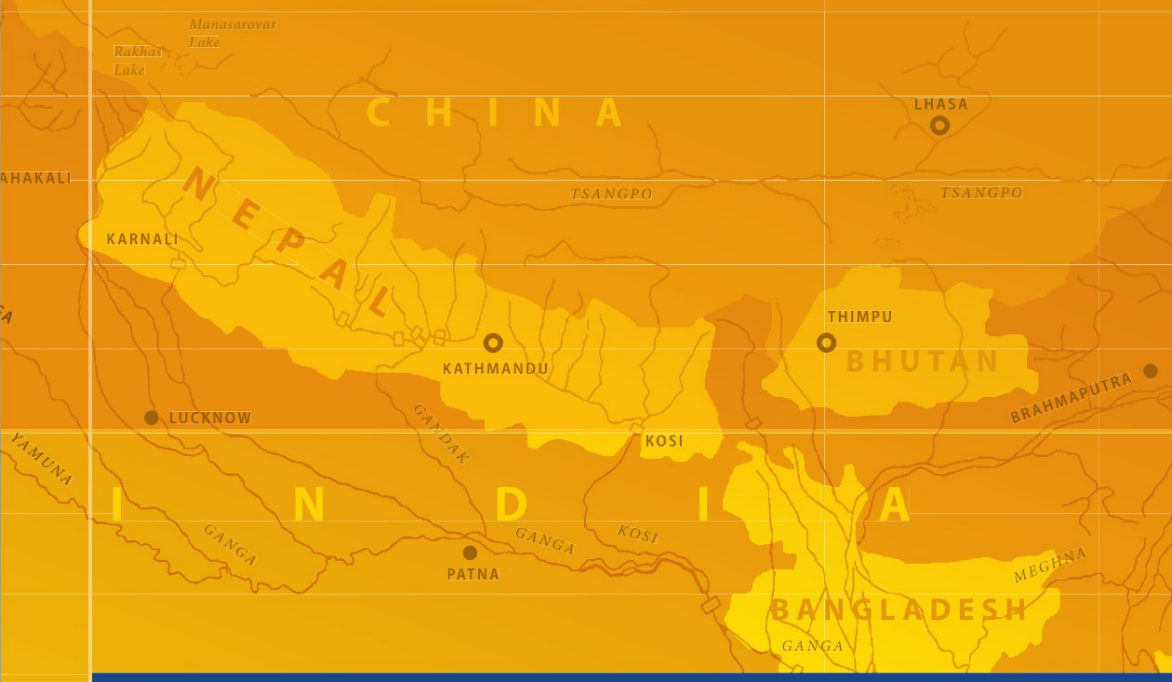
D. N. Dhungel · S. B. Pun (Eds.)



The Nepal-India Water Resources Relationship: Challenges

Springer

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Dwarika N. Dhungel • Santa B. Pun
Editors

Institute for Integrated Development Studies (IIDS)
Kathmandu, Nepal

Springer

Editors
Dr. Dwarika N. Dhungel
Senior Researcher, Former Executive Director, Institute for Integrated Development Studies (IIDS) and Former Secretary, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
ddhungel@hotmail.com

Santa B. Pun
Former Managing Director, Nepal Electricity Authority and Former Officer on Special Duty, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
santapun@ntc.net.np

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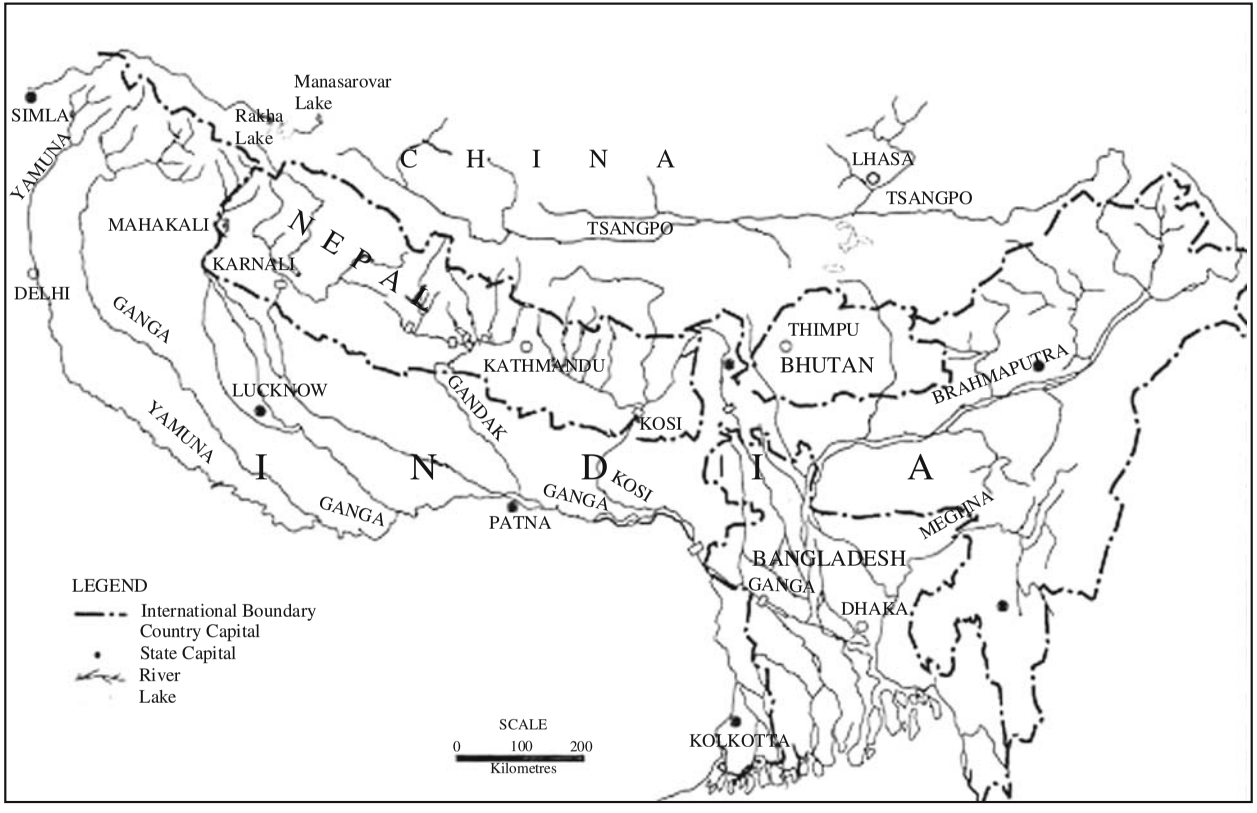
Ganges, Brahmaputra and Meghna River System



Source: B.B. Thapa and B.B. Pradhan (Eds.): Water Resources Development: Nepalese Perspectives, Konark Publishers Pvt. Ltd. Delhi 1995.

Foreword

Since its establishment as a policy research institute in 1990, the Institute for Integrated Development Studies (IIDS) has been engaged in promoting public awareness and understanding of issues of national importance by undertaking studies and research on contemporary themes. It has been disseminating findings of its studies to policymakers in the public and private sectors and ultimately to the public at large.

Water resources is one of the areas of strong public interest in Nepal. It is considered a potent engine of economic growth. Its optimal use is dependent on, among other things, the cooperation among the riparian countries, especially India and Bangladesh. Water resources development is one of the subjects in which the Institute has been engaged since its beginning by undertaking studies through national professionals and joint studies on the water resources of the Ganges, Brahmaputra and Meghna river basins with policy research institutes from India and Bangladesh. In order to help policymakers to develop long-term perspectives of the need for cooperation for optimal use of water available in the tributaries of the Ganges, the Institute was involved in a major track-two exercise for over five years during the 1990s. The Institute has been undertaking a series of exercises in the form of publication and dissemination of study findings in the field since the early 1990's. In that series, this book is the latest one and is published in collaboration with Springer Science + Business Media BV, Dordrecht, The Netherlands.

Due to the nature of this book, we hope that it would be useful to the policymakers involved in cooperation between Nepal and India in the area of water resources to draw lessons and move forward for fruitful cooperation; to the students and researchers in this sector to understand the intricacies of the relationships between these two riparian countries and help develop appropriate strategies to handle an extremely sensitive issue for the benefit of the cooperating countries; and to other readers who have been following the relationship between these two countries in this area to understand the problems and prospects for cooperation in the sector.

The Institute wishes to acknowledge the contribution of the current Senior Researcher and my predecessor, Dwarika Nath Dhungel and his colleague Santa Bahadur Pun for mooting the idea behind this volume, lining up well-known professionals to join hands on this very important theme and contribute their knowledge and experience by participating in the exercise. Therefore, each of the contribu-

tors along with Dhungel and Pun, deserve special thanks. Also, Mrs. Petra D. van Steenbergen, Senior Publishing Editor, Geosciences, and her colleagues at Springer deserve special thanks from our Institute for their interest and willingness to collaborate with the Institute for the publication of this book.

Kathmandu, Nepal
June 2008

Basudev Dahal
Executive Director
Institute for Integrated Development Studies (IIDS)

Preface and Acknowledgements

Water is the most valued natural resource that Nepal possesses. Its efficient and optimal use would not only help Nepal to build a strong economy but also substantially contribute to the growing water requirements of the countries in the Ganga basin, as water is becoming an increasingly scarce resource in this century. Such optimal use would also contribute to the development of various sectors of the economy—agriculture, trade and industry, power and energy, transportation and navigation—of Nepal as well as the lower riparian countries.

The very geography of Nepal and India is such that these two countries have to engage with each other in many spheres: social, economic and political. Of all the spheres of engagement that these two countries have to deal with, water resources is the most important one. It is because, first of all, water is becoming a scarce resource in south Asia. Second, because of the past experiences, it has become a very sensitive matter for Nepalese people. Due to her size and rugged terrain, Nepal needs to cooperate with her southern neighbour to obtain optimum benefit from her vast water resources. As Nepal contributes over 71 percent of the Ganges lean season flow, India also needs to cooperate. If Nepal and India could really agree on the optimal use of the water available in the Ganges in a win-win situation, Bangladesh would also benefit immensely.

In order to help both countries address the problematic issues, to understand each other's sensitivity in the water resources sector and to build a healthy congenial relationship between them so that this 'white gold' could be turned into an engine of development and growth for both the countries, various professional and academic individuals and organisations have been making contributions in the form of track-two exercises, studies, articles, public debates and policy inputs. Furthermore, there has been a series of developments in the relationship between the two countries in this sector over the years. This book is a continuation of this series.

Actually, the genesis of this book started in a very humble manner. The original core team who initiated the concept of this book, comprised of Som Nath Poudel and Shiva Kumar Sharma besides the two editors. While Poudel continued his association with the team to the end as one of the contributors of the book, Shiva Kumar Sharma, a water resource expert at the Ministry of Water Resources, Government of Nepal, left due to his preoccupation with his government job. We, however, want to acknowledge his valuable contribution. Personalities like Bhubanesh Kumar Prad-

han, Dr. Hari Man Shrestha, Dr. Ananda Bahadur Thapa, Prachar Man Singh Pradhan, Damodar Bhattarai and Basistha Raj Adhikari were brought in as contributors. The purpose of this book is to provide the Nepalese perspectives as well as various dimensions of the relationship between Nepal and India in the water resources sector through the eyes of experienced persons in the field. If the IIDS had not provided the forum, this book would not have materalised. The current Executive Director of the Institute, Basudev Dahal, has been extremely cooperative and wanted the book to be published in time and provided all possible support. For this we want to sincerely thank and acknowledge him.

This book would not have been published but for the hard work, perseverance and patience of its contributors. So, our thanks to each and every one of them.

Many persons working in different institutions, including those at the IIDS, have helped to make our effort a success. Among them, Dr. Bhekh Bahadur Thapa, chairperson of the governing board of the IIDS, and other members of the board, especially Dr. Mohan Man Sainju and Kul Sekhar Sharma, deserve special acknowledgement for providing continuous support and encouragement to complete the work.

Numerous persons helped, encouraged and sometimes pushed us to complete the work. All of them deserve thanks. The following persons and officials, especially, were extremely helpful during our work and we would like to duly acknowledge their help and cooperation. They are Karna Dhoj Adhikary, ex-Water Resources Secretary, ex-Chief Secretary and ex-Nepalese Ambassador to India, Bhairab Risal, veteran journalist, Babu Ram Acharya, Secretary, Ministry of Land Reforms and Management, Umakant Jha, Secretary, Ministry of Physical Planning and Housing, Jitendra Ghimire, Joint Secretary, Ministry of Water Resources, Narayan Bhattarai, Director General and Khom Raj Dahal, Deputy Director General, Water Induced Disaster Prevention Department, Madhusudan Paudel, Director General, Department of Irrigation, Rajaram Chhatkuli, Deputy Director General, Department of Survey.

A number of persons helped us in collecting information, materials, maps and sketches, and some also helped us in refining our materials. The names and institutions of these persons are Manik Kalu Shrestha and Sashi Bista of the Department of Irrigation, Deepak Sharma Dahal, Amir Prasad Neupane, both surveyors, and Puspa Lal Balla, surveyor/cartographer at the Department of Survey. Similarly, Sunder Shyam Shrestha, Alokik Shrestha, Gita Shrestha and Mukunda Acharya of the Ministry of Water Resources and Dr. Jagat Bhusal of the Department of Hydrology and Meteorology deserve our sincere thanks.

We also want to acknowledge the professional support of Dr Umesh Parajuli of Nepal Engineering College and Ajab Lal Shrestha, engineer of Consolidated Management Systems (CMS) Ltd. Also acknowledgement to Birendra Chaudhari and Lalan Jha of Gaur Bazzar.

An eminent water resources expert of the country and former Minister of Water Resources, Dipak Gyawali, was very cooperative in providing critical comments on the book. For this we gratefully acknowledge his input.

Also during the process, Tula Narayan Shah, an engineer and Ms. Nipuna Shrestha, who not only helped her father, Dr. Hari Man Shrestha, to finalise the

chapter on India's River Linking Project but also helped him to go through old documents in the course of finalising the references for this chapter, helped us in completing the work. They deserve our thanks.

Colleagues at the Institute, especially Dr. Vikas Satyal, Shankar Aryal, Puranjan Bista and Devendra Shrestha deserve our sincere thanks for their professional support during the arduous task of getting this work finished.

During the process, if Ms. Silam Ranjit, Librarian/Documentation Officer, had not provided us with the relevant materials in time, we would have been lost in the wilderness of the vast quantity of literature available on the subject. For all her help in this matter, Ms. Ranjit deserves our thanks.

The typing as well as the typesetting of documents prepared by different persons is, we feel, a very time-consuming and difficult task. But our colleagues, Govinda Ghimire, Naba Raj Shrestha and Jamuna Joshi, did wonderful work. During the finalisation of the typesetting, Govinda Ghimire did the job single-handedly. For this work, all, and especially Ghimire, deserve special thanks.

Without proper logistic support from the Institute we would have been constrained in our job. In this work, we got full-hearted support from Kalash Thaib of the administration and finance section and other colleagues, Om Acharya, Umesh KC, Bishnu Kafle and Radheyshyam Budhathoki. We wish to acknowledge their help and cooperation during the whole process.

The editorial team of the institute, Anil Shrestha and Niva Shrestha, worked extremely hard and agreed to become co-contributors on Introduction. For this, we are extremely thankful to them.

We would be failing in our duty if we did not acknowledge the help and thank our publishers, Springer and its senior staff members, Ms. van Petra Steenbergen, and Ms. Cynthia de Jonge. It was Dr. Mirza Monirul of the Adaptation and Impacts Research Division, Environment Canada, Department of Environment and Physical Sciences, University of Toronto at Scarborough who introduced us to the publishing house. For this, and for taking interest in the work we were doing for this book, we would like to duly acknowledge Dr. Monirul.

To conclude, we wish to mention that the contributors of this book are well-known personalities in the water resources sector of the country and have contributed on the basis of their experiences. But the contributors wish to mention that the views expressed here are their own personal views and not those of the Institute or the publishing house. The editors wish to honour this view of the contributors, but are ready to take any responsibility for any mistakes found in this book. However, if this book helps to broaden the horizon of the readers, policymakers and planners on the relationship between Nepal and India on water—a valuable natural resource and its use—the credit should go to the contributors.

Kathmandu, Nepal
June 2008

Dwarika Nath Dhungel and Santa Bahadur Pun
Editors

Contents

Contributors

Ananda Bahadur Thapa
Former Executive Secretary, Water and Energy Commission Secretariat, Ministry of Water Resources, Government of Nepal, Former Associate Member Royal Nepal Academy of Science and Technology, Kathmandu, Nepal. Email: abt@mos.com.np

Anil Shrestha
Research Officer/Editor: Institute for Integrated Development Studies (IIDS), Kathmandu, Nepal. Email: iids@wlink.com.np

Basistha Raj Adhikari
Water Resources Engineer, Kathmandu, Nepal. Email: basistha@wlink.com.np

Bhubanesh Kumar Pradhan
Former Director General, Department of Irrigation; Former Executive Secretary, Water and Energy Commission Secretariat; Former Secretary, Ministry of Water Resources and Former Member-Secretary, National Planning Commission, Government of Nepal, Kathmandu, Nepal. Email: bhubanesh_kumar@yahoo.com

Damodar Bhattarai
Former Deputy Director General, Department of Electricity, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal. Email: bhattaