute of canal water to Punjab farmers. However, ground water is not an independent source of irrigation supply. It is generated from the loss of seepage water through unlined canal systems. River water at canal head, the source of the ground water, is already allocated to each province as a part of its overall share;

- During the formulation of the Indus Waters Treaty, the World Bank decided not to consider tube wells for meeting shortages, but to construct storages at Mangla

and Tarbela. Various commissions and committees on provincial water disputes did not consider ground water as a source while apportioning river water;

- The Punjab farmers picked up the canal seepage losses in the form of ground water at a very high cost of Rs.1000 to Rs.1200 per acre-feet. Further, the good ground water has 3 to 4 times as much dissolved salt as river water. Punjab has nearly exhausted its ground water potential for further private tube-wells. Sindh has vast potential to substantially increase its irrigation supply by the lining of the channels.

Actually, the 1991 Accord was a document for prosperity sharing and for determining the future shares of all riparians in the developed supplies. The Accord has envisaged a total availability of 114 million acres feet (Maf) of irrigation water against the actual availability of 104 Maf on the premise that the surplus water in summer will be conserved in new reservoirs. But this objective could not be achieved due to the stiff opposition from Sindh to the construction of any reservoirs. The two provinces - Punjab and Sindh- the main users of irrigation water, are quarrelling on the existing water supplies by interpreting the Accord according to their own interests.

Sindh is asking for its share as written in the 1991 Accord. The Punjab, however, insists that this allocated share was subject to the condition that Sindh would agree to the construction of new water reservoirs. As Sindh did not allow the building of any reservoir, water ought to be apportioned as it used to be before the Accord. Punjab's expert told "The News" in Lahore that in the 1991 Accord the existing uses of all the provinces at that time were fully protected (Kabir, 2000). This baseline was taken as the average of actual five years post -Tarbela 1977-88 uses of the irrigation water by all the provinces, and it was to form the basis of equitably sharing shortages between the provinces. While signing the Accord, the provinces have accepted, under the accepted distribution principles, the priority of existing uses and the Indus Waters Treaty of 1960. However, in a recently circulated paper titled, 'Kharif 2000 River Water Distribution and Management some leading Sindhi experts, called 'the Reformers', have taken the position that in the shortage year no water should be given to the two Indus link canals, which irrigate southern Punjab. They have asked not to fill Tarbela and Mangla reservoirs during the summer (Kharif) in case of water shortages.

7.2. Inter-State River Water Conflicts in India

The framers of the Indian constitution have drawn up very specific laws and provisions governing the development and management of the country's water resources. During the last five decades, since the Constitution of India was enacted (1950) in the Parliament, the changes necessitated in these laws and provisions, under the quasi-federal system of governance (Union of States), have been complex. A National Water Policy was defined only in the year 1987 (GOI, 1997b), forty years after India attained independence, and many of the policies contained therein still need to be implemented.

Since the adoption of National Water Policy 1987, many developments in the water sector at the national level have necessitated its revision. A revised National Water Policy 2002 was approved by the National Water Resources Council (NWRC) on April 1, 2002.

Basically, "water" is a State subject, with the Union's role limited to the Inter-state Rivers. The constitutional provisions related to water are contained in the Seventh Schedule - Article 246 (MOL&J, 1996), as discussed under the Union List, State List, and Concurrent List, which are defined below:

"List I - Union List" (Entry 56)
"Regulation and development of Inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union declared by law to be expedient in the public interest".

"List II - State List" (Entry 17)
"Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of List I".

"List III - Concurrent List" (Entry 20)

There is no entry on water, but there is an entry on planning, under "Economic and Social Planning". Since water is a significant input in agricultural development and industrial development, which are indicators of economic development, and since water is a primary need (drinking and sanitation) for social planning, water resource development could be covered under Concurrent List also. Only Entry 17 of List II has been in operation all along. However, Entry 20 of List III (Concurrent List) could also be said to have operated indirectly, in view of the fact that the Central Government, through the Planning Commission, has to clear Water Resources Development projects for investments, if these projects are to be eligible for central funds.

"Article 246"
"Subject – matter of laws made by Parliament and by Legislatures of States"

"(1). Notwithstanding anything in clauses (2) and (3), Parliament has exclusive power to make laws with respect to any of the matters enumerated in List I in the Seventh Schedule (in the Constitution refereed to as the "Union List")".
"(2). Notwithstanding anything in clause (3), Parliament, and subject to clause (1), the Legislature of any State also, have power to make laws with respect to any of the matters enumerated in List III in the Seventh Schedule (in the Constitution referred to as the "Government List")".
"(3). Subject to clause (1) and (2), the Legislature of any State has exclusive power to make laws for such State or part thereof with respect to any of the matters enumerated in List II in the Seventh Schedule (in the Constitution referred to as "State List")".

> "(4) Parliament has power to make laws with respect to any matter for any part of the territory in India not included (in a State) notwithstanding that such matter is a matter enumerated in the State List".

In accordance with the existing constitutional provisions relating to 'water', the primary responsibility for development rests with the State Governments. However, if water is transferred from List II to List III - Concurrent List, as per Article 246 (2), Parliament as well as the legislature will have the power to make laws with respect to water.

> Entry 56 of List I does not deprive the States of any power to which they are entitled under Entry 17 of List II; List I stipulates "Regulation and Development of Inter-State rivers and river valleys" with respect to water.

> ***"Disputes relating to Water: Article 262"***
> "Adjudication of disputes relating to waters of Inter-State Rivers or river valleys--
> (1) Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any Inter-State river or river valley".
> (2) "Notwithstanding anything in this Constitution, Parliament may by law provide that neither the Supreme Court nor any other court shall exercise jurisdiction in respect of any such dispute or complaint as is referred to in clause (1)".

Most of the rivers in India are inter-state. The regulation and development of waters of these rivers is a source of inter-state differences and disputes leading to inordinate delays in implementation of projects. Even so, "Entry 56 of List I (Union List)" has never been invoked under Article 246 of the Constitution, which deals with the subject matter of laws to be made by the Parliament and by the States Legislatures. On the contrary Article 262 of the constitution has been used to resolve inter-state river water disputes.

The political perceptions may not help in enacting legislation under Entry 56. With different parties in power at the Center and in the States, with regional parties in the States demanding more autonomy, and Article 262 having been used, though sparingly, strong opposition from the states may be expected to any attempt at significant changes in the constitution. Major amendments in the constitutional provisions may be even more difficult.

The Inter State Water Disputes Act, 1956 (ISWD) has been enacted by Parliament in exercise of the power conferred by this article (GOI, 1956a). The subject matter of the act is not covered by any of the Entries in the Legislative Lists. Moreover, the power conferred by this article overrides the legislative Entries. Under this Act, five Tribunals i.e., Krishna Water Dispute Tribunal, Godavari Water Dispute Tribunal, Narmada Water Dispute Tribunal, Ravi Beas Water Dispute Tribunal, and Cauvery Water Dispute Tribunal have been set up.

> ***"Article 253 - Legislation for giving Effect to International Agreement"***
> "Notwithstanding anything in the foregoing provisions of this chapter, Parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or any decision made at any international conference, association or other body".
> Entry 10 of the Union List I under Seventh schedule confers on the Union Parliament right on "Foreign affairs; all matters which bring the Union into relation with any foreign country" and Entry 14 empowers the Union to "Enter into treaties and agreements with foreign countries for implementation of treaties, agreements, and conventions with foreign countries".

Article 253 makes it clear that the power to enter into treaties conferred on Parliament, carries with it, as incidental treaties, a power to override the State list, to enable the Union to implement the treaty. Thus, a law passed by the Parliament to ratify an international convention shall not be invalidated on the ground that it contained provisions relating to the State subjects. The effect of Article 253 is that if a treaty, agreement or convention with a foreign State deals with a subject within the competence of the State legislature, Parliament alone has, notwithstanding Article 246(3), the power to make laws to implement the treaty, agreement or convention or any decision made at any international conference, association or other body. The article deals with legislative power; thereby power is conferred upon Parliament, which it may not possess otherwise.

Under the powers conferred by the above, the Union of India signed the Indus Waters Treaty with Pakistan in the year 1960. In conformity with the Treaty provisions, further Inter-state Agreements have been signed from time to time (CWC, 1995 & 1997). Under the same Article, the Treaty with Nepal on the Integrated Development of the Mahakali, 1996 and the Treaty on Ganga Water Sharing at Farakka, 1996 with Bangladesh, have been signed.

The Central Govt. has enacted a number of Acts & Laws on Inter-state Water Resources, and also enunciated a National Water Policy. These are discussed in the following sections.

The River Board Act 1956

This Act, which came into effect on 12 September 1956 (GOI, 1956b), provides for the establishment of River Boards for the Regulation and Development of Inter-state rivers and river valleys.

The Central Government has not constituted any River Board under this Act. The role of the River Boards, as envisaged in the Act, is only advisory in nature. The Government of India, however, constituted the Betwa River Board, Bansagar Control Board, Tungabhadra Board, Brahmaputra Board, and Yamuna Board, outside the River Board Act 1956, for specific purposes. The National Commission has recommended (GOI, NICWRDP, 1999) enacting a new Act called "Integrated and Participatory Management Act" in place of the existing River Board Act, 1956.

Inter-state Water Disputes Act, 1956, as modified/ amended up to 1986

This Act is to provide for the adjudication of disputes relating to waters of inter-state Rivers and River Valleys. The Act came into effect on 28 August 1956, has been modified from time to time, and was last amended on 18 March 1986 with the insertion of a new provision, Section 14, to achieve the objectives set forth.

The Act empowers the Central Government to set up, on a complaint from a State Government that a water dispute with the Government of another in relation to the water of an Inter-state river or river valley has arisen or is likely to arise, a tribunal for adjudication of the dispute. The Tribunal shall consist of a chairman and two other members nominated in this behalf by Chief Justice of India from among persons who at the time of such nomination are judges of the Supreme Court or of a High Court (Section 4 (2)).

> After constitution of the Tribunal under Section 4, the Central Government shall, under Section 5 of the Act, refer the dispute and any other matter appearing to be connected with, or relevant to, the water dispute to the Tribunal for adjudication, subject to the provisions contained in section 8.
>
> The decision of the Tribunal shall be published in the official gazette and the decision shall be final and binding on the Parties to the dispute and shall be given effect to by them (Section 5). Under Section 6, no reference shall be made to a Tribunal of any dispute that may arise regarding any matter which may be referred to arbitration under the River Board Act - 1956. Under Section 11, neither the Supreme Court nor any other court shall have or exercise jurisdiction in respect of any water dispute, which may be referred to a Tribunal under this Act.

The above Act was used to set up several Tribunals to settle the inter-state water disputes. This Act was revised in 2001, taking due consideration of the recommendations of the Sarkaria Commission on Center-State relations.

Standing Committee on Inter-State Issues in Water Resources

This Committee was set up by the Ministry of Water Resources in April 1990 to assist the National Water Resources Council (NWRC). With a view to resolving Inter-state differences, it renders advice on modifications to specific elements of Water Plans and on such other issues that may arise during the planning or implementation of projects. The Committee comprises the Union Minister of Water Resources as the chairman, and the Union Ministers of Agriculture, Energy, Urban Development, Environment and Forests, and Science & Technology as its members. The Secretary (Water Resources) serves as Member-Secretary. The Chief Ministers of the concerned States are special invitees to the meetings of the Committee. The recommendations of the Committee are advisory in nature, and are without prejudice to the provisions of the Inter-state Water Disputes Act.

Sarkaria Commission on Centre- State Relations

This Commission, while examining matters of Inter-state relationships, also examined the constitutional provisions related to water in respect of Inter-state water disputes. The Commission was of the opinion that there is need for Union control over waters of Inter-State rivers and river valleys. In matters of local concern, however, as in the case of 'land', States should have powers in respect of waters which are not part of inter-state rivers, and are located in the State and are located within the territory of each State. The Commission was of the view that the existing arrangements in the Constitution are the best possible method of distributing powers between the Union and the States with respect to a highly difficult and sensitive subject. The Commission also ruled out the entry of the subject in the 'Concurrent List'.

The Sarkaria Commission had also examined the provisions of the Inter-State Water Dispute Act of 1956. It gave several recommendations for amending the Act, out of which the Inter-State council and its Standing Committee, after examination endorsed the following (GOI, NICWRDP, 1999):

- Once an application under Section 3 of the Inter-State River Water Disputes Act (33 of 1956) is received from a State, it should be mandatory on the Union Government to constitute a Tribunal within a period not exceeding one year from the date of receipt of any disputant State; modified by the Council to the extent that "the disputes already settled may not be reopened'.

- There should be a Data Bank and Information System at the national level and adequate machinery should be set up for this purpose at the earliest. There should be a provision in the Inter-State Water Disputes Act, that States shall be required to give necessary data for which purpose, the Tribunal may be vested with the powers of a Court.

- The Tribunal should give its award within a period of three years from the date of its constitution. However, if for unavoidable reasons the award could not be given within the specified period of three years, the Union Government may extend the period suitably not exceeding two years. The award should be implemented two years from the date of notification of the award. If for unavoidable reasons the award could not be implemented within period of two years the Union Government may extend the period suitably.

- The Inter-State Water Disputes Act, 1956 should be amended so that a Tribunal's award has the same force and sanction behind it as an order or decree of the Supreme Court to make a Tribunal's award really binding.

The Commission's recommendations have been worked on. Other Commissions and Committees have from time to time given similar recommendations and also suggested

action on Sarkaria Commission's recommendations. The Inter-State Water Dispute Act, 1956 was amended in 2001.

Indus Basin

The Indus basin extends over an area of 11,65,500 sq. km. and lies in Tibet (China), India, Pakistan and Afghanistan. According to the Indus Waters Treaty of 1960, India has exclusive rights to the uses of the three Eastern rivers (the Sutlej, the Beas and the Ravi) and Pakistan has full rights on the uses of the three Western rivers (the Indus, the Jhelum, & the Chenab). The drainage area is nearly 9.8% of the total geographical area of the country. The basin lies in the States of Jammu and Kashmir, Himachal Pradesh, Haryana, and Punjab.

Eastern Rivers

The high level of development in the basin is reflected by the fact that out of an ultimate irrigation potential of 5.3 million hectares (m. ha), 4.5 m. ha have already been developed; the present stage of utilization of surface water is 87% and of ground water is 80.5%. The live storage capacity created is 14 billion cubic metres (BCM). The Bhakra–Beas system in the basin is a major multi-purpose system catering to competing demands, and forms a major part of the overall plan for optimum utilization of waters of the three rivers. In the hydroelectric power generation sector, a total installed capacity of 3,517 MW from 190 projects are in operation, out of an assessed total potential of about 20,000 MW at 60% load factor. 14 projects with a potential of 3,517 MW (CWC, 1989) are under construction.

The Bhakra-Beas system, a major multipurpose development in the basin, with the Bhakra dam (highest dam in India) forming a part of the system and the gigantic Indira Gandhi Canal Project, which has changed the complexion of the arid region of the Northwestern part of Rajasthan, are monumental achievements. Thus, a fairly good integrated basin management is taking place in this basin. The Bhakra-Beas Management Board (BBMB), was set up under the Punjab Reorganization Act 1966, as an institutional mechanism to monitor and implement sharing of the Ravi-Beas waters as per inter-state agreements.

Ravi-Beas Tribunal

With the Reorganization of the Punjab into the two separate States of Punjab and Haryana in November 1966, the distribution of the share of the water in the Indus System's Eastern Rivers became, inter alia, a major issue of contention. Notwithstanding the special provisions made with respect to the rights and liabilities of successor States in relation to the Bhakra-Nangal Project and Beas Project, claims and counter - claims were raised by both Punjab and Haryana. A lasting and satisfactory solution could not be reached even after 20 years of negotiations.

Finally, an Accord, called the "Punjab Settlement", was signed between the Prime Minister of India and a leader of the Punjab in July 1985 (GOI, 1987a), which also dealt

with the question of sharing of the Ravi-Beas waters. The Punjab Settlement of 24-7-1985 provided for the following on sharing of river waters under paragraph 9 of the Accord:

9.1. The farmers of Punjab, Haryana and Rajasthan will continue to get water not less than what they are using from the Ravi-Beas system as on 1.7.1985. Waters used for consumptive purposes will remain unaffected. Quantum of usage claimed shall be verified by the Tribunal referred to in para 9.2 below;

9.2 The claim of Punjab and Haryana regarding the shares in their remaining waters will be referred for adjudication to a Tribunal to be presided over by a Supreme Court Judge. The decision of this Tribunal will be rendered within six months and would be binding on both parties. All legal and Constitutional steps required in this respect be taken expeditiously;

9.3 The construction of SYL Canal shall continue. The canal shall be completed by 15th August 1986"

This settlement led to the setting up of a Tribunal in April 1986 to adjudicate the claims of the States regarding their share of the Ravi-Beas waters. The Tribunal was presided over by a Supreme Court Judge, and the decision of the Tribunal would be binding on all parties. Haryana, Punjab and Rajasthan, the Party States to the Tribunal, put forth claims and counter - claims.

The Tribunal, after hearing the arguments of all the parties to the dispute, gave its report in January 1987 (GOI, 1987a). The Central Government made a *suo moto* reference to the Tribunal in August 1987 seeking explanations and guidance, in accordance with the provisions under Section 5(3) of the Inter-State Disputes Act, 1956. The Central Government also forwarded similar references received from the States of Rajasthan, Haryana and Punjab to the Tribunal. The Tribunal started hearing the references in September 1987, but since then the hearings have only been held in fits and starts. The Final Award of the Tribunal, which was to be originally given within six months of constituting the Tribunal, is yet to see the light of day. The Ravi-Beas water sharing conflict remains. The reasons are not far to seek --- they are simply electoral politics. For the people, the issue is emotional, based on perceived injustice as articulated by the political parties.

Western Rivers

In the area covered by the three western rivers of Indus, Chenab and Jhelum, on which India has only very limited consumptive use rights but full rights for non consumptive uses, development has not been as extensive as along the Eastern rivers of Ravi, Beas and Sutlej. Development activities within India are governed by the Treaty provisions, which are monitored by the Permanent Indus Commission. The Tulbul Barrage project on the Jhelum for navigation purposes for the welfare of the people of Jammu and Kashmir was

started in 1984 but has been stalled since Pakistan raised objections, in the Indus Commission, on water sharing under the Indus Waters Treaty (GOI & GoP, 1960). The conflict is yet to be resolved.

Ganga Basin – Inter-state Conflicts

Within India, it should be noted that the river waters of the Ganga basin as a whole have not been allocated to the basin States of Uttaranchal, Himachal Pradesh, Haryana, Rajasthan, Delhi, Uttar Pradesh, Bihar, Jharkhand, & West Bengal, except for specific sub - basin or project - specific Agreements among or between the States. The major sub - basins of the Ganga on the right bank above the delta bifurcation are the Yamuna, including the Chambal River - its most important tributary, the Tons, the Karamnasa, and the Son. The Right Bank of the Ganga below its confluence with the Son is drained by a number of small rivers.

The important left bank tributaries of the Ganga above the delta bifurcation are the Ramganga, the Gomati, the Ghaghra, the Sarda (Mahakali in Nepal on which a treaty on water sharing has been signed) a major right bank tributary of the Ghaghra, the Gandak, the Buri Gandak and the Kosi (formed by three major tributaries of Sun Kosi, Arun and Tamur). The Mahananda, a left bank tributary, which rises and flows in India for 65 % of its catchment, joins the Ganges/Padma tributary in Bangladesh. Bhagirathi, the right bank tributary of the Ganga in its last stretches in India, receives drainage from the Dwarka, Ajay, Damodar, Rupnarain, and Haldi rivers, before it joins the sea through the Hooghly estuary.

The Ganga and its left bank tributaries - Yamuna, Ghaghra, Gandak and Kosi - have their origins in the glaciers in the Great Himalayas, and therefore have a significant snow melt contribution which sustains the river flow during the lean season. The sub - basin Agreements and the conflicts in water sharing are discussed in greater detail below.

Yamuna Sub basin

The River Yamuna, rising in the Great Himalayas of Uttar Pradesh (now Uttaranchal State), has a catchment area of 366,220 sq. km, all of which is within India. The utilization of its waters started in 1882 under the British Raj (CWC, 1989). The reach of the river from its origin up to Delhi is called the Upper Yamuna River, involving the States of Himachal Pradesh, Haryana, Delhi, Uttaranchal and Rajasthan. The most recent agreement is the Upper Yamuna Agreement of May 1994. This Agreement (CWC, 1995 &1997) has a significant bearing on the evolution of the Water Plans of the States, since it takes note of the maximization of use of the surface flow of the river through a number of identified storage projects on the river, upstream of Tajewala.

The mechanism of the Upper Yamuna Board has been established for allocating available flows among co-basin States, within the overall framework of the Memorandum of Understanding (MoU). The MOU provides for building of upstream storages to enhance the utilization of the surplus flow of the river Yamuna. The Upper Yamuna Board is

periodically meeting to monitor the implementation of the MOU and resolve any conflicts."

An interesting feature of these negotiations was that the total demand of the basin States was over three times the available flow in the river. These demands were based purely on political grounds. Another interesting aspect of the conflict deals with the established irrigation needs of Uttar Pradesh (U.P) and Haryana, and the projected Municipal and Industrial (M&I) needs of Delhi and Rajasthan. Notwithstanding the agreement, the conflict is far from over. The Courts had to intervene often to ensure that Delhi gets its share to meet M&I needs. U.P. and Haryana could otherwise withdraw all the water upstream of Delhi for irrigation.

The Chambal River, an important tributary of the Yamuna with a catchment area of 140, 000 sq km, is almost fully utilized for irrigation and power development in the States of Madhya Pradesh and Rajasthan through a cascade of three storage dams. The entire development has taken place by mutual consent between the two States without a formal agreement. The Chambal Control Board, an Inter-state body with Rajasthan, Madhya Pradesh and the Central Government constituting the Board, resolves Inter-state issues on an ad-hoc basis. Although Uttar Pradesh is a riparian of the Yamuna, it has not staked claims for the Chambal Waters under a tacit informal understanding with the Central Government.

The Sone Sub Basin

The Sone River is a south bank tributary of the Ganga, with a catchment area of 71,260 sq. km covering the States of Madhya Pradesh, Uttar Pradesh, and Bihar. The utilization plans for the waters of this river have been formulated, and specific agreements reached among the co-sharing States for sharing of the waters as also the benefits from identified projects (CWC, 1989 & Char, 2000). The Bansagar Board, comprising the States of Bihar, Madhya Pradesh (MP) and Uttar Pradesh (UP) and the Central Government, controls the construction and operation of the Bansagar dam project on the Son, under an agreement signed by them. However, the Rihand dam constructed on the Rihand river, a tributary of the Sone, has been built by the Uttar Pradesh Government.

Bihar, which has a large irrigation system in its territory developed since 1874 through a weir, since replaced by a barrage, to command an area of 350,000 ha for irrigation, did not contribute to the cost of construction of Rihand dam. They also did not object to the project. The Rihand dam has only a power generation component and it can enhance the lean season flow in the river to the advantage of Bihar.

Bihar may have assumed that the water will be released through the power station to meet their requirements. However, the hydropower Plant at Rihand is operated to meet the emergency requirements of the large U.P. power grid. The operation hardly ever synchronizes with Bihar's needs – creating a conflict that frequently requires the intervention of the Central Government.

Another issue is the assessment made by the Sone River Commission of the 75% availability of the basin yield. The State of Bihar has neither accepted this assessment nor given any alternate figure with justification to substantiate their objections. Other party States have accepted the Commission's assessment.

Damodar Sub Basin

Damodar is the first basin in India where Integrated River Basin development was started, patterned on the lines of the Tennessee Valley Authority (TVA) in the USA. The development envisaged the building of seven reservoirs on the Damodar and its tributary rivers, with the joint participation of the basin States of then Bihar (now Jharkhand), West Bengal, and the Central Government. The objectives of this integrated development were the construction and operation of irrigation facilities, water supply, drainage, flood control, thermal and hydro-electric generation, navigation, afforestation, control of soil erosion, public health, and the agricultural, industrial, and economic development of the valley (Char, 2000).

The implementation of the Plan was initiated in 1948, when India was still a Dominion. Full implementation of the original Plan could not be undertaken, since the basin States had full rights after 1950, when the Indian Constitution was enacted and water became a State subject. Even partially implemented, the scheme has been extremely beneficial to the States in irrigation, power development, and flood control.

The Projects were implemented through the Damodar Valley Corporation (DVC), which was specially set up under an Act of the Parliament as a semi - autonomous organization. DVC has been faced with multiple conflicts. It would like to operate the Dams for optimization of power benefits, whereas West Bengal wants the water for irrigation. Irrigation and power demands do not coincide. The important benefit of flood moderation cannot be realized fully, because Jharkhand does not allow full flood storages in the reservoirs, as land would be submerged in that State.

The upstream riparian State of Jharkhand has to acquire land for reservoir submergence, which is a difficult task now. Also, some coal mining areas would be submerged at higher elevations, which is not a feasible proposition. Since the benefits to the upstream State are minimal, there is hardly any progress on the overall scheme of seven dams (five are already in operation, even though some of them are partially impounded due to submergence problems), and even the existing dams are not able to fully provide the planned benefits. It will be difficult to reconcile the conflicting interests of the basin states and to develop the basin as envisaged originally.

Upper Ganga Sub Basin including Ramaganga Sub Basin

The basin lies in the northwestern part of Uttar Pradesh, now a new State called Uttaranchal, and has a catchment area of 32,490 sq. km. The sub - basin lies entirely within India. Development projects through river diversion schemes, with canal systems on the main stem of the Ganga and its tributary Ramganga, were started during the 1840s

and 1880s. Three storage projects are under construction or planned on the main Ganga, of which the most controversial is the Tehri dam project due to submergence problems (Char, 1997). On the Ramganga, a hydroelectric project with the Ramganga dam and associated weir for downstream irrigation has been operational since 1974.

Under the newly constituted Uttaranchal State (area 55,845 sq. km), there is a provision in the Gazette notification constituting the State of Uttaranchal, to set up a Ganga Management Organization (GOI, 1999). This organization is to be under the control of the Central Government, and will have the States of Uttaranchal (the upper riparian) & Uttar Pradesh (now lower riparian after bifurcation of the State) as members. As per Section 78 of the Uttar Pradesh Reorganization Act, 2000, the rights and liabilities are to be decided by agreement by the states within two years, and if it is not entered into, the Central Government may decide within one year. The sharing of benefits and costs will be a key issue which could create conflicts, since most of the head works in this sub basin that provide extensive irrigation and power benefits to Uttar Pradesh are located in the newly formed State. Only time will show the intensity of the conflicts, unless they can be resolved before they are politicized.

Brahmaputra Basin – Inter-state conflicts

The Brahmaputra basin lies in the States of Arunachal Pradesh, Assam, Meghalaya, Nagaland, Sikkim and West Bengal. The water resources potential of the basin is the highest in the country. Their utilization for irrigation is, however, very small so far -- only about 1 BCM against the identified capacity of 60 BCM (CWC, 1989). Only a few medium and small projects have been taken up for implementation. The Hydropower potential is assessed at 31,012 MW (at 60% load factor), accounting for 37% of the country's potential, while the developed schemes account for only 1,043 MW installed capacity. The flood and erosion problems in the valley are endemic.

The economic development in this region was almost negligible prior to India's independence. In the post - independence period, much emphasis has been placed on finding lasting solutions for the flood problems of the valley, with due consideration given to developing multipurpose projects for hydropower and irrigation development. With this goal in view, a separate Board called the Brahmaputra Board, was set up under an Act of Parliament. Several mega projects have been investigated for power development and flood control, which could increase the low season flows in the river and also reduce flood problems in the valley by virtue of flood cushion to be provided in some of the major dams. Except for the issues of sharing of benefits from the multipurpose projects, there are no water sharing conflicts in the basin amongst the riparian States.

Barak Basin – Inter-state aspects

The Barak basin lies in the States of Meghalaya, Manipur, Mizoram, Nagaland, Assam and Tripura. The proposed Tipaimukh multipurpose project (details were provided in section 3.5) on this river has not made much progress due to the lack of agreement

amongst the riparian States on the issues of reservoir submergence areas and the sharing of benefits.

Narmada Basin

The Narmada basin States are Madhya Pradesh, Maharashtra and Gujarat. Water disputes between the basin States had retarded the progress of water resources development in the basin until a Tribunal was set up in 1969 to adjudicate the basic framework of development in the basin on the basis of the plans prepared by the basin States. The State of Rajasthan, though not a riparian State, was included as a beneficiary State on the grounds of social justice to benefit the desert and arid parts of the State, which had no other reliable source of water.

The Tribunal had the advantage of a mutually agreed settlement (1974) worked out through the good offices of the Prime Minister, among the Chief Ministers of the four States on assessment of the total available flows. All the Party States accepted the principle of equitable distribution. The Tribunal gave its Award in 1979, after 10 years of deliberations, and laid down the basic framework for water resources development in the basin (GOI, 1978), envisaging detailed directives on the Narmada Sagar Project in Madhya Pradesh and the Navagam dam (Sardar Sarovar Project - SSP), the terminal dam in Gujarat.

Twenty-nine major dams on the river and its tributaries, 135 medium reservoirs, and 3000 small size storages for utilizing the available water were also proposed. The Tribunal endorsed the mutually agreed share of water among the States and made it clear that each State has freedom to use the water allocated to it within or outside the basin, as deemed fit. The apportionment of water ordered is to be reviewed after 45 years. The height of the Navagam (Sardar Sarovar) dam, the ruling levels for FRL (455') and MWL (460') and Full Supply Level of the Canal (300') were prescribed by the Tribunal after a detailed examination of the claims put forth by the Party States.

Detailed guidelines on the Resettlement and Rehabilitation of project - affected people (called "oustees") have been set out based on a land for land package, the first such package for any project in the country. The Tribunal also stated that displaced persons in Maharashtra and Madhya Pradesh desirous of resettlement in Gujarat must be rehabilitated there. The Tribunal held that amendments, alterations, and modifications may be effected by agreement between all the Party States. The Narmada Control Authority (NCA) was established to implement the decisions of the Tribunal. The NCA has structured two high level Sub-groups, one for Environment and the other for R&R (Resettlement and Rehabilitation).

The review mechanism of the "Review Committee of NCA" (RCNCA) is also functional. The Sardar Sarovar project, as conceived and under implementation, envisages a 163 m high dam (above deepest foundation level) with ruling levels as prescribed in the Award, with two power stations - the Canal Head power Station with an installed capacity of 250 MW and a River Bed Power House with an installed capacity of 1,200 MW (6 units of reversible turbine generators).

People affected by the Sardar Sarovar project protested strongly, with the help of a dedicated and strong NGO group. They started initially with bitter criticism of the R&R package and its implementation, and sought an improved package. They were able to put pressure on the World Bank to undertake a Mission to examine the "very basis" of the Project. The Mission's report (Morse, Independent Review Mission, 1992) and the subsequent withdrawal of the Bank from this project further heightened the opposition to the Project, and resulted in a Public Interest Litigation (PIL) being filed in the Supreme Court in April 1994. The petition sought the stoppage of construction of project work, and a comprehensive review of the project by an independent expert body. The conflict in this case is not really about water sharing but between the affected people and the States.

The PIL filed by the NGO in the Supreme Court was admitted in April 1994. Madhya Pradesh reopened the issue of the height of the dam. The case went on for over 6 years (when the construction of the main dam was stopped), a period that was very crucial for achieving the planned benefits from the project, and finally in October, 2000, the Supreme Court gave its judgment -- a majority judgment of 2 to 1.

The important aspects of the judgment are:

i) Construction of the dam shall proceed as per the NWDT award;
ii) The Narmada Control Authority (NCA) will formulate an Action Plan with regard to R&R, environmental safeguard measures etc.;
iii) The construction of the dam shall be worked out by the NCA in consultation with the Secretary (Environment and Forests) and the Secretary (Social Justice and Empowerment) as Chairman of the Environmental Sub-Group and R&R Sub-group respectively. The views of the Grievance Redressal Authorities (GRAs) of the States shall also be considered; and
iv) The Review Committee of NCA (RCNCA) shall meet whenever any unresolved matter is referred to it by NCA, and at least once in three months, to oversee the progress of the work.

The dissenting judge upheld the petitioners' plea and ruled that the construction should be seized immediately, that there is no environmental clearance for the project and a Committee should scrutinize the available data and recommend for environmental clearance, and presuming that the environmental clearance is given, the construction shall proceed pari passu with the resettlement and rehabilitation of those ousted.

The Godavari Basin

The Godavari Basin, the largest river basin in South India, lies in the States of Maharashtra, Andhra Pradesh, Madhya Pradesh, Orissa and Karnataka. Before the middle of the nineteenth century, there were tanks and small diversion schemes in the basin. The first major irrigation work, namely the Godavari Delta Canal System, was completed in 1877. Until 1950, when the new Constitution of India came into effect, few major irrigation works were undertaken in the basin.

After 1950, the pace of development increased and major irrigation and multipurpose schemes were planned by all the riparian States This necessitated an agreement for sharing the waters of the Godavari and its tributaries, and a Memorandum of Agreement signed in 1951 allocated the flows of the river basin among the concerned States (GOI, 1979 & 1980). However, Orissa, a co-riparian interested in the sharing of the Godavari waters, was not invited to that conference. In view of the territorial changes due to reorganization of the States, the Central Water & Power Commission had drawn up a scheme for re-allocation of the Godavari waters, which was not accepted by the States, and a dispute ensued. In May 1961 the Krishna Godavari Commission was set up to determine the dependable flow for sharing but the Commission found that this could not be done without additional data.

Several conferences were convened by the Central Government to settle the dispute, but the States of Maharashtra, Mysore, Orissa and Madhya Pradesh made fresh applications in 1968 for reference of the dispute to a Tribunal. Eventually, in April 1969, the Central Government constituted the Tribunal. Between the time the Tribunal was set up and the time they started hearing the dispute in January 1974, several projects were approved for construction. In December 1975, all the five riparian States of Maharashtra, Madhya Pradesh, Orissa, Karnataka and Andhra Pradesh agreed to the clearance of projects for the utilization of the waters of the River Godavari and its tributaries in accordance with certain bilateral agreements between them.

The claims before the Tribunal were for equitable distribution of dependable flows, annulment of the 1951 Agreement, submergence caused by projects, suitable provision for the sharing of excess or deficient supplies, and directions for diversion of the waters of the Godavari into the Krishna. Additional claims focused on a suitable machinery for implementing the orders of the Tribunal, the right to appropriate the Godavari waters to the extent of its contribution within their territory, ensuring timely supplies to the committed projects taken up before 1951 on a daily basis and for projects taken up between 1950 and 1960 assurances of supplies on a weekly basis.

As the adjudication proceedings of the Tribunal were in progress, the States arrived at mutually acceptable solutions on water sharing by bilateral and trilateral negotiations in 1978-79, and signed agreements with regard to a number of irrigation projects. The Tribunal took cognizance of all these Agreements.

The Award

The Tribunal, in its Final Award of July 1980, ratified the bilateral and trilateral Agreements entered into by the five States that were party to the dispute, and allowed the specific use of Godavari waters up to specified dam sites, with due protection of downstream uses on the main river and its tributaries in each of the Party States (GOI, 1979 & 1980). It also ruled that the States can make use of underground water within their respective State territories in the basin, and such use shall not be reckoned as use of the water of the river Godavari. The States have the liberty to divert any part of its share of waters allocated to it to any other basin. There is no conflict at present.

Krishna Basin

The Krishna has the second largest Inter-state river basin in Southern India, covering the States of Maharashtra, Karnataka, & Andhra Pradesh. The basin is agriculturally well developed, with major irrigation works undertaken since the 1855s. Prior to 1855, the irrigation works were mostly in the form of tanks and small diversion schemes. During the British rule, until the conclusion of the Second World War, the unitary control of the Government of India provided little scope for water disputes. Only minor disputes, relating to the Tungabhadra waters, were amicably settled in 1892 and 1933. With the GOI Act of 1935 giving exclusive rights of water to the Provincial Governments, agreements were reached in 1944 concerning the sharing of Tungabhadra waters, which enabled the States concerned to construct a few major projects.

With the Constitution of India coming into force from 1950, and with the subsequent reorganization of States in 1956, the basin came under the jurisdiction of the States of Maharashtra, Mysore (name was again changed to Karnataka after Mysore State Act, 1973) and Andhra Pradesh. Extensive development works in the water resources sector were undertaken. In July 1951, a Memorandum of Agreement was drawn up apportioning the available supply of the Krishna River system for a period of 25 years, but the State of Mysore refused to ratify the Agreement. The Planning Commission, however, continued to clear the projects on the assumption that this agreement was binding upon the States.

With the pace of development increasing, and the projects planned by the State Governments envisaging demands on more water than the available supplies, objections were raised concerning several major projects (GOI, 1976). Disputes arose and a request was made to set up a Tribunal. The Krishna Godavari Commission appointed by the Central Government in May 1961 found that, without further data, it was not possible to determine the dependable flow accurately. In March 1963, the Union Government held that the 1951 Agreement had become void and suggested that pending final allocation the projects should be cleared on the basis that the withdrawals of supplies by Maharashtra, Mysore and Andhra Pradesh should not exceed 400, 600, and 800 TMC respectively. This was not agreeable to the States, and Maharashtra asked for a reference of the dispute to the Tribunal.

