

WASSA Project Reports, Volume 3:
WATER SHARING CONFLICTS BETWEEN COUNTRIES,
AND APPROACHES TO RESOLVING THEM

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And

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*The views expressed herein do not necessarily represent those of the U. S. Government.

PREFACE

More than 1.3 billion people live in South Asia. Almost half of these depend on river systems for their water needs. Many of these major rivers, some of which are amongst the world's largest, flow across national borders and have been a source of tension in the region. At times, when the snow melts in the Himalayas, or during the monsoon, there is too much water, and 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.

The project on "Water and Security in South Asia" focuses on the critical issues mentioned above. It has several goals:

- Identification of the key issues regarding water resources in the subcontinent;
- An examination of the provisions of the Indus Water Treaty of 1960 between India and Pakistan, and the other water Treaties or Agreements critical to the region;

- Identifying approaches to water conflict issues within and between the countries of South Asia that could be used throughout the region;
- Examining some of the climate change and investment aspects of water availability that could affect the future availability of water in the region.

The Carnegie Corporation of New York has identified water availability as a priority area for its Program. In his report to the Board of the Corporation, President Vartan Gregorian has 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". In keeping with this priority, the Carnegie Corporation of New York provided the funding for the WASSA project.

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 placed 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 have 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 has been 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 each of the following organizations (and in one case, two eminent consultants) have taken the lead on one of the above topics, and have 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) have made valuable contributions to individual volumes.

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 are serving 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), Ambassador of Nepal to India.

The Policy Advisors have given generously of their time and provided valuable input. The authors of the project reports have incorporated this input in the Final Reports, which have been printed 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 Final Drafts of the volumes were reviewed by water resource specialists not associated with the WASSA project. Input received from them, as well as from the project Conferences held in Islamabad in February 2003 and in New Delhi in September 2003, has been incorporated in the Final Reports. In addition, a comprehensive Executive Summary has been prepared. Some of the individual reports can be downloaded from the GEE-21 web site (www.gee-21.org).

Water Sharing Conflicts Between Countries

Toufiq A. Siddiqi and Shirin Tahir-Kheli

Project Coordinators

November 2003

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1.0 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 rivers¹ 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 water 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 Report 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. The report 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 Report is divided into eight chapters. Chapter 2 first presents an overview of the Indus and Ganges river basins on which international treaties have been made for sharing the river waters. Chapters 3 through 5 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 6 discusses the actual implementation of the treaties. This is followed by discussions on the important issues in relation to the international treaties in chapter 7. The Report ends with a summary and recommendations in chapter 8. The actual text of the treaties is provided in the Appendices.

¹ The number of international rivers might have increased with the breakup of the former Soviet Union.

2.0 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 km² (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 with fertile agricultural flood plains. About 10 percent of the world's population (over half a billion people) lives in the IGB 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 1 presents some socio-economic indicators of the South Asian countries, with their irrigation and hydropower potential.

Table 1: 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).

² The indicated flow of the Indus belongs to Pakistani part.

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 IGB basin.

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 Water 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 Nepal³. The drainage outlets of these river systems are

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.

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 1 and 2** present the layout of the Indus and the GBM river systems respectively. The river basins of Nepal are shown in **Figure 3**, while **Figure 4** 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.

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 5** 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 (**Figure 6**) and decreasing water supply, especially during the dry months, (**Figure 7**), 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.

3.0 The water sharing treaty between India and Bangladesh

3.1 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 Bangladesh⁴. 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 2. 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.

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.

Table 2: 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 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 the 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.

3.2 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 - Hooghly⁵ River through a 38.3 km long feeder canal (**Figure 8**).

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 ingress⁶.

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,

⁵ Bhagirathi River is a bifurcating branch (tributary) 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.

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 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 Bangladesh⁷. The Government of India, 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

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 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).

including the United Nations General Assembly⁸. 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

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).

reasons 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 develop 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.

3.3 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 Water 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.

4.0 Treaties between Nepal and India

4.1 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 available⁹. Earlier, the Mahakali River formed the border between Nepal and India (**Figure 9**).

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;

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

- During Kharif season (15 May to 15 October), India is to provide 13 m³/s of water to Nepal from the Sarada Barrage, which could be increased up to 28.34 m³/s if surplus water is available in the river. During Rabi season (16 October to 14 May) Nepal is to receive 4.25 m³/s of continuous supply or being alternately closed and opened for 10 days at 8.5 m³/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. 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 m³/sec (NEDECO, 2001)¹⁰ is not specified. The present right bank canal (also known as Sarada canal) that transports water from the barrage to Uttar Pradesh in India has a discharge capacity of about 396 m³/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;

¹⁰ The minimum water available during the dry season in the Mahakali River at the barrage is about 130 m³/sec (NEDECO, 2001).

- 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 Project¹¹. 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;
 - 4.25 cumecs from 16 October to 14 May;
 - (10 cumecs of water are to be released in the Mahakali River for the ecosystem).
- 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.

¹¹ Pancheshwar Project incorporates a storage dam (about 250- 300 meters) high dam with installed capacity of 4000- 6000 MW of hydropower generation) and is to be constructed about 70 km upstream of the Tanakpur Barrage on the Mahakali River.

- For Dodhara-Chandani area¹²
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.

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).

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.

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.

Koshi Project Agreement-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 10**). 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 border. 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 m³/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 facilities¹³ 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. Detail project report (DPR) will be prepared using the principles as agreed to in the Indo-Nepal Mahakali Treaty.

¹³ Such irrigation facilities included the Chandra Canal receiving water from the tributary of the Koshi River, 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.

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 also 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 m³/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 m³/sec. The western main canal is designed to draw about 447 m³/sec (Sarin, 1994) of water to irrigate 930,000 ha (Malla, 1999) of land in Uttar Pradesh, India.

4.2 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:

- Downstream benefits in India (flood control and irrigation) caused by increased regulated flow through the construction of dams in Nepal should be assessed;
- 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;
- Equitable principle of 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 institutions¹⁴.

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 deprive 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

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

Agreement of 1920. 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 mean time, 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 Kalapani¹⁵ 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.

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 country.

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 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 infeasible. 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.

4.3 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 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.

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.

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

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.

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.

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.

5.0 Water sharing treaty between India and Pakistan

5.1 The treaty

The only international water sharing treaty that exists between India and Pakistan is the Indus Water 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 Water 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 Water 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;
 - 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.

5.2 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 11**). Table 3 shows the chronological sequences of development of irrigation infrastructure in the Indus River System.

Table 3. 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 3 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 mean time, 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 Lilienthal¹⁸ 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

¹⁸ David Lilienthal was the former chairman of the Tennessee Valley Authority and of the US Atomic Energy Commission, who visited the region to write a series of articles for a magazine.

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 Water 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.

Under the treaty Pakistan was required 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 partition¹⁹. 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.

¹⁹ 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.

Perspective from India

The Indus waters dispute surfaced with the partitioning of undivided India. This arbitrarily vivisected 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 the 168 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 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.

5.3 Institutional arrangements for implementing the treaty

Article VIII of the Indus Water 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 Water 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 Water 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.

6.0 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.

6.1 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 12** 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 groundwater 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 Mahakali²⁰, 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

²⁰ Although the Mahakali treaty also includes the Sarada Agreement, in this section they are dealt with separately

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 13**). 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 13 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. 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 14** 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 India²¹

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 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 every effective and were dormant for quite some time. The two were combined and reconstituted as a single Koshi and Gandak Committee in October 2001 and 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.

²¹ Please see also the perspectives from India in section 4.2

6.2 Implementation of the treaty provisions

Indo-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 Nepal²² along with the storage of 51 dams in India on the 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.

²² 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 and Sapt Koshi with a preliminary cost estimate of US\$ 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

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 water²³ 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 canal²⁴ to the

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.

²³ In terms of available water per unit of cultivable land, which amounts to about 44,180 m³/ha

²⁴ This 324 km long canal was to take off at Joghghopa on the Brahmaputra in Assam, and after passing through northwestern Bangladesh, was to feed into the Ganges

Ganges, and diversion of waters from some 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)²⁵.

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.

above Farakka (Figure 8). The proposed link canal was to have run northeast to southwest, which is against the lay of the natural gradient.

²⁵ The 10th Congress of ICID held in Athens in 1978 initiated such principles.

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 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 Project²⁶ 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).

²⁶ 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.

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.

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 15**).

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 India²⁷. 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 m³/sec of water in wet season and 8.5 m³/sec in the dry season from the Tanakpur Barrage. The treaty also specifies that in case the Sarada Barrage becomes non-functional, the quantum of water (28.35 m³/sec in wet season and 4.25 m³/sec in the dry season) that Nepal is receiving from the Sarada Barrage would be received from the Tanakpur Barrage. This means the head regulator of the Tanakpur Barrage should have a capacity of discharging 28.35 m³/sec with the possible extension of up to 56.70 m³/sec.

While constructing the Tanakpur Barrage, India had fixed the crest level of the head regulator for supplying water to Nepal, hereafter referred 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

²⁷ 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.

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 accordingly²⁸.

Nepal's arguments against the proposed crest level of 245.0m as proposed by India are as follow²⁹:

- In order to allow 28.35 m³/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 m³/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 m³/sec of water can still be diverted to India, but Nepal would not receive any water at this pond level.

²⁸ 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.

²⁹ 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 m³/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 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) Power trade: 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 Water Treaty.

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.

7.0 Water sharing issues in South Asia

7.1 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 16**.

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 groundwater 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 groundwater. 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 country³⁰ 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.

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 downstream 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

³⁰ 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.

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 4) are a major reason for this discontent.

Table 4: 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

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.

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.

7.2 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.

7.3 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 change³¹. Thus Bangladesh's primary concern is to determine how the flow at Farakka can be maintained at the present level.

³¹ 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.

In this context, article II (ii) of the treaty states:

“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 Water 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 Water 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.

Hopefully, Indo-Pakistan relations will improve sooner rather than later. When that happens – and even in anticipation of that day – it is necessary 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, the generation of additional energy and improve 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 belligerence³². 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.

7.4 International principles for utilizing international waters

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.

³² See, (Durrani, 2000)

- 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 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.

7.5 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.

8.0 Summary and Conclusions

This Report has examined 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.

1. 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.

Un 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.

2. 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.
3. 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 than 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.

4. 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 Water 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.
5. 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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APPENDICES

Appendix 1. The Indus Waters Treaty 1960

Appendix 2. Treaty on Sharing of the Ganges/Ganga Waters, 1996

Appendix 3. Mahakali Integrated Development Treaty of 1996