The Central Government tried several rounds of negotiations through Inter-state conferences, but failed to resolve the dispute and finally in April 1969, the Government of India constituted the Krishna Water Disputes Tribunal for adjudication of the water dispute.

The main points of the case are:

- The 1951 Agreement is void, and the subsequent interim allocations suggested by the Union Minister of Irrigation and Power in March 1963 are not acceptable;
- The water utilization in the proposed projects and trans-basin diversion should be restricted;

- Equitable distribution of the waters is to be determined at 75 % availability;
- A suitable mechanism for the implementation of the Tribunal Award should be proposed;
- The dependable yield should be set at 1745 TMC;
- Full supplies should be ensured on a daily basis for all projects committed before 1951, and on a weekly basis for projects committed up to 1960.

The Tribunal Award

The Tribunal Award of May 27, 1976 was announced on 31st May 1976. The important aspects of the Award are:

- The 1951 Agreement was not valid. The 75% dependable flow of the river Krishna up to Vijayawada is 2060 TMC, allocated to the three States of Maharashtra (560 TMC), Karnataka (700 TMC), and Andhra Pradesh (800 TMC);
- The expected return flow by 1998-99 would be 25 TMC allocable to Maharashtra, 34 TMC to Karnataka, and 11 TMC to Andhra Pradesh;
- The evaporation losses from reservoirs of projects using 3 TMC or more annually shall be excluded in computing the 10 % figure of the annual utilizations;
- The Party States will be free to make use of underground water within their respective territories;
- The Award (all or any of the clauses) can be altered, amended or modified by agreement between the parties or by Legislation of Parliament; and
- The Tribunal's order is to be reviewed or revised by a competent authority or Tribunal at any time after 31 May, 2000, but such review or revision shall not, as far as possible, disturb any utilization that may have been undertaken by any State within the limits of their allocated shares.

The Tribunal, in its report discussed two schemes namely, Scheme "A" and Scheme "B". In the Final Award, the Tribunal mentioned only the Scheme "A" (GOI, 1976). The Tribunal's report states that scheme "B" can be implemented if all three States agree. There is also a provision of setting up of a Krishna Valley Authority under Scheme "B", as well as specifications on the distribution of flows in excess of 2060 TMC among the three States. A complete scheme "B" drawn up by the Tribunal is given in their Further Report of 1976.

The Tribunal Award could be reviewed by a competent Authority or a Tribunal on any date after 31st May 2000, without disturbing any utilization undertaken by the States within the limits of their allocated shares. One of the upper riparian States (Karnataka) has filed a petition in the Supreme Court on 29 June 2001 seeking the Court's directive to restrain Andhra Pradesh from taking up any new projects on the Krishna River until the water sharing issue is settled again. Thus, even before the issue could be taken up for conciliation, the matter has reached the Court. At the request of the three riparian states, the setting up of a Review Tribunal has been approved.

Implementation

The World Bank's India Water Sector Review report of June 1998 sums up the implementation of the Tribunal Award stating "The Krishna Water Dispute is a good illustration of how water tribunal awards could result in competitive disjointed investments aimed at establishing claims to water when the awards come for review." This is the main reason why the States, racing against time, tried to establish rights to certain projects, leading to disputes on the interpretation of the Award. A case in point is the Upper Krishna Project (Alamatti dam). This dispute is elaborated below. The Supreme Court has ruled on this matter and the case law is of interest.

Alamatti case

The Award permits the States to reallocate their share of water from other projects. Karnataka, in formulating the scheme for the Upper Krishna Project did some reallocation. It revised the earlier allocation of 155 TMC made for this project to utilization of 173 TMC by reallocation from other projects. In doing so, it envisaged a Stage II proposal to keep the top level of the gates at 521.0 m, which provides for storing extra water. Karnataka further modified this in April 1976, with FRL 524.256 m against the earlier level of 518.7 m., justifying that the additional storage above the prescribed limit of 173 TMC would be utilized only for hydropower generation and the discharge would be let back into the Krishna River.

Andhra Pradesh has stated that the extra storage above the level of FRL 518.7 m was ultra-vires (not in accordance with the provisions of the Law) under the Award. They also pointed out that the Award allows for generation of hydropower as part of beneficial use, and has to be accounted within the overall allocation of water to the Basin States. Andhra Pradesh also expressed apprehension that, apart from allowing Karnataka to store extra waters, there will be drastic reduction in the flows during the months of June, July and August, which in turn will affect the power generation at Srisailam and Nagarjunasagar dams and also the agricultural operation in Krishna and Nagarjunasagar Commands during these months.

The Central Government's efforts to resolve the issue as directed by the High Court did not succeed. A political solution was attempted but suits were filed in the Supreme Court in 1997. Karnataka argued that the Union Government should be directed to notify Scheme "B" of the Award, and constitute the Krishna Valley Authority. Andhra Pradesh requested that the Government of Karnataka should not raise the height of the Alamatti dam beyond level 509.0 m. A Five Member Constitutional Bench heard the original suits of both the States and delivered its judgment on 24th April 2000, restricting the height of the Alamatti Dam (SC, 2000). The Court has ruled that there is no bar for raising the height of the dam at Alamatti up to 519.6 m, subject to getting clearance from the appropriate Authority of the Central Government and any statutory Authority required under law including clearance from the Ministry of Environment and Forests.

Telugu Ganga Project (TGP)

There is another dispute arising out of differing interpretations of the Award by Andhra Pradesh and Karnataka. The award allows Andhra Pradesh (AP) the use of surplus water without conferring a prescriptive right. AP claims that TGP is just that it utilizes the surplus water of Krishna. Karnataka is concerned that AP will claim prescriptive rights on this water, when the award comes up for review. The Conflict continues.

Cauvery Basin

An Inter-state River basin in the southern peninsula lies in the States of Karnataka, Kerala, Tamil Nadu and Pondicherry. During the 200 years of British rule, until India attained independence in 1947, substantial development of irrigation took place in the deltaic plains of Tamil Nadu and only partly in the princely State of Mysore, now Karnataka. The two important storage projects of the pre-independence period are the Krishna Raja Sagar dam (1931) in Karnataka and the Mettur dam (1934) in Tamil Nadu. Prior to these two dams, the Tanks and Anicuts (ungated diversion structures) dominated the irrigation development in the basin. Since independence, the pace of development has been remarkable, and almost 95 % of the surface water is reported to be utilized, which is the highest for any basin in the country.

The earliest Agreements that governed the use and development of the Cauvery waters are the 1892 and 1924 Agreements between the erstwhile princely State of Mysore and the province of Madras. These are the Agreements on which the case of the Cauvery Water Dispute hinges, with Karnataka calling it unjust while Tamil Nadu swears by its validity considering their established prescriptive rights. Tamil Nadu had the advantage of initiating development in the basin (delta) much earlier than the other States of Karnataka and Kerala and could therefore utilize a much higher proportion of the yield than that generated in its own catchment. The State of Kerala was not a party to these Agreements.

Cauvery Tribunal

The 1924 Agreement, a water sharing agreement, came up for review at the end of its 50 years of validity, and since then the sharing of the waters of the Cauvery remained under discussions between Karnataka and Tamil Nadu, with the Government of India (GOI) acting as a mediator. The course of the negotiations from 1968 to 1990 until the Tribunal was set up, at the bilateral level and at the Central level, swung from periods of hope to periods of despair. Even before the 50 years validity period expired, Tamil Nadu approached the GOI to refer the dispute to a Tribunal, and in the absence of any response from the Central Government, approached the Supreme Court requesting for a direction to be given to GOI to set up a Tribunal and to direct Karnataka not to proceed with its new projects. Kerala also filed suits to refer the disputes to the Tribunal.

Efforts by the Central Government at negotiation to find a solution did not result in the settlement of the dispute. The writ petition of the Tamil Nadu Government was heard by the Supreme Court in April 1990, and it directed the Central Government to set in motion the legal proceedings, as statutorily mandated. The Cauvery Waters Dispute Tribunal

was accordingly set up in June 1990 for adjudication of the dispute. The cases made out by the Party States are summarized below:

Karnataka

i) The Agreements of 1892 and 1924 are void since they were 'imposed' by the British on the 'vassal Princely State' of Mysore;
ii) The 1924 Agreement has expired in its entirety in 1974 at the end of the 50 year period, the 1892 agreement placed restrictions on Karnataka for the development of irrigation, while Tamil Nadu had no corresponding restrictions;
iii) Tamil Nadu has the benefit of being exposed to both the South-West and North-East monsoons;
iv) Tamil Nadu's canal systems are to be modernized;
v) Karnataka's drought prone area is almost double that of Tamil Nadu, and has therefore a right to use of more water;
vi) Trans - basin diversions for irrigation or power should not be permitted;
vii) The ground water resources in the Delta region are to be taken into account for the purpose of equitable distribution.

Tamil Nadu

The Central Fact-Finding Commission's (CFFC) reports of 1972 and 1973 with regard to yield and utilization should be revised. The average annual utilization is already higher than the yield, even at 50 % availability, and hence there is no scope for savings. The 1892 and 1924 agreements are considered inviolable, binding on all the States. There is thus little to be gained from working out any fresh allocation of waters in terms of actual amount or periodic releases.

Kerala

The allocation of Cauvery waters should be made taking into consideration the amount and percentage contribution of each State.

Pondicherry

The full allocation of a minimum quantity of 9.355 TMC of water for irrigation and drinking water purposes should be made during normal years.

Interim Relief/Award

Tamil Nadu requested the Tribunal for interim relief. The Tribunal heard the petitions of the States, after the Supreme Court ruled that interim relief was part of the reference before the Tribunal. The Tribunal gave an interim order on 25 June 1991 (GOI, 1991). Karnataka was directed to release 205 TMC of water from its reservoirs so as to ensure that it is available in Tamil Nadu's Mettur Reservoir in a year from June to May,

effective from 1July 1991, in accordance with the monthly inflows schedule. Restrictions were also placed on Karnataka not to increase its area under irrigation by the waters of the Cauvery beyond existing 11.2 lakh (100,000) acres.

Karnataka felt aggrieved and reacted very strongly to the above order and raised several legal and technical lacunae, some of which are mentioned here: the interim relief is arbitrary, granted without prima facie assessing the yield, utilization, basin needs and other relevant matters; unworkable schedule for the release of water arbitrary since it operates irrespective of availability of waters in Karnataka etc. It also represented to the Central Government not to implement the Tribunal's order, and to stay all the proceedings of the Tribunal until a National Water Policy was formulated and an appropriate amendment was brought to the Inter-state Disputes Act of 1956, and the Tribunal given clear guidelines (CWDT, 1995). Due to the urgent nature of the matter, GOI approached the Supreme Court seeking clarifications.

The Supreme Court ruled that the order of the Tribunal be published in the official gazette. The Tribunal upheld its order. Following this, there was political one- upmanship in both the States. Until the end of the 1994-95 season there was no crisis as the monsoon was favorable. However, in 1995, due to delayed monsoon and low flows in the river, the dispute again came up before the Supreme Court on the issue of noncompliance of the Tribunal's order by Karnataka. The Supreme Court, in December 1995, asked Tamil Nadu to approach the Tribunal.

The Tribunal directed Karnataka to release 11 TMC, being the cumulative deficit up to mid December 1995, and to keep up further release of 17.4 TMC until end of May. Karnataka did not release the flows as directed by the Tribunal. The Supreme Court on a petition by Tamil Nadu requested the Prime Minister to intervene and find a solution within three days.

The Prime Minister of India (PM), after intense parleys and discussions with the Chief Ministers of the States, announced a three-point package, which defused an otherwise explosive situation. The details of the PM's package are mentioned below:

- Package 1- PM requested Karnataka for immediate release of 6 TMC of Cauvery waters, against 11 TMC as per the Tribunal Order, to Mettur in Tamil Nadu. This was complied with. (In subsequent years, this is being done under a formalized institutional arrangement as explained further);
- Package 2 - A three member Expert Group was set up to make an on the spot assessment of the status of standing crops in Cauvery ayacuts in Tamil Nadu and Karnataka and their water storage levels and immediate requirement of water to save standing crops in both the States. This was only an interim action to defuse an otherwise sensitive situation. Such solutions may soon become necessary in exceptional cases in the future. (There is now an established institutional arrangement to undertake any such tasks).
- Package 3 - This addressed the larger issue of sharing of river waters at a policy level by proposing to hold a meeting of the National Water Resources Council

(NWRC), on which all the Chief Ministers are represented, to evolve guidelines for sharing of Inter-state river waters. This meeting has been held and a Working Group has been set up to work out the modalities for preparing the guidelines. Recently, in May 2001, the Working Group set up under the Chairmanship of the Minister of Water Resources, GOI and of all the State Irrigation/'Water Resources Ministers of the States as Members, held a meeting to discuss the guidelines.

Cauvery Water Scheme -The Cauvery River Authority

Tamil Nadu filed a suit in the Supreme Court on the grounds that Karnataka was not following the directives given by the Cauvery Water Disputes Tribunal. It asked, inter-alia, to pass a decree of mandatory injunction, directing the Union of India to frame a scheme making provisions for all matters necessary to give effect to the decisions of the Tribunal, and to issue a notification thereof in the official gazette. In pursuance of the Order given by the Supreme Court, the Central Government notified a scheme called "Cauvery Water Scheme" under Section 6 A of the Inter-State Water Disputes Act, 1956 on 11 August 1998, to give effect to the Interim Order and all subsequent orders under which "The Cauvery River Authority" was set up. The Prime Minister chairs this Authority, and Chief Ministers of the basin States are its Members. The Secretary, Ministry of Water Resources, is the Secretary of the Authority.

The "Monitoring Committee" which is headed by the Secretary, Ministry of Water Resources, GOI assists the Authority. The Chief Secretaries and Chief Engineers of the Cauvery Basin States and the Chairman, Central Water Commission are Members of the Committee. While meetings of the Authority and the Committee are being held, the Tribunal is proceeding with its hearings and its Final Award is eagerly awaited. It remains to be seen whether the award will end the conflict.

The Cauvery Water Dispute has become highly litigious and hostile this year (2002). High politicking surrounds the dispute, arising from the reported severe shortfall in the Southwest monsoon rainfall this year. This has created a very low storage situation in the four key reservoirs, particularly of the Krisnarajasagara and Kabini reservoirs in Karnataka state, from where releases are made to the Mettur reservoir in Tamil Nadu.

Water releases of 205 billion cubic feet (BCF = thousand million cubic feet, Mcf), the bulk of the releases from the two reservoirs mentioned above, are to be made by Karnataka state from June to May every year, to the Tamil Nadu State, in accordance with the Interim Award of the Cauvery River Water Tribunal. The State of Tamil Nadu, unable to get the water released as provided in the award, has constantly knocked at the doors of the Supreme Court of India and the Cauvery River Authority (CRA) headed by the Prime Minister, for providing redress. The Cauvery Tribunal set up in 1990 under the ISWD Act has yet to give its final report.

On a petition by the Tamil Nadu State, the Supreme Court, duly noting that the storage quantity in the four reservoirs of Karnataka had increased from about 41 TMC to about 73 TMC in August, passed an interim order directing Karnataka to release 1.25 TMC of

water every day to the Mettur reservoir in Tamil Nadu till a final decision was taken by the CRA. The Court's order also stated that "The CRA is requested to finally decide the dispute between the states with regard to pro-rata sharing of water by the Cauvery river basin states, especially in times of distress".

Following the Supreme Court's order, the CRA met on an emergency basis, reviewed the situation, and ordered on September 8, 2002 the release of 0.8 TMC of water daily by Karnataka. However, Karnataka did not honor the order, citing again the reason that any release of water as per CRA's order would be harmful to the standing crops in the state. Taking cue from the reluctant attitude of the Karnataka Government, the Ryots (farmers) of the state in the Cauvery basin resorted to rioting and forced the Government (which was more than willing anyway) to stop releases from the reservoirs. The Government of Karnataka, in turn, is trying to prove that the farmers did not take kindly to the decision of the SC and that the situation has gone beyond its control.

The Tamil Nadu Government again filed a petition in the Supreme Court seeking initiation of contempt proceedings against the Chief Minister of Karnataka and four others on the ground that the state had violated Supreme court's order for release of 1.23 TMC water every day as well as the CRA order for release of 0.8 TMC of water daily. The Supreme Court, after getting report from the Cauvery Monitoring Committee, and after hearing the pleas of both the state governments, in its order of 4th October 2002, observed that "We are at present concerned with the plight of the farmers, be they of Tamil Nadu or of Karnataka" and directed that "Water is directed to be released by Karnataka in the manner indicated in the September eighth order of CRA headed by Prime Minister".

When Karnataka repeatedly contended that release of more water to Tamil Nadu would adversely affect the standing crops, the court said, "You (Karnataka) shall obey the CRA order but it is open to the CRA to change its order." But the ground situation has not altered. In fact, the position of Karnataka has hardened. The State Cabinet has taken a decision not to release water to Tamil Nadu as per CRA order and most of the political parties in the state have supported the stand of the Government. In its report to the Supreme Court, the Cauvery Monitoring Committee had highlighted the severe drought conditions in both the states and stated that the water level in the reservoirs in the states had been at the lowest.

Matinee idols of the film world in Tamil Nadu and Karnataka have joined the chorus of protests; in Karnataka they have urged stopping the screening of Tamil films and TV programs, apart from stoppage of release of Cauvery water to Tamil Nadu, while in Tamil Nadu they have urged the state to stop electricity supply to Karnataka from its Power station at Neyvelli till Karnataka agrees to release Cauvery water as per Court's orders. The Tamil Nadu Government has also filed a second petition of contempt of Court against Karnataka for violating the Supreme Court's orders.

A distress sharing arrangement, as between Bangladesh and India at Farraka, is very much a feasible proposition, but the political expediency in both the states has become

the driving force in perpetuating the dispute. It is a hard nut to crack and the Prime Minister as the Chairman of the Cauvery River Authority is faced with a highly explosive situation. The defying of the highest court's order by Karnataka has also created a constitutional crisis. Can a State government for its own narrow goals of electoral politics, defy the orders of a constitutional authority (Tribunal), the apex judicial authority (Supreme Court) and the Country's highest executive authority (The Prime Minister) and still be free of blame?

The Pennar Basin

The Pennar basin, with a drainage area of 55,233 sq. km, lies in the States of Karnataka (6,937 sq. km) and Andhra Pradesh (48,276 sq. km). The basin is semi-arid and drought - prone. The ultimate irrigation potential of the basin has been assessed as 0.19 M ha., of which 0.13 m ha are already being used. The average annual runoff has been estimated at 6.86 BCM, which has also been assessed as the utilizable flow. The present surface water use is reported to be 5 BCM, out of which the storage in reservoirs is 2.51 BCM including projects under execution. There are no sites for major projects and no hydroelectric potential in the basin.

Development during the pre-plan period consisted mainly of medium and small irrigation projects. The only major project in the basin is the Somasila Project, which is under construction.

The earliest Agreement of water sharing and projects dates back to February 1892, when the Princely State of Mysore signed an agreement with Madras Presidency (included the present State of Andhra Pradesh) for the restoration of irrigation works and the construction of new irrigation works (CWC, 1995 & 1997). The next Agreement was in 1933 between the same Parties for the restoration of anicuts, construction of new anicuts, tanks and distribution of water of tributaries of the Pennar and from irrigation canals and deficient supplies in some rivers. The 1892 agreement is now being reopened by the States on the ground that tanks are being improved or diversions effected from tanks without prior approval between the States. Karnataka has taken legal recourse to settle the matter.

Brahmani-Baitarani Basin

The combined basin of Brahmani and Baitarani has a drainage area of 51,822 sq. km which lies in the States of Orissa (34,749 sq. km), Bihar (now Jharkhand) (15,757 sq. km) and Madhya Pradesh (1,316 sq. km). The Brahmani River rises near Nagri village in the Ranchi district of Jharkhand, and has a total length of 799 km. The Baitarani River rises in the hill ranges of the Keonjor district of Orissa, and has a length of about 355 km. Both river systems drain into the Bay of Bengal and form a common delta area. The important tributaries of Brahmani are the Karo, the Sankh, and the Tirka and those of the Baitarani are the Salandi and the Matai. The basin has a cultivable area of about 3.2 m. ha. The average annual natural run-off is assessed to be 36.23 BCM out of which the utilizable flow is 18.30 BCM. The hydropower potential has been assessed as 548 MW at 60% load factor from 17 identified schemes. Only one project with installed capacity of 135 MW has been completed.

There is a long history of Irrigation in the basin. The most important project of the pre-plan period is the Orissa Canal system. During the Plan period, many important projects have been built or are under construction, such as the Salandi Project, the Rengali Multipurpose Project on the Brahmani, and the Andpur Barrage on Baitarani. There is adequate water, which could be developed for beneficial uses by storage projects and ground water exploitation. Taking up the various projects under consideration can increase the present storage capacity of 4.76 BCM to about 14 BCM in the future.

There are no Inter-state disputes of any significance, as all projects are taken up by mutual agreements among the Party States. The basin has surplus water flows and hence the sharing arrangements have not created disputes so far.

The Subernarekha Basin

The basin has a drainage area of 19,296 sq. km, and lies in the States of Bihar, Jharkhand, West Bengal and Orissa. The ultimate irrigation potential from the existing and ongoing projects is assessed to be 1.02 M ha, of which 0.5 M ha. have already been developed. The storage potential assessed is 4 BCM, of which 0.5 BCM is currently in place. The hydroelectric potential is assessed at 52.5 MW at 60% load factor, whereas the present installed capacity is 43 MW.

The development of water resources in the basin in the pre-plan period was limited to medium and minor irrigation projects. The pace of irrigation development picked up momentum during the Plan period. There are three major projects under implementation following several Inter-state water agreements negotiated since June 1964. The Agreements signed in June 1964 were on assessment of water availability at specific locations on the River and the requirements of each State. The assessed potential of 4.5 MAF at 75% availability was allocated as follows: to Bihar 3.2 MAF, Orissa 1.2 MAF, and 0.1 MAF to West Bengal.

The projects under implementation under subsequent project-specific agreements between States are (i) the Subarnarekha Multipurpose Project, (ii) the Chandil Dam with a specific flood cushion, (iii) the Kharki Dam and Galudih Barrage with Canal system. The storage under each dam and its sharing and the costs and benefits sharing from each project between the Party States have been specifically defined, including the ratio of sharing shortages in the proportion of their respective water shares. Joint operations of the Kharki Dam and the Galudih Bararge along with the Right Bank Canal have been agreed. Orissa, as the lowest riparian, has the right to use the surplus water from the free catchment below Kokpara.

The Mahi Basin

The drainage area of the Basin is 34, 842 sq. km, which lies in the States of Rajasthan (16,453 sq. km), Gujarat (11694 sq. km), and Madhya Pradesh (6695 sq. km). The Mahi River is the main artery in the Basin, which rises in the northern slopes of Madhya

Pradesh and flows for about 583 km. before flowing into the Arabian Sea through the Gulf of Cambay. Important tributaries of the river are the Som, the Anas, and the Panam. The cultivable area of the Basin is 2.21 M. ha. The utilizable surface water has been assessed (CWC, 1989) at 31.0 BCM (average annual runoff 118.3 BCM), of which nearly 81% is the reported beneficial use.

Important major projects in the basin are the Kadana Dam (Mahi Project) and Panam in Gujarat, Mahi Bajaj Sagar and Jhakam in Rajasthan, and Mahi in Madhya Pradesh. The live storage capacity created in the reservoirs is 4.75 BCM. The hydropower potential in the basin has been assessed as 68.6 MW at 60% load factor. Most of the potential has been developed with three projects. The ground water utilization is about 25% of the utilizable potential.

The Riparian States have negotiated several project - specific agreements since 1966, for sharing of water, sharing of costs of land acquisition, resettlement and rehabilitation, and the sharing of benefits. There is also a proviso for cost reimbursement by Rajasthan to Gujarat, subsequent to the development of the Narmada river to provide water for Mahi at a later date. These agreements have worked well.

Tapi Basin

The basin drainage, extending over an area of 65,145 sq. km, lies in the States of Maharashtra (51,504 sq. km), Madhya Pradesh (9804 sq. km), and Gujarat (3837 sq. km). The main artery of the basin is the Tapi River, which rises in the Betul district of Madhya Pradesh and flows over a length of about 724 km. before flowing into the Arabian Sea through the Gulf of Cambay. The important tributaries of the river are the Purna, the Panjhra, the Vaghur, the Bori, and the Aner. The cultivable area of the basin is about 4.29 M. ha. The average annual runoff is assessed at 18.0 BCM, out of which the utilizable water is 14.50 BCM (CWC, 1989). The hydropower assessment in the basin is 119.7 MW at 60% load factor. Two projects using 70% of the assessed potential have been completed. The Pre-Plan development of irrigation was mainly through medium and minor projects. Important projects developed in the basin during the Plan period are the Ukai dam, Kakrapar diversion weir, and the Girna dam. The Upper Tapi and Wagnur projects are under construction. About 25% of the assessed ground water potential has been realized.

The States of Maharashtra and Madhya Pradesh have negotiated several agreements for the sharing of waters, and for specific projects upstream of the Ukai dam in Gujarat. The Ukai project in Gujarat was cleared by GOI subject to the upstream utilization of 261.4 TMC (6 MAF) at 75% availability for Maharashtra and Madhya Pradesh. The latter two States entered into an Agreement on 12 January 1986 to share 261.4 TMC, with allocation of 70 TMC to Madhya Pradesh and 191.4 TMC to Maharashtra (CWC, 1989). These two States have entered into several other project - specific Agreements since 1964, with specified allocations of storage to each State, and benefit and cost apportionment, with an Inter-state Control Board for efficient, speedy and economical investigation and execution of Joint Projects.

West Flowing Rivers from Tapi to Kanyakumari

The Issue of Mulla Periyar Dam

This basin of west flowing rivers is a composite of 115 rivers extending over an area of 112,117 sq. km. The rivers are in the States of Gujarat, Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu. All these rivers have a coastline on the west and experience high rainfall. Consequently, they have good water resources.

One of the 115 rivers of interest, from the conflict resolution angle, is the Periyar River in Kerala. It has one of the oldest inter-basin water transfer schemes in which the west flowing waters of the Periyar River are diverted from the Mulla Periyar Dam (built during 1885-1897) located in the Basin, to the east for power generation and irrigation in Tamil Nadu. The ownership and operation of this dam is vested in the Government of Tamil Nadu under the Agreement of October 1886 between the Maharaja of Travancore & Madras State, with a validity of 999 years. This lease deed was revised and amended in 1970 permitting Tamil Nadu to use Periyar Waters for power generation. However, in 1979, press reports in Kerala about damage in the Periyar dam prompted an examination of the safety aspects of the dam by the Central Water Commission, and consequently Tamil Nadu undertook strengthening measures.

Even after undertaking strengthening measures, the Government of Kerala has restricted the conservation level in the reservoir due to apprehensions about the safety of the dam. Kerala initially objected to the intervention for conciliation by the Government of India. Several Writ petitions were filed during 1997-99 in the High Court of Tamil Nadu in Chennai, and in the High Court of Kerala in Trivandrum. The Government of Tamil Nadu followed it up with a transfer petition in the Supreme Court, requesting the transfer of all the cases related to Mulla Periyar Dam from High Courts of Tamil Nadu and Kerala.

The Supreme Court directed the Minister, Water Resources, GOI to convene a meeting of the Chief Ministers of the States to amicably resolve the issue and convey the outcome to the Court before the case came up for hearing in July 2000. The Minister (WR) convened this meeting, and an Expert Committee was set up to inspect the dam from the dam safety angle vis-à-vis the status of strengthening works carried out by the Tamil Nadu Government, and give recommendations with regard to the raising of water level in the dam in a phased manner. The Court was informed accordingly and as a follow up, the Expert Committee headed by Member (D&R), Central Water Commission was set up with Chief Engineer (Design/Dam safety) of Government of Tamil Nadu and Chief Engineer of Kerala and other eminent engineers as Members.

The Committee has finalized its report and submitted it to the Central Government for necessary action. It is understood that the Expert Committee has recommended the raising of the conservation level. The matter is yet to be resolved. Kerala's official objection, as stated in the Court, is that raising the conservation storage level will result in the submergence of reserve forest land and the Elephant Wild Life Sanctuary.

Conclusions

The mechanisms for conflict resolution need to be expedited. The processes of conflict resolution, as brought out above, are complex and time consuming. In order to resolve the issues amicably at all levels, the following approaches are recommended:

The resolution of Inter-state water disputes through negotiations, and through the three Tribunals (Narmada, Godavari, and Krishna), and the provision of an Interim Award by the Cauvery Tribunal, the Supreme Court's judgments on Interim Award on Cauvery, the resettlement and rehabilitation of Project affected people in the Sardar Sarovar Project and the Alamatti dam issue, all have contributed valuable principles that could be culled out and included in the Guidelines that the Central Government is now preparing as a part of the National Water Policy for sharing of Inter-state Rivers. In this context, the Indus Treaty with Pakistan, the Mahakali Treaty with Nepal, and the Treaty on Ganges Water Sharing at Farakka with Bangladesh would also provide useful principles.

The time tested method of ' negotiations ' with the Parties to the dispute to reach agreements would be an ideal solution, as the Parties to the dispute would be prepared to discuss a number of alternatives in a cooperative effort to find the best alternative which is acceptable to all the Parties. The time period for such negotiations could be dictated by the gravity of the issue, but there should not be any uncertainty in it.

In cases where all negotiation efforts have failed, the reference to setting up a Tribunal under the Inter-state Water Disputes Act should be resorted to. Even in this case, certain amendments are essential. These are:

a) Introducing a time limit to the setting up of the Tribunal from the time a reference is received by the Central Government;
b) The Central Government, if after fixing a time frame for the States to arrive at a negotiated settlement, finds that such settlement has not been possible, should on its own, set up the Tribunal *suo moto;*
c) The Act should introduce a time frame clause (not exceeding three years, including extensions) for the Award by the Tribunal;
d) An age limit for the Chairman, Members and Assessors of the Tribunal should be fixed;
e) The Award should have the same force and sanction behind it as an order or decree of the Supreme Court, to make the Tribunal's Award binding;
f) Disputes, once settled, should not be reopened;
g) The Tribunals should also hear the views of the Stakeholders;
h) The decisions of the Inter-State Council on the Sarkaria Commission's Report on Inter-state matters regarding the steps to be taken on the ISWD Act should be implemented.

Track II diplomacy has worked well in recent years in bilateral negotiations with neighboring Trans-boundary countries, and has facilitated settlement of the Ganges

Treaty with Bangladesh and the Mahakali Treaty with Nepal. With increasing objections of stakeholders to development projects, and the proliferation of Public Interest Litigations by NGOs and other stakeholders, this kind of diplomacy may be fruitful in resolving Inter-state water issues.

It is now being suggested that the conflict resolution process needs a shift from a purely legal and Inter-Governmental matter to a humanitarian approach, based on peoples' participation and cooperation, in which all stakeholders and partners (including the project affected people who are the victims) should come together on one platform to find viable solutions. In this context, initiating action on the above and following the suggestions, particularly in the Guidelines on water dispute resolution being evolved by a Ministerial Working Group set up by the NWRC, would be timely.

7.3. Case Studies of Water Conflicts in Bangladesh

Farmers vs. Fishers*: Land and Water Use Conflicts

(*The term `fisher' is used here, instead of the conventional word `fishermen', in order to emphasize that the fishing community includes both men and women).

Bangladesh possesses enormous wetland areas, of which the principal ones are the rivers and streams, freshwater lakes, and marshes including water bodies locally known as *haors, baors, beels* and *jheels.* Haors are bowl-shaped depressions (often tectonic in origin) between the natural levees of rivers. These are subject to monsoon flooding every year, but may shrink in the dry season. These are mostly found in northeastern Bangladesh – generally known as the Sylhet Haor Basin. Beels are a combination of freshwater marshes, lakes and swamp forests, as well as the deepest parts of haors, which remain as perennial water bodies. An important beel of great ecological significance is the Chalan Beel in northwestern Bangladesh. Baors are actually ox-bow lakes, formed due to the detachment of a meander from the main stream, and are common in southwestern Bangladesh, while jheels are freshwater marshes of varying sizes.

Some authors estimate the total area of wetlands in Bangladesh as between seven and eight million hectares, or about 50 percent of the total land surface. This includes estuaries and large tracts of mangrove swamps (the Sundarban forest). However, in realistic terms, the wetlands of Bangladesh cover an area of about 16,000 sq km, which is around 11 percent of the total area; these include rivers, haors, lakes and ponds. Such coverage is much higher than the global average of six percent. The wetland ecosystem contains very rich components of biodiversity. Of more than 5000 species of flowering plants and 1500 vertebrate species in Bangladesh, wetlands provide the habitat for about 300 plant and over 400 vertebrate species (Nishat et al., 1993).

Wetlands are the also the habitat for a large number of resident and migratory waterfowl, including a number of endangered species. Fisheries are the most important use of the

Bangladesh wetlands. Fisheries play a dominant role in nutrition, employment and foreign exchange earnings. Fish provide nearly 70 percent of the animal protein intake, account for five percent of the GDP and about 12 percent of the export revenues. About one million people are directly employed in fishing, and another 10 to 12 million are employed in fish processing and marketing.

The majority of the rural households are engaged in seasonal fishing activities during the dry season (November to March). The wetlands become interconnected with links to the river channels in the wet season, and provide ideal habitats for the breeding cycle of a large number of fish species. The increase of the human population and the demand for more agricultural land has adversely affected the wetland ecosystem. Indeed, wetlands in Bangladesh provide a typical instance of conflicts in utilization and allocation of a resource between two important water-using sectors: farming and fishing.

Development activities in the wetland areas are mainly aimed at reduction of the flood level and size of wetlands to facilitate agriculture. The flood protection embankments (primarily constructed to reduce crop losses from flooding) have considerably altered the natural hydraulic regime. Increased withdrawal of water for irrigation, drainage of flooded areas for cropping, and other flood control measures have a dramatic impact on open water fisheries through reduction in the size of fish habitats, and prevention of the movement of fish. The farmers, on the one hand, are inclined to increase their crop output through wetland conversion, but the fishers, on the other hand, are disadvantaged in maintaining a sustainable livelihood as their habitats continually shrink.

Wetlands are the home of several hundred varieties of rice. Traditionally, deepwater (floating) rice or broadcast *aman* rice used to be the dominant crop in the use of wetlands. With the introduction of high yielding varieties (HYVs) and flood control, drainage and irrigation measures in the wetlands, cropping pattern has changed in favour of *boro* (winter) rice. Drainage of wetlands has diminished fish output, but increased both cropped area and cropping intensity. Of the three rice crops grown in Bangladesh – *Aus* (pre-monsoon), *Aman* (monsoon), and *Boro* (winter) – *Aman* is the leading crop, while *Boro* traditionally used to be the least important in terms of area. However, in recent years, due to the increased availability of land from drainage of wetlands, *Boro* now occupies the second place (in area) among the three rice varieties. (The proportional area coverage of the three rice varieties is: *Aman* [56 percent], *Boro* [27 percent] and *Aus* [17 percent]).

The conflict in utilizing and allocating land and water between farmers and fishers is a continuous problem in water management in Bangladesh. Neither sector can be marginalized if the goal is to attain food security and a balanced diet. For the past 30 years, national planning pivoted around the objective of making the country self sufficient in food. Hence, special emphasis was given on agricultural expansion as well as protection of farmlands from floods in order to minimize crop losses. The interests of farmers thus received priority and the interests of fishers were neglected. The cumulative result was a reduction in fish habitat, fish population, and diversity.

Heavier emphasis on agricultural growth and protection of crop lands from floods is not to be blamed, because the country – with its runaway population growth – has averted serious food scarcity situations, and has indeed become self sufficient in rice production in 2000. The fault lies in myopic planning strategies which were oblivious to, or did not take due consideration of, the needs of the fishers and the fish habitat.

Conversion of wetlands into farmlands has not only altered the land use pattern, but also changed the entire natural landscape. Many partial flood control projects with the construction of submersible dykes have been taken up to protect *boro* rice from pre-monsoon flooding. Full flood control projects have also been implemented for providing a controlled water regime for agriculture. Projects for drainage facilitation have also been undertaken. Flood control, drainage and irrigation structures reduce floodplain size and obstruct fish movement and migration from rivers and the beels to the floodplains for breeding and feeding. River closures and barrages – both major and minor – obstruct the upstream and downstream migrations of fish populations, and thereby inhibit their sustenance and reproduction. The barrages and closures also change the flow pattern, which adversely affects fish species composition and diversity.

The conflict in land and water use between the farmers and the fishers is a recurrent annual phenomenon in the haor and beel areas. In the months of November and December, when the farmers need rapid drainage of water from their rice fields to start cultivation, the fishers resist and often put bunds across drainage canals to protect their fish. Later, in February, when the farmers need water to irrigate their lands, the fishers want to decrease water levels in the beels to maximize the catch. Besides, water control regulators built across the irrigation or drainage canals are a major impediment to fish migration during the early monsoon breeding season.

Impacts of flood control, drainage and irrigation (FCDI) infrastructures have been studied in detail under the Flood Action Plan (FAP) component of the "Northeast Regional Water Management Project: FAP 6" (WRPO, 2000). It was identified in that study that some of the impacts have been positive; however, there are some serious adverse impacts of major environmental concern. It was established that changes in cropping patterns and increased rice coverage have brought higher financial returns. Reduced flood depths and duration have led to a transition from deepwater broadcast *Aman* rice to transplanted *Aman* and HYV *Aman* in the wet season, and proliferation of HYV *Boro* cultivation in the winter season.

The FAP study also found that the FCDI activities have a major negative impact on open water or capture fisheries due to substantial reductions in the areas of regularly inundated floodplains and beels. Many fishers have lost their livelihoods and been forced to look for alternate occupations. The magnitude of these losses from conflicts between the interests of farmers and fishers appears to be substantially greater than has been previously estimated (WRPO, 2000). Such conflicts are the direct result of the absence of an integrated flood protection and fisheries planning strategy in the water sector, a lapse that is receiving remedial attention only now.

The National Water Policy (NWPo), formulated in January 1999, makes a firm commitment to a more equitable allocation of water rights and sharing among the different water using sectors (GOB, 1999). In recognition of the water requirements for open water fish and the fishing community, specific clauses (given below) have been included in the NWPo:

- *Natural water bodies such as beels, haors and baors will be preserved for maintaining the aquatic environment and facilitating drainage;*
- *Water bodies like baors, haors, beels, roadside borrow pits etc. will, as far as possible, be reserved for fish production and development. Perennial links of these water bodies with the rivers will also be properly maintained;*
- *Water development plans will not interrupt fish movement and will make adequate provisions in control structures for allowing fish migration and breeding.*

The National Water Management Plan (NWMP), now in its final stage of completion, has also stipulated that 'water structures should be so designed and operated that there are no major obstacles or danger points on the migration routes of fish (WRPO, 2002). The NWMP also recommends that fish passes or gates be included in all regulators and be kept open as far as possible, but especially in the key migration months. Strategies for fish and fisheries management are to be agreed at local levels, so that potential land or water use conflicts (especially with the farmers) are avoided, or at least minimized. The basic premise is that there has to be a symbiotic balance between the two interest groups: the fishers and the farmers – who need water at different times and in different quantities.

Fish passes for the mitigation of the adverse effects of FCDI works are now fully recognized in water sector planning in Bangladesh, although substantial construction of such passes is yet to begin. During the formulation exercise of the NWMP, an evaluation study was conduced in 1999 for one fish pass Pilot Project, completed in 1995 in Sylhet (WRPO, 2000). A vertical slot-type fish pass was installed at the Manu River Irrigation Project in Sylhet, to facilitate fish migration between Kawadighi Haor, an important fishing ground that had been enclosed by the Manu River Irrigation Project and the Manu river. The evaluation study concluded that the fish pass has been very successful, and has resulted in a substantial increase in fish production in Kawadighi Haor.

Increased fish production has also contributed to a significant increase in the average daily income of the fishers, as well as in the household consumption of fish during the post-construction period. No significant disbenefits from the fish pass operation were reported. There were concerns that the inflow of water to the haor resulting from the fish pass operation in the pre-monsoon and monsoon seasons would cause some flood damage to crops. However, no such adverse effect on crops was observed, probably because the volume of inflow (about 0.6 cumec) was too low to cause any significant increase in water depths.

It is now recognized that the conflicts between the farmers and fishers on water use and allocation can be positively addressed through policies of social equity, enforcement of committed programs and effective participation of people at grassroots level.

Our recommendations include:

The restoration or rehabilitation of fish habitat should be carried out through proper assessment of the negative impacts of previous misuse, and enforcement and implementation of the National Water Policy and the Fisheries Policy.

Wetlands should be reserved for fisheries and prevented from farmland encroachment through drainage. The perennial links of floodplain water bodies with rivers should be resuscitated.

Rice Farming vs. Shrimp Farming: Land and Water Use Conflicts

Unplanned shrimp aquaculture development in the coastal areas of southwestern Bangladesh and the Cox's Bazar district in the southeast has caused serious social conflict, damaged local livelihoods and agriculture, and raised crucial issues of land and water use. The resolution of such problems, especially those affecting rice farmers vis-à-vis shrimp farmers, is a joint task for the industry, fisheries and water sectors as well as the private sector enterprises. At the same time, the valuable contribution made by shrimp production to Bangladesh's export earnings must be acknowledged, and there is little likelihood of rolling back the development that has taken place. Instead, the emphasis should be on reducing its adverse social and environmental impacts and carefully monitoring future potential conflicts.

As noted above, shrimp and prawn cultivation takes place mainly in the southwestern coastal districts (Satkhira, Khulna and Bagerhat), and in the Cox's Bazar district of southeastern Bangladesh. Dry season production of local species of shrimp and fish, grown from naturally stocked fry and fingerlings carried into the *'ghers'* (large shallow ponds in which shrimp and fish are grown) by controlled tidal inflow, is a long tradition in the coastal regions of Bangladesh. Under this system, the only significant input was labor, and the shrimp and fish yields per hectare were very low. Production was largely in the hands of the local farmers, who grew rice on the same land; hence, conflict between shrimp farmers and rice growers was minimal.

A major change to the situation occurred in the 1970s, with the spread of commercial farming of shrimp by entrepreneurs, many from outside the coastal region. These producers rented land from the local farmers for each dry season, usually on relatively short (typically, one to three year) leases, and stocked their *ghers* with purchased wild shrimp fry. Most production was on a low input-low output basis, though considerably more intensive than the preceding traditional system.

Shrimp production is still largely in the hands of commercial operators who lease land from local farmers. The latter, however, are becoming increasingly involved in shrimp cultivation themselves. Tensions exist between the commercial operators and the local rice farmers (from whom the former has rented *ghers*) because of the coercion used in

many cases, leading to widespread conflicts. This is particularly the case where the affluent shrimp farmers are absentee outsiders and live away from their farms.

In the southwest shrimp-growing region, the ideal scenario is based on a shrimp and rice rotation, with shrimp grown in the dry season, and the landowners (from whom the shrimp farmers lease their land) growing aman (monsoon) rice in the wet season. Since most shrimp farming takes place inside polders, rice farming normally should not suffer from saline flooding, although fresh water flooding resulting from drainage congestion does become a problem. Shrimp stocking usually takes place around February – after the completion of the aman rice harvest in December. In the December-February period, the *ghers* are filled with brackish water taken in at high tides. Salinity in the local river systems also increases in the December to May-June period due to decreasing fresh water discharge from upstream sources.

In order to enable the rice farmers to transplant their aman crop by late July or early August, the *ghers* should be drained, which implies that the shrimps should be harvested by the first half of July at the latest. However, the shrimp farmers tend to retain water in the *ghers* for as long as possible in order to maximize shrimp yields. Often, the shrimp farmers are powerful enough to prevent the rice farmers getting their way, and hence, the draining of the *ghers* may take place too late to allow adequate time for the necessary leaching out of the salts from the salinised soil to a level which would allow aman planting. Consequently, transplanting is delayed and aman yields are reduced. This is the basic conflict between the two parties using the land, caused by the unavoidably conflicting requirements of the two "crops", viz., shrimp and rice.

Prior to the construction of coastal polders (enclosed embankment), the natural and indigenous system of shrimp cultivation was practiced in small *ghers*. Ideally, saline water (which was stored in *ghers* behind wooden sluice gates) would be flushed out and replenished with monsoon rainfall and fresh water flows after the shrimp harvest, so that an aman rice crop could be grown. But, in reality, such is not the case. The scale of shrimp farming has changed from the previous indigenous practices. The industry is now characterized by greater intensification.

Practices such as the stocking of fry, feeding of shrimp and liming of the ponds have been introduced. The construction of coastal polders, originally designed to "keep out" saline water, have actually been deployed to "retain" salt water in the *ghers*. More importantly, the scale and extent of the land area leased out to shrimp cultivators has significantly increased in recent years, leading to a lopsided struggle between the powerful shrimp growers and the local small farmers.

Two main types of shrimp are produced commercially in Bangladesh: the Tiger Shrimp, (locally known as *bagda*) grown under saline conditions and the Giant Prawn (locally known as *golda*), grown under fresh or near-fresh water conditions. In terms of output, the Tiger Shrimp is the more important of the two types, and has a greater export demand; average annual production of Tiger Shrimp is around 26,000 tons compared to

some 8500 tons of Giant Prawn. Tiger Shrimp's area of cultivation is also 10 times greater than that of the Giant Prawn.

Shrimp from Bangladesh accounts for some three percent of the world's shrimp exports, with about 30 percent going to the U.S.A., 20 percent to Japan, and 50 percent to the European Union (WRPO, 2000). During the 1990s the Tiger Shrimp cultivation expanded very rapidly, with farm area progressively encroaching on rice producing lands. The process has now somewhat slowed down, and social and environmental problems with the industry have generated pressures for more control over its operations, especially through the type of land use zoning envisaged in the National Water Policy.

Rice farmers and shrimp producers have been in perpetual conflict since the unregulated expansion of the shrimp industry in the 1980s. Serious disputes have often tended to arise when shrimp farmers deliberately implant a pipe into an embankment and allow saline water into a field, causing overspill and inundation of standing crops. Empirical studies under the Khulna-Jessore Drainage Rehabilitation project (in the waterlogged Khulna-Jessore area) have reported (BWDB, 1995) that social tensions between groups are exacerbated because polarized power relations. The large shrimp producers (who are also influential in the social hierarchy) tend to cultivate Tiger Shrimp, while small farmers concentrate on Giant Prawn (which require fresh water), often grown in rotation with *boro* (winter rice) crop. Because they have less clout, small farmers growing rice or Giant Prawn/boro rice combinations have little recourse against the man-induced inundation of saline farmers (The Tiger Shrimp producers). As the shrimp areas expand, the rice farmers are feeling even more vulnerable.

It is unlikely that the conflicts between rice and shrimp farmers will be resolved in the near future. Rice production is becoming increasingly difficult as more and more land is devoted to shrimp, and producers, in order to get maximum profit, tend not to release the land on time to rice farmers. Current management practices do not allow rice farmers to gain access to the land at the right time to produce seedling beds of their own. Consequently, they are forced to import seedlings from outside the area at a higher cost. Soil salinity is also increasing due to prolonged water logging, and as a result, rice yields are diminishing. It has been sometimes argued by experts that Tiger Shrimp farming can become compatible with rice farming on the same land through coordinated management practices. But, in reality, this has not been found to be the case.

Giant Prawn production might provide a viable alternative to the current conflict situation between rice and shrimp farmers. Unlike Tiger Shrimp, there are no major physical, social or environmental constraints on its expansion. There is also no inherent conflict between the two types of production (rice and shrimp) on the same land. This is because Giant Prawn is a fresh water rather than brackish water production system, and small farmers can adopt its production through integrating it with existing rice (irrigated *boro*) cultivation. Giant Prawn growers, who are generally small holders, grow *boro* rice (using irrigation) in their *ghers* only after harvesting the prawns. They are, however, dependent on fresh water (pumped from shallow tube wells or low-lift pumps) for the cultivation of the winter (dry season) rice.

Giant Prawn cultivation is gradually becoming popular, since this cash crop can be grown on the same plot of land with rice, but without adverse effects on the water table or the water quality. Although exports of Tiger Shrimp are higher than those of Giant Prawn, Bangladesh has recently developed and expanded its export market for the latter as well (WRPO, 2000). Exporters do not anticipate major problems in finding markets for increased Giant Prawn output. Market prospects for Tiger Shrimp and Giant Prawn exports appear satisfactory, provided hygiene standards are maintained.

Conflicts between rice farming and shrimp farming will not go away easily, primarily due to two reasons: unequal power and economic status of the shrimp growers and small rice farmers; and the construction of *ghers* by shrimp growers which increase soil salinity (detrimental to rice production) and prevent drainage. Local level water management mechanisms supported by planned zoning for shrimp cultivation might be the long term answer to this increasingly complex conflict scenario in land and water use between rice growers and shrimp producers.

Our principal recommendation is that Giant Prawn production, which can grow in fresh water, should be emphasized in coastal aquaculture planning, so that farmlands along the coast are not destroyed through incursion of saline water for Tiger Shrimp farming.

7.4. Case Study of a Conflict in Valuing Water in Nepal

A Typical Development Dispute in Chitwan

In this section, we would like to start with a tale of transition, both social and environmental, at the boundary of the Royal Chitwan National Park in central-south Nepal. It is a story that describes a water use conflict between two resource-managing community groups and indicates that water security, which overrides water economics, can be as crucial an issue at the local level as at the regional and international. Even though water conflict narratives between nation-states tend to get more press coverage, this case also highlights how alternative (and environmentally friendly) water use can be economically at least as valuable as conventional irrigation, and communities can fight to maintain the benefit accruing to them.

Both the Khageri irrigation project and the Baghmara community forest are adjacent to the Royal Chitwan National Park in the Chitwan valley, which is an east-west elongated *doon* valley between the Siwaliks in the south and the Mahabharat range to the north. The East Rapti, which is a non-snow fed river that originates from the southern slopes of the Mahabharat range south-west of Kathmandu valley, bisects the valley as it flows east to west. The river picks up smaller tributaries on both banks such as the Lothar, the Manahari and the Khageri before finally meeting the Gandak in Nepal, just before the latter debouches through the Siwaliks at Bhainsalotan into India forming the Bihar-Uttar Pradesh border. Much of this area was a jungle until the middle of the 20th century, but in

the early 1960s, a malaria eradication program was successfully carried out, which opened up the valley for resettlement.

Khageri Irrigation Project

The Khageri is a small river that flows from the Mahabharat hills in the north to meet the Budhi Rapti, the old channel of the Rapti. The irrigation project consists of a weir at the point where Nepal's national east-west highway crosses the river. The details are shown in **Figure 8**.

Its foundation was laid in 1959, and by July 1967, its canal started supplying water. The total cost of the project then was Rs 74 lakhs (a lakh equals 100,000), all in Nepali currency, with no involvement of any foreign aid initially. Its total irrigation command is 3,900 ha. In a normal year, the reliable irrigation area is 2800-2900 ha, but in dry years such as 1969, 1976 and 1992, irrigation has been provided to less than 2000 ha. In the monsoon season of 2000, irrigation was provided to 3500 ha and in 2001, the entire command of 3900 ha because rainfall was exceptionally good in these two years.

In an attempt to reduce people-park conflicts, people from within the national park area on the left bank villages of the Rapti such as Padampur were resettled to the north in Saguntole, which is an area that lies in the upper catchment of the Khageri at the foot of the hills from where the river emerges into the Chitwan valley. These settlers have now begun abstracting water that used to flow in the Khageri and was used for irrigation by the farmers downstream. The new settlers have also begun to deforest the area and build check dams to check landslides and the consequent flashfloods. However, this interferes with the natural regime of the river system and channels the waters that previously used to flow through the jungle in a more spread-out fashion. This means that the Khageri waters reach the irrigation barrage in a more violent form during the monsoon, with the danger of damaging or washing it away.

In order to protect the Khageri irrigation system and the investments made by the people and the Government of Nepal, the managers of the community-owned irrigation system propose to construct a pump scheme at the point where the Khageri meets the Budhi Rapti. This arrangement would not only compensate the downstream users for the water withdrawn by the new settlers or oustees from the National Park, but would also provide the additional water required to expand the irrigated area of the Khageri command by an additional 1000 ha. (Tika Ram Dahal, 1999). It is claimed that mostly poor people live in this area.

While there were 3400 households in the old command area of 3900 ha, this additional 1000 ha area has 1500 households, obviously with poorer people having far smaller landholdings. Consultants from the Asian Development Bank – which funded the Padampur resettlement and have been involved in Chitwan valley's irrigation as well – initially estimated the total cost of the pump scheme at Rs 14 crores (one crore = 100 lakhs = 10 million), but there is a feeling among the Khageri system managers and others that this can come down to 10 crores with a frill-free design.

While this scheme would augment the flow in the Khageri system and provide irrigation benefits to the people of the Khageri command, it has severe environmental and economic consequences that need to be addressed. The Khageri diversion weir and its primary irrigation command in Devinagar area are separated by the Barandabhar wildlife corridor that connects the National Park with the forests to the north. The Khageri main canal bisects this crucial forest corridor, whose conservation is vital to maintain a viable population of endangered wildlife. The proponents of the irrigation expansion argue that more pumped water in the Khageri main canal would be environmentally beneficial, as it would provide reliable supplemental water to the Bees Hazari Taal, a wetland area within the Barandabhar corridor. However, there are other consequences, both environmental and economic, to pumping water from the Budhi Rapti that will be discussed below (Dahal, 1999).

Baghmara Community Forestry

The Royal Chitwan National Park with its *sal* and riverine forests and grassland ecology was established in 1973 (it had been a protected Royal Hunting Reserve since 1965) and was declared a World Heritage Site in 1983. Its 932 km^2 area has 570 species of flowering plants, 40 of mammals, 486 of birds, 17 of reptiles and 68 of fish, including the endangered tiger, rhino, gaur, wild elephant, striped hyena, sloth bear and the Gangetic dolphin (Resources Nepal, 1999).

Realizing that nature protection required the support of the surrounding community that depends upon the forest resources, the King Mahendra Trust for Nature Conservation felt the need for a buffer zone program. Under this approach, the land surrounding the core conservation area is earmarked for a community forest managed by the villagers themselves, that addresses the fodder and fuel wood needs of the people in the perimeter of the national park. In 1989, the pilot Baghmara community forestry project was launched, and similar activities were initiated subsequently in eleven other sites. By 2000 AD, more than 3000ha of highly degraded land surrounding the national park had been revived as community forests, which now support not only forest cover but also a rich variety of wildlife.

Even in the small Baghmara community forest, 16 species of wild animals and over 162 species of birds have so far been recorded by KMTNC monitoring team. The animals include the rhinoceros, tiger, three species of deers, marsh mugger crocodiles, leopard, jackal, small Indian civet, wild boar, python, five stripped squirrel, Indian fox, yellow throated martin, golden monitor lizard and jungle cat. The Chitrasen community forest on the opposite bank of the Budhi Rapti from Baghmara has recorded the grey fox in addition to the over 159 species of birds and all the animals that are found in Baghmara (KMTNC, 1999).

The result of this growth in wildlife was an economic disaster for the surrounding farmers, but it has today been converted into a blessing. The wild herbivores made farming difficult, as they would devour the crops planted by farmers. Because these animals belonged to the national park and were protected, they could not be killed or injured. Over time, the villagers realized that they could earn a lot more money from

tourists coming in to see the wildlife than from the crops they could raise. They then began operating their own elephant rides and built lodges and observation *machaans* from where wildlife could be observed, thus earning money from tourism.

The most lucrative eco-tourism activity for the Baghmara/Chitrasen community forestry groups has been the dugout canoe boat ride on the Budhi Rapti. Because both banks of the river have been restored to riverine forest conditions with the success of community forestry in Baghmara and Chitrasen, wildlife has returned. So a roughly forty-five minute gentle punting downstream from the point where the river is met by the Khageri up to its confluence with the East Rapti allows the visitors excellent bird watching as well as a chance to see the rare marsh mugger crocodiles in their natural habitat conditions. The trip ends at the elephant-breeding center, which is another major tourist attraction, and the canoe ride is the easiest and most pleasant way to get there.

Run by the communities that manage the forest, each tourist is charged Rs 200 (about US$3), of which the Baghmara takes 55%, and 45% is taken by the Chitrasen Community Forest user groups. The total revenue generated so far from the boat rides is Rs 99,57,550 with the income for fiscal year 2000-2001 being Rs 39,04,000 and for 1999-2000 being Rs 36,61,600. Some thirty thousand tourists of various nationalities visited Baghmara in 2000.

Conflict and Resolution

If the Khageri farmers pumped the waters of the river after its confluence with the Budhi Rapti, it would dry out the river below, and the Baghmara forest users would have to close their lucrative canoe rides. In direct economic terms, it would mean a loss of about 4 million rupees per annum for them. Indirectly, there would be further impact on wildlife habitat, and loss of tourist trade. The Khageri farmers also have a strong case: they argue that the loss of their water is due to the National Park resettling people from within the park boundary in the upper catchment of their stream source. Hence they are now the new victims who need to be compensated with the proposed pump scheme. They also argue that an area of 1000 ha brought under additional two- or three-crop irrigation would provide economic benefits several times that from boat rides. However, when asked if they would then be willing to compensate the Baghmara people four million rupees per annum from their increased earnings, they seem less enthusiastic (Dahal, 1999).

In analyzing this conundrum, one clearly sees three proclivities at work: that of the profit-inclined market (farmers, boat rides), that of egalitarian conservation efforts (preserving the habitats), and that of a regulatory solidarity that can adjudicate between the conflicting claims (the government mechanism). How a balance is struck will really depend upon the perception of fairness regarding the regulatory body, the space for dialogue between contending claims, and the innovative ways of transcending the impasse that it can bring forth from the discourse. If the government mechanism is seen as leaning too heavily on the side of the profit makers, conflict and impasse is inevitable. If it were able to bring forth a solution that fully pleases no one but partially is something

no one can ignore, an impasse may be avoided and a "circle of improvement"[ii] may be initiated.

While it is difficult to predict which way the discourse will take, a possible solution that would not drive any of the solidarities off the map could be if there was, for example, a bit of "conservation plus development" activism in this matter. If some water has to be given to the Khageri irrigation system, it is environmentally less damaging to pump water from the main Rapti just after its confluence with Budhi Rapti than from the Budhi Rapti itself. The canal would be slightly longer, but then this variant could also serve the Elephant Breeding Center with water supply and wallowing pond.

The role of the adjudicator would be to make sure that development is not neglected, but any development embarked upon must also be conducive to the long-term goal of wildlife corridor maintenance. For this, it must make sure that no more water is pumped from the East Rapti (which is a much bigger river) than would be available if the pumping were done from Budhi Rapti itself. In such a case, the canoe rides could continue in a preserved habitat, the market forces could continue their profit making irrigated agriculture, and public confidence would not be lost in the adjudication mechanism.

Valuing Water

The purpose of the above story, repeated across the Indo-Gangatic plains, is to highlight the fact that, although one cannot have good politics without good economics, water economics – because of the multifaceted nature of water and its crucial role in all forms of life-sustaining processes – will always be subservient to water politics. A transparent pricing of water is possible where there is a genuine overground economy with a fair and just adjudicator: it is not possible where the economy is informal and the regulatory bureaucracy essentially rent-seeking. Several issues of valuation comes up for consideration and a possible research agenda, when one looks at water within the broader social context:

There is a difference in valuing water and valuing the service of delivering water. The former is difficult because of multiple reasons, the most crucial of which are the different properties of water that is put to different uses. Some of them are of such symbolic importance that attempting to place a price on them would be considered sacrilegious. For example, water at a religious site would be considered holy (bathing ghats near temples) and would require certain properties of flow to be maintained. It cannot be substituted by tanker-supplied water. The latter is easier to measure, allocate and hence price to the satisfaction of all. Therefore the debate over water tariff would be quite different if it was seen as price hike of water on the one hand, and on the other, admitting that water is a "human rights" subject of egalitarian concern, but that the delivery of water has a cost associated with it that needs to be met.

The context of the market – whether it is genuine or a phantom – will determine the reactions to market pricing of water. The poor have many skills and other intangible assets that they could bring to the market. Unfortunately, much of it is in the informal sector (including much of their labor) that is not officially recognized and hence not

formally priced. In a trading regime, they would be at a tremendous disadvantage because what is in the cash economy is only a small portion of what they "own" and which is needed for many other trading needs.

Maintenance of water systems (whether drinking water or irrigation) often demands some degree of voluntary contribution. Governments never have enough money for everything, anyway, and would find it difficult to allocate for the running costs once construction of new development is over. In such a case, the question of ownership, as well as the sense of ownership, is important. It allows for reasonable price increase as well as voluntary service where rewards are in the form of social recognition.

Integrated management, like sustainable development, is an attractive concept with serious unanswered questions. The most important one is: who does the integrating? The obvious one, from the past alliance of foreign aid and national bureaucracy, is one more bureaucratic "authority" to do it. This has failed in the past, and there is no reason to suspect a future with more of the same will be any more successful. The answer from the free marketers is that the market will automatically do the integrating, hence the push for privatization of the water utilities in Southern countries by donor agencies of the North. However, the market's failure to "integrate" social and environmental concerns is too well known to re-iterate here. This Case Study makes a plea for a three-legged "contested terrain" integration, where a just hierarchy regulates an innovative market, but both are under constant "audit" by a genuinely voluntary civil society.

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Section II

MANAGING WATER CONFLICTS *BETWEEN* COUNTRIES

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9. Introduction

The freshwater systems all over the world continue to undergo natural changes in terms of quantity and quality. These changes are accelerated in South Asia by the increases in human exploitation of water resources caused by increasing population pressures, and rising levels of urbanization and industrialization. Growing concern for environmental degradation has further increased pressure on water resources. In many regions of the world, these pressures are intense within national borders and even more intense in the case of international rivers, where two or more countries share the same river basins. Growing competition for water resources of the international rivers across several countries is expected to intensify the potential for acute social upheaval and conflict in many regions.

Worldwide, there are more than 200 international rivers covering more than one-half of the total land surface (Beach *et. al.*, 2000), where more than 40 per cent of the world's population lives. Ideally, cooperation based on mutual trust and transparency between the riparian countries should ensure an optimal management and sharing of international rivers. Unfortunately, such has not been the case in most instances – primarily either due to the "upstream-downstream" syndrome, "unequal" partners, lack of definitive international laws, or an enforceable global convention on the issue.

Despite the absence of a legal framework governing the use of international river waters, instances of cooperation and agreement in river basin management are not totally uncommon. Examples are the Indus Waters Treaty of 1960 between Pakistan and India, and the 1995 agreement on the Mekong River basin between Cambodia, Laos, Thailand and Vietnam.

Although there is tension between countries sharing the same river basins, ample potential exists for the cooperative development of international rivers if the apportionment issues among the riparian countries are resolved amicably.

This requires examining issues pertaining to the success and failure of international treaties and agreements made between countries for sharing international rivers.

This Section examines some key issues concerning potential conflicts and the implementation of international treaties made between the South Asian countries, with the goal of promoting a regional approach which may offer the best promise for managing the scarce water resources of the South Asian region. It synthesizes the country reports provided by the individual authors, and draws on information from working group meetings held in Kathmandu in April 2001, Dhaka in February 2002, and Islamabad in February 2003.

The Section is divided into eight chapters. Chapter 10 first presents an overview of the Indus and Ganges river basins on which international treaties have been made for sharing the river waters. Chapters 11 through 13 presents case studies on international treaties or agreements made between Bangladesh and India, India and Nepal, and India and

Pakistan. Each of these chapters presents the salient features of the treaty, factors leading to the treaty, and the institutional arrangements for its implementation. Chapter 14 discusses the actual implementation of the treaties. This is followed by discussions on the important issues in relation to the international treaties in chapter 15. The Report ends with a summary and recommendations in chapter 16. The References for Section II are provided in Chapter 17.

10. Overview of South Asian river basins

The South Asian rivers include some of the major river systems of the world. These include the Indus, the Ganges, the Brahmaputra and the Barak (Meghna) river systems (IGBM basin), which extends over six Asian countries -- Bangladesh, Bhutan, China, India, Nepal and Pakistan. These four river systems drain an area of about 3,278,000 km^2 (Chalise and Sial, 2000) stretching about 3,000 km in East - West direction and 800 km in North - South direction. The IGBM basin has immense water resources with an overall runoff in excess of 1,500 billion cubic meters (BCM) per year (Bandhyopadhyay and Gyawali, 1994). The Brahmaputra River system carries the highest volume of water with 586 BCM per year, which is followed by the Ganges and Indus with 525 BCM and 181 BCM respectively[2] (Reddy, M. S. et al. 2002).

These river systems are not only rich in land and water resources but also rich in ancient civilizations on fertile agricultural flood plains. About 10 percent of the world's population (over half a billion people) lives in the IGBM basins. With agriculture forming the basis for the livelihood of most of the people living in the area, enormous potential for irrigation development exists. Endemic poverty and high population growth characterize the basin area. Table 5 presents some socio-economic indicators of the South Asian countries, with their irrigation and hydropower potential.

Table 5: Socio-economic indicators, and projected water demand/availability in the South Asian countries

Country	Population		Per capita GDP at 2001 (US$)	Projected water (in BMC)		
	Density Person per km^2 (at 2001)	Growth Rate (%) (1990-2001)		Demand up to 2025	Availability	Surplus/ Deficit
Bangladesh	1025	1.8	370	48	1181	(+) 1133
India	348	1.8	460	1060	1086	(+) 26
Nepal	165	2.4	250	40	232	(+) 192
Pakistan	183	2.5	420	335	236	(-) 102

Source: World Bank (2003) and Reddy et. al. (2002).

At present, irrigation is the main consumer of water. With the rapid industrialization and urbanization of the South Asian countries and the implementation of several poverty alleviation programs, water demands for domestic, industrial and hydropower needs are also increasing rapidly. Increasing population and growing concern about the environment have further aggravated the situation. As a result, there is growing tension between the countries in sharing water from the international rivers, especially during periods of lean flows. In this respect, river basin planning and management with due consideration of potential environmental impacts is of concern to the riparian countries in the IGBM basin.

[2] The indicated flow of the Indus is for the Pakistani part.

As noted above, from the perspective of water sharing, the Indus and Ganges (Ganges) river systems are the concern of this Report where international treaties and agreements have manifold prospects and problems. The Indus river system has rivers in India and Pakistan, which include the Indus, Jhelum, Chenab, Sutlej, Ravi, and Beas rivers. The Indus Waters Treaty of 1960 covers these six rivers. Similarly, the Ganges flows through the territories of Nepal, India and Bangladesh and has several tributaries. Four of the tributaries, namely Koshi, Gandak, Karnali (Ghagra) and Mahakali, which cross the Indo-Nepal boarder, are discussed in this Report. Although about 14 per cent of the catchments area of the Ganges lies in Nepal, the contribution of the Nepalese rivers to the Ganges is about 45 per cent of the average annual flows and over 70 per cent of the Ganges lean flow (WECS, 2002). The Indo-Nepal treaties cover all these rivers except the river Karnali. The 1996 Indo-Bangladesh treaty focuses on the lower end of the Ganges after all the tributaries join to form a single river.

The origin of the Indus lies on the Tibetan Plateau whereas the Ganges originates in the High Himalayas in India and Nepal[3]. The drainage outlets of these river systems are different. The Indus, after flowing through India and Pakistan drains into the Arabian Sea near Karachi, while the Ganges joins the Brahmaputra in South Bangladesh before draining into the Bay of Bengal. **Figures 9 and 10** present the layout of the Indus and the GBM river systems respectively. The river basins of the individual countries are shown in **Figure 3-6** in Section I. **Figure 11** shows the catchment areas of the tributaries of the Ganges shared by India, Nepal, and China.

The climate of the upper Indus basin is transitional between that of central Asia and the monsoon climate of South Asia, and is characterized by low overall rainfall, large variations in temperature and low winter temperatures. The mean annual rainfall is as low as 100 mm in the upper Indus basin (Alford, 1992), increasing as the river descends from the Himalayas. The climate of the Ganges basin is largely conditioned by the southwest monsoon originating from the Bay of Bengal. The mean annual rainfall decreases towards westerly direction from about 3000 mm in the coastal area of Bay of Bengal to about 350 mm in the west (Pun, 2001). Similarly, the upper Brahmaputra River basin also receives low annual rainfall of about 50 mm, which gradually increases to 3000 mm per year in the eastern states of India. Cherapunji in India, where the world's highest rainfall occurs, is also located in this basin. It has an average annual rainfall of about 11,615 mm (Bandhyopadhyay and Gyawali, 1994). In the IGB basin areas, about 80 per cent of the average annual rainfall occurs between June and September.

[3] These rivers are perennial feeding both by monsoon rainfall and snowmelt. The numerous glaciers located in the headwater of these rivers contribute significantly to their runoff. The Karakoram Range of the Himalayas in the upper Indus basin has one of the longest glaciers outside the Polar Regions (Alford, 1992). The glaciers of Tamor and Dudh Koshi Rivers in Nepal (tributaries of Koshi) also contribute significantly to the runoff of the Koshi River, which in turn contributes to the runoff of the Ganges.

All the IGBM river systems exhibit a remarkable temporal and spatial variation in the availability of water. The distribution of river flow is uneven over time and space, and the hydrology of these rivers follows the rainfall pattern. About 80 percent of the total annual flow occurs during the four months between June and September, with 20 percent occurring during the remaining months. This results in an alternative cycle scenario of excess and scarcity. **Figure 12** presents average monthly hydrographs of some of these rivers.

Such a wide temporal and spatial variation in the availability of water in the IGBM basin provides several prospects and problems for water resource developments between co-basin countries. In the monsoon period (June to September), surface water is abundant and prone to floods in many river plain areas of South Asian countries, especially in Northern India and Bangladesh. Further, in dry months (November to May) water is scarce in most of the region. The trend towards an increase in fresh water demand and decreasing water supply, especially during the dry months, has further aggravated the situation resulting in contradictions in the water sharing provisions for international rivers. It has therefore become essential to evolve an effective mechanism for sharing international waters in the region in order to sustain the people and their environment.

Figure 9:

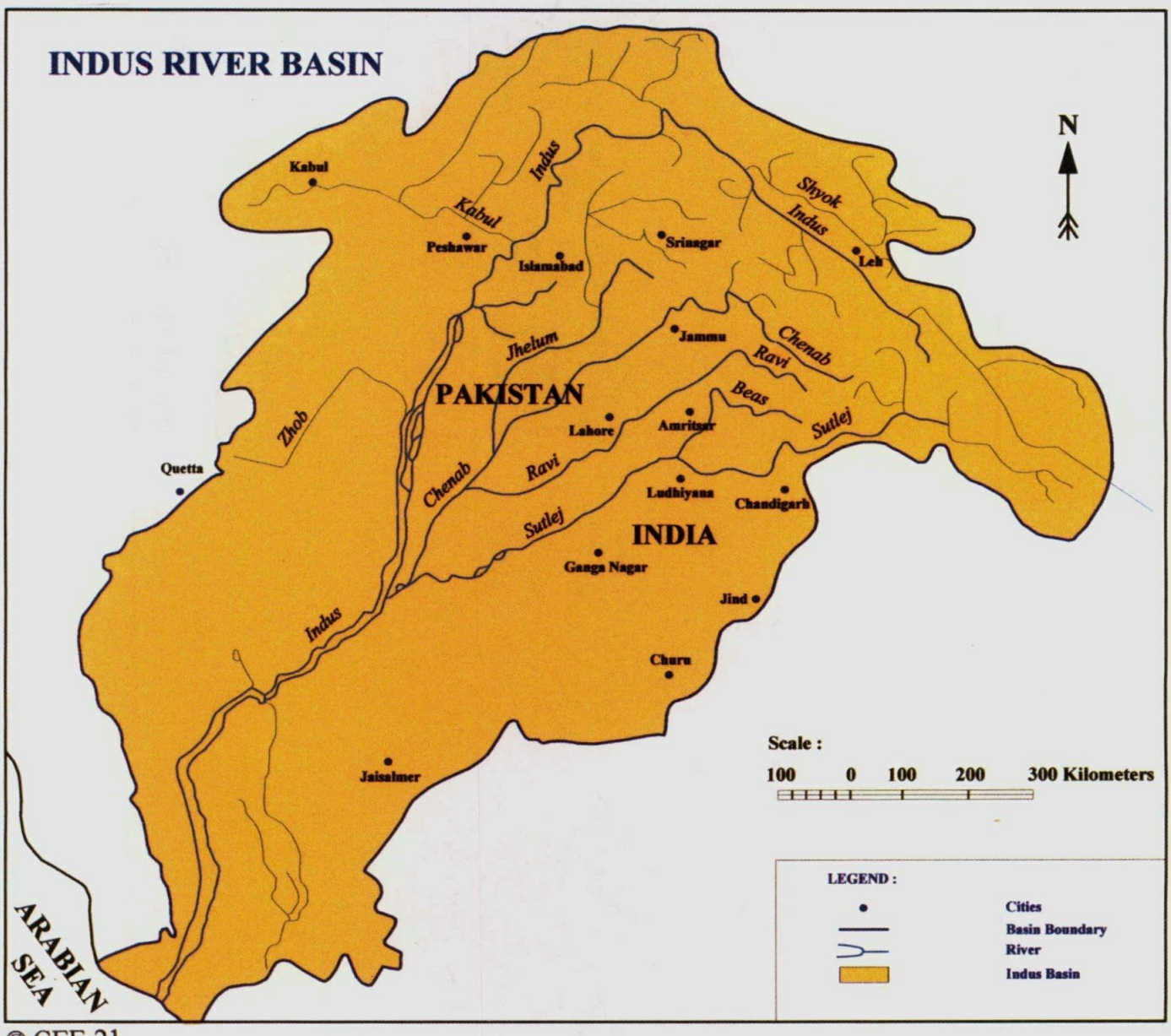

Figure 10:

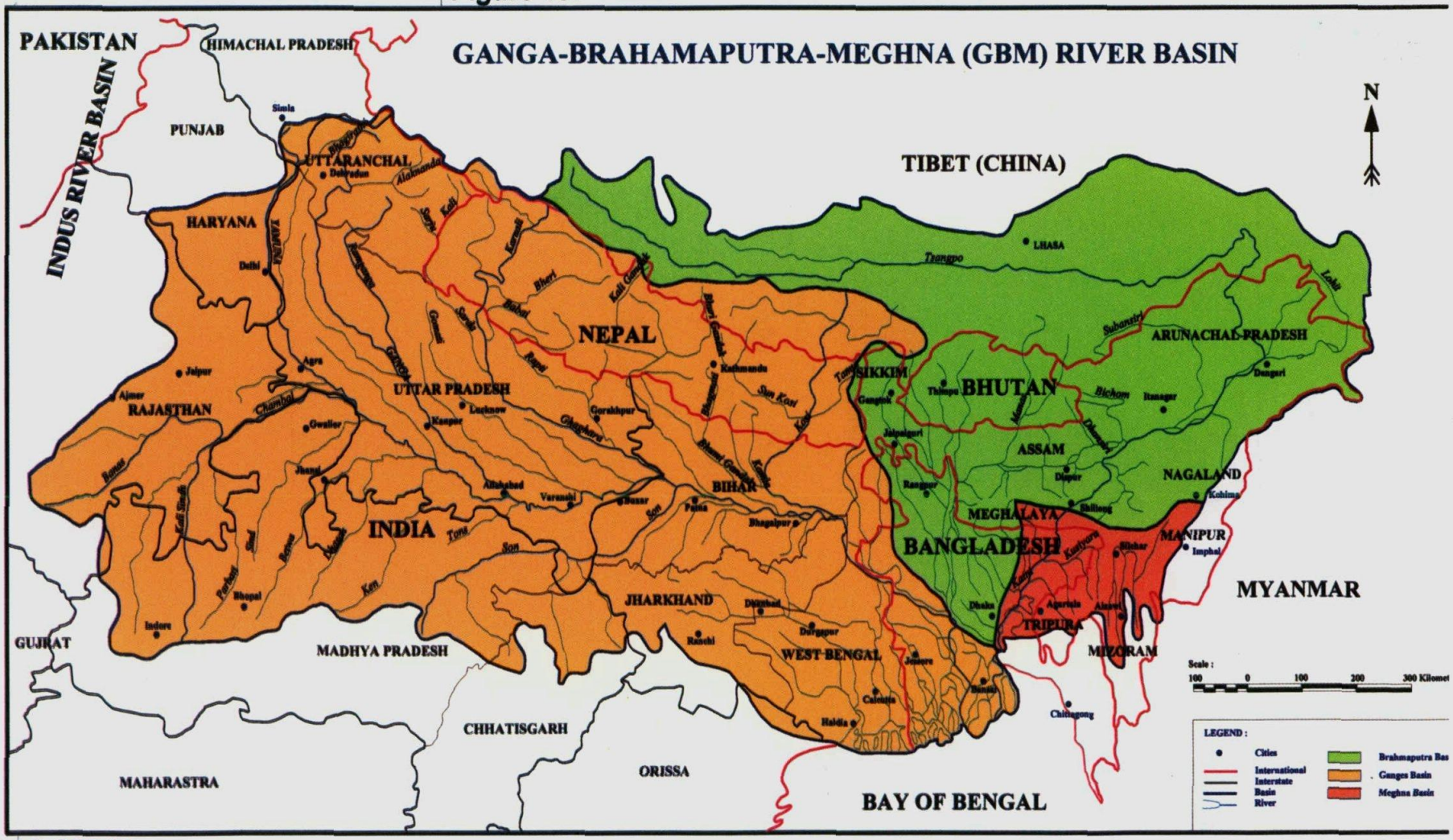

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Figure 11: Catchment areas of the Indo-Nepal rivers (tributaries of Ganges) at the confluence with the Ganges.

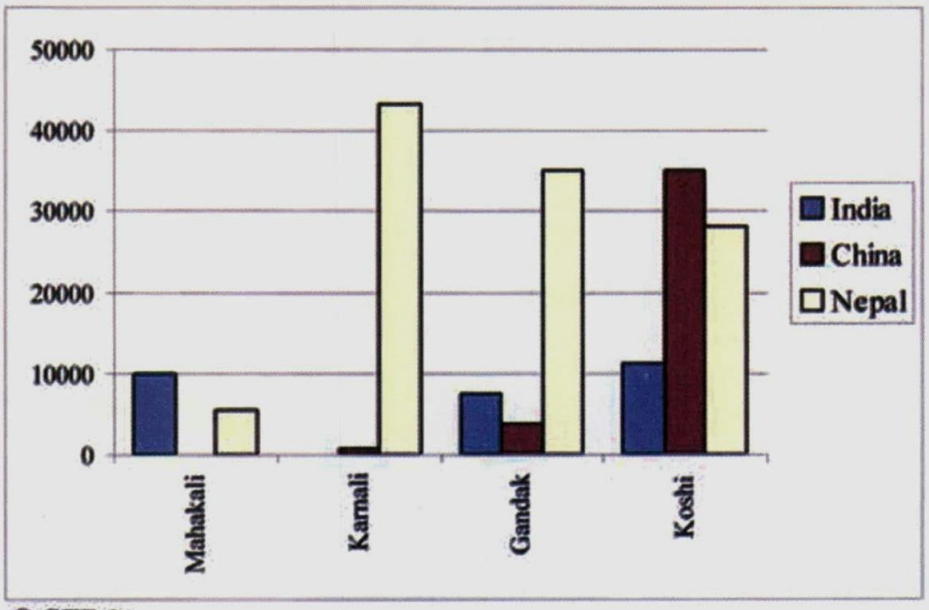
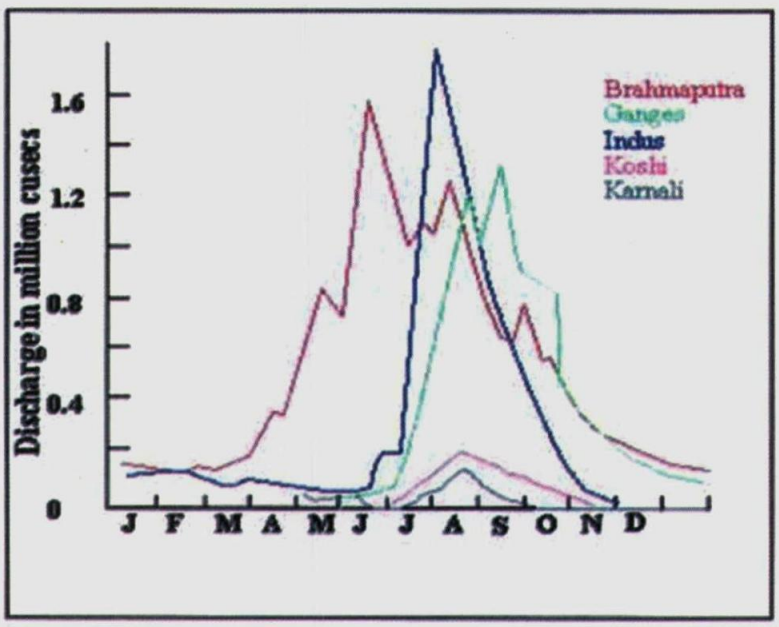


Figure 12: Average monthly discharges of some of the South Asian rivers.



Source: Sharma (1992), as cited by Rao and Prasad (1994).

Figure 13: Schematic layout of the Ganges river system, Farakka Barrage and the Feeder Canal.

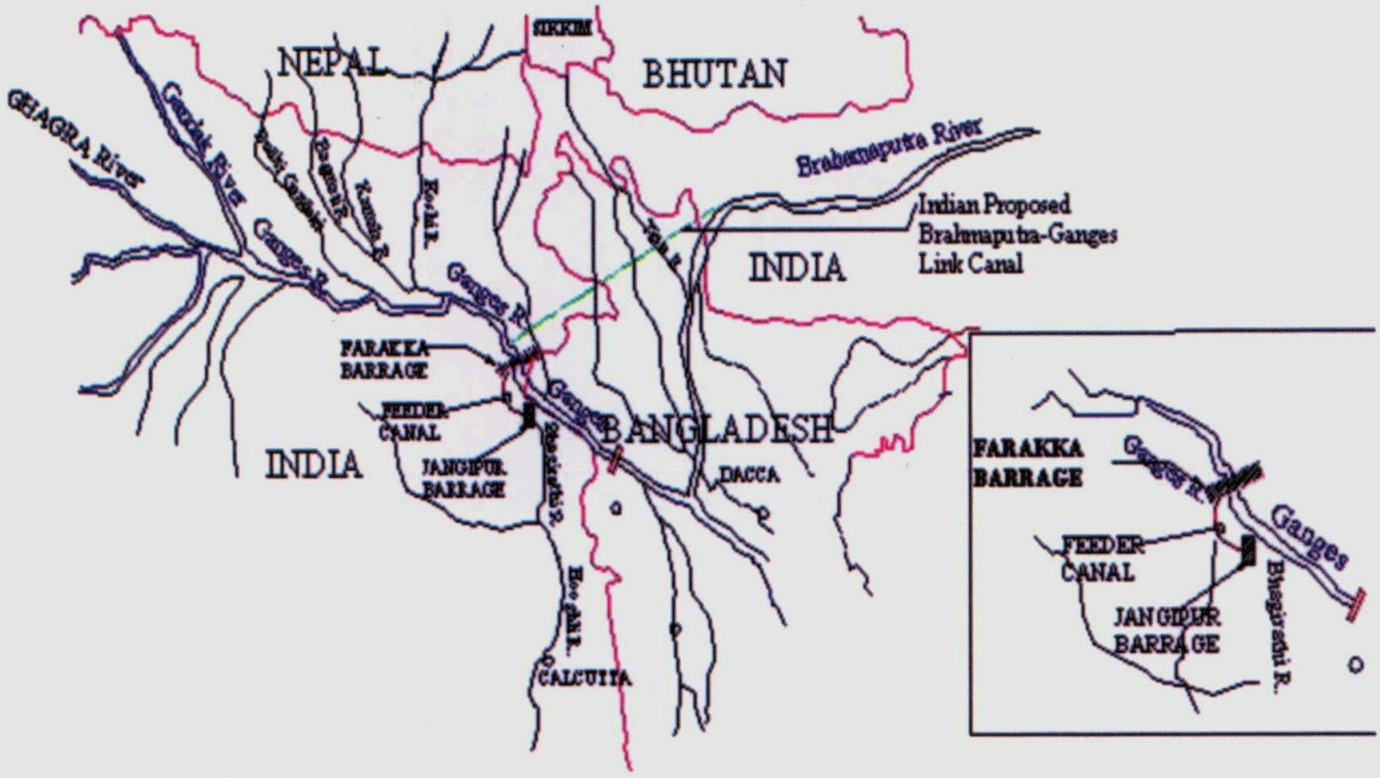


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Figure 14: Mahakali River and the infrastructure developed according to the Indo-Nepal Treaty.

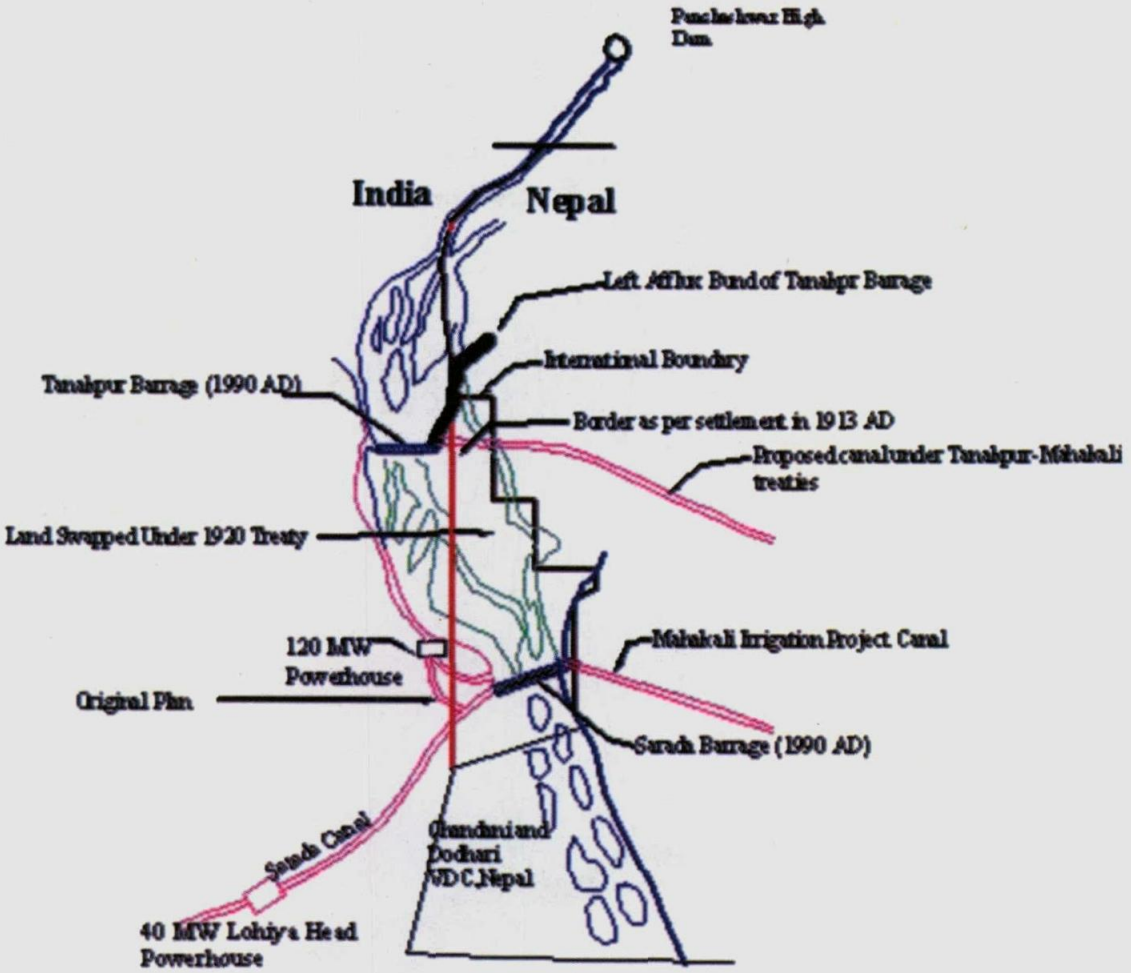

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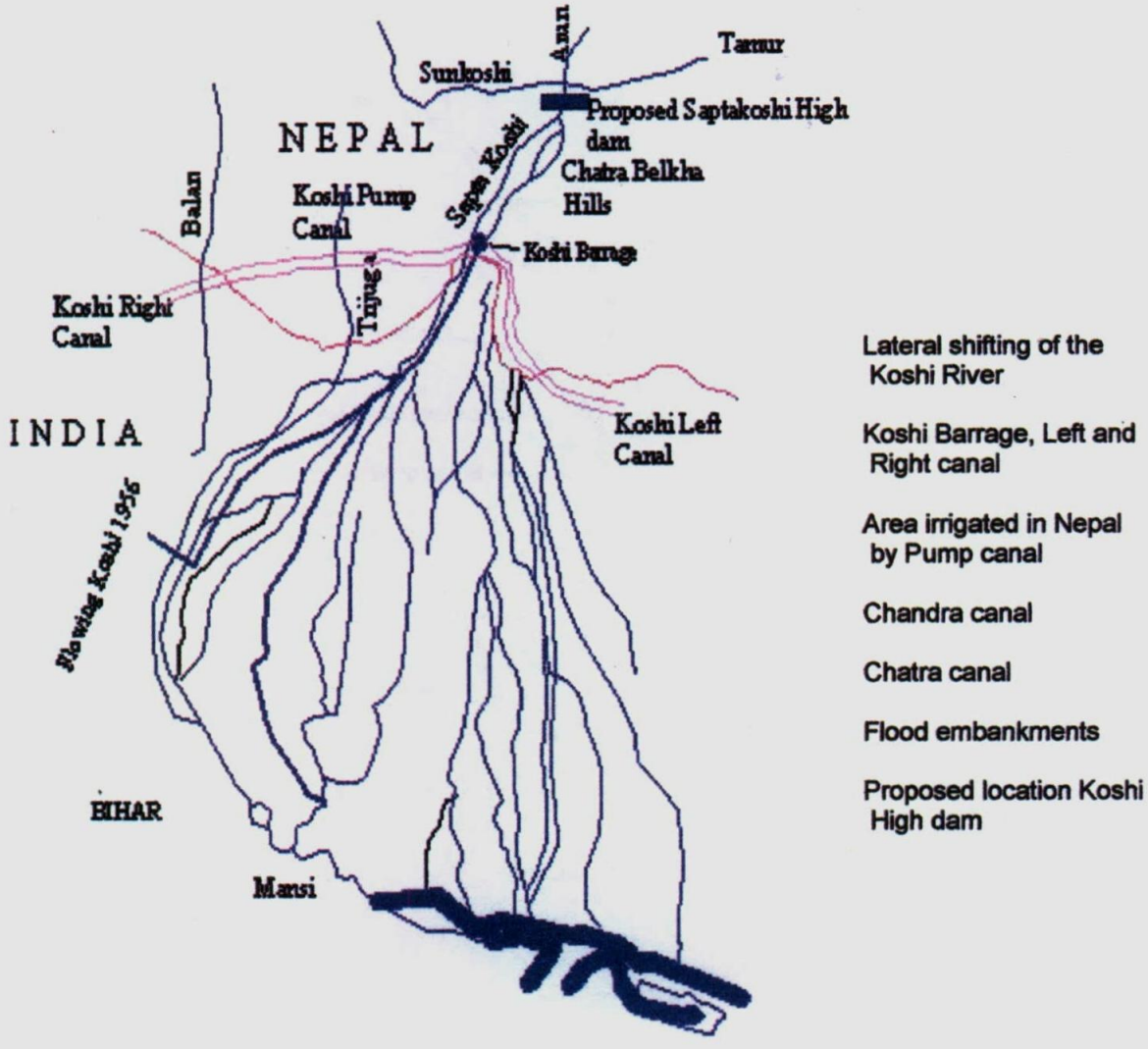
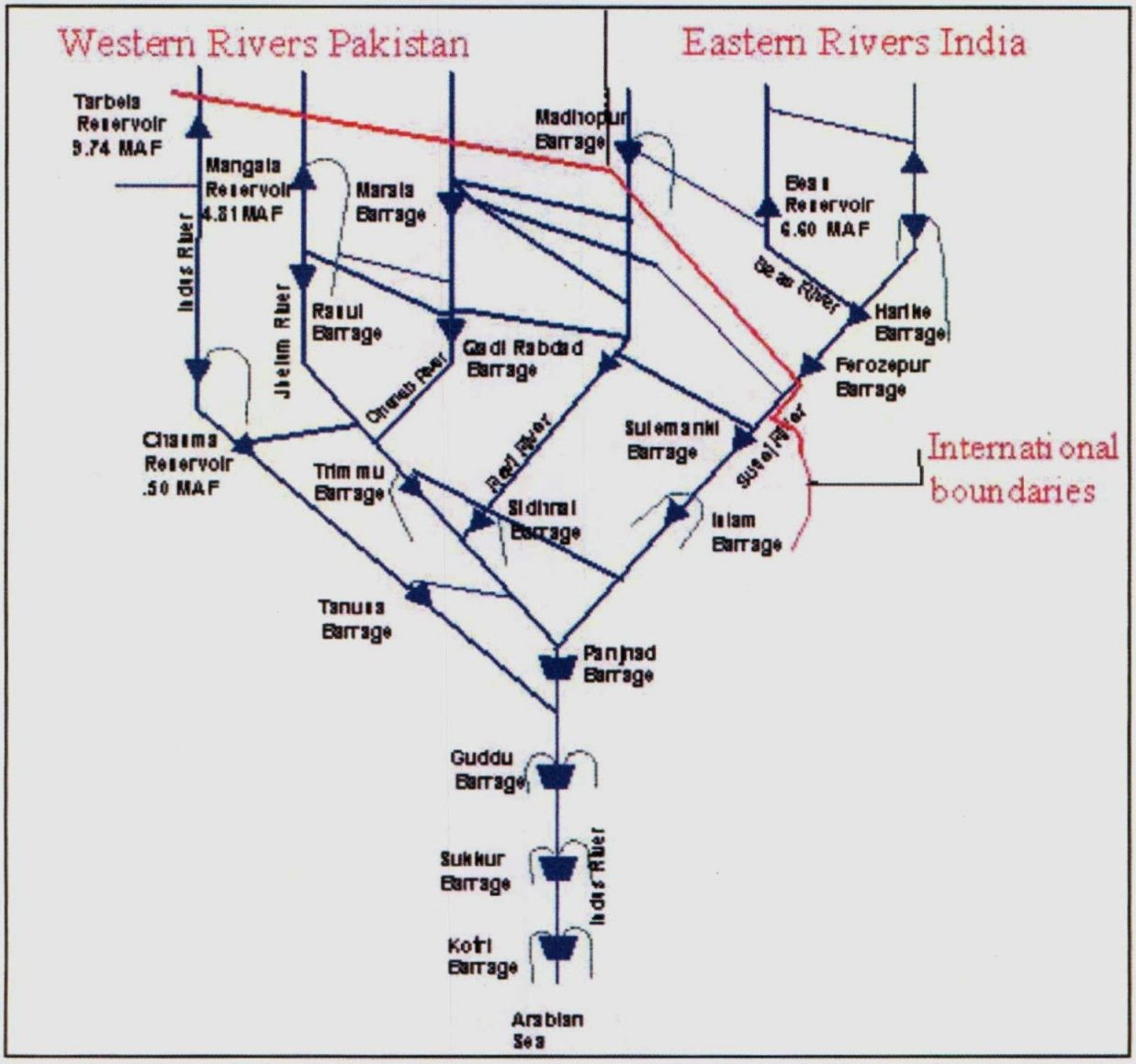
Figure 15: Koshi River and infrastructure developed by Indo-Nepal Agreements



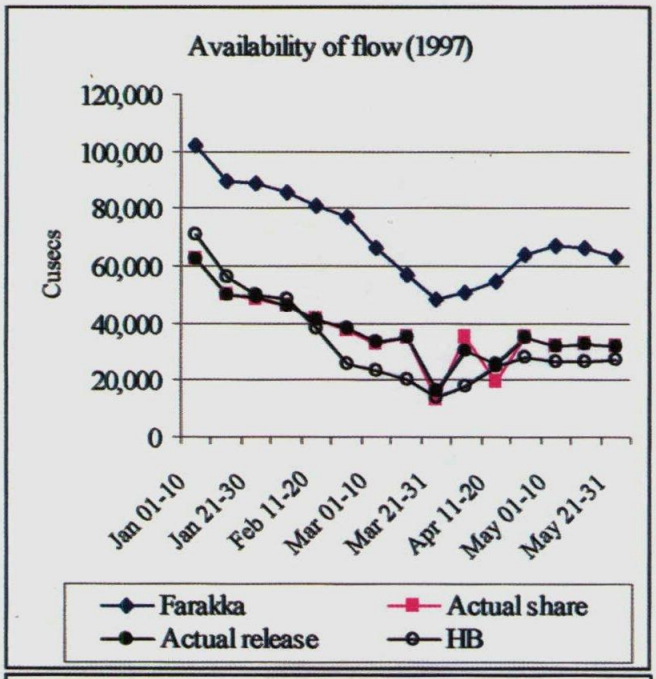
Source: Developed from Rao and Prasad (1994)

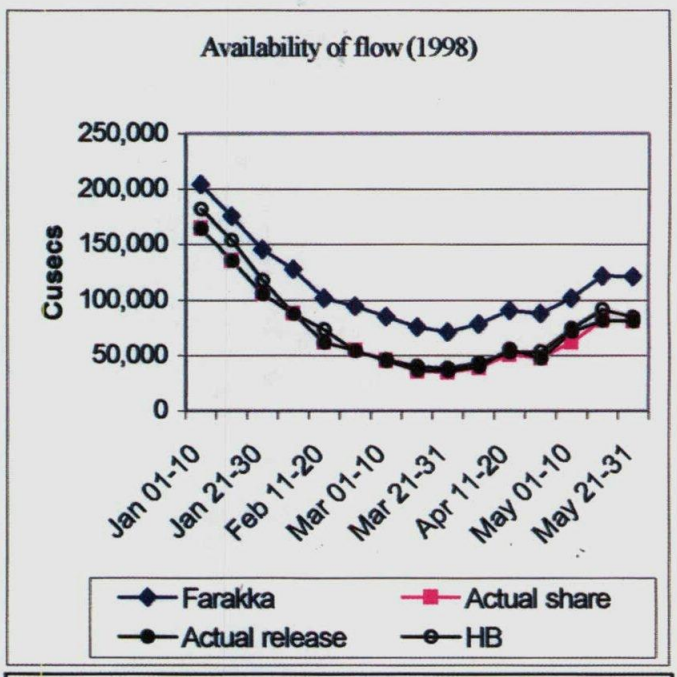
Figure 16: Schematic diagram of the Indus river system

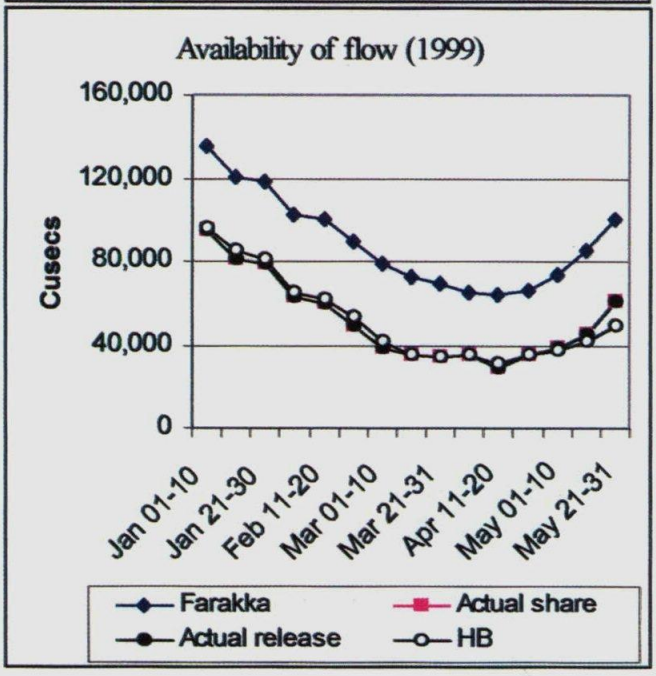


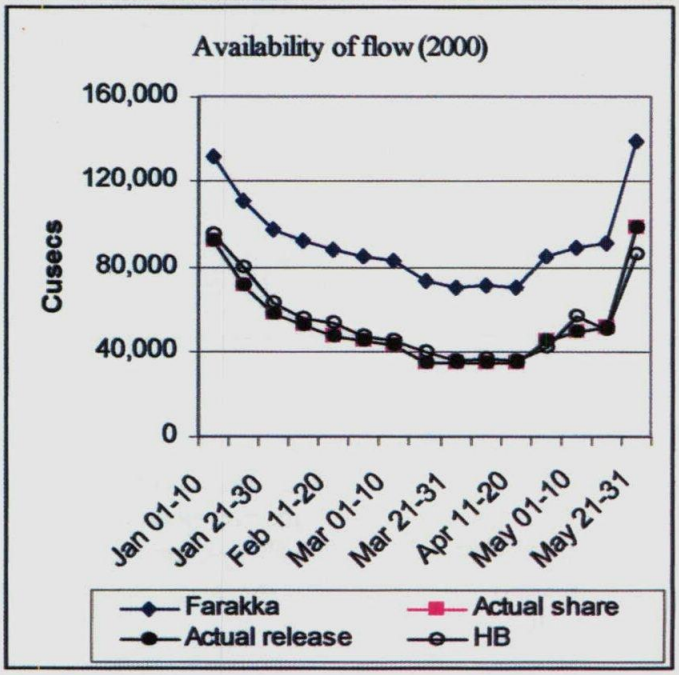
Source: Government of Pakistan, Pakistan Irrigation System
All six rivers, International boundary upstream of Indus, Chenab and Jhelum, Ranbir Canal, Pratap Canal, all systems listed in Table 5.1.
Tarbela and Mangla Dams, 5 Barrages, 1 Siphon and 8 Inter-river link canals as per treaty.

Figure 17: Delivery of water to Bangladesh vs.its share of water specified by the treaty.









Source: BUP (2001)

Figure 18: Schematic layout of the network of canals supplying waters to Narayani and West Gandak Irrigation Systems of Nepal.

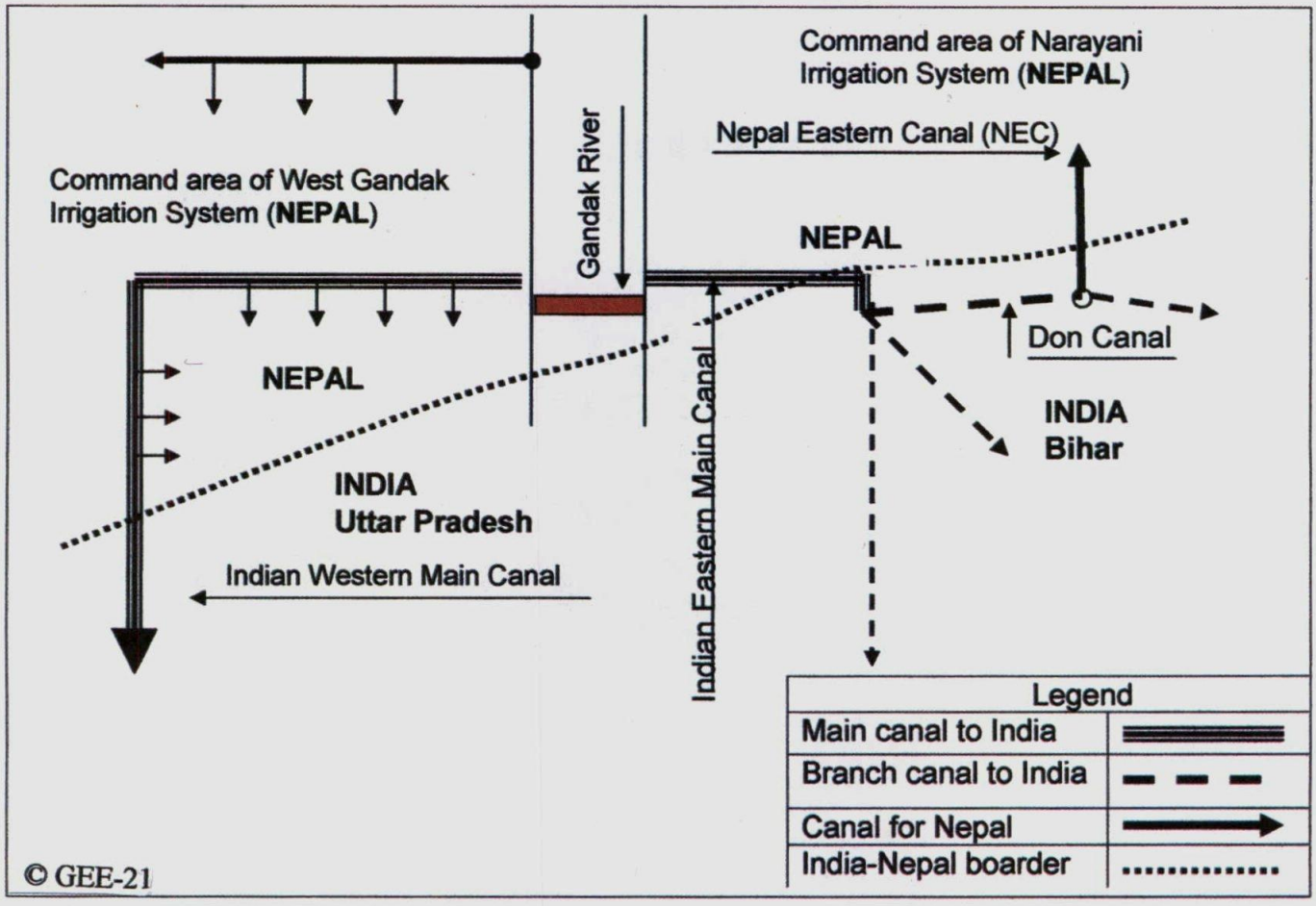
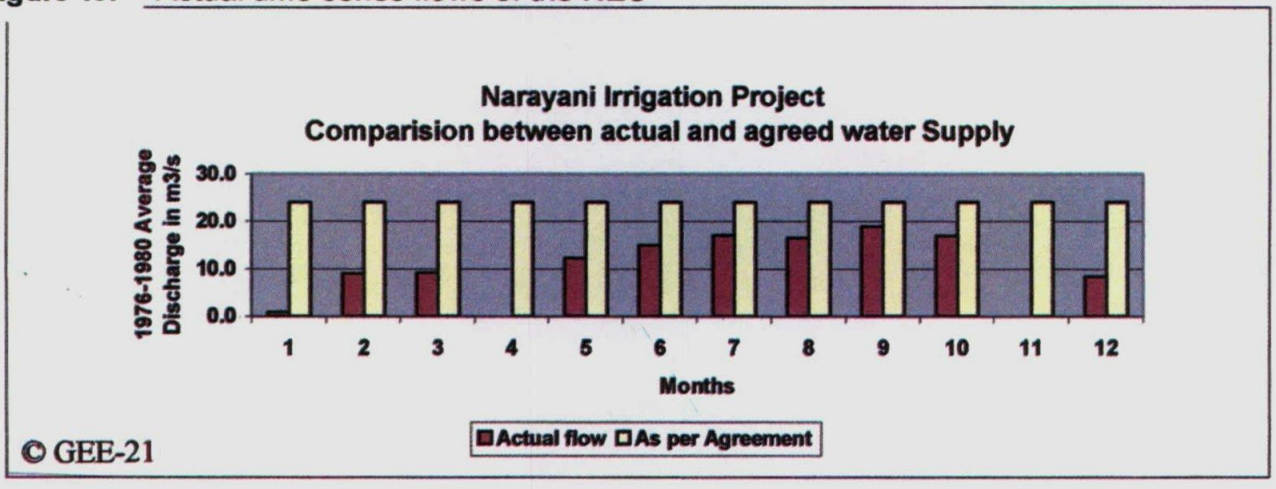
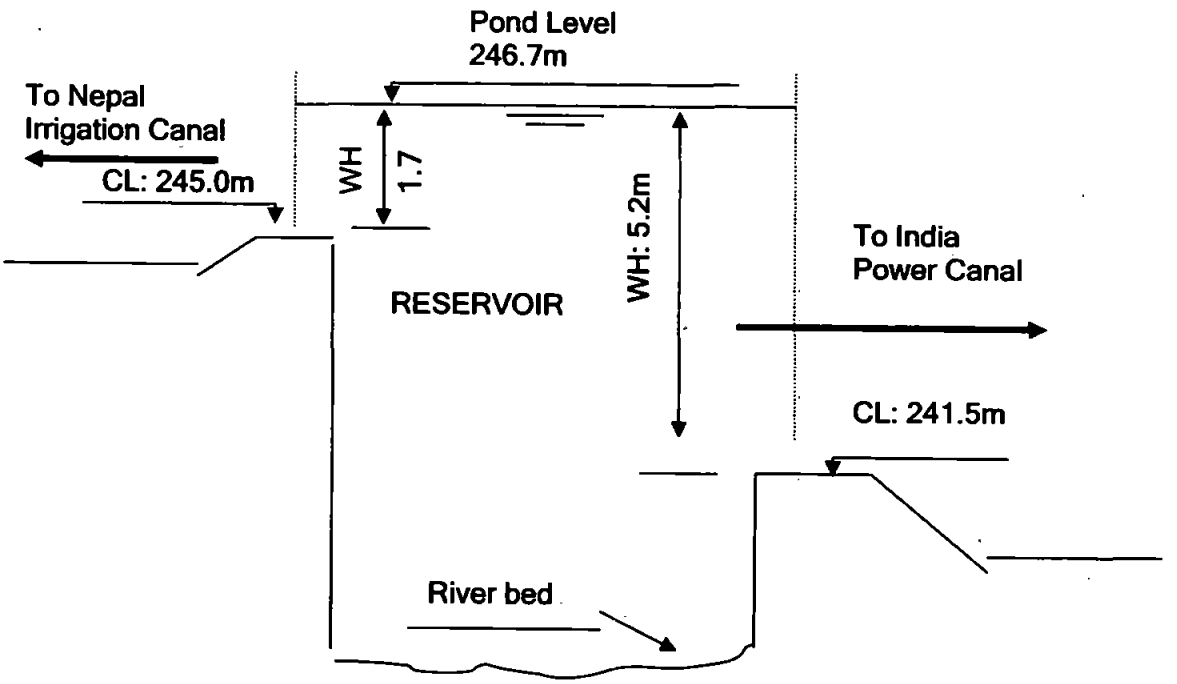


Figure 19: Actual time series flows of the NEC



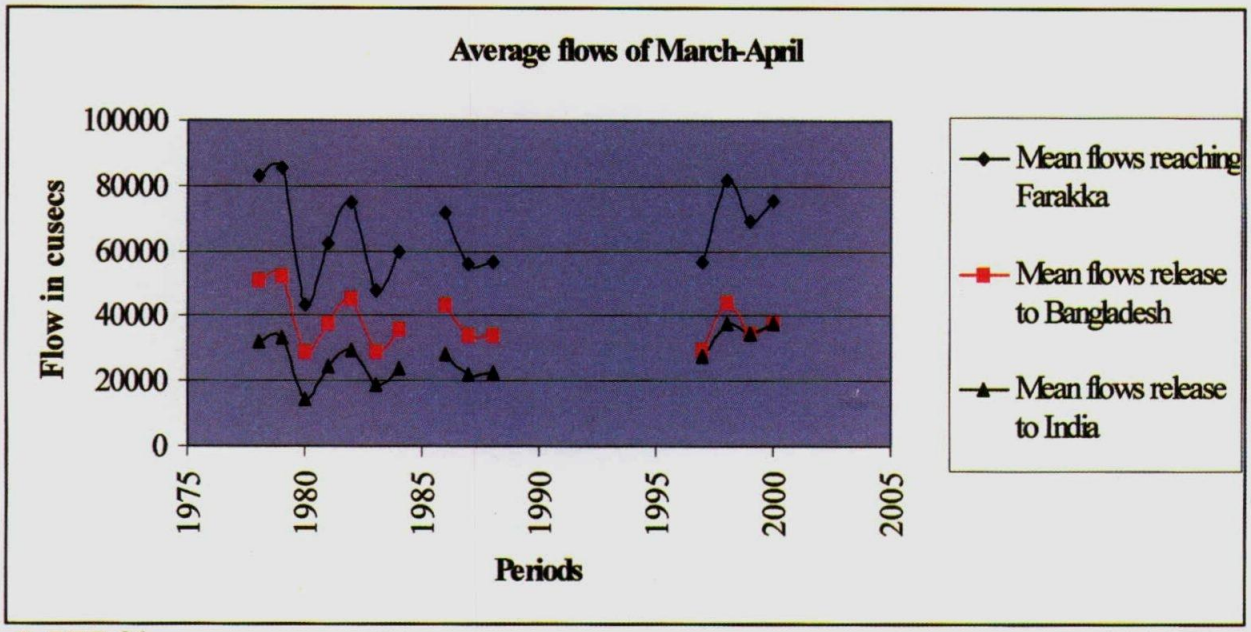
No systematic data are available after 1980.

Figure 20: Section of cross regulator



Note: not to scale
WH refers to water-head
CL refers to crest level

Figure 21: Average flows made available to Bangladesh during March and April



11. The Water Sharing Treaty Between India and Bangladesh

11.1 The Treaty

The only international water treaty that exists between India and Bangladesh is the Ganges Water Sharing Treaty, which was concluded on 12 December 1996. The Ganges is an international river flowing through the territories of the three countries Nepal, India and Bangladesh. This treaty allows for the sharing of water from the Ganges at the Farakka Barrage in India, located about 18 km upstream from the western border of Bangladesh[4]. Prior to this treaty there were several short-term agreements and memoranda of understanding between the two countries for sharing the Ganges waters, which are described in the next section.

Although the preamble to the treaty spells out several other objectives, the treaty only contains provisions for water sharing. However, apart from the water sharing agreement, this treaty enunciates broad policy issues that have a major bearing on future agreements on other international rivers.

As the barrage is located in India, about 18 km. from the border with Bangladesh, India regulates the flow of water through the barrage. However, a joint committee formed by the two governments monitors the implementation of the treaty. Under the treaty, the quantum of water to be released by India to Bangladesh shall be in compliance with the formula presented in Table 6. The sharing of the Ganges waters at Farakka between India and Bangladesh is based on 10-day periods, during the dry season, starting from 1 January to 31 May every year.

Table 6: Formula for sharing the Ganges waters between India and Bangladesh (Annexure - I of the 1996 treaty).

Availability at Farakka	Share of India	Share of Bangladesh
70,000 cusecs or less	50 per cent	50 per cent
70,000-75,000 cusecs	Balance of flow	35,000 cusecs
75,000 cusecs or more	40,000 cusecs	Balance of flow

1 cusec = 1 cubic foot per second; 1 cumec= 31.3147 cusecs of flow.

India and Bangladesh are each guaranteed to receive 35,000 cusecs of water in alternate three 10 day periods during the period March 11 to May 10, as indicated in Annexure II of the Treaty. This means that Bangladesh shall receive the guaranteed amount of water

[4] Until 18 km downstream of the Farakka Barrage, the Ganges flows through West Bengal (Indian territory), after which the Ganges forms the international boundary between India and Bangladesh for nearly 140 km and then enters into Bangladesh.

during March 11-20, April 1-10 and April 21-30, while India shall receive the same amount during the periods March 21-31, April 11-20 and May 1-10.

The main features of the treaty, as agreed to by both countries are as follows:

Article – II

i) The sharing between India and Bangladesh of the Ganges/Ganges waters at Farakka by ten day periods from the 1st January to the 31st May every year will be with reference to the formula at Annexure I and an indicative schedule giving the implications of the sharing arrangement under Annexure I is at Annexure II.

ii) The indicative schedule at Annexure II, as referred to in sub para (i) above, is based on 40 years (1949-1988) 10-day period average availability of water at Farakka. Every effort would be made by the upper riparian to protect flows of water at Farakka as in the 40 years average availability as mentioned above.

iii) In the event flow at Farakka falls below 50,000 cusecs in any 10-day period, the two Governments will enter into immediate consultations to make adjustments on an emergency basis, in accordance with the principles of equity, fair play, and no harm to either party.

Article - III

The waters released to Bangladesh at Farakka under Article I shall not be reduced below Farakka except for reasonable uses of waters, not exceeding 200 cusecs, by India between Farakka and the point on the Ganges/Ganges where both its banks are in Bangladesh.

Article - VIII

The two Governments recognize the need to cooperate with each other in finding a solution to the long-term problem of augmenting the flows of the Ganges/Ganges during the dry season.

Article - IX

Guided by the principles of equity, fairness and no harm to either party, both the Governments agree to conclude water sharing Treaties/Agreements with regard to other common rivers.

Article - XII

This Treaty shall enter into force upon signature and shall remain in force for a period of thirty years and it shall be renewable on the basis of mutual consent.

The treaty has incorporated an indicative schedule giving the implications of the sharing arrangement as given in Annexure II of the treaty. It has also been stated that in case the flow at Farakka falls below 50,000 cusecs in any 10-day period, the two governments

would enter into immediate consultations to make adjustments on an emergency basis. This will be done in accordance with the principles of equity, fair play and no harm to either party.

11.2 History and factors leading to the treaty

The Ganges water sharing conflict began shortly after the partitioning of India in 1947. It started with the Indian media coverage of India's plan to construct the Farakka Barrage in the Ganges, which became known to the then Pakistan government in 1951. The declared purpose of the barrage was to divert 40,000 cusecs of water from the Ganges into the Bhagirathi - Hooghly[5] River through a 38.3 km long feeder canal (**Figure 13**).

This diversion was required mainly during the dry season, presumably in order to improve the navigability of the Calcutta port and to combat salinity in the greater Calcutta area from tidal ingress[6].

Bangladesh Perspectives
In October 1951, Pakistan expressed its concern about the barrage and requested prior consultation on the grounds that the lower riparian (East Pakistan) was a stakeholder in any upstream water utilization scheme. Six months later, India replied that the project was only under preliminary investigation and brushed off Pakistan's apprehensions by calling them 'purely hypothetical'.

During the period between 1951 and 1970, a series of negotiations were held at political, bureaucratic and technical levels between Pakistan and India about the proposed construction of the Farakka Barrage. In this context, Pakistan tried several approaches to reach some concrete agreements including cooperative ventures, negotiations at higher levels, as well as involving the assistance of a third party like UNO (Crow, 1995). But the negotiations were fruitless.

Pakistan's apprehensions were further heightened when, in March 1956, India repudiated the Barcelona Convention and Statute of 1921 on the regime of navigable waterways of international concern. Pakistan regarded this move as a signal by India to proceed with

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[5] Bhagirathi River is a bifurcating branch (distributary) of the Ganges, which takes off from its right bank at about 40 km downstream of the Farakka barrage. In the lower reaches, near the Calcutta city, it is known as Hooghly River.

[6] In those days, it was believed that the Hooghly River was silting up, jeopardizing normal operation of the Calcutta Port. Diversion of water from the Ganges at Farakka into the Bhagirathi-Hooghly was identified as one of the solutions to improve its navigability. However, its efficacy in solving the problem of siltation has never been free from differences of opinion (Crow, 1995). In this context, BUP (2001) presents the opinions of several other experts regarding the proposed diversion of the Ganges water and the Calcutta Port problem.

the construction of the Farakka barrage in the Ganges since the said convention explicitly required each riparian state to refrain from all measures likely to prejudice the navigability of the waterways' (Abbas, 1984).

In the meantime, India and Pakistan were negotiating the Indus water sharing treaty, which was signed by both the countries in September 1960. Shortly after this, in 1961, India formally informed Pakistan that the Farakka Barrage project was being launched. Although the 'dialogues' on the proposed Farakka Barrage were continuing, construction of the barrage (without feeder canal) was completed in 1970 without any agreed understanding between the two countries.

With Bangladesh becoming an independent nation in 1971, while accepting the *'fait accompli'* of the Farakka barrage, the two nations decided to agree to a sharing arrangement of flows of the lean season duly recognizing the shortage of the lean season flows to meet the needs of both the countries. Accordingly, in March 1972, a friendship treaty was signed between the Prime Ministers of both the countries. This friendship treaty spelled out the need of a Joint River Commission (JRC) that was then established in November 1972, with an objective of maximizing benefit from the common rivers.

Even after the establishment of the JRC and despite several levels of negotiations, the water sharing issues concerning Farakka could not be resolved. It was only in May 1974 that a joint declaration signed by both the Prime Ministers at New Delhi expressed their determination of resolving water sharing issue at Farakka before the commissioning of the Farakka Barrage project. Further, as the available lean flow at Farakka was not enough to meet the water demands of the two countries, both the Prime Ministers recognized the need for the augmentation of flow in the Ganges. Accordingly, direction was given to JRC to examine the issue of flow augmentation.

Meanwhile, the construction of the feeder canal from the Farakka Barrage to the Bhagirathi River was completed, and the barrage was ready for commissioning. Despite the fact that a water sharing agreement had not been reached, India requested Bangladesh to allow for an experimental operation at the Farakka Barrage project. In April 1975, Bangladesh allowed India to test run the experimental operation at the Farakka Barrage and the feeder canal for a period of 41 days, starting from April 21 to May 31, 1975.

After the experimental operation of the barrage, India continued to withdraw waters from the Ganges to the feeder canal's full capacity even during the dry season of 1976. As a result, during the lean period, the availability of water in Ganges at Hardinge Bridge (in Bangladesh) decreased to about 23,200 cusecs from the pre-Farakka flows of around 65,000 cusecs. This created a water-deficit problem that adversely impacted a number of sectors in the Ganges Dependent Area (GDA) of Bangladesh[7]. The Government of India,

[7] The impacts of water withdrawal in the Ganges which precipitated the degradation process in southwestern Bangladesh may be grouped into two broad categories: (a) salinity increase in soil and water (surface and ground) from tidal ingress, and (b) accelerated channel siltation producing hydromorphological changes. In specific

however, denied or minimized the extent and gravity of such damage (Bandhyopadhyay, 1995). The Indian perspective on this issue is presented at the end of this sub-section.

India's action of withdrawal of Ganges waters in 1976 was 'unilateral'. In 1976, the Government of Bangladesh took the water sharing issue to several international fora including the United Nations General Assembly[8]. The UN responded to Bangladesh's case with an ambivalent consensus statement (26 September 1976) urging both parties to negotiate, while recognizing that 'the situation called for an urgent solution'.

Short-term water sharing arrangements

Finally, after a series of bilateral negotiations, both the countries entered into a five-year agreement on the sharing of the Ganges Water at Farakka in November 1977. The 1977 agreement fixed the quantum of water to be released to Bangladesh at Farakka for the dry season (January 1 to May 31) according to a sharing schedule on a 10-day basis. Bangladesh was to receive at least 34,500 cusecs of water (about 60 percent of the Ganges flow at Farakka).

As noted above, the sharing of the Ganges water during the dry season was not a permanent solution, which required augmentations of the Ganges dry season flow. The 1977 agreement recognized the need for this augmentation, and provided a time frame of three years for finalization of all augmentation proposals. Recognition of the need for flow augmentation within a defined time was considered an important aspect of the 1977 agreement. In this context, the agreement also contained two side letters that allowed both countries to include any scheme or schemes for building storage in Nepal for flow augmentation.

In the course of preparing proposals for flow augmentation both Bangladesh and India had different perceptions. Bangladesh felt that the total water requirements of the entire Ganges basin could be met from the resources available within the basin itself. India, however, proposed to transfer waters from the Brahmaputra to upstream of Farakka at the Ganges. Both Bangladesh and India disapproved of one another's proposals. The reasons

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terms, the manifestations of reduced water flow can be outlined with reference to such sectors as salinity, groundwater, agriculture, forestry, fishery, inland navigation, channel morphology, and public health (GoB, 1976; Asafuddowlah, 1994; Begum, 1987; Crow, 1995; and Rasheed, 1994).

[8] In March 1977, Bangladesh raised its water sharing issue in the UN Water Conference held at Mar del Plata, Argentina. On the legitimate concern of lower riparian regarding the water utilization by upper riparian, the conference participants were divided according to their geographical location of the respective river basins, and thus, the moral issues of equitable apportionment and 'no-injury to the lower riparian' were lost. The end result was a diluted resolution with vague promises of protecting lower riparian' interests (Abbas, 1984).

are discussed in the next section. As the obligation for the flow augmentation scheme was not fulfilled, the 1977 agreement expired in 1982.

During the period between 1982 and 1988, Bangladesh and India entered into a short-term water sharing arrangement through the signing of Memoranda of Understanding (MOUs) - once for a period of two-years (1983-1984), and another for three years (1986-1988). The MOUs expired in 1988. These short-term agreements as well as accompanying negotiations reiterated the need for linking augmentation with water sharing arrangements.

From 1989 onwards, India continued withdrawing water from the Ganges without any mutual agreements. Meanwhile, Bangladesh continued to urge India for a long-term sharing agreement as conditions in the Ganges Dependent Areas in Bangladesh started to become critical due to upstream diversion. Ahmad *et. al.* (1994) noted that in March 1993 the situation intensified when the Ganges flow came down to about 9,218 cusec (261 cumec). To cope with the situation, several levels of negotiations took place between the two countries to arrive at a permanent water sharing arrangement at Farakka, which was followed by meetings between the two Prime Ministers in 1992 and 1993. However, differences of understanding persisted and the four-decade long impasse continued. As a result, Bangladesh was unable to establish any comprehensive water resource development programs in her Ganges Dependent Areas due to the absence of a guaranteed quantum of water in the river.

In June 1996 a new government came into power in Bangladesh. It recognized the gravity of the situation and accorded a top priority to concluding a long-term agreement with India for sharing the Ganges waters. After negotiations at various levels, an agreement was reached and the Prime Ministers of Bangladesh and India signed a treaty on 12 December 1996 for sharing the Ganges waters for a period of thirty years. Bangladesh viewed this treaty as an opportunity for opening up the development of the country's water resources.

Indian Perspective

The environmental degradation complained of in southwest Bangladesh has little to do with Indian diversions at Farakka, which marks the apex of the Ganges delta. The entire Ganges system has witnessed a secular shift eastwards for over a century and more, a morphological change resulting in the progressive siltation of successive deltaic channels starting with the Bhagirathi-Hooghly, the westernmost arm of the river on which Calcutta stands.

By the early 1950s, Gorai flows through SW Bangladesh had begun to suffer the same fate. As established by Bangladesh's own records, the river would be cut off and find itself left high and dry variously between November and February, depending on the hydrology of the Ganges.

The Farakka diversions only commenced in 1975. Bangladesh was certainly justified in demanding a firm Ganges sharing agreement that would enable it to plan its water resources accordingly. However, it was unable to make more than very limited use of Farakka releases on account of the Gorai hump, a 30 km long and five-meter high silt plug at its offtake. After the signing of the Ganges Treaty, Bangladesh secured Dutch assistance to dredge a massive Gorai cut to resuscitate this moribund river. With only partial success attending this effort, Bangladesh has mooted a Farakka-type Ganges Barrage at Panghsa to pond the river and force supplies into the Gorai throughout the lean season.

Other issues remain. All of these can be solved with a modicum of accommodation and trust on both sides. Past mistrust should not be permitted to cloud future cooperation.

11.3 Institutional arrangements for implementing the treaty

The 1996 Indo-Bangladesh treaty on sharing of Ganges waters at Farakka incorporated the following institutional arrangements for implementation:

- A Joint Committee consisting of nominated representatives from the two governments in equal number shall be constituted. The Joint Committee shall set up suitable teams at Farakka to monitor the daily flows below the Farakka Barrage, in the Feeder Canal and in the navigation lock, as well as at the Hardinge Bridge;

- The Joint Committee shall decide its own procedure and method of functioning;

- The Joint Committee shall submit to the two Governments all data collected by it and shall also submit a yearly report to both the Governments. Following submissions of the reports, the two Governments will meet at appropriate levels to decide upon further actions as may be needed.

In pursuance of the above arrangement, a Joint Committee comprising of 3 members from each side has been constituted. This Joint Committee finalized the procedure and method of its functioning for joint inspection and monitoring of the sharing of the Ganges waters at Farakka. The Joint Committee created detailed guidelines for functioning of the joint observation team at Farakka and at Hardinge Bridge, the measurement site of the Ganges in Bangladesh.

The Joint Committee also adopted a procedure for sharing the Ganges waters at Farakka at all the points, which included daily reports by the team at Farakka (wherein the sharing mechanism has been worked out) as well as daily water level records at Farakka at different points. The Committee also finalized procedures for setting up Teams at Farakka and Hardinge Bridge for joint observations during the period 1 January to 31 May.

According to the procedure, each side will have one set of basic data from Farakka and the Hardinge Bridge. During the joint observations, the measurement sheets are signed by the team leaders from both sides of the joint observation team stationed at Farakka as well as at Hardinge Bridge.

At the end of each year, the joint committee meets to finalize the annual report for the period from 1 January to 31 May. This report is submitted to both the Governments. Both the committees retain one set each of the authenticated basic data.

Monitoring arrangement

Monitoring the implementation of the sharing arrangements at Farakka, as well as observations at Hardinge Bridge, is the responsibility of the Joint Committee. The Committee visits the sites at Farakka and Hardinge Bridge and holds a number of meetings as required for the purpose of monitoring the water sharing arrangements.

Dispute settlement

The Joint Committee is responsible for implementing the arrangements contained in the Treaty and resolving disputes arising out of its implementation. Any difference or dispute arising in this regard, if not resolved by the Joint Committee, shall be referred to the Indo-Bangladesh Joint Rivers Commission. If the dispute still remains unresolved, it shall be referred to the two governments, which shall meet urgently at the appropriate level to resolve it by mutual discussion. A similar arrangement for dispute settlement was also adopted in the 1977 Agreement.

However, there is no provision for arbitration in the Treaty as incorporated under article 11 of the Indo-Nepal Mahakali Integrated Water Resource Development Treaty of 1996 or the Indus Waters Treaty of 1960. In the latest codification, Convention on the Law of the Non-Navigational uses of International Water Courses, as adopted in UN General Assembly, Article 33 provides direction for such dispute settlement.

12. Treaties between Nepal and India

12.1 The Treaties

Since the beginning of the last century Nepal and India have entered into several treaties on the Trans-boundary Rivers with the objective of sharing benefits from the rivers. These treaties include:

- Sarada Agreement (1920) on the Mahakali River (also known as Sarada in India), which is now encompassed by the Mahakali Integrated Development Treaty of 1996;
- Koshi Project Agreement (1954) on the Koshi River;
- Gandak Project and Power Agreement (1959) on the Gandak River.

The Sarada Agreement of 1920, and the Mahakali Integrated Development Treaty of 1996.

Through the exchange of letters dated August 23, 1920 and October 21, 1920, the Sarada agreement between Nepal and British India still regulates the diversion of waters of the Mahakali River exclusively for the purpose of irrigation and power in Uttar Pradesh in India (World Bank, 1987). This agreement allowed India to construct a barrage at her own expense on the Mahakali River, on parts of land that Nepal made available[9]. Earlier, the Mahakali River formed the border between Nepal and India (**Figure 14**).

The main features of the Sarada Agreement are:

- Nepal is to provide 4000 acres of land to India on the left bank (eastern side) of the Mahakali River for the construction of the barrage in exchange for 4000 acres of land located elsewhere and Rupees (Rs.) 50,000 compensation for Nepal;

- During Kharif season (15 May to 15 October), India is to provide 13 m^3/s of water to Nepal from the Sarada Barrage, which could be increased up to 28.34 m^3/s if surplus water is available in the river. During Rabi season (16 October to 14 May) Nepal is to receive 4.25 m^3/s of continuous supply or being alternately closed and opened for 10 days at 8.5 m^3/s whenever the canal is opened.

After this agreement, both the left and right banks of the Mahakali River in the vicinity of the Sarada Barrage belonged to India. Since then, the Mahakali River forms a boundary on major stretches between Nepal and Uttaranchal and Uttar Pradesh States of India.

[9] Before 1920 the Mahakali River was a border river with the left bank in Nepal and the right bank in India. The Sarada Agreement of 1920 transferred ownership of part of the left bank area (in the vicinity of the barrage) from Nepal to India.

Although the treaty specifies Nepal's share of the water, the *quantum* of water that India could draw from the river discharging average annual flow of about 725 m^3/sec (NEDECO, 2001)[10] is not specified. The present right bank canal (also known as Sarada canal) that transports water from the barrage to Utter Pradesh in India has a discharge capacity of about 396 m^3/s (World Bank, 1980). In addition to the irrigation facilities, India also generates hydropower with an installed capacity of 41 MW from this canal. Although the Sarada Agreement was made in 1920, Nepal could not utilize her share of the water until after the construction of the Mahakali Irrigation Project in 1975.

Conflicts between India and Nepal over sharing the benefits of the Mahakali River started shortly after India's unilateral decision in 1983 for the construction of Tanakpur Barrage at about 18km upstream of the Sarada Barrage. Since then, both governments have continued talks and negotiations on the Tanakpur issue. The following have been the main issues of dispute:

- Reservoir submergence of a small area at the border in Nepal territory due to construction of the Tanakpur barrage and power project in Indian Territory;
- Power benefits to be shared equally with additional water allocation for irrigation in Nepal areas from the barrage;
- Equal sharing of water was demanded by Nepal on the basis that the river forms a common border in certain stretches as against equitable sharing suggested by India;
- The prescriptive rights of irrigation established in India, which according to Nepal were to be treated as an additional benefit from the proposed dam;
- Incidental benefits of flood control in India should also be assessed in working out benefits and apportioning the costs of the dam;
- Nepal desired all hydropower projects to be designed as peaking stations and a separate tariff to be worked out for the purpose based on the costs of alternative energy from fossil/nuclear/gas based generation to decide the rate of sale of power to India.

Finally, on 12 February 1996, a treaty was signed between Nepal and India concerning the Integrated Development of the Mahakali River including the Sarada Barrage, Tanakpur Barrage and Pancheshwar Project[11]. Nepal ratified the Mahakali treaty on 20 September 1996, while India ratified it on 27 November 1996. The treaty specified the quantum of water and hydropower that Nepal is to receive from Mahakali River in pre-Pancheshwar scenario. They are as follows:

- From Sarada Barrage
  28.35 cumecs from 15 May to 15 October;

[10] The minimum water available during the dry season in the Mahakali River at the barrage is about 130 m^3/sec (NEDECO, 2001).

[11] The Pancheshwar Project incorporates a storage dam (about 250- 300 meters high) with an installed capacity of 4,000- 6,000 MW of hydropower generation. It is to be constructed about 70 km upstream of the Tanakpur Barrage on the Mahakali River.

4.25 cumecs from 16 October to 14 May;
(10 cumecs of water are to be released in the Mahakali River for the eco-system).

- From Tanakpur Barrage/project
  28.35 cumecs from 15 May to 15 October;
  8.5 cumecs from 16 October to 14 May;
  70 millions kilowatt-hours (unit) of hydropower are to be provided per annum on a continuous basis.
- For Dodhara-Chandani area[12]
  10 cumecs of water for Irrigation purposes

After the Pancheshwar Multipurpose Project, both countries have equal entitlement to the utilization of the water from the Mahakali River without prejudice to their existing consumptive uses. The basic principles ensure that both sides design and operate the project as a single, integrated scheme to yield the maximum total net benefit with costs borne by both parties in proportion to the benefits accruing to them. The power benefits from the Pancheshwar Project shall be assessed on the basis of, inter-alia, saving in costs to the beneficiaries as compared to the relevant alternatives available. In assessing benefits from the project, it has also been specifically stated that this "precludes the claim in any form by either Party on the unutilized portion of the shares of the waters of the Mahakali River of that Party". It is also agreed that the Pancheshwar Multipurpose Project would be developed on the basis of mutual costs and benefit principles to be outlined in a Detailed Project Report (DPR).

The Detailed Project Report for the Pancheshwar Project is under preparation according to the Treaty provisions and it is to be seen as to how the existing irrigation in India would be incorporated and what rate is decided for assessing the net power benefits. Another important aspect in Nepal's case is the approval of the Treaty and any subsequent agreements to build projects by the Nepalese Parliament by a two-thirds majority. While the Treaty has been ratified by Nepal's Parliament, it is to be watched, in view of the high politicization of water issues in Nepal vis-à-vis India, as to how the agreement for construction of the Pancheshwar Project will be worked out. This could well be the test for the future of Indo-Nepal cooperation in the development of Hydropower potential in Nepal.

The Mahakali Treaty provides for a Mahakali River Commission to inspect all structures included in the treaty and to make recommendations to both the countries to take necessary steps to implement the provisions of the treaty. This treaty also provides for the possibility to constitute any project-specific joint entity for the development, execution and operation of new projects including Pancheshwar Multipurpose Project on the Mahakali River. However, the arrangements for such projects are open to future agreement, but they need to be designed and implemented on the principles established by the treaty.

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[12] The Dodhara-Chandani area is located on the right-bank of the Mahakali River adjacent to the Sarada Barrage premises. It is surrounded on three sides by India and the remaining side by the Mahakali River itself (**Figure 9**).

As the Mahakali Treaty covers aspects of broader scope concerning the integrated development of the Mahakali River and stipulates uniform principles to be adopted in future arrangements, it can be considered as a framework treaty versus a water sharing treaty.

The Koshi Project Agreement of 1954

The Koshi Project Agreement was signed between India and Nepal on 25 April 1954 to control the floods and to prevent free oscillation of the Koshi River over time (**Figure 15**). It was revised on 19 December 1966 in response to the dissatisfaction and protest of the Nepalese people (Upreti, 1993). The agreement allowed India to construct at her own cost a pair of embankments to confine the Koshi River in its course, and a barrage across the river in Nepal close to the Indo-Nepal boarder. Construction of the embankments and the barrage were completed in 1959 and 1963 respectively (Rao and Prasad, 1994). The Koshi Barrage also provides irrigation water to Bihar in India through eastern and western main canals. The eastern main canal covers an area of about 612,500 ha (Malla, 1999) of land with a safe withdrawal of 16,000 cusecs, while the western main canal covers about 356,610 ha (Malla, 1999) with its discharge of 210 cumecs (7,408 cusecs) (Agarwal, 1996).

The salient features of the Agreement are:

- Nepal has every right to withdraw water from the Koshi River and its tributaries for irrigation and other purposes in Nepal as may be required from time to time;

- India has the right to regulate the balance in the Koshi River at the barrage site from time to time for irrigation and to generate hydropower from the eastern main canal;

  The Koshi Project Agreement of 1954, subsequently revised in 1966, made no provision for irrigation in Nepal from the project. However agreements and understandings through an exchange of letters made the following provisions:

  - An understanding reached in 1971 allowed Nepal to withdraw 400 cusecs (11.34 m^3/s) of water from the western main canal to irrigate about 25,000 ha of land in Nepal through a project called Western Koshi Canal Project, which was developed by India at its own cost.

  - An additional Agreement between India and Nepal as of 7 April 1978 made provision for the renovation and extension of irrigation facilities[13]

[13] Such irrigation facilities included the Chandra Canal receiving water from the tributary of the Koshi River, the Pump Canal constructed earlier to lift water from the western main canal to irrigate lands in Nepal, and command area development of the Western Koshi Canal Project.

developed earlier in Nepal. India met the cost of such renovation and extension.

Recently; the two countries agreed that the investigations of the Koshi Multipurpose Project be undertaken jointly. This multipurpose project includes a Koshi high dam in Nepal upstream of the Koshi Barrage near Barakshetra, as a long-term measure to augment the lean season flow for irrigation, to control floods with specific flood cushion in the reservoir and for power generation. A Detailed Project Report (DPR) will be prepared using the principles as agreed to in the Indo-Nepal Mahakali Treaty.

The multipurpose project also includes trans-basin transfer of water from the Sun Koshi to the Kamala River in Nepal for irrigation development in both Nepal and India. A navigation canal access from the Koshi high dam, along the left bank, up to the Ganges River, is also being considered, which could provide navigation access to the sea to the land locked Nepal and North India. It could also benefit Bangladesh as it could provide the much-needed augmentation of lean season flow in the Ganges at Farakka and also flood control benefits.

The outstanding issue in this case is that India wants to develop this project with a concept of providing a flood cushion in the Koshi high dam to provide flood relief to the State of Bihar. Nepal wants to maximize its own benefits from the project. Further, Nepal is keen on developing the Sun Koshi- Kamala diversion independent of the Koshi high dam, while India thinks that both the Koshi High dam and the Sun Koshi - Kamala diversion be taken up together. India is also interested in the Kamala dam project, in addition to the Sun Koshi trans-basin diversion into the Kamala, but Nepal has raised some environmental problems with this dam. In this basin, a number of other projects have been identified for development. Bangladesh has also urged India to develop this project with Nepal.

Gandak Irrigation and Power Project Agreement

The Gandak Irrigation and Power Project Agreement, hereafter referred to as the Gandak Agreement, was signed between India and Nepal on 4 December 1959, mainly to irrigate 0.96 million ha of lands in India located on both the riverbanks through the eastern and western main canals (Rao and Prasad, 1994). This agreement allowed India to construct a barrage at its own cost across the Gandak River (known as Narayani River in Nepal) at the Nepal-India boarder near Bhaisalotan Village. The agreement was later amended on April 30, 1964. The Gandak Project was commissioned in 1971 and was completed in 1985. The main features of the Agreement are:

Nepal has the right to withdraw water from the Gandak River or its tributaries in Nepal for irrigation or any other purpose as may be required from time to time in the valley. For the trans-valley uses of Gandak River waters, separate agreements between Nepal and India need to be entered into for the use of water in the months of February to April only. The agreement allowed Nepal to irrigate 103,500 acres of land in Nepal by diverting water from the Gandak Project (World Bank, 1987). According to the agreement, India

agreed to develop at its own cost an irrigation and hydropower infrastructure in Nepal for Nepal's use.

Although the agreement specified Nepal's share of the water, the quantum of water that India could draw from the Gandak River, which discharges an average annual flow of about 1,600 m^3/sec (WECS, 2000), was not specified. The present eastern main canal aims to irrigate about 920,520 ha in Bihar in India (Malla, 1999) with a designed discharge of about 425 m^3/sec. The western main canal is designed to draw about 447 m^3/sec (Sarin, 1994) of water to irrigate 930,000 ha (Malla, 1999) of land in Uttar Pradesh, India.

12.2 History and factors leading to the Treaties

The irrigation potential of the Ganges plain in India was assessed prior to the massive push towards agro-industrial development of British India. Construction work commenced at the beginning of the last century, when irrigation was recognized as a high priority. In this respect, the international rivers flowing through Nepal and India provided promising sources of water. Hence, the provisions of the Sarada and Gandak Agreements between India and Nepal were basically guided by the irrigation requirements of Northern India.

In contrast, the need of the Koshi Agreement was guided mainly by the need for flood control, although it also made provisions for irrigation development. In the past, the dynamic and unpredictable nature of the Koshi River had caused several major and minor floods in Bihar in India, which in turn devastated the vast majority of cultivated lands and the settlements there. As a result, the Koshi River has come to be known as 'river of sorrow' in Bihar.

Efforts to manage the Koshi flood and to utilize river waters for several other uses have been initiated since the independence of India in 1947. For this, India first proposed to build a multipurpose Koshi high dam in Nepal, which could manage the Koshi flood, provide irrigation facilities and generate 1,800 MW of hydropower. The major flood of 1953, however, concentrated India's effort towards the immediate flood mitigation measures in Bihar, resulting in the Koshi Agreement. The Agreement is basically the intermediate flood mitigation measure of Bihar, while the complete solution for the Koshi problem includes the storage dam as mentioned in the Agreement itself.

Between 1960 and the mid 1990s, several multipurpose water resource projects were identified and studied in Nepal for their joint development by India and Nepal. These include Koshi, Karnali, Pancheshwar, Kankai and several other mega projects. However, despite several levels of talks and negotiations, further co-operation between India and Nepal in the field of water resources did not materialize till the signing of the Mahakali Treaty in 1996. Though part of the reason may have been political, an important factor was the lack of mutual trust between the two countries in resolving several issues. The following are the approaches pursued by the two countries:

Nepal's overall approach is that:

- The downstream benefits in India (flood control and irrigation) caused by increased regulated flow through the construction of dams in Nepal should be assessed;
- The benefits of hydropower should be assessed on the basis of other alternatives;
- Nepal's water needs should be given first priority.

India's overall approach is that:

- Nepal has the first right to use the water of the rivers for legitimate uses in its territory;
- There should be an equitable principle for sharing trans-boundary rivers, recognizing existing uses in India; and
- Assessment of power tariff should be as per similar alternatives available in the area (which is hydro-power).

Although both countries recognize Nepal's prior use right to water from trans-boundary rivers, in actual practice Nepal is not able to use waters from some of these rivers due to India's objection to Nepal borrowing funds from donor institutions[14].

Mahakali Integrated Treaty 1996

Perspective from Nepal

As noted earlier, Nepal could not utilize her share of water specified by the Sarada Agreement until the construction of the Mahakali Irrigation Project, which was initiated in 1971 with a loan from the World Bank. The project became operational in 1975. In 1977, both Nepal and India had agreed to investigate further the possibility of harnessing the Mahakali River. Despite this understanding on joint investigation in the early 1980s, India unilaterally started the investigation and thereafter the construction of the 120 MW Tanakpur Hydroelectric Project. This project comprised of the Tanakpur Barrage in the Mahakali River on land that was transferred earlier to India by Nepal as per the 1920 Sarada Agreement. The Tanakpur project aimed to use the entire dry season flow of the Mahakali River, and the Tailrace canal was proposed to link directly with the existing Sarada Canal on the Indian side (shown earlier in **Figure 9**). This proposal would bypass the Sarada Barrage and completely eliminate Nepal's Mahakali Irrigation Project.

Nepal repeatedly expressed her disagreement regarding the construction of the Tanakpur Project, which was not in accordance with the international duties and obligations of international watercourses. After several complaints made by Nepal, India agreed to redesign the project and release the tailrace water back into the Mahakali River so that Nepal could utilize waters from the Sarada Barrage as per the Sarada Agreement of 1920.

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[14] During the early 1980s, Nepal initiated the development of the Babai and Sikta Irrigation Projects with the financial assistance of the World Bank and the Asian Development Bank respectively. After the completion of detailed studies of both projects, they were dropped by the Banks due to India's objection to the loans.

By 1988, construction of the power station and the Tanakpur Barrage without the afflux bunds were completed.

Even though the Tanakpur Project was implemented in a confrontational manner, it could not be completed due to the unavailability of land for the afflux bund. Technically, it was necessary to connect the barrage to high ground in Nepal through a left afflux bund, without which the project could not operate. The designers of the project either overlooked this aspect, or they assumed that it would not be difficult for India to persuade Nepal to provide them with land for tying up the barrage to high ground in Nepal. The length of this left afflux bund that needed to be constructed in Nepal was 577 m. By doing so, about 2.9 ha of land in Nepal, upstream of the left afflux bund, would also be submerged by the project.

As the Tanakpur barrage is located in Indian Territory, India has insisted since the early stages of its investigation that the Tanakpur Barrage is completely an Indian project, and Nepal has nothing to do with its development and operation. In spite of this opinion, India requested Nepal to allow them to construct a 577 meter long left afflux bund in Nepalese territory. At that time Indo-Nepal relations were worsening, resulting in an economic blockade of Nepal by India. As a result, the issue concerning construction of the left afflux bund in Nepal could not be pursued further.

In 1990, the political situation in Nepal changed with the restoration of a multi-party democracy. Accordingly, India forwarded her request to Nepal for the construction of the left afflux bund for the Tanakpur Barrage in Nepal. In turn, Nepal started to claim her rights to water and other benefits in respect to the international watercourses. As a result, once again the Tanakpur issue received a higher priority on the agendas of the two governments. Finally in 1991, Nepal agreed to provide the land for the construction of the left afflux bund. The government of Nepal referred to this agreement as an "Understanding" requiring no parliamentary ratification. In response to this, India agreed to provide Nepal (free of cost) 10 million kWh of electricity per annum and 150 cusecs of water for irrigation from the Tanakpur Project.

The provisions made by the 1991 agreement came under severe criticism by several political parties in Nepal. As a result, in 1992, the Supreme Court of Nepal decided that the 1991 agreement was indeed a treaty requiring parliamentary ratification. The court, however, left it up to the parliament to decide whether a two-third or simple majority would be needed to ratify the treaty.

In the mean time, India in 1992 suddenly announced that she would increase the supply of hydroelectric energy to Nepal (free of cost) from the previously agreed quantity of 10 million kWh (as per 1991 agreement) to 20 million kWh per annum. Such an ad hoc announcement for quantifying the benefit of water resources to Nepal made the Nepalese people more suspicious about India's interest in the 1991 agreement. People started to ask the question–why only 20 million, why not 25 or 15 million? By this time, the people of Nepal were already looking for principles for sharing the benefits of water resources. With such an ad hoc quantification of benefit, the people of Nepal started to wonder how

much more benefit could be derived from the Tanakpur Project if Nepal could negotiate properly with India.

Despite India's announcement of increasing the hydroelectric energy to Nepal, the issue concerning the ratification of the 1991 Agreement (Treaty according to the court) remained unresolved. Some argued that, as per Nepal's new constitution of multi party democracy, the 1991 agreement required parliamentary ratification by a two-thirds majority; others argued that a simple majority could ratify the agreement. From a Nepalese perspective, the 1991 agreement became futile since Nepal could not ratify the 1991 agreement until 1992. In the meantime, India completed the construction of the left afflux bund of the Tanakpur Barrage, which became operational shortly after that.

In 1995 the government of Nepal re-initiated the negotiation of the Tanakpur Project with India; but this time the Tanakpur Project was linked with the Sarada Agreement of 1920 and India's most wanted (Gyawali and Dixit, 2001) Pancheshwar Dam on the Mahakali River. Accordingly, the topic on which the negotiations were to be made was entitled 'Integrated Development of Mahakali River".

Finally, on 12 February 1996, a treaty was signed between Nepal and India concerning the Integrated Development of the Mahakali River including the Sarada Barrage, Tanakpur Barrage and Pancheshwar Project. Although certain flaws still exist in the treaty, unlike the treaties made during 1950s, this treaty does recognize certain principles of sharing costs and benefits. The treaty also recognizes Nepal's prior use right of water. Certainly, the 1996 Mahakali treaty is a breakthrough after more than three decades of tension related to Indo-Nepal cooperation on water resources, and is progressive compared to earlier treaties.

As noted earlier, according to the constitution of Nepal, the treaty required parliamentary ratification by a two-third majority. Prior to ratification in Nepal, several issues emerged concerning the newly signed treaty. These included the Kalapani[15] issue, selling principle of hydroelectric power to India from the proposed Pancheshwar project, process of forming a Mahakali Commission in Nepal, and issues concerning the definition of equal rights and border rivers (Gyawali and Dixit, 2001). Although Nepal could have ratified the Mahakali treaty on 20 September 1996, prior to its ratification the parliament passed a set of parameters on the treaty that focused on the above-mentioned issues. This implied that from the Nepalese perspective the ratification was conditional, which however was not binding on India. India on the other hand ratified the treaty on 27 November 1996.

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15 Kalapani is located at the head reach of the Mahakali River and is occupied by the Indian Military. Some argue that Kalapani belongs to Nepal, and thus the Indian military should leave the place. This is basically a border problem, which needs to be solved by both the countries.

A perspective from India on the Koshi, Gandak and Mahakali Treaties

Nepal's perspectives on its water relations with India are partly rooted in what it sees as the unsatisfactory outcome of past engagements. These relate to the Sarada Agreement of 1920 (entered into with the British Raj), now subsumed in the 1996 Mahakali Treaty, and the Koshi and Gandak agreements of 1954 and 1959. In each case Nepal feels aggrieved by the far larger water use by India as compared to the more limited area it has been able to irrigate. This is obviously a fact of geography. Nepal's mountainous landscape limits its arable and irrigable area as compared with India's vast and sprawling Gangetic plain. Any sense of hurt on this score is therefore misplaced.

It is true that the Sarada agreement gave Nepal the smaller share of water diverted from the Banbassa (Sarada) barrage, especially during the Rabi season and that the latter allocation could not be fully honored owing to low lean season flows. There is an attempt to correct this under the Mahakali Treaty, with water availability being augmented from storage behind the proposed Pancheshwar dam. However, Nepal itself only commenced Stage I of its Sarada irrigation in 1975 and is yet fully to develop that command.

The Koshi and Gandak treaties were both modified after some years to accommodate Nepalese interests and, like all other agreements, give primacy to Nepal's water uses. The grievance about the Koshi agreement is that, like in the Gandak project that followed, the barrage was located at the border rather than further upstream which would have conferred greater benefit to Nepal. The fact is that the Koshi Project was conceptualized in three continuous, inter-linked stages. The first was a barrage to anchor this wayward river that had migrated westwards over 112 kms in 130 years, laying waste to a huge tract in North Bihar. There were some irrigation and energy benefits to Nepal as well. Secondly, embankments were to be built both below and above the dam so as to jacket the river within a defined channel. And, thirdly, a high multipurpose dam within Nepal was planned at Barakshetra to provide a substantial flood cushion along with large irrigation and power benefits to both countries.

Unfortunately, political strains between the two sides precluded work on the Koshi high dam, the kingpin of the project. But the upstream embankments were constructed and canal systems developed, providing a measure of flood protection and irrigation to Nepal. The Gandak project too provided Nepal with similar multiple benefits. However, in both cases, it must be admitted that maintenance and other problems in the adjacent Indian states of Bihar and Uttar Pradesh did cause Nepal problems periodically.

Nevertheless, the Koshi and Gandak barrages provided Nepal with a valuable east-west road link as well as canal networks and structures that were built and funded entirely by India. The Trisuli (21 MW) and Devighat (14 MW) projects were also financed and constructed by India. Together with considerable Indian assistance in other key sectors of development, this reflects a basic goodwill for the Kingdom by its giant southern neighbor.

Attempts were also made to lay to rest controversies over India's Tanakpur barrage on the Mahakali above the Banbassa barrage. In lieu of three hectares of land required to tie an afflux bund to high ground in Nepal, India agreed to provide the Kingdom with 70 million units of continuous power annually and guarantee stipulated irrigation supplies from Tanakpur along with the related delivery infrastructure. It also agreed to construct a road linking Tanakpur to the Kingdom's east-west highway.

As a part of the project, two power stations have been projected, one on either bank, with an overall installed capacity of about 6,480 MW. A re-regulating dam either at Poornagiri or at Rupali Gad is to be built to hold the waters passing through Pancheshwar turbines and provide lean seasons releases for irrigation both in India as well as Nepal. An equal entitlement to the utilization of the Mahakali waters by both India & Nepal is guaranteed without prejudice to their respective existing consumptive uses.

The basic principles ensure that both sides design and operate the project as a single, integrated scheme to yield the maximum total net benefit, with costs borne by both parties in proportion to the benefits accruing to them. Thus the net power benefit is to be assessed on the savings in cost compared with relevant alternatives available, and that from irrigation on the basis of incremental and additional benefits due to the augmentation of river flow and that from flood moderation in proportion to the value of works saved and damage avoided. Over and beyond cost sharing, Nepal's water requirements are to be accorded primacy in the utilization of Mahakali waters. India has more or less accepted this commitment with respect to all of Nepal's major rivers.

The Mahakali treaty subsumes all other Indo-Nepalese Agreements relating to downstream projects on the river including the Sarda barrage and Tanakpur barrage. Both of these are located downstream of Pancheshwar before the river finally enters Indian territory. Under the treaty, the Pancheshwar project will be executed and operated by joint entities established by both the countries and the Treaty as a whole will be monitored by the Mahakali Commission on the basis of equality, mutual benefit and no harm to either party. In case of any unresolved dispute, a provision for binding arbitration has been kept, with the chairperson of the three-member tribunal being named by the Secretary General of the Permanent Court of Arbitration at The Hague.

The Mahakali Treaty was intended to establish a framework for all future mutual water development. This sets out cost-benefit sharing principles that are intended to apply across the board. They have, in fact, been explicitly reiterated in respect of the Koshi High Dam/Sun Koshi-Kamala Diversion project that both sides have agreed to investigate and build jointly.

Nepal initially had some internal problems over ratification of the Mahakali Treaty. These have hopefully been left behind or, like the Kalapani boundary demarcation issue that was raised, are being dealt with separately. The principles of cost-benefit sharing have been set out and can be operationalized, once the parameters of the Mahakali project are frozen in the light of an agreed detailed project report. There is essentially no problem with regard to protecting "existing (water) uses" in India or in assessing future

downstream benefits to it from Pancheshwar storage. Nepal's interests can be fully safeguarded.

However, a difficulty has arisen since Nepal's preferred site for a re-regulating dam below Pancheshwar has, on joint investigation, been found to be technically unfeasible. Even so, Nepal is unwilling to permit investigation of the alternative site posed by India further downstream at Poornagiri, owing to the significant displacement projected and other political sensitivities. If a satisfactory intermediate site cannot be found for the diurnal storage of waters passing through the Pancheshwar turbines for generating peaking power, the overall Project parameters may need to be recast. One way or the other, delay cannot be in anybody's interest.

12.3 Institutional arrangements for implementing the treaties

In general, the institutional arrangements for implementing several Indo-Nepal Treaties, Agreements and Understandings are weak. Although 14 joint committees exist to manage, develop and implement cooperation between India and Nepal in the field of water resources,[16] the outcomes of these committees have not been satisfactory. By looking at the number of joint Indo-Nepal committees formed earlier, it seems that whenever problems emerge the existing committees are keen to form another committee to look after the issues without trying to solve them. Performances of many of these committees are never monitored. As a result, some of these committees have not met since their formation, while others meet infrequently. This implies that, in general, Indo-Nepal treaties and agreements lack several institutional mechanisms. The following few paragraphs discuss the treaty-specific institutional arrangements.

Sarada, Koshi and Gandak Agreements

Except in the case of the Sarada Agreement of 1920, Indo-Nepal water related treaties have provisions of institutional arrangements for their implementation. The Koshi Agreement made provisions for an Indo-Nepal Koshi Project Commission, which was later superseded by the Koshi Coordination Committee. Similarly, the Gandak

16 These 14 committees include: (1) Standing committee on Inundation Problems between Nepal and India-1985, (2) Joint Team of Expert on the extension of embankment on Bagmati, Lalbakeya, Kamala and Khando Rivers-1991, (3) Joint Committee on Embankment Construction-1993, (4) Joint Group of Expert (JGE) for the Preparation of Master Plan for Flood Management-1999, (5) Coordination Committee for Koshi Project-1954, (6) Co-ordination Committee on Gandak Project-1959, (7) Sub-Commission on Water Resources-1987, (8) Commission on Karnali River, (9) Karnali Coordination Committee-1977, (10) Joint Group of Experts of Nepal and India on Pancheshwar Multipurpose Project-1977, (11) Joint Committee of Experts on Sapta Koshi High Dam Multipurpose Project-1991, (12) Power Exchange Committee-1991, (13) Joint Task Force on Flood Control and Forecasting, (14) and Joint Committee on Water Resources-2000.

Agreement of 1959 and the Mahakali Treaty of 1996 also made provisions for a Gandak Coordination Committee and Mahakali Joint River Commission for implementing the respective treaty.

The Koshi and Gandak coordination committees consist of three representatives from each country. The Minister of His Majesty's Government of Nepal (HMGN) heads the committee and the administrator of the concerned project acts as secretary. These committees were designed to look after matters of common interest concerning the early completion of the project construction,[17] implying that these committees were more like a construction coordination committee. As per the treaty, these committees were intended to meet from time to time to consider matters of common interest, but they have not met for some time.

The Koshi Coordination Committee has met seventeen times since the first meeting in November 1954, the last being in February 1991. The Gandak Coordination Committee has met only six times since its first meeting in May 1962, the last being in December 1980. Although there are a number of problems at field level, the inability to hold meetings more frequently implies that the Koshi and Gandak Coordination Committees have either lost their relevance or the committees are at too high a level for the nature of problems to be tackled.

Recognizing the institutional constraints set up by the previous treaties and agreements, an agreement was reached between India and Nepal on setting up of a Joint Commission in June 1987. The Joint Commission at its very first meeting in August 1988 set up another Sub-Commission on Water Resources, which was mandated to deal with all aspects of water resource development and outstanding issues for mutual benefit. However, like other previous commissions, this sub-commission has also met only twice since its inauguration. The last meeting was held in April 1991. During the Nepalese Prime Minister's visit to India in August 2000, both countries agreed to form another committee named the 'Joint Committee on Water Resources (JCWR)', which would be headed by the Secretaries of the Ministries of Water Resources of both countries. This Joint Committee has the mandate to discuss all the important issues pertaining to cooperation in the water resources sector, including implementation and monitoring of the existing treaties and agreements.

The Joint Committee on Water Resources (JCWR), in its first meeting held at Kathmandu from October 1-3, 2000, recommended to the respective governments that the Koshi and Gandak Coordination Committees be dissolved. The JCWR also recommended the forming of a committee entitled 'Joint Committee on Koshi and Gandak Project' which would be headed by the Director General of the Department of Irrigation, Nepal and Engineer-In-Chief, Bihar, India.

[17] Main activities of these committees included land acquisition, rehabilitation of displaced population, maintenance of law and order, soil conservation measures, and operation and maintenance of the project.

The Sarada, Koshi and Gandak Agreements do not have specific provisions for joint monitoring of the implementation of the treaty. Also, there is no provision for arbitration. Any differences or disputes arising in their implementation are referred to the two governments.

Mahakali Treaty

The Mahakali Treaty is quite progressive in terms of the institutional mechanism when compared to the Sarada, Koshi and Gandak Agreements. A Mahakali River Commission has been set up, to be guided by the principles of equality, mutual benefit, and no harm to either party. The Commission will have an equal number of representatives from both countries. However, the Mahakali River Commission has yet to be formed. At present, as stipulated by the Mahakali Treaty, a joint project office has been established for the preparation of Detailed Project Reports (DPR) on the Pancheshwar Multipurpose Project.

The Mahakali Treaty has provisions for an arbitration tribunal composed of three arbitrators and has endorsed a method to appoint arbitrators. The treaty specifies that each party shall nominate one arbitrator, with neither to nominate its own national, and the third arbitrator should be jointly appointed to preside over such an arbitration tribunal. If the parties are unable to agree upon the third arbitrator, either party may request the Secretary General of the Permanent Court of Arbitration to appoint such an arbitrator, who also shall not be a national of either party. The decision of the majority of arbitrators shall be accepted as final, definitive and binding. However, the treaty also provides an alternative procedure, if the parties agree through an exchange of notes.

As the Mahakali Treaty has not yet been fully implemented, the effectiveness of its institutional arrangements cannot be determined at this time.

13. Water sharing treaty between India and Pakistan

13.1 The Treaty

The only international water sharing treaty that exists between India and Pakistan is the Indus Waters Treaty, which became effective in April 1960.

The system of rivers in the Indus basin comprises the river Indus and its five main tributaries namely the Jhelum, Chenab, Ravi, Beas and Sutlej rivers, as shown earlier in Figure 1. This is one of the most important river systems in the world, and has been the lifeline of the subcontinent. The partitioning of India in 1947 created a new international boundary, which cut across the Indus river system unevenly. Presently, the upper reaches of the main Indus River and its tributaries lie in India, while the lower reaches are in Pakistan. They all combine into one river near Mithan Kot in Pakistan, and finally discharge into the Arabian Sea south of Karachi.

The Indus Waters Treaty allows arrangements for sharing the waters of the Indus and its tributaries between India and Pakistan, which became necessary after the partitioning of India in 1947. It is a framework as well as a water sharing treaty. Annex 1 provides the main text of the treaty.

The main features of the Indus Waters Treaty include:

- All the waters of the Eastern rivers (Sutlej, Ravi and Beas) shall be available for unrestricted use by India;
- Pakistan may withdraw water from the Basantsar tributary of the Ravi, as may be available and necessary for irrigation of not more than 100 acres (40 ha) of land annually;
- Pakistan may also withdraw water from the following tributaries of the Ravi as may be available and as may be necessary for the irrigation to the limits specified below:

Tributary	Maximum annual cultivation (acres)
Basantar	14,000
Bein	26,600
Tarnah	1,800
Ijh	3,000

- All the waters of any tributary and in its natural course, while flowing in Pakistan, joins the Sutlej main or the Ravi main after these rivers have finally crossed into Pakistan, shall be available for unrestricted use by Pakistan. India shall not construct this provision as giving Pakistan any claim or right to any releases in any such territory.

- Pakistan shall receive for unrestricted use all the water from the western rivers (Indus, Jhelum and Chenab) which India is under obligation to let flow. India shall let flow all the waters of the western rivers, and shall not permit any interference with these waters, except for the following uses:

a) Domestic use;
b) Non - consumptive use;
c) India may withdraw from the Chenab main for agriculture use the following maximum withdrawals:

Name of the canal	Maximum withdrawals for agriculture use
Ranbir canal	100 cusecs from 15 April to 14 October, and 350 cusses from 15 October to 14 April.
Pratap canal	400 cusses from 15 April to 14 October, and 100 cusses from 15 October to 14 April.

d) India could continue to irrigate from the Western rivers from areas that were irrigated as of the Effective Date i.e. 1st April 1960.
e) India can also make further withdrawals from the following basins:

Particulars	Maximum cropped area(acres)
From the Indus in its drainage basin	70,000
From the Jhelum in its drainage basin	400,000
From the Chenab in its drainage basin	225,000 acres, of which not more than 100,000 acres will be in the Jammu district
Outside in its drainage in the area west of Dag Nadi, the aggregate capacity of irrigating channels leading out the drainage basin of the Chenab to this area not exceeding 120 cusses	6000

f) Generation of hydro-electric power from hydro-electric plants which were in operation or under construction on the Effective Date (April 1, 1960);

g) India can develop new runoff river plants or store water subject to certain criteria as outlined in Annexures D & E of the Treaty.

- Each party agreed that any non-consumptive use made by it shall be so made as not to materially change, on account of such use, the flow in any channel to the prejudice of the uses on that channel by the other party under the provisions of this Treaty.

- Each party declared its intentions to prevent as much as possible the pollution of the river waters which adversely affect the uses similar in nature to those to which the waters were put on the effective date (April 1, 1960). Both countries agreed to take all reasonable measures to ensure that any sewage or industrial waste will be treated before it is allowed to flow into the rivers.

- Both countries agreed to create a permanent post of Commissioner for Indus water, which together form the Permanent Indus Commission. Unless either government should decide to take up any particular question directly with the other government, each Commissioner will be the representative of his government for all matters arising out of this Treaty and will serve as the regular channel of communications on all matters related to the implementation of the Treaty.

13.2 History and factors leading to the treaty

The development of irrigation facilities in the then West Punjab (in the pre-independence era) was initiated by British India in the middle of the 18th Century through the construction of canals, weirs, and barrages across several rivers of the Indus river system. As available water resources of individual rivers were not in proportion to the lands that could be irrigated, some of these rivers, mainly Jhelum, Chenab and Ravi, were also linked to one another through several link canals (**Figure 16**). Table 7 shows the chronological sequences of development of irrigation infrastructure in the Indus River System.

Table 7. Chronological sequence of development of canals and barrages on the Indus

Barrage and canals	Diversion site	Source river	Year of completion
Upper Bari Doab	Madhopur (India)	Ravi	1859
Sirhind	Rupar (India)	Sutlej	1872
Sidhnia	Sidhnai	Ravi	1886
Lower Swat	Munda	Swat	1890
Kabul	(Below Warsak)	Kabul	1890
Jamrao	Jamrao Head	Estern	1899
Jhelum(Lower)	Rasul	Jhelum	1901
Paharpur	Chashma	Indus	1909
Upper Chenab	Marala	Chenab	1912
Lower Bari Doab	Balloki	Ravi	1913
Upper Jhelum	Mangla	Jhelum	1915
Upper Swat	Amandara	Swat	1915
Sutlej Valley Canals (11 canals)	Ferozepur, Suleimanki Islam, Panjnad	Sutlej	1926-29
Sukkur Barrage Canals (7 canals)	Sukkur	Indus	1932
Haveli Project (2 Canals)	Trimmu	Chenab	1932
Thal Chnal	Kalabagh	Indus	1955
Kotri Barrage Project (4 Canals)	Kotri	Indus	1955
Gudu Barrage Project	Gudu	Indus	1962

Table 7 suggests that in the then West Punjab, many of the water resources development projects, mainly for irrigation, were developed during the pre-independence era, using waters from the Indus and its tributaries.

The partitioning of India in 1947 created a new international border, which cut the network of irrigation infrastructure and tributaries of the Indus river system unevenly. The geography of the partition was such that the diversion structures of some of the systems were located in India, while the distribution network was in Pakistan. This partitioning created conflict between India and Pakistan over the rights to the use of Indus river water. Some of the tributaries that supplied waters into the Pakistani portion of the basin were located on Indian territory, raising concern about the continued availability of water supplies.

Perspective from Pakistan

After partition, the Chief Engineers of India and Pakistan met to discuss the allocation of water in the context of new international boundaries. Temporary standstill agreements were successfully established committing India to release water from Indian controlled tributaries of the Indus basin to Pakistan's canals until 31 March 1948. On 1 April 1948, India stopped supplying water to canals that irrigated about 1.6 million acres of land in Pakistan. India's argument was that it was no longer obligated to supply water to Pakistan since the Standstill Agreement had not been extended. One explanation for the stoppage of water was to establish a legal claim over such tributaries (Ravi, Beas and Sutlej) and the water flowing in them.

Having sparked an international water dispute, representatives from India met their Pakistani counterparts in April 1948 to discuss the water allocation problem. On 30 April 1948, the Indian Prime Minister, however, intervened in the problem and released water to those canals. The release of water to Pakistan did not end the dispute. In May 1948, a high level inter-dominion conference was held in New Delhi. As a result, the Delhi Agreement was signed the same month, which facilitated bilateral talks between the two countries. Although these talks continued over the next three years, the water allocation dispute could not be resolved. In the meantime, Pakistan's attempts to bring the case to the International Court of Justice (ICJ) for arbitration were rebuffed by India.

By 1951, the two sides were no longer meeting and the situation became intractable. The Pakistani press was calling for more drastic action and the deadlock contributed to the hostility with India. The situation resulted in a serious water conflict between India and Pakistan, which dragged both countries to the brink of war. In the same year, David Lilienthal, formerly the chairman of the Tennessee Valley Authority and the US Atomic Energy Commission, visited the region to write a series of articles for a magazine. Lilienthal had a keen interest in the subcontinent and was welcomed by the highest levels of both the Indian and Pakistani governments. During the course of his visit, he came to know about the water-related conflict that existed between India and Pakistan. He decided to concentrate on this issue and look for areas of possible cooperation: thinking

that progress in this area would promote a sense of friendship between the two countries that might, in time, lead to the settlement of the Kashmir dispute.

In this context, David Lilienthal proposed a joint program for the development of the Indus river system, upon which both India and Pakistan were dependent for irrigation water. He believed that, with new dams and irrigation canals, the Indus and its tributaries could be made to yield additional water, which each country needed for increased food production. He suggested that the World Bank use its good offices to bring both the countries to a consensus, and help in the financing of an Indus Development program.

Lilienthal's idea was well received by officials at the World Bank and by the Indian and Pakistani governments. Eugene R. Black, then president of the World Bank noted that Lilienthal's proposal "makes good sense all round". Black also made a distinction between the "functional" and "political" aspects of the Indus dispute. In his correspondence with Indian and Pakistani leaders, Black asserted that the Indus dispute could most realistically be solved if the functional aspects of disagreement were negotiated apart from political considerations. He envisioned a group of experts that could tackle the question of how best to utilize the waters of the Indus Basin - leaving aside questions of historic rights or allocations.

The President of the World Bank proposed that a core group of experts made up of Indian, Pakistani and the World Bank engineers prepare plans for the development of the Indus river system. Mr. Black further proposed that The World Bank delegation act as a consultative group charged with offering suggestions and speeding dialogue.

Black's hopes for a quick resolution on the Indus water dispute were premature. Although both the World Bank and Lilienthal had expected that both India and Pakistan would come to an agreement on the allocation of Indus waters, neither of the countries seemed willing to compromise their positions. While the Pakistani delegates insisted on their "Historical use rights" of waters from the Indus and its tributaries, the Indian side argued that the previous distribution of waters should not set the future allocation. Instead, India argued for a new basis for distribution, with the waters of the Western tributaries going to Pakistan and the Eastern tributaries to India.

In 1954, after nearly two years of negotiation, the World Bank offered its own proposal stepping beyond the limited role it had apportioned for itself and forcing the two sides to consider concrete plans for the future of the basin. The proposal offered India the three eastern tributaries of the basin and Pakistan the three western tributaries. Canals and storage dams were to be constructed to divert waters from the western rivers and replace the eastern river supply lost by Pakistan.

The Indian side agreed to the World Bank proposal, while Pakistan found it unacceptable, since it did not take into account Pakistan's historical use of waters from the Indus River and its tributaries. As a result, Pakistan argued that her share of waters from the Indus river system should be based on the pre-partition distribution. Further, as the World Bank proposal was more in line with the Indian plan, the Pakistani delegates were angered.

They threatened to withdraw from the negotiating table. As a result, negotiations between the two countries virtually collapsed.

Ultimately, neither side could afford the dissolution of talks. In December of 1954, the two sides returned to the negotiating table. The World Bank proposal was transformed from a basis of settlement to a basis for negotiation, and the talks continued for the next six years. Finally, both sides agreed to write the terms of the agreement, which were incorporated in the Indus Waters Treaty that became effective in April 1960.

Under the Treaty, the waters of the three eastern rivers (Sutlej, Beas and Ravi) were allocated to India for her exclusive use. The waters of the three remaining western rivers (Indus, Jhelum and Chenab) were allocated to Pakistan, with the exception of certain specified uses like hydroelectric use, non-consumptive use and limited agricultural use in their upper catchments.

The treaty required Pakistan to construct and bring into operation a system of reservoirs and canals to transfer waters from the western rivers to feed the canals, which were dependent upon the supplies amounting to about 24 MAF from the Eastern rivers prior to partition[18]. These included the Tarbela and Mangla Dams on the Indus and Jhelum Rivers, 5 Barrages, 1 Siphon and 8 Inter-river link canals. An Indus Basin Development Fund (IBDF) was established and administered by the World Bank. The replacement works (a system of new reservoirs and canals as noted earlier) were constructed using the IBDF at a cost of about US$ 1,208 million.

Perspective from India

The Indus waters dispute surfaced with the partitioning of undivided India. This arbitrarily cut up an integrated and intricate system of barrages, headworks and link canals diverting 73 million acre-feet of water to irrigate 1.02 million hectares of land, essentially in Punjab and Sind and developed over the preceding century.

With most crown lands under the Raj being located in what was known as British India, the bulk of the irrigation developed was in areas that fell to Pakistan. The Princely States of Punjab and what is now Haryana, that became a part of India, received relatively little benefit. An interruption in canal water supplies to Pakistan in 1948, following the termination of an inter-Dominion standstill agreement in this regard, triggered a serious crisis the final resolution of which was embodied in the Indus Waters Treaty.

The Treaty divided the waters of the Indus and the hitherto integrated irrigation network into two, the waters of the three eastern rivers going to India and those of the three western rivers plus the Kabul, a major right bank tributary of the Indus, going to Pakistan. In the final reckoning, of the168 MAF discharge of the Indus, 81 per cent of the waters were allocated to Pakistan and 19 per cent to India. Further, India and the international

[18] As noted above, in the present context, such a mass transfer of water from one basin to another is a distinct departure from the concept of the international law of upper and lower riparian rights.

community funded Pakistan for the development of replacement works to render it totally independent of any canals, links or structures located in India. These transitional arrangements were completed in a decade, by 1970.

Both sides constructed storages on their rivers and further developed their respective commands. In India, the Bhakra and Pong dams on the Sutlej and Beas and the power generated from them, laid the basis for the green revolution to follow and energized a vast network of tube wells drawing on irrigation recharge and providing vertical drainage. The Mangla and Tarbela dams did the same for Pakistan.

With the recent completion of the Thein dam on the Ravi, the third major storage on the eastern rivers is in position. The Pong and Thein dams divert eight million acre-feet of water to Rajasthan. This has transformed the Thar desert, with a swathe of green running north-south along the Pakistan border.

The Indus Treaty allows India limited existing and new water uses from the western rivers in Jammu & Kashmir as well as restricted non-consumptive uses on the Chenab and the tributaries of the Jhelum for hydropower. This potential has yet to be fully exploited and has partly been delayed as a result of Pakistani objections on what it has insisted were and are technical-cum-strategic considerations. The Tulbul of Wulur barrage project, essentially to maintain navigation along the Jhelum, remains a casualty.

The Indus Treaty does not permit optimal harnessing of the full water and energy potential of the Indus system. It had a narrower objective. Even within those parameters it ranks among the triumphs of the United Nations system. There is still considerable scope for improving the benefits to both countries.

13.3 Institutional arrangements for implementing the treaty

Article VIII of the Indus Waters Treaty 1960 states:

"India and Pakistan shall each create a permanent post of commissioner for Indus waters, and shall appoint to this post, as often as a vacancy occurs, a person who should ordinarily be a high-ranking engineer competent in the field of hydrology and water-use. Unless either government should decide to take (up) any particular question directly with the other government, each commissioner will be the representative of his government for all matters arising out of this treaty, and will serve as the regular channel of communication on all matters relating to the implementation of the treaty ...".

Under the above provisions of the treaty, both India and Pakistan have appointed a commissioner for the Indus waters. Each commissioner serves as a representative of his government for the implementation of the treaty. The two commissioners together form a permanent Indus Commission. The purpose and functions of the Indus Commission are to:

- Establish and maintain co-operative arrangements for the implementation of the treaty;
- Promote co-operation between the parties in development of the waters of the rivers;
- Make every effort to settle any question arising between the parties; and
- Undertake tours of inspection of the rivers to ascertain facts.

Monitoring arrangements

The Indus Commission monitors implementation of the Indus Waters Treaty. The Commission visits the Indus River and its tributaries as required, and holds regular meetings for monitoring the treaty. About the activity of the Commission, Rahim (1992) notes that until then the Indus Commission had held 74 meetings and undertaken 91 inspection tours.

Dispute settlement

The Indus Waters Treaty authorizes the Indus Commission to implement the Treaty and resolve disputes arising out of its implementation. The Indus Commission, which has survived two wars, is providing an on-going machinery for consultation and conflict resolution through inspection, exchange of data, and visits. The Commission is required to meet regularly to discuss potential disputes as well as cooperative arrangements for the development of the basin. Each commissioner is required to provide data about the river and proposed water resource development plans, as agreed in the Treaty, to his counterpart commissioner. Prior to implementation, the Indus Commission discusses all water resource development plans that might affect others.

If the commission does not reach agreement on any of the question referred to it, a difference will be deemed to have arisen that shall be dealt with as follows:

Any difference or dispute arising in this regard, if not resolved by the Indus Commission, is referred to the 'Neutral Experts' for mediation and arbitration. A highly qualified engineer appointed jointly by both the governments can act as a 'Neutral Expert'.

A neutral expert deals with any differences falling within the prescribed categories stipulated by the Treaty. These include questions concerning determination of water availability for use, and the determination of boundaries of particular drainage basins etc. If the difference does not fall within the above categories or if a neutral expert has informed the commission that, in his opinion, the difference should be treated as a dispute, then a dispute will be deemed to have arisen which shall be settled in accordance with the treaty's dispute settlement mechanism.

The neutral expert shall reach a decision on the question referred to him, giving his reasons. His decisions on all matters within his competence shall be final and binding. Without prejudice to the finality of a decision, any question that is not within the competence of a neutral expert should be settled in accordance with the provisions relating to the settlement of dispute, if such question cannot be resolved by agreement.

If a dispute is not settled through negotiation, then the dispute shall be referred to a Court of Arbitration, established upon agreement between the parties to do so. The Court is entitled to decide all questions relating to its competence and shall determine its procedure. An award signed by four or more members of the Court shall constitute the award of the Court and shall be final and binding upon the parties with respect to that dispute. Appointment and other required procedures are stated in detail in the Treaty.

14. Conflicts related to the Implementation of the Treaties

This section examines specific issues in relation to the implementation of water sharing treaties and agreements made between South Asian countries and discusses the associated conflicts between them. This is done through a few small case studies that encompass two aspects: actualization of water sharing as per the treaty, and implementation of the provisions stipulated by the treaty.

14.1 Actualization of the water sharing provisions of the Treaties

Water sharing here refers to the sharing of water between two countries from a specified point of a common river. In this process, several hydraulic and institutional externalities emerge. These include variable low flow in the river, uneven upstream withdrawals, and hydraulic parameters of water control structures, poor operation and maintenance of hydraulic infrastructure, poor institutional arrangements and human efficiencies. Thus, sharing these externalities is an integral part of sharing international waters.

The Indo-Bangladesh and Indo-Nepal water treaties have made provisions for sharing the waters from a common river by specifying the ranges of some of the above-mentioned externalities. In contrast, the Indo-Pakistan treaty, in general, does not provide a mechanism for sharing the waters from a common river. Rather, the Treaty makes provision for sharing the rivers. Thus, in the case of the Indo-Pakistan treaty, sharing of hydraulic externalities does not exist. In examining the Indo-Pakistan Indus Treaty from the perspective of water sharing, it is not a water-sharing treaty, but rather a treaty for partitioning the rivers between the two countries. Thus, the issue concerning actualization of water delivery according to the treaty is not applicable for the Indo-Pakistan treaty, and therefore it is not discussed here. The following few paragraphs discuss the actualization of water delivery for the Indo-Bangladesh and Indo-Nepal Treaties.

India-Bangladesh

Perspectives from Bangladesh

As noted earlier, the Indo-Bangladesh Treaty specifies the share of both India and Bangladesh in terms of proportion of incoming flow at the Farakka Barrage on a ten-day basis from 1 Jan to 31 May every year. Actualization of delivery of water to Bangladesh as per 1996 treaty started on January 1, 1997. **Figure 17** summarizes the time series flow on the availability of water at Farakka, each country's share of water, and actual flow delivered. The figure suggests that except during the dry season of 1997, in general, the delivery of water to Bangladesh matched broadly with the quantum of water stipulated in the Treaty.

During 1997, however, certain discrepancies were observed between the flows released at Farakka and the flows received at Hardinge Bridge. In that year, the clause in the Treaty related to "the flow falling below 50,000 cusecs in any ten day period that the two governments will enter into immediate consultations to make adjustments on an

emergency basis in accordance with principles of equity" became operative as the flow in the river remained below 50,000 cusecs for a few days in March and April. This led to a serious dispute that was extensively covered in the newspapers in both the countries; Bangladesh accused India of violating the Treaty and wanted India to protect the average flows and assure 35,000 cusecs to Bangladesh irrespective of the actual flows in the river at Farakka. Although a provision was made for joint observation of flows, the joint observations also came under debate. The issue remains unresolved.

Recognizing this discrepancy, both India and Bangladesh agreed to create a joint team of experts to find out the reasons for this. Although this joint team has been working on the analysis for the last five years, no report has been published so far.

Perspective from India

Two problems did arise in the first year after the Treaty came into force. The 1997 lean season marked a difficult hydrological year, with a late winter and subsequent overcast skies that retarded summer snowmelt. First, the alternate switching of 10-day flows to ensure a 35,000 cusec release to either side alternately, could not be done at a stroke if the unlined walls of the Farakka feeder channel were not to collapse on account of sudden fluctuations in water levels. The flows needed were gradually enhanced and reduced as a safety measure in accordance with operational practice, as previously brought to the notice of Bangladesh officials. This entailed a staggered increase and decrease in flows over 24-48 hours, while maintaining the overall schedule of releases, except in two 10 day periods when the river was running low. These small shortfalls were immediately made good from the Indian quota in the ensuing 10-day period.

The second problem arose with jointly measured releases at Farakka not arriving at Hardinge Bridge, the Bangladesh observation point. Instead of regeneration, as might be normally expected, there was degeneration as the summer progressed. Mala fides were alleged and a media and a political campaign was mounted against India. India contended that the releases and arrivals were being jointly monitored and that the site and source of leakage should be investigated. A joint committee of geologists, hydrologists and other experts was indeed set up but is yet to report. The delay is inexplicable and inexcusable, as the truth must be made known. There should be no scope for another crisis should degeneration recur in the future.

While the outcome of a scientific study is awaited, it is worth noting what the influential Bangladesh daily "Sangbad" wrote on the eve of the 1997 lean season. It warned that Bangladesh may receive little water at Hardinge Bridge if it continued over-pumping ground water at intermediate points in Rajshahi district. It stated that as much as 31,700 cusecs had been pumped by a battery of 100,000 tubewells in the Borendra project area as against a safe limit of 15,500 cusecs prescribed. The result over the years had been a considerable fall in aquifer levels and serious arsenic contamination.

Official Bangladesh records establish that the Gorai drew a mean monthly flow of 13,150 cusecs during the April trough between 1946 and 1975, when the Farakka barrage was commissioned. The Ganges Treaty provides an average release of double that quantum.

However, as mentioned earlier, only a fraction of the releases being made under the Treaty even now enter the still partially-moribund Gorai river. They are unable to top the Gorai hump as the Ganges falls with the progress of summer. This, is in spite of the effort to dredge a "Gorai cut".

While the issue related to the above mentioned technical problems of implementation is continuing, issues related to lean season flow falling below 50,000 cusecs still remains unresolved. It is very likely that the flows in the lean season in the future may go down below the average figures (as has happened in the past) and may also go down below 50,000 cusecs. As the Treaty provides for a review after every five years or earlier, a final solution is called for.

India-Nepal Agreements

A Perspective from Nepal

As noted earlier, there are four Indo-Nepal agreements on the Mahakali[19], Sarada, Gandak, and the Koshi Rivers. With regard to the Mahakali Treaty, due to the absence of conveying canals and other irrigation infrastructure in the Nepalese portion, Nepal has not yet started drawing water from the Tanakpur Barrage. As a result, the question of conflicts in terms of implementation of water sharing does not arise. Similarly, in the case of the Sarada Agreement, Nepal started utilizing her share of water from the Sarada Barrage only recently. No large mismatch between the actual delivery of water and that stipulated by the treaty has been reported so far.

However, in the case of the Gandak and Koshi Agreements, the implementation of water delivery has been highly unsatisfactory from the perspective of Nepal. To examine this aspect, it is important to first examine the physical arrangements influencing the delivery of water to Nepal.

As per the Gandak Agreement, the Gandak Barrage supplies water to the Narayani and West Gandak Irrigation Systems in Nepal. Part of the system area receives water directly from the Gandak River through independent intake, while other parts receive water either from the Indian Main Canal through several turnouts or from the branch canal supplying water to the Indian territory (**Figure 18**). This means the Gandak Barrage does not supply water to Nepal through a single control point. Several hydraulic structures managed by the concerned state governments of India control irrigation water to Nepal. Similarly, the Koshi Project also has similar arrangements for supplying water to the Nepalese territory.

Considering the example of the Narayani Irrigation system, Figure 18 shows that its feeder canal named the 'Nepal Irrigation Canal (NEC)' receives water from the tail end of 92 km long Don Canal, which in turn is fed by the Indian Eastern Main Canal. As per the Gandak Treaty, the NEC is supposed to receive 850 cusecs of water throughout the year.

[19] Although the Mahakali treaty also includes the Sarada Agreement, in this section they are dealt with separately

However, the Don Canal in India is not fully operational due to the lack of proper maintenance. Further, Nepal has never been satisfied with the actual operation of the Don Canal. As a result, Nepal has yet to receive the 850 cusecs of water from the Don Canal as per the bilateral understanding. **Figure 19** shows the actual time series flows of the NEC, which is far below the agreed amount of water to be delivered to Nepal from the Indian controlled Don Canal.

Assuming in good faith that India would provide the agreed quantum of water to Nepal, the latter country obtained a loan from the World Bank to develop the command area of the Narayani Irrigation System. Because the agreed quantum of water was not made available, Nepal was compelled to downsize the system area from the originally conceived 37,000 ha to 24,000 ha. Even after downsizing the system area, the delivery of water from the canal has been so erratic in time and quantity that the farmers have received little benefit from the irrigation water, and are still depending on the vagaries of the monsoon.

Command area development of the Narayani Irrigation Project was completed with a loan of US$50 Million from the World Bank with an expectation that it would bring an internal economic rate of return of 23 per cent. The investment has become unproductive; the expectation of annual incremental crop production of 95,000 metric tons has remained far from realization. It should also be noted that from 1986 to 1991 there was no supply of water due to the breach of the Don Canal. The breaching of the canal and intermittent supply of water are still acute problems.

Similarly, in the West Gandak Irrigation System, Nepal has not been able to obtain the requisite amount of water because the reservoir level upstream of the Gandak Barrage has not been maintained as agreed. This has resulted in a decrease in the supply of water from the designed discharge of 350 cusecs. The story of the Koshi Project is no better than that of the Gandak Project.

Part of the reason for the inadequate delivery of water to Nepal is due to the poor operation and maintenance of irrigation infrastructures on the Indian side. The lack of appropriate institutional arrangements has also contributed to the problem. This aspect is discussed further in subsequent sections of this Report.

Perspectives from India[20]

Nepal's grievances regarding the Koshi and Gandak irrigation systems were partially corrected in the supplementary agreements that followed within a few years of the main treaties. If some remain, they have stemmed from problems of maintenance of these systems in Bihar and Uttar Pradesh, occasioned by heavy flood damage and other factors to the detriment of these two Indian states as much as to Nepal. Such problems, when they have arisen, have therefore been systemic, affecting both sides. This may be poor consolation to Nepal; but it is necessary to recognize that both the initial Koshi and

[20] Please see also the perspectives from India in Section 12.3

Gandak irrigation systems in Nepal down to the field channels were constructed and gifted by India as goodwill gestures to its smaller neighbor.

India must certainly continue to strive to ensure sound operational and maintenance parameters of both systems that serve Nepal. It would, however, be an exaggeration to lay every deficiency in optimizing irrigated agriculture in these two commands at India's door. Nepal's own "Water Resource Strategy" (WECS, 2002) notes that "in general, irrigation activities in Nepal to date have not been very successful. Many projects have not reached their planned levels of productivity....". Such a critique could apply to the Indian side too: there is a learning curve.

The earlier joint Koshi and Gandak committees were not very effective and were dormant for quite some time. The two were combined and reconstituted as a single Koshi and Gandak Committee in October 2001, which has met thereafter to monitor and discuss issues pertaining to the maintenance of the barrages and canal systems. The new institutional mechanism will, hopefully, ensure greater satisfaction to both parties.

The Banbassa-Tanakpur projects have been subsumed in the framework Mahakali Treaty and the construction of the Pancheshwar dam will resolve all outstanding issues of water availability related to the two earlier irrigation systems. The task is now to expedite the Mahakali project and not permit any further delay.

14.2 Implementation of the treaty provisions

India-Bangladesh Treaties

Perspectives from Bangladesh

Recognizing that the dry season flow at the Farakka Barrage is insufficient to meet the water demands of both the countries, all the past Indo-Bangladesh water sharing treaties or agreements have made provisions for augmentation of the Ganges lean season flow. Despite such provisions, India and Bangladesh could not reach a consensus for an augmentation proposal. As a result, the issue concerning augmentation of the Ganges lean season flow has been the root cause of conflict between the two countries for more than two decades.

Regarding the augmentation of the river flow, the position of Bangladesh is that the total water requirements of the entire Ganges basin could be met from the resources available within the basin itself. Bangladesh has therefore proposed augmentation through harnessing and developing the enormous monsoon flows of the Ganges in the upper catchment region of Nepal and India. This would involve the construction of storage reservoirs at seven sites in Nepal[21] along with the storage of 51 dams in India on the

[21] The updated proposal indicated the feasibility of construction of at least seven storage dams in Nepal at Pancheshwar, Chisapani, Kali Gandaki (2 sites), TrisulGanges, Seti

Ganges. In addition to the dry season augmentation, the proposal would also provide hydropower to the co-basin countries as well as help downstream flood moderation in the wet season. This proposal, put forward by Bangladesh, was unacceptable to India since it required the participation of Nepal. India has consistently shown its preference for bilateral arrangements rather than regional ones.

Perspectives from India

India had been negotiating with Nepal over the preceding 25 years and continues to do so even today for the development of storage projects in Nepal for the use of India, which Bangladesh had also proposed for augmenting the Ganges lean flows. Nepal has its own perspectives and priorities with regard to water resource development. Each of the seven mega–projects proposed by Bangladesh entails an investment in excess of the Kingdom's GDP. Therefore the notion that Nepal would readily allow its development planning to be determined by extraneous considerations but for Indian obstructionism was and remains a gross simplification of ground realities. In point of fact, a joint Indo-Bangladesh approach was made to Nepal in 1986, but nothing came of it.

Over 60 million hectares of land are under cultivation in the Ganges basin in India as against 3.14 m ha in Bangladesh. The population living within the Ganges basin in the two countries is also roughly 450 million and 40 million respectively. Of this, the "Farakka dependent" as opposed to "Ganges-dependent" area and population in Bangladesh would be even smaller.

It was keeping these factors in mind that India proposed the augmentation of the Ganges from the river Brahmaputra. The Brahmaputra River basin contained surplus water[22] with an advantageous lag of two months over the lean season flows of the Ganges. Further, the river is marginally utilized with only a fraction of the arable area and population served as compared to the Ganges basin. Considering GBM (Ganges, Brahmaputra, and Meghna Rivers) as a single river basin system, India therefore forwarded several proposals. These included the transfer of about 100,000 cusecs of water from the Brahmaputra River by constructing a 324 km long link canal[23] to the Ganges, and diversion of waters from some

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and Sapt Koshi with a preliminary cost estimate of USS 17.1 billion at 1984 international construction rates. These dams in Nepal (total installed capacity 11,500 MW) with four raised (Chisapani, Sapt Koshi, Seti, TrisulGanges) above normal height, could provide augmentation to the Ganges to the tune of 5,339 cumec (188,345 cusec) during the dry season. It is, therefore, quite possible to solve the problem of water shortage in the Ganges at Farakka during dry season within the Ganges basin itself, without the need to transfer water from other basins.

[22] In terms of available water per unit of cultivable land, which amounts to about 44,180 m^3/ha

[23] This 324 km long canal was to take off at Joghighopa on the Brahmaputra in Assam, and after passing through northwestern Bangladesh, was to feed into the Ganges above Farakka (Figure 8). The proposed link canal was to have run northeast to southwest, which is against the lay of the natural gradient.

of the north bank tributaries (Manas, Sunkus Raidak, and Torsa) to Tista and further down to Ganges above Farakka. There are several proposals being considered. These proposals were not acceptable to Bangladesh for two reasons.

First, Bangladesh viewed the Indian proposal as based on the concept of mass transfer of water from one basin to another (from Brahmaputra to Ganges). Bangladesh was of the opinion that such a mass transfer of water across a basin would be against the internationally accepted principles initiated by the International Commission of Irrigation and Drainage (ICID)[24].

Second, Bangladesh is of the opinion that all the lean season flows of the Brahmaputra River basin are required in the Brahmaputra-dependent areas to maintain the ecological balance of the river, to prevent salinity ingress in the lower Brahmaputra-Meghna Basin, and to meet irrigation demand.

This raises the question: Why could a consensus not be reached between the two countries for augmenting the Ganges lean season flow despite all provisions made repeatedly by the Indo-Bangladesh treaties and agreements? There could be several reasons for this, only a few of which are mentioned here.

First, the desire to implement any provision made by the Treaty depends on the extent of its need for both the countries. For India, the need to arrive at an early settlement of an augmentation proposal did not seem that great. For Bangladesh, augmentation was urgently needed (Bandhyopadhyay, 1995). Thus, differences in the level of urgencies between the two countries may have delayed finalization of augmentation proposals. This suggests that for implementing any provision made by the Treaty, the urgency of its need for both the countries should be similar.

Second, a lack of general principles for sharing waters from Trans-boundary rivers has also helped in delaying finalization of augmentation proposals. This aspect is discussed separately in the next section.

Third, the success story of the Indo-Pakistan Indus Treaty suggests that involvement of an outside institution for mediation, and availability of financial resources, are key to arriving at an early settlement of any conflict between two countries. Lack of such a mediator and financial resources may have contributed to the disagreement between India and Bangladesh concerning the augmentation proposal. This is because the availability of financial resources could have provided several other incentives, which in turn may have led to an early settlement in implementing provisions of the treaties.

Bangladesh's water requirements are not limited to the Ganges alone. Of a cultivable area of just under 9 million ha, only 3.14 million ha lie in the Ganges basin, as against 3.75

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[24] The 10th Congress of ICID held in Athens in 1978 initiated such principles.

and 2.61 million ha in the Brahmaputra and Meghna basins respectively. Since the entire GBM flows enters Bangladesh from India or beyond, regional cooperation is a compelling necessity whether for managing floods or drought. Bangladesh cannot manage flood control by its actions alone.

In the case of Indo-Bangladesh water resource development, while the direct benefits to both sides from specific projects and agreements are obvious, there is surely a larger purpose and more generous dividend to be gained. Water Resources development is no more than an entry point to the bigger issue of alleviating poverty, hunger and unemployment and ensuring a better quality of life. This, too, should be seen as a ground area development programme embracing a vibrant agriculture, the fashioning of new transport corridors and inter-nodal carriage port development, new patterns of hydro electric/hydrocarbon/coal energy exchange and the creation of new market opportunities and trans-border linkages.

Chittagong could be a great entry port at the head of the Bay of Bengal, with Calcutta becoming a hub for inland waterways up to Ganges, Brahmaputra and Barak. The restoration of connectivity between Northeast India and its heartland through Bangladesh, and from all of this region to South East Asia and Southwest China through Myanmar, could initiate new regional relationships.

The Ganges and Mahakali agreements hold out real hope for a brighter future. A framework has been fashioned. Now is the time to move from dialogue to action.

Indo-Nepal treaties

There are several issues concerning the implementation of the provisions of the Indo-Nepal water treaties. This section, however, concentrates only on the issues concerning the Mahakali Treaty. These issues have surfaced only recently and are presently the causes of conflict between India and Nepal.

Perspectives from Nepal

The issues that are important to discuss here are (i) the existing consumptive use of the waters of the Mahakali River and (ii) the crest level of the head regulators in the Tanakpur Barrage.

Existing consumptive use of the waters of the Mahakali River

As noted above, the Mahakali Treaty of 1996 also includes the Pancheshwar Multipurpose Project, which would be constructed about 70 km upstream of the Tanakpur Barrage on the Mahakali River. In relation to the Pancheshwar Multipurpose Project, Article-3 of the Treaty stipulates:

> '...Both the parties agree that they have equal entitlement in the utilization of waters of the Mahakali River without prejudice to their respective existing

> consumptive uses of waters of the Mahakali River. Therefore both the parties agree to implement the project in the Mahakali River in accordance with the Detailed Project Report (DPR) being jointly prepared by them...'

Although the above article clearly established a prior use right of the existing consumptive uses, the Treaty failed to quantify such uses in India.

Before examining the existing consumptive uses, it is worth looking at the cost sharing arrangements of Pancheshwar Project. The capital cost of the Pancheshwar dam is to be apportioned between power, irrigation and flood moderation. Assuming hypothetically that the cost apportionment is 70 per cent for power and 30 per cent for water, including a tiny fraction for flood moderation, if the water benefits for irrigation are to be utilized in equal proportions, the total cost of the dam allocable to irrigation should be shared 50:50. However, as the potential area to be irrigated in India is much larger than that in Nepal, the water benefits for irrigation are not likely to be in equal proportion. Thus Nepal feels that, should India use more than its half share, it will be liable to bear an equivalent proportion of the capital cost. Following the Treaty provision, India on the other hand, feels that Nepal cannot claim in any form the unutilized portion of its share of the water.

The above arrangement for sharing the cost of the Pancheshwar dam made it necessary to identify existing consumptive uses to arrive at a consensus about the actual benefit that each country would receive from the project. In this regard, India claimed that the existing use right of the Lower Sarada Project[25] located at about 160 km downstream of Indo-Nepal border should be considered. India's claim on existing consumptive uses of waters in the Lower Sarada Project seems to be based on Helsinki Rules and UN convention on the non-navigational uses of International waters (Iyer, 2001).

Nepal, however, claims that such rules are not applicable because the condition of applicability of existing consumptive uses is well defined by the Treaty itself. Quoting the words of the Treaty, Nepal claims that the provision of the existing consumptive uses is applicable only on the waters of the Mahakali River, which is defined as a border river. Nepal thus protects the stipulated and existing quantum of irrigation from the Sarada canal taking off from Banbasa and Tanakpur barrages. By the same token, the argument proceeds, it is not committed to protecting any existing uses from the Lower Sarada located 160 km below Nepalese border which commands an additional 2 million ha.

The present controversy of preparation of the DPR primarily relates to this issue of existing consumptive use.

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[25] Lower Sarada is an irrigation project. As much of the water of the Mahakali River is used upstream by the Sarada Canal through Sarada Barrage, most of the water demand of the Lower Sarada is met by the Karnali River (known as Ghagara in India) through a feeder canal. Lower Sarada, however, may occasionally use certain amount of waters from the Mahakali River. The quantum of such use across the year is not known.

Crest level of the head regulator in the barrage

As this topic is technical in nature, it is worth examining the meaning and function of a barrage and head regular. A barrage is a gated structure built across the river in order to create a reservoir in the river in its upstream. The surface water level in the reservoir is termed as pond level. The reservoir then supplies water to the canal through intake structures, usually termed as head regulators, which are normally located on the riverbanks. The apex of the floor of the head regulator through which waters flow is called the crest (**Figure 20**).

The amount of discharge passing through a head regulator into a canal partly depends on how high the crest of the regulator is located with respect to the pond level of the reservoir. The difference in elevation between the pond level of the reservoir and the crest level of a regulator is called the water-head. The higher the water-head, the higher is the flow passing through the head regulator.

In implementing some of the past Indo-Nepal water sharing agreements or treaties, fixing the crest level of head regulators in the barrages and other water control structures has been very difficult. As a result, in practice, Nepal has not been able to receive its authorized share of water compared to that of India[26]. These past experiences have made Nepal more cautious in deciding the crest level of the head regulator for Nepal in the Tanakpur Barrage under the Mahakali Treaty, which in turn has become a source of conflict between the two countries.

Under the Mahakali Treaty, Nepal is allowed to withdraw 28.35 m^3/sec of water in wet season and 8.5 m^3/sec in the dry season form the Tanakpur Barrage. The Treaty also specifies that in case the Sarada Barrage becomes non-functional, the quantum of water (28.35 m^3/sec in wet seasoned 4.25 m^3/sec in the dry season) that Nepal is receiving from the Sarada Barrage would be received from the Tanakpur Barrage. This means the head

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[26] For example, in the case of Nepal's West Gandak Irrigation System (WGIS), the crest of the head regulator, located at about 600m upstream of the barrage, has been fixed only about 60 cm below the designed pond level of reservoir of the Gandak Barrage. Theoretically, with this arrangement, Nepal can receive 8.5 m3/sec of water as stipulated by the treaty. However, in actual practice, pond level of the reservoir has never been maintained, which in turn allowed less flow to Nepal. This is because to maintain the required flow in the two large canals leading to India and to regulate the floodwater for managing sediment, the pond level of the reservoir needs frequent fluctuation, especially in rainy season. This period coincides with the paddy cultivation season in the WGIS system. The frequent fluctuation in the canal discharge due to fluctuation in the reservoir level has made the operation of the WGIS unreliable and difficult, especially during the monsoon season for cultivating paddy.

Similarly, in the case of Indo-Nepal water division structure located at the end of the Don Branch Canal, the crest of the head regulator feeding Nepal Eastern Canal (NEC) is fixed in such a way that when its gates are fully opened, the structure behaves as a proportional divider. As a result, Nepal has not been able to receive water as per her share, although the bilateral agreement allows a continuous supply of 24.1 m3/s of water irrespective of the incoming water.

regulator of the Tanakpur Barrage should have a capacity of discharging 28.35 m^3/sec with the possible extension of up to 56.70 m^3/sec.

While constructing the Tanakpur Barrage, India had fixed the crest level of the head regulator for supplying water to Nepal, hereafter refereed to as Nepal head regulator, at an elevation of 245.0 meters. Whereas the crest level of the head regulator for supplying water to the power canal in India had been fixed at 241.5m, the designed pond level of the reservoir was 246.7m. This meant that the difference in the elevation between the pond level and the crest head regulator (water-head) was 1.70m for Nepal, and 5.2m for India (Figure 15). This difference between the water-head at head regulators belonging to Nepal and India increased the chances that Nepal would not get its share of water compared to that of India, especially when the pond level fluctuates. As a result, Nepal has insisted that the crest level of the Nepal head regulator be fixed at an elevation of 241.5m, similar to that of India. With the expectation that India would accept Nepal's request, irrigation infrastructures of the Mahakali Irrigation Project (stage 3) have been designed accordingly[27].

Nepal's arguments against the proposed crest level of 245.0m as proposed by India are as follow[28]:

- In order to allow 28.35 m^3/sec of water into the Nepal main canal, the minimum pond level required in the barrage would need to be 246.45m during the wet season and about 246.0m during the dry season. At the designed pond level of 246.7m, the margin available in the wet season is 0.25m and is 0.70m in the dry season. Such a narrow margin is usually considered inadequate for operating a large barrage. Normally, from an operational consideration, a margin of at least 1.0m is needed. This means the crest of the head regulator needs to be fixed in such a way that it could discharge the designed flow even if the actual pond level lowers by at least 1.0m below the designed level. This suggests that the crest level of the Nepal head regulator needs lowering.

- With the crest level of India's head regulator at 241.5m, the minimum pond level required in the barrage to allow the designed discharge of 680 m^3/sec in the power canal in India would be about 244.56m. This situation, however, would reduce the water level in the power canal. This means that if the pond level in the reservoir is maintained at 244.56m, about 680 m^3/sec of water can still be diverted to India, but Nepal would not receive any water at this pond level.

[27] Mahakali Irrigation Project (stage 3) aims to irrigate about 34000 ha. The project would receive water from the Tanakpur Barrage. Recently, an international consultant NEDECO (Netherlands Engineering Consultants) completed the feasibility study and detail design of the project under the technical assistance of the World Bank.

[28] For details, please refer to NEDECO (2001).

- In the dry season, the lowest 10-day average flow in the Mahakali River reaches the level of 130 m^3/sec. India can still divert the entire low flow with the pond level at 242.53m. This, however, would allow no water to Nepal.

The preceding arguments suggest that, theoretically, if the pond level of the reservoir is maintained at 246.7m, Nepal would receive its share of the water. In actual practice, however, this pond level is not likely to be maintained, which in turn would leave less water for Nepal. In contrast, the lowering of the pond level in the reservoir does not affect the supply of water to the Indian power Canal. This, however, would reduce the water level in the power canal. Considering the above arguments, Nepal has been insisting that for both countries the crest level of the respective head regulators should be fixed at the same footage.

India argues that, unlike the Gandak, Koshi and Sarada Barrages, which were designed mainly for irrigation purposes, the Tanakpur Barrage was designed mainly to generate hydropower. As a result, in order to produce the maximum possible hydropower, the water level in the power canal and in the reservoir needs to be kept as high as possible. In such a situation, the question of lowering the pond level in the reservoir should not arise, as this would reduce the production of hydropower. With this argument, India is insisting that Nepal should agree to fix the crest level of the head regulator at an elevation of 245.0m.

The above argument made by India does not consider the increasing future demands of water across several water use sectors. At present, in the Tanakpur Barrage, generation of hydropower seems to be the priority sector for water use. In future, this priority may change to some other water use sector, which in turn may not require keeping the pond level of the reservoir at the highest possible elevation. In such a situation, Nepal would not receive its authorized share of water.

In spite of these arguments, Nepal questions the rationale for India's insistence on keeping the pond level of the Nepal head regulator fixed at an elevation different from that of India. It believes that the only possible reason could be that by doing so Nepal may receive more water than that stipulated by the Treaty. This, however, is possible only if the operation of the head regulator remains solely under Nepal's control. As the Mahakali Treaty clearly stipulates, the head regulator for Nepal and the conveying canal up to the Indo-Nepal border would be operated jointly by India and Nepal. Therefore, the chances of Nepal drawing more water than that stipulated by the Treaty should not arise.

Certainly, the above discussion suggests that a high level of mistrust exists between India and Nepal on the sharing of International river waters. Thus, there is an urgent need for both the countries to arrive at a consensus in all aspects related to these technical matters for the benefit of both countries.

Perspective from India

a) Existing consumptive use of water (water rights)

Any notion that the Mahakali Treaty implies a 50:50 ownership by the two sides of the natural river flows of the Mahakali is mistaken. The ownership of the water by the upper riparian was a claim embodied in the Harmon Doctrine of territorial sovereignty asserted by the US in 1898 in the course of a dispute with Mexico over the waters of the Rio Grande. The doctrine was subsequently given up. Though asserted from time to time, it has never found acceptance anywhere in the world as a legal principle, any more than its mirror opposite, namely the theory of territorial integrity advocated by lower riparians to claim a perspective right to flows entering their territories. Section 3 (a) of the side letter exchanged with the Treaty leaves no room for ambiguity. It explicitly states that the irrigation benefit shall be assessed on the basis of incremental and additional benefits due to the augmentation of river flow. Hence, any reference to ownership of half shares relates only to the augmented flows as a result of the storage created behind the dam, and not to the natural flow of the river.

The live storage to be created in the Pancheshwar reservoir is estimated to yield around 582 cumecs. As there is an equal entitlement in the utilization of Mahakali waters, Nepal claims an equal share in the natural flow of 144 cumecs generated in the catchment between Pancheshwar and Banbassa as well, thus making available 726 cumecs at Banbassa. India requires 448 cumecs at Banbassa for the upper Sarada canal command. Nepal requires 160 cumecs to meet existing and planned uses. The Treaty mandates 10 cumecs for ecological purposes, thus bringing the total up to 618 cumecs. This still leaves a 108 cumecs surplus, as against the requirement of 228 cumecs at Girijapur. The deficit of 120 cumecs could normally be available by additional flows from the free catchment below Banbassa and through regeneration. If the base figure of water availability is taken as 726 cumecs, India's actual utilization may work out to around 75% rather than the stipulated half share, requiring it to pay 75% of the capital cost of the irrigation component of the project.

Having started on the road to development more recently, Nepal has sometimes felt itself disadvantaged by India's prior appropriation of water for irrigation and other uses in Uttar Pradesh and Bihar. As an overall principle, therefore, India has in all recent agreements conceded "primacy" to Nepal in the use of its river waters. The Mahakali agreement specifically stipulates "equal entitlement" to the waters of the Mahakali, including that impounded by the proposed Pancheshwar dam. It, however, goes on to state that neither side can make any claim in any form to that part of its entitlement that it does not utilize.

No one can claim "ownership" of natural river flows under international law and practice. It is yours if you use it. Yet, emerging international law does not accept "prior

appropriation" as an absolute principle and enjoins "equitable apportionment" instead. India accepts this in relation to Nepal even though the Mahakali Treaty protects "existing uses" (Verghese, 1999). The apparent contradiction between these two propositions is reconciled by the further proviso that costs are to be shared in proportion to the assessed benefits.

Applying these principles to the Mahakali, the facts are that India had long ago developed two irrigation systems on the Sarada, as the river is known in Uttar Pradesh, before it falls into the Ghagra (or Karnali in Nepal). The Upper Sarada canal takes off from the Banbassa barrage and irrigates 1.6 m ha and the Lower Sarada canal 160 kms downstream from the Girjapur barrage to command two million hectares. In view of the shortage of lean season flows in the Sarada river, the Lower Sarada canal is fed by the Sarada Sahayak, a link canal from the Ghagra. However, on account of the Ghagra's high silt carriage during the floods, Sarada Sahayak supplies are suspended for around 100 days between June and October when the Lower Sarada canal draws water from the Sarada river which is then in flood.

The Mahakali has a natural flow of 144 cumecs. The Pancheshwar dam will additionally impound 6 BCM of water (582 cumecs). Adding the two, the Treaty confers on Nepal and India an equal entitlement from this cumulative total of 726 cumecs. This is sufficient to meet Nepal's full existing and planned requirements of 160 cumecs to irrigate some 93,000 ha of land. The proposed high 140 percent intensity of irrigation during the lean (Rabi) season will take some decades to develop, and entails forest clearance. The Pancheshwar storage will also suffice to meet the additional requirements of India's Upper Sarada canal while leaving over enough to feed the Lower Sarada canal as well.

Calculations made by both sides indicate that, taking into account regeneration and free flows below Banbassa, it is only once in every three or four year that there could be a marginal shortage in the Lower Sarada while the Pancheshwar reservoir is filling. If India's requirements for more water at that time necessitate an adjustment in reservoir releases (in terms of power generation or otherwise), Nepal must of course be suitably compensated for the loss. No interest of Nepal need therefore suffer and its own water requirements will always be met in full.

The next question is how the cost of the Pancheshwar dam is to be allocated between power and irrigation (with flood moderation accounting for only one per cent or so of the water component). The cost of the Pancheshwar project (in accordance with the assumptions made in the DPR) comes to about Rs. 13,624 crores (in Indian rupees or $ 2.76 billion at the current exchange rate of a little under IRs 49 to the US dollar). The re-regulating dam at Rupali Gad would add another IRs 1,514 crores, bringing up the total cost of the project to IRs 15,138 crores.

However, of this cost, only IRs 8,492 crores or 55 percent is attributable to the water component of the Pancheshwar dam and spillway, the balance being attributable to the powerhouses, turbines and penstocks. It is this "water cost" that will be shared not 50:50

but 80:20 (or whatever), if that is the proportion of water that India uses. Nepal, of course, gets a half share of the power output and is free to sell any surplus to India at a negotiated price.

The discussions above suggest that the issue of existing uses of water becomes important to arrive at irrigation benefits, which in turn affect the sharing of the capital cost of the dam. As the water demands of both the countries can easily be met, certain basic principles must therefore be asserted. These are:

- Water rights should not be confused with ownership of flowing waters;
- India must accept that prior appropriation is not an absolute principle. Reasonable adjustments would be necessary should any such contingency arise in order to ensure equitable apportionment.
- Paying a larger proportion of capital cost as a one-time royalty by India for the dam construction.

There is thus a need for both countries to discuss the issues concerning the existing uses of water and capital cost sharing to arrive at a consensus for their mutual benefit.

b) Re-regulating dam

A re-regulating dam is necessary below Pancheshwar only because of the peaking requirement. Without it, water flows would be unregulated in view of massive surges in releases to generate 6,480 MW during four hours every day at 16 per cent load factor. It is moot whether or not India's Northern grid needs and can absorb such a large amount of peaking power during the next decade (with similar Indian plants in operation). However, the fact is that joint investigations of Rupali Gad (for which Nepal had a strong preference) clearly establishes that the site is unsuitable on account of early silting that will render its re-regulating function totally incapable in under two decades.

The understanding was that the Poornagiri site, lower down, would also be investigated and a final decision taken on the basis of comparative costs and benefits. But Nepal is reluctant to go ahead with the Poornagiri studies on account of the required higher displacement of people and other political sensitivities. This has interrupted further work on the DPR. Nepal has now suggested investigations at some intermediate site, but the problem is that the Main Boundary Fault, one of the two principal Himalayan tectonic fault lines, traverses this segment, making any structure located here a high seismic hazard. Poornagiri, however, lies below the MBF.

Another alternative informally proposed by the Indian side is that Pancheshwar be designed more as a base load power station with a higher load factor. This will obviate the need for a re-regulating dam while yet generating the same annual energy output and meeting all the specified irrigation requirements. Nepal however is anxious to maximize peaking power in the expectation of getting a better unit price for such energy. On this consideration of maximum net benefits, the aggregate power and water potential of

Poornagiri (1000 MW and a third of the storage of Pancheshwar)) would be far greater than the Rupali Gad option even if that were feasible, but it now turns out that it is not.

A third option is to build a dam of lower height at Pancheshwar in order to reduce submergence. But this too has so far been unacceptable to Nepal. The impasse must be broken soon as further delay will only add to cost escalation and deferred benefits, to nobody's advantage. The proposed Koshi High Dam - Sun Koshi-Kamala Diversion DPR was also put into cold storage for two years because of the earlier hiatus on the Mahakali project.

As an aside, it is worth mentioning that Bhutan started on the road to development a decade after Nepal but has forged ahead. Its per capita income of $100 per year in 1970 has soared to $545 with the Chukha hydro project (370 MW) built with Indian assistance. It is further likely to double with the coming on stream by the end of 2004-05 of the Tala project (1,020 MW), which is also being developed with Indian assistance. Bhutan has made hydropower its engine of sustainable development, poverty alleviation, environmental conservation and capacity building. There is a lesson here.

c) Crest level of the Tanakpur canal on the Nepal side

Nepal would further like the crest level of the Tanakpur canal to be lowered to that on the Indian side, despite Indian assurances that with the Pancheshwar storage, and even otherwise, it will always be ensured full supplies. This is a matter that India will need to address suitably through some compensatory mechanism in the unlikely event of Nepal's fears being realized. It may, however, be better for India to allay Nepal's anxieties by remodeling the Nepalese offtake, even though this may dislocate power generation for a short period of time and entail some cost to India. This is notwithstanding Indian explanations that in the absence of a clear indication from Nepal of the canal alignment it desired with reference to the delivery point on the border, the crest level of its canal was fixed at a point that would command higher ground by gravity flow.

d) Pricing of hydropower

The Treaty provides that Nepal's sale of power to India be priced in relation to the replacement cost of that energy and other relevant factors. This replacement cost cannot necessarily be equated with that of the equivalent coal or other fossil fuel or nuclear-based power in India for two reasons. The first is that India has an untapped potential of about 70,000 MW of hydro power in the central, eastern and western Himalayas and if the cost of Nepalese power is excessive, it will be priced out of the market even for peaking purposes. That is what happened to offers of power from Arun-3 earlier and more recently from West Seti. India has cheaper options. The second point is that, with the completion and strengthening of grid and inter-grid links within India, it is now possible to transfer substantial and increasing blocks of power, whether from more distant hydro plants or giant pithead power stations in the coal belt, across large distances over extra-high voltage transmission lines.

With the development of load dispatch centers, it is also going to be logical and feasible to shut down high cost plants during off-peak and off-season periods to reap the benefits of least-cost marginal pricing. Therefore, while peaking power may command a higher time-of-day price, it cannot enjoy too high a premium in an increasingly competitive market.

There is a further point that needs to be clearly understood. The Mahakali Treaty aims at "maximum net benefits". Nepal is right to treat its water potential as a strategic resource. It is therefore natural for it to seek not merely to maximize power output but to emphasize peaking power in a bid to better the price it commands.

e) The problem of floods in Nepal

Nepal has also expressed apprehensions about flooding from certain Indian embankments and structures on smaller streams along the border. These are relatively minor problems that have been exaggerated and avoidably politicized on the basis of an incomplete or mistaken understanding of the causative factors on both sides of the border. They are easily capable of resolution. India, for its part, is willing to do whatever is necessary to mitigate or prevent any distress after joint surveys by the two sides, which are in progress.

India has another problem. Nepal's Kamala and Bagmati barrages have deprived the corresponding barrages on the Indian side of sufficient water. It has accordingly proposed that Nepal build suitable storages on both rivers. Nepal, however, pleads environmental problems. Joint action is still possible and Indian assistance to construct the storages, with power benefits and a flood cushion, should be forthcoming.

There is in being an Indo-Nepal Standing Committee on Inundation Problems (SCIP) that now meets annually. All border problems are referred to it. This affords an institutional basis for dealing with trans-boundary water issues. It is headed by senior officials and could head off looming disputes by anticipatory action. The International Joint Commission set up under the US-Canada Boundary Waters Treaty of 1909 suggests itself as a possible model. With a permanent membership and a secretariat, all local plans and projects that intrude on the regime of any river along the common boundary could be required to be intimated to the commission for information, mutual consultation and clearance so that neither side is presented with a fait accompli.

f) Trade in electricity: an opportunity for the future

While the Mahakali Treaty bars any claim by Nepal for its share of unutilized augmented flows, it may, if it so desires, sell any or all of its share of power under the terms of the 1996 Indo-Nepal power agreement. This permits the two governments, semi-official agencies, or private parties to enter into agreements for the investigation, construction and generation of power and its transmission between the two countries or to a third country.

The Mahakali Treaty is a framework agreement that spells out the general parameters for overall water resource cooperation. The Indo-Nepal power trade agreement opens the door to private investment in water resource development. Private entrepreneurs are now allowed to sell energy to third parties. India need therefore no longer be a monopoly buyer. Bangladesh and Pakistan could also become partners with Bhutan and Nepal in a sub-continental power grid that could provide great flexibility and reliability in the system.

Apart from Pancheshwar, there is an Indo-Nepal agreement on Sapta Koshi high dam and Sun Koshi hydro diversion into the Kamala basins. It includes a navigation link by river or canal from the dam to the Ganges to give Nepal an outlet to the sea.

The regulated releases from the West Seti can augment lean-season flows in the Karnali by about 30%, which could beneficially be used by India some time in the future. A tradeoff with India on the projects on the Babai and Kankai or from the proposed Bheri Hydro project, which would divert water outside the Karnali valley with augmentation of flows of Karnali from West Seti, can be a good proposition. Nepal and India could trade water for energy. The feeling that Nepal's earlier innocence was cunningly exploited by India in the Koshi and Gandak projects is somewhat exaggerated. Nevertheless, that perception is a reality and can best be dispelled by the manner in which India now approaches its smaller neighbors.

India-Pakistan Treaty

In the three western rivers of Indus, Chenab and Jhelum, on which India has only very limited consumptive use rights but full rights for non consumptive uses, development is not as extensive as in the Eastern rivers of Ravi, Beas and Sutlej. As against a power potential of 8,845 MW (60% load factor), only 1,350 MW has been developed. The irrigation and flood cushion benefits permitted in these rivers have also not been utilized so far.

A Pakistan Perspective

Even though the Indus Waters Treaty has been successful for over forty years, the increasing needs for water and power in India and Pakistan are beginning to subject the Treaty to tensions. Pakistan believes that the 450 MW Baglihar Hydropower project by India on the Chenab River is a violation of the Treaty. Its request for a visit by Pakistan's Commissioner for the Indus Waters to visit the site has not been granted, and it may invoke Article IX(2)(a) of the Treaty for the appointment of a Neutral Expert to resolve the problem. This would be the first time in 43 years that a dispute on the river waters would be referred to a neutral expert.

Further, the Tulbul Navigation Project on the Jhelum in Jammu and Kashmir has not progressed satisfactorily. This Project is pending resolution since 1984. Pakistan's objection to this project is that it is a storage project, re-regulation is not permitted, and hence cannot be accepted under the Indus Waters Treaty.

The improvement in relations between India and Pakistan during 2004 may enable a resolution of the current impasse. The Statements by the Foreign Secretaries of the two countries after their meetings indicate this will be one of the topics to be addressed in meetings to be held later in 2004.

An Indian Perspective

India's argument is that the Tulbul scheme as envisaged is only a control structure (barrage) to regulate the natural storage of the Wullar Lake without any additional storage and rise in water level in the lake. The objective is only to improve the navigable draft in the river after the floods, over a period of four months during the winter season. India has also highlighted the additional power benefits that would accrue from all the hydroelectric projects downstream, to both India and Pakistan, due to increased regulated lean season flow downstream of the lake. The objection of Pakistan is, therefore, not technical but political. There is no conflict if the Tulbul scheme is removed from the political agenda.

15. Water sharing issues in South Asia

15.1 Public perceptions

India-Bangladesh

Perspectives from Bangladesh

Considerable differences exist within Bangladesh about the interpretation of the Indo-Bangladesh Treaty on sharing the Ganges waters. Some feel that the Treaty has overlooked the sentiment of the Bangladeshi people by satisfying requirements of the upper riparian India, and think that it needs modification (Miah 2001). Reasons for dissatisfactions are discussed later. Others welcome the Treaty, considering that it can lead to further development of the country's water resources (BUP, 2001).

With respect to the availability of water to Bangladesh, Miah (2001) argues that Bangladesh is not receiving the quantum of water that has been agreed to in the Treaty. According to Miah, the non-availability of flow data to the public, which used to be easily accessible, is part of the reason for the confusion and mistrust among Bangladeshi people about the quantum of water said to have been released to Bangladesh. Referring to the annex provided in the 1996 Treaty, he notes:

> "Annex-II of the 1996 Treaty is a redundant one, and is designed to hoodwink public opinion showing a higher figure of water availability. As it is based on average flow from 1949 to 1988, whose certainty of occurrence cannot be guaranteed, one cannot expect to get the quantum of water as mentioned in it for each 10-day period".

However, analysis of the flow data suggests that the actual quantum of water that has been released to Bangladesh (Figure 12 shown earlier) matches quite well the provisions of Annex-II of the 1996 Treaty, except during the dry season of 1997, as mentioned earlier. In fact, the Figure suggests that during most of the dry season the amount of waters that was released to Bangladesh was even more than that provided in the said Annex. This implies that Annex-II of the 1996 Treaty does provide indicative values about the availability of water to Bangladesh.

This raises the question — why does a certain section of Bangladesh society continue to express their dissatisfaction with the 1996 Indo-Bangladesh Treaty on sharing the Ganges waters? Such dissatisfaction, however, seems to be based on the reduction in Bangladesh's share of water as provisioned by the 1996 Treaty when compared to the 1977 Agreement, especially during March and April which are critical months of the dry season. This is shown in **Figure 21**.

It should be noted that during March and April, the quantum of water that Bangladesh received per the 1977 agreement (with respect to incoming flow) was much greater than the provision made by the 1996 Treaty. As a result, during 1978 to 1987, when the 1977 agreement was followed, except that in 1985 there was a considerable gap between the water shares of the two countries, as shown in Figure 16. In contrast, during the period 1997 to 2000, the gap between the water delivered to the two countries was narrowed down considerably due to an increase in India's share and a decrease in shares to Bangladesh. This ad hoc reduction in Bangladesh's share of water as provisioned by the 1996 Treaty, especially during the critical months of the dry season (March-April), seems to be one of the reasons for peoples' dissatisfaction with the present Treaty.

Perspectives from India

The notion that Bangladesh got a raw deal under the Ganges Treaty is misconceived. The average low season flows at Farakka work out to 55,000 to 70,000 cusecs at 75 and 50 per cent dependability, respectively. The apportionment of water made under the Treaty on this calculation, gives Bangladesh a generous share taking all relevant parameters such as population, arable area, rainfall and Ganges dependant area into account.

Critics in Bangladesh sometimes argue that it is not the Ganges flows that are being divided but merely the residual flows at Farakka. This is true. But upstream diversions are partly based on storages or monsoon flows and arrivals at Farakka include a measure of regeneration.

Be that as it may, a comparison with the Brahmaputra, a larger river, is illuminating. The lowest discharge of the Brahmaputra at Dhubri, just before the river enters Bangladesh, is of the order of 110,100 cusecs. So it is unlikely that the virgin flow of the Ganges at its lowest would be any larger, and probably smaller. However, assuming the minimum virgin flow at Farakka is even 100,000 cusecs, Bangladesh would be receiving a quarter of the lean flows under the Ganges Treaty formula when it has a Ganges command and a population therein of less than a twentieth and a twelfth of that in India respectively.

As for the switch from calculating flows on the basis of average (50 %) dependability in place of the 75 % dependability used earlier, this was done to create a political feel-good factor in a bid to assuage critics on both sides. Bangladesh's negotiators were keen on showing a minimum of 35,000 cusecs (half the 70,000 cusec average minimum flow) during alternate 10-day periods through March to May whereas the 1977 Ganges Accord, negotiated by an earlier regime, had won a minimum guarantee of 34,500 cusecs. India, in turn, wished to show that the 35,000 cusecs it was getting was not far short of the 40,000 cusec designed capacity of the Farakka Feeder to flush Calcutta port. Such political gamesmanship apart, the plain fact is that Bangladesh has in each year received more water over the entire lean season period than stipulated in the indicative schedule in Annexure II. These indicative flows are not assured, but set out the proportionate allocations either side might receive in a normal hydrological year.

The Ganges Treaty provides for a review of the Accord every 10 years but either side was empowered to seek an initial review after the first five years. That deadline passed in December 2001. Despite periodical protestations, Bangladesh has not sought to invoke a review. Nor has India. This is significant. On the whole, the Treaty constitutes a fair settlement, with each side sharing the shortage. Augmentation remains a future hope. There could be supplementation from the Koshi if a high dam is constructed. The irrigable commands in Nepal, North Bihar (which has an abundance of ground water and suffers from severe drainage problems) and West Bengal are limited.

Demand management and water conservation, including a diversification of cropping patterns, could also play a role in stretching available supplies. Water use efficiency can be improved. Water can no longer be treated as a social good in all circumstances and not be charged an economic price.

In relation to the water resources development of Ganges River, both Bangladesh and Nepal have urged for multilateralism. India has, however, been overly anxious to act bilaterally. Yet, if bilateral cooperation is stymied, the expectation that a multilateral framework will work magic is equally fanciful. Were bilateral cooperation really to get under way, the unfolding logic is more likely than not to promote multilateral cooperation in fields such as flood mitigation, power grid connections, augmentation of water, or navigation with inter-modal links.

A useful beginning could be made were senior representatives of India, Nepal, Bangladesh and Bhutan to meet and just exchange notes about where they stand in terms of water resource development and where they hope to get within the next five to 15 years. None has any real knowledge, let alone appreciation, of what the other is doing or attempting to achieve. Such meetings, starting with an exchange of public information and sharing data, would reveal complementarities, common opportunities and possible synergy. India is already assisting Bangladesh in controlling arsenic pollution of its ground water. If the Koshi high dam moves forward, Bangladesh's concerns could be incorporated in the project design and operational parameters, establishing a partnership that would necessarily grow.

In sum, the above discussions suggest that considerable differences in opinions exist between India and Bangladesh about the principles of sharing the water of the trans-boundary rivers. India is of the opinion that all trans-boundary river water needs are to be shared on an equitable basis depending on the several relevant parameters such as drainage area contributed by each country[29], population, rainfall, arable area, river dependent area and so on. Bangladesh, however argues that water sharing should be on the basis of equal sharing, based on ecological considerations and historical use rights. The lack of well-defined principles for sharing international water between riparian countries has further helped promote such differences.

[29] For example, in the case of the Tista River, about 83 per cent of its catchment areas lie in India and the rest in Bangladesh. Accordingly, India wants to share water in the same proportions.

India-Nepal

Sharing the benefits

Most of the Indo-Nepal treaties and agreements concentrate on sharing the benefits. These include incremental benefit due to irrigation, hydropower, flood moderation, navigation, tourism and so on. Of these benefits, those due to irrigation development are especially worth mentioning here.

Construction of any storage project in Nepal will augment lean season flow of the river and moderate floods. As irrigable land in Nepal is limited, this will ultimately benefit India. Nepal has been demanding that India should give due consideration to the down stream benefit that would be created by storage projects in Nepal, and would like to account for it based on certain principles. India however feels that she already has prior appropriation of water and no additional benefit would be generated. It is to be noted that India has already developed irrigation infrastructure in many more areas compared to the natural lean season flow of the major trans-boundary rivers. Further, India believes that Nepal is asking for compensation for downstream benefits based on the latter's ownership rights to flowing water. In this context, India feels that no one can claim ownership of natural water; it is yours if you use it.

Part of the reasons for pending implementation of a few storage projects in Nepal is due to issues related to down stream benefit and prior appropriation of water. An example is the West-Seti storage Project in Nepal. The regulated releases from the West Seti can augment lean-season flows in the Karnali River (Ghagra in India), which could beneficially be used by India some time in the future. As discussed earlier, the Pancheshwar Multipurpose Project also has similar unresolved issues.

Thus, certain basic principles must be asserted for the future if the water resources of the region are to be developed without conflict. It is suggested that India accept that prior appropriation is not an absolute principle. Similarly, Nepal should not insist that she has ownership rights over flowing water.

Sharing the water

As in Bangladesh, many people in Nepal are also dissatisfied with the Indo-Nepal Treaties on the Sarada, Koshi, and Gandak Rivers. They feel that they have not been treated equitably in the past. The large differences between water shares assigned to India and Nepal (Table 8) are a major reason for this discontent.

The Table above clearly shows that Nepal's share of water is very small compared to India's share. As a result, people in Nepal feel that they have been misled in the name of cooperation and financing the projects that were fully funded by India. Further, as explained earlier, Nepal has always been dissatisfied with the real implementation of the Treaty.

Table 8: Water sharing provisions in Indo-Nepal treaties

Name of Treaty	Average annual river flow (m^3/sec)	India's share (based on canal capacity)		Nepal's maximum share (as per Treaty)	
		Quantity (m^3/sec)	Percentage of available flow	Quantity (m^3/sec)	Percentage of available flow
Sarada Agreement 1920	725	326	50.5	28.35	3.7
Koshi Agreement 1954	1,550	630	40.6	20.00	1.3
Gandak Agreement 1959	1,590	892	56.0	34.50	2.1

These aspects have created a suspicion in the minds of the Nepalese people about India's position on issues related to the sharing of water resources. Some of the urgent issues of the Mahakali Integrated Treaty (existing consumptive use and the crest level of the head regulators in the Tanakpur Barrage) also support this notion.

The Indian perspective on these issues is different. India feels that the percentage of water delivered to Nepal from these projects should be looked at from a geographical perspective. As Nepal is a mountainous country, there is not much land available for irrigation. India thus feels that from the perspective of irrigable land, the quantities of water delivered to Nepal match quite well India's share of water. Further, India believes that she has helped Nepal considerably in developing several water resources projects, which were not stipulated by the Treaty. Some of these examples are the Trishuli and Devighat Hydroelectric Projects with an installed capacity of 38.5 MW, the Chatra Canal with an irrigated area of about 60,000 ha, and the renovation of Chandra Canal. These projects, which were fully funded by India, have provided a variety of benefits to Nepal.

There are several other arguments raised by both parties. What is lacking in these agreements are the principles governing the sharing of benefits and costs. Sharing of water and other benefits in past agreements was done on an ad hoc basis resulting in Nepal's dissatisfaction. For example, as shown in Table 4, Nepal's share of water from the Gandak Project is 2.1% compared to India's share of 56 %, which was based on the average annual river flow. The question that arises is "Why is Nepal's share of water 2.1 percent?" Why not 3.1 percent or 1.1 percent? Due to the lack of governing principles regarding the sharing of costs and benefits, both the governments of Nepal and India are unable to answer these questions to their respective people. As a result of this, dissatisfaction exists in both countries.

15.2 Institutional Aspects

The success of any water sharing treaty is possible only with its effective implementation and joint monitoring in a climate of mutual trust and complete transparency. This requires effective institutional arrangements.

In the case of both the India-Bangladesh and India-Pakistan treaties, formation of a Joint Committee provided a sound institutional base for its effective implementation. Despite this, some institutional deficiencies still exist in the case of the Indo-Bangladesh Treaty. Two of them are worth mentioning: the sharing of water when the flow reaching Farakka falls below 50,000 cusecs, and the lack of provisions for mediation in cases of conflict between the two countries.

For sharing the Ganges water (when the flow at Farakka is below 50,000 cusecs) between India and Bangladesh, article II (iii) of the Treaty stipulates that:

> In the event when flow at Farakka falls below 50,000 cusecs in any 10-day period, the two Governments will enter into immediate consultations to make adjustments on an emergency basis, in accordance with the principles of equity, fair play and no harm to either party.

Such a situation occurs only during the critical periods of the dry season, and needs to be resolved immediately. However, it is not clear in the Treaty which level of government is to meet for immediate consultation. Moreover, would it be possible for both the governments to enter into immediate consultation to sort out the matter of a water deficiency? This is very unlikely. By the time the two governments meet for consultation, the period of water scarcity would be past and the damage beyond repair.

As an example, in 1997 the flow reaching Farakka during one 10-day period remained below 50,000 cusecs, and the flow trend observed between the Farakka barrage and Hardinge Bridge varied considerably. As a result, Bangladesh received lower flows than what was released at Farakka, which in turn resulted in a dispute. Both the countries therefore decided to constitute a joint team of experts to resolve the dispute. However, the committee has yet to submit its findings although five years have passed since its formation. There is no provision for arbitration in the Indo-Bangladesh Treaty for resolving conflicts between the two countries. For a 30-year treaty, such provisions for arbitration are essential. Absence of such provisions may promote conflict.

Thus, as a part of the settlement of conflicts as stipulated in the Treaty, an additional mechanism or instrument should be introduced. The Treaty could make a provision for a tribunal, whose decision(s) would be binding on both parties. The tribunal could comprise of three members well versed in international water law and management, one each from Bangladesh and India and the third member (who would act as the chair) should be from outside this region but acceptable to the two governments.

With respect to the Indo-Nepal treaties, as noted above, institutional arrangements for implementing the Sarada, Koshi, and Gandak Agreements are relatively weak. In spite of the formation of several committees and sub-committees between the two countries, there has been little progress. While the institutional mechanisms of the Mahakali Treaty are relatively progressive, they have not yet been fully implemented.

The main issue concerning the Indo-Nepal treaties is that despite the signing of the agreements between the governments of Nepal and India at a national level, Nepal needs to deal with the state governments (Bihar and Uttar Pradesh) at the field level for their implementation, especially for delivery of water. Due to inadequate linkage between the states and the central government in India on water issues, provisions of the water sharing arrangements need to be implemented on the basis of personal relationship between the Nepalese engineer and the engineer of the concerned state of India. Those who can influence the Indian authority can manage to draw more water to Nepal, and those who cannot do this have to manage with the reduced supply. Thus, the implementation of the provisions of the agreements at the field level has not been satisfactory in keeping with the spirit of the agreements.

An effective institutional mechanism with adequate authority at field level is therefore necessary for the implementation of the provisions made by the past agreements. This requires generating and sharing relevant data which will provide a scientific basis for decision making, monitoring and dispute resolution.

15.3 Water security

India-Bangladesh

Since the Indo-Bangladesh Treaty is valid for a period of 30 years, during which water needs will increase in both countries, serious concerns about water security have emerged. In this context, some aspects that need to be considered include:

1. Augmentation of the flow for meeting the increased water demands. This aspect has been discussed in the preceding section;
2. Maintaining the present supply of water to both the countries, if augmentation of the flow is not likely in the near future.

As Bangladesh is the lower riparian country, its main concern is for maintaining the present supply of water by the inclusion of a clause in the water sharing Treaty that guarantees the release of a certain flow to Bangladesh. India, however, believes that inclusion of such a guarantee clause is not possible because the availability of water at Farakka depends on several factors including global climate change[30]. Thus Bangladesh's primary concern is to determine how the flow at Farakka can be maintained at the present level.

In this context, article II (ii) of the Treaty states:

[30] To some extent, the 1977 Indo-Bangladesh water sharing agreement had guaranteed a certain flow to Bangladesh amounting to at least 80 per cent of Bangladesh's stated share irrespective of flow available at Farakka. However, the 1996 treaty provides a formula of water sharing, which depends on the availability water at Farakka, except during the periods of critical flows.

> "Every effort should be made by the upper riparian to protect flows of water at Farakka as in the Annex-II (40 years average availability) of the Indo-Bangladesh 1996 Treaty".

However, the term 'effort' does not oblige the upper riparian (India) to maintain the flow. This is because India can always make an effort, but may not succeed in those efforts (Miah, 2001). Maintaining the present level of flow at Farakka includes several challenges:

- With the increasing demand for water, the local upstream communities from the reaches of the Farakka barrage may withdraw increasing amounts of water from the Ganges. It is noteworthy that, since 1988, more than four hundred pumps have already been installed in upstream reaches of Farakka for extracting Ganges water for several purposes (Miah, 2001). Since there are no institutional arrangements to check such extractions, the Ganges flows during the lean season are likely to be reduced in future.

- Bangladesh uses Ganges water downstream of Hardinge Bridge that is located about 120 km downstream of Farakka. The alignment of the ground and also of the aquifer in Bangladesh is generally from the Northwest to the South and Southeast. It has therefore been found that the water volume recorded at the Hardinge Bridge is more than what is released at Farakka in India, the interflow from the North contributing to it. However, this normal pattern was not observed during five 10-day periods during 1997, two 10-day periods during 2001, and two 10-day periods during 2003 (Miah, 2003).

- Issues relating to water in India are under provincial jurisdiction. As a result, the Government of India cannot prohibit its provincial governments (Bihar and UP) from extracting additional water from the upstream reaches of the Ganges. Such prohibition may be possible only if the Ganges is declared an international river with ownership affixed with the central governments of both countries.

- Nepal is an upper riparian country with respect to the tributaries of the Ganges. Although Nepal represents only 14 per cent of the Ganges catchment, the contribution of Nepalese rivers to the Ganges lean flow is about 71 percent. At present, the use of lean flows in Nepal for its own use is minimal due to lack of resources for their development. However, a few projects for consumptive use of water mainly for irrigation have already been identified and studied. These projects include West Koshi, Sunkoshi-Kamala diversion, Bheri-Babai diversion, and West Rapti. The development of these projects by Nepal in future may further reduce the Ganges lean flow at Farakka.

As with Bangladesh, India is equally concerned about maintaining the present supply of water to manage the Calcutta Port.

These aspects further necessitate finalizing the flow augmentation plan between the two countries and at the same time increasing the end use efficiency of water.

India-Nepal

Unlike Bangladesh, Nepal's main concern lies in securing rights over the water before it flows to India. Despite the fact that Nepal is an upper riparian country, it has not been able to use water from many Nepalese rivers for its own use. Babai, West Rapti and Kankai Rivers are examples of this. In the course of implementing irrigation projects from these rivers in Nepal for its own uses, India has objected to these projects by raising riparian issue through donor agencies. As a result, donors have been reluctant to lend funds to Nepal for these projects. This has hurt Nepal's plans to utilize water from these rivers for irrigating its most backward areas. Nepal has been seeking cooperation from India, particularly with regard to the development of river systems like the West Rapti, Babai and Kankai for irrigation.

India-Pakistan

In contrast to Bangladesh and Nepal, India and Pakistan are essentially independent of one another in managing their water supplies under the Indus Waters Treaty. As a result, concerns related to water security have not been very acute in the past but the situation is changing, as mentioned earlier.

As seen earlier in Table 1, Pakistan is already a water-stressed country with all its water potential already utilized. Thus further cooperation between India and Pakistan is essential, in order to meet the water demands of both the countries. The Indus Waters Treaty did not seek to develop the full potential of the Indus system in terms of storage, flood cushioning and hydropower through integrated basin development and management. Pakistan, too, cannot develop the full potential of the three Western rivers allocated to it without cooperation with India. Even drainage problems in the lower regimes of the river and canal networks could be better overcome through collaborative arrangements.

Hostility between the two countries has precluded India from developing the Eastern rivers, even within the ambit of the Treaty, in view of objections by Pakistan. The Tulbul barrage on the Wulur Lake is a case in point. This envisages a low structure at the point where the Jhelum exits the Lake, to impound the floodwaters of the river at no more than bank level, and regulate its releases through the lean season. The scheme has faced a virtual veto. This, despite the fact that it would moderate silt flows into Pakistan and marginally improves the efficiency of the Mangla dam.

If India-Pakistan relations continue to improve, it would be desirable to think ahead and conceptualize building on the 1960 Treaty. One can envisage storages on the upper Indus, Jhelum and Chenab, over and above what is presently permitted, that could benefit both countries. These could enhance conservation, flood moderation, lean season regulation,

generation of additional electricity, and improvement in the management of the upper catchments.

The idea may appear remote at the present time, but the very exercise of looking ahead would reveal the opportunity costs of non-cooperation and belligerence[31]. Governments may not venture to think on these lines today, but intellectuals and professionals can do so. Both northwest India and Pakistan are water-stressed and energy short, and the potential of the Indus river system has not been exhausted.

15.4 International principles for utilizing cross-border rivers

The historical development of international treaties suggests that many of the conflicts between the South Asian countries are in part the result of non-recognition of international norms and principles in utilizing international waters, particularly by the larger country. It is to be noted that, under contemporary international principles, a state can use or manage international waters through the construction of physical infrastructure without causing appreciable harm to other riparian states. This requires an understanding between the riparian countries before utilizing or managing the international waters, either through the development of barrage and dams or simply by managing the existing infrastructure.

The historical development of past treaties and agreements between the South Asian countries suggests that India first developed and managed barrages on the international rivers unilaterally, which forced the concerned riparian countries to come to the negotiating table. This is against international principles, which require that negotiation should precede the construction and management of barrages or dams. The following examples illustrate India's unilateral decisions on the use of international waters:

- In 1948, India first stopped the water supply in all the canals leading to Pakistan from the Eastern Indus River System. As a result of this, after 12 years of difficult negotiations between India and Pakistan, the Indus Treaty was signed in 1960.

- In 1983, India first constructed the Tanakpur Barrage on the Mahakali River (Indo-Nepal border river) in order to generate 120 MW of hydroelectric power for its own use. In 1988, the main portion of the barrage and the power station were completed. However, India could not operate the project without constructing an afflux bund that connected the barrage with high ground in Nepal. This situation dragged Nepal to the negotiating table, as a result of which the Mahakali Treaty was signed in 1996.

- In 1951, India first initiated construction of the Farakka Barrage on the Ganges to divert 40,000 cusecs of water into Bhagirathi - Hooghly. In spite of repeated protests from Bangladesh, the Farakka Barrage was completed in 1970 without any agreed understanding between the two countries. Finally, after a series of negotiations

[31] See, for example, Durrani (2000).

between India and Bangladesh, the Ganges Treaty was signed in 1996. Earlier, a 5-year Agreement had been signed in 1977.

Such incidents continue today. A very recent example is the construction of an embankment at the Laxmanpur Barrage (in the Rapti River) by India on its own land close to the Indo-Nepal boarder. This embankment has adversely impacted Nepal in terms of an inundation affecting more than 10,000 poor farmers. Although Nepal protested against India's actions, Nepal had no other option but to work with India to find an alternative solution. At present, negotiations between India and Nepal regarding the embankment continue.

15.5 Factors contributing to the success of the Indus Treaty

The Indus Waters Treaty is the only agreement that has been faithfully implemented and upheld by both India and Pakistan. Although its negotiation was often arduous and frustrating, the final outcome is generally considered to have been a success.

Pakistan had found itself in a very vulnerable position, and was prepared to negotiate, accepting the unique position that the lower riparian rights in the Eastern Rivers would be completely ignored. These are circumstances to which very few countries would agree to in today's atmosphere given that new International conventions have made considerable headway in trying to protect the rights of lower riparian states. However, Pakistan's willingness to ignore its traditional rights to the Eastern Rivers was heavily subsidized by the proposal for constructing replacement works for diverting the waters from the western to the eastern rivers through the development of several storage works and link canals. The replacement works were only possible with funding from the World Bank.

India believes that it has also considerably sacrificed her rights over the water of the Indus River system. In spite of the major headwaters of the Indus being located in India, the Treaty delivered 81 per cent of the total river flow to Pakistan and only 19 per cent to India.

The Indus Waters Treaty suggests that cooperation between other countries in the region is possible in cases where the benefits of agreement are substantial and urgent. This may overcome the political concerns that are frequently an obstacle to cooperation. The Treaty, however, did not take into consideration some important impacts of its implementation. The environmental consequences of the replacement works for diverting the waters from the western to the eastern rivers have been substantial -- water logging and salinity in the areas adjacent to the canals have increased.

Further, the Treaty ignored aspects related to the economic dislocation caused to the people in Pakistan as a result of giving up their traditional use rights for the waters of the Eastern Rivers. In the current scenario of an environmentally conscious world, and where farmers are far more vocal about their traditional water rights, it is unlikely that a similar

Treaty could be negotiated without some regard for the rights of the people directly affected by them.

16. Summary and Conclusions

We have examined in Section 2 some key issues concerning current and potential conflicts related to the international water treaties made between the South Asian countries, with the goal of promoting regional cooperation in the field of water resources. The focus has been on the Indo-Bangladesh Treaty on the Ganges, the India-Pakistan Treaty on the Indus River, and Indo-Nepal treaties on the Mahakali, Koshi and Gandak Rivers.

Depending on the context, the above-mentioned South Asian treaties can be grouped into three categories. Accordingly, the nature of conflicts and possible solutions for further cooperation in the region vary considerably. The Indo-Nepal treaties, which concentrate more on sharing the benefits through development of international rivers, can be placed in the first category. The Indus Treaty, which partitioned the rivers between the two countries rather than sharing their waters, would fall into the second category. Those treaties intended for sharing waters would fall into the third category.

In the case of sharing the benefits between India and Nepal through development of international rivers, two issues are found prominent: (i) Defining existing consumptive uses of waters and (II) the basis for power tariffs, especially for peaking power, when sharing power benefits. The issues concerning existing consumption are summarized below. In the case of selling power to India, Nepal believes that for peaking power a separate tariff based on the costs of alternative energy needs to be worked out. In contrast, India believes that while peaking power may command higher time-of-day price, it cannot enjoy too high premium in an increasingly competitive market. This is because with the strengthening of several power grids and load dispatch centers within India, it is now possible to transfer substantial and increasing blocks of power, whether from more distance hydro-power plant or giant pithead power stations in the coal belt area across large distance over extra high voltage transmission lines.

In reality the Indus Treaty is not a water-sharing treaty, but rather a treaty for partitioning the rivers between the two countries. As a result, both the countries (India and Pakistan) are independent of one another in managing their water supplies and safeguarding issues concerning water security. This aspect is considered an important element in the success of the Treaty.

Unlike the Indus Treaty, the Indo-Bangladesh and Indo-Nepal treaties do not create a situation of independence in their implementation, which is influenced by several hydraulic and institutional externalities. As a result, several issues concerning interpretation and implementation of these treaties continue to emerge. They are summarized here.

Considerable differences exist within Bangladesh regarding the Ganges Treaty, especially in relation to Bangladesh's share of the water. Some feel that the Treaty has overlooked the sentiment of the Bangladeshi people, and should be revised. Such differences seem to

appear due to the ad hoc nature of defining the water share of each country, especially during the dry season. It should be noted that Bangladesh's share of water as provided for in the 1996 Treaty has been reduced from that of the 1977 agreement, especially during the critical months of the dry season.

Similarly, many people in Nepal are dissatisfied with the India-Nepal Agreements on the Sarada, Koshi, and Gandak Rivers. The large differences between the water shares belonging to India and Nepal are in part the reason for such dissatisfaction. Nepal's share of water from the barrages constructed by India on these rivers averages to about 2.6 percent of the available flow. In contrast, the quantum of water that India can draw from these barrages is unlimited. As a result, the people of Nepal feel that they have not been treated equitably in the past. This aspect has led to increased resentment in Nepal.

The Indian perspective is somewhat different. In the case of Indo-Bangladesh Treaty, India feels that the apportionment of water made under the Treaty gives Bangladesh a generous share taking all relevant parameters such as population, arable area, rainfall and Ganges dependant area into account. As Bangladesh has not sought to invoke a review of the Treaty, the deadline of which was December 2001 (as per Treaty), India argues that despite periodical protestations, on the whole the Treaty constitutes a fair settlement, with each side sharing the shortage.

In the case of the Indo-Nepal Treaties, India feels that the percentage of water delivered to Nepal from these barrages should be looked at from a geographical perspective, especially from the perspective of the availability of irrigable land. In this context, India also believes that the help provided by India to Nepal in developing several other water resource projects that were not stipulated by the Treaty also needs to be accounted for.

Further, construction of any storage project in Nepal will augment lean season flow of the river and moderate floods. As irrigable land in Nepal is limited, this will ultimately benefit India. Nepal has been demanding that India should give due consideration to such down stream benefit, and would like to account for it based on certain principles. India however seems to be reluctant to account for such benefit thinking that Nepal is asking for such benefits based on the latter's ownership rights to flowing water. In this context, India feels that no one can claim ownership of natural waters; it is yours if you use it.

There are several other arguments raised by each country in relation to its share of the water and benefits. The principles on governing the sharing of water and other benefits are lacking in the Indo-Bangladesh and Indo-Nepal Treaties. The usual upstream - downstream tensions, the unequal size of the countries, and several other geo-political aspects may all have contributed to the ad hoc arrangements for the sharing of water (Salman and Uprety, 2002).

There is a need to define governing principles regarding the sharing of water, the costs of the water resource development projects, and benefits derived by them through a framework treaty based on a regional approach.

In general, the delivery of water to Bangladesh up to the present time seems to be satisfactory except during a few periods. However, the delivery of water to Nepal as per the Gandak and Koshi Agreements appears to be less than that provided in the Agreements. As a result, Nepal continues to be dissatisfied with the actual delivery of water irrespective of the provision made by the Treaty. One reason for this may be the lack of proper maintenance of the water systems by each country, particularly India in its part of the system that delivers water to Nepal. Another factor is the lack of appropriate institutional arrangements and joint operational control of the system.

With regard to the implementation of the provisions made by the Mahakali Treaty, serious concerns have emerged. These include deciding on a site for a re-regulating dam, and defining existing consumptive uses of water from the Mahakali River.

A re-regulating dam is necessary to hold the water released from the main dam (Pancheshwar dam). Earlier, two sites namely Rupali Gad and Poornagiri were proposed for the study. A difficulty has arisen since the Rupali Gad, Nepal's preferred site for a re-regulating dam, is found to be technically infeasible. India thinks that the next site, that is Poornagiri, should be considered for the re-regulating dam. However, Nepal is reluctant to go ahead with Poornagiri on account of the higher displacement of people required, and other political sensitivities. This has interrupted further work on the DPR. Thus, if a satisfactory intermediate site cannot be found for the diurnal storage of waters passing through the Pancheshwar dam, the overall Project parameters may need to be recast. One way or the other, delay cannot be in anybody's interest.

The Mahakali Treaty established that, after the Pancheshwar Project, both Nepal and India should have equal entitlement to the utilization of waters from the Mahakali River without prejudice to their respective existing consumptive uses. Although the Treaty stipulates Nepal's existing consumptive uses, it fails to define such uses in India. India's claim of existing consumptive uses of water appears to be based on the Helsinki Rules and the UN convention. Nepal, however, claims that such rules are not applicable because the condition of applicability of existing consumptive uses is well defined by the Treaty itself.

For successful development of regional cooperation in the field of water resources, treaties and agreements reached between countries should be honored and implemented in a true spirit of cooperation by the concerned countries.

As the Indo-Bangladesh Treaty is valid for a period of 30 years during which water needs will increase in both countries, serious concerns about water security emerge. For Bangladesh, augmentation of the Ganges lean season flow for meeting the increased water demands is imperative. For India, however, the need for augmentation of the Ganges flow does not seem that great. Despite the provision for flow augmentation made repeatedly by the Indo-Bangladesh treaties, the two countries have not been able to reach a consensus on the flow augmentation issue.

Since Bangladesh would like to augment the Ganges flow through the development of storage projects in the basin itself (in the upper reaches of the Ganges in India and Nepal), this would require the inclusion of Nepal and a regional arrangement. In contrast, India has been interested in the inter-basin transfer of water (from the Brahmaputra to the Ganges). Bangladesh is of the opinion that such a mass transfer of water across a basin would be against internationally accepted principles as initiated by the International Commission of Irrigation and Drainage (ICID). As a result of this, Bangladesh has rejected India's proposal. This issue, concerning the augmentation of the Ganges lean season flow, has been the root cause of conflict between the two countries for more then the last two decades.

This suggests that, in dealing with regional or bilateral cooperation, there is a need to understand the compulsions of the other party. The will to agree, the will to accept ideas put forward by the other party, and the will to change positions when necessary are vital for the successful implementation of any water-sharing treaty.

Although, until recently, the Indus Treaty allowed both India and Pakistan to act independently in safeguarding issues concerning their water security, they may not be able to do so in the future. This is because Pakistan is already a water-stressed country and requires utilizing the full potential of the Indus river system in an integrated basin approach. This cannot be implemented without further cooperation between India and Pakistan. It is therefore necessary to think ahead and build on the 1960 Agreement. One can envisage storages on the upper Indus, Jhelum and Chenab, over and above what is presently permitted by the Indus Waters Treaty. The idea may appear remote at the present time, but the very exercise of looking ahead would reveal the opportunity costs of non-cooperation and belligerence.

There is a perception in the countries neighboring India that the latter has frequently gone ahead first with the construction of a project and then forced the smaller riparian countries to come to the negotiating table and enter into treaties. This is against international principles, which require that it should be the other way around - that is negotiation first and then the construction or management of barrages and dams. The Farakka Barrage on the Ganges, the Tanakpur Barrage on the Mahakali River, and the Laxmanpur Barrage on the Rapti River close to the Indo-Nepal boarder, are all cited as examples of this.

This suggests that unless South Asian countries agree to respect international laws and principles and agree to consult with one another while utilizing or managing international waters, regional or bilateral cooperation in the field of water resource development is not likely to take place.

A stark reality that will greatly influence water demand in the region is that the population in the South Asian countries is increasing at an average annual rate of about two percent. The region will see an increase in the demand for water, thereby creating pressures to increase withdrawals from international rivers. In this context, regional

cooperation has become imperative, involving all co-riparian countries in order to manage the increasing demands for water resources.

Recommendations

The Indus, Ganges and Brahmaputra River basins (IGB basins) offer unique opportunities for optimal water resource development through cooperative efforts. With the signing of the Ganges Waters Treaty between Bangladesh and India in 1996 and the Treaty on Mahakali River between India and Nepal in 1996, the climate in the region is changing and there is a desire to create an atmosphere of confidence. The Male Declaration (1997) and the Colombo Declaration (1998) of the SAARC summit were a boost to regional cooperation by endorsing the idea of two or more countries cooperating in project-based development works within the SAARC framework. Hence, the countries of the IGB basins can now look ahead to collaborative approaches in harnessing the region's water resources. This Report would like to make the following recommendations:

- It is essential to establish governing principles for sharing international waters among the riparian countries in a river basin through a framework treaty. Defining principles for sharing the costs and benefits of water resource development projects within each river basin would be highly desirable for reducing tensions between countries.

- Effective institutional mechanisms with adequate authority to guide, instruct and monitor the implementation of each treaty are necessary for successful implementation. Mechanisms for joint operation of control structures, and provisions for settlement of disputes as per international practice are essential for the successful implementation of the treaty. A joint river basin commission to deal with a specific river and treaty, or a joint country commission to deal with several water related treaties, would be the most appropriate form of institutional arrangement. Similarly, a Tribunal, well-versed in internal water law and management, whose decisions would be binding for all the parties concerned, would be the most appropriate mechanism for dispute settlement.

- The involvement of funding institutions and outside mediators could be very helpful in formulating water-related treaties and resolving outstanding conflicts in sharing international waters.

- Water related disputes have a greater likelihood of being solved if the functional aspects of disagreement are negotiated separately from political, historical and traditional considerations.

- The willingness to agree, to accept ideas put forward by other parties, and to change positions when necessary, are vital for successful implementation of any water sharing treaty. These considerations are most likely met when the urgency of the water sharing treaty is equally great for both the parties.

- For the successful development of regional cooperation in the field of water resources, the treaties and agreements reached between the countries need to be honored and implemented in true spirit by all the concerned countries.

- Understanding the compulsion of the other party is essential for success of regional or bilateral cooperation.

- Cooperation between the countries in the region is more likely when the benefits of agreement are substantial and pressing enough to overcome the political difficulties that exist.

- The South Asian countries need to agree to respect the principles of international law to consult with each other before initiating projects that utilize or manage international waters.

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$23.00

ISBN 0-9759663-1-6

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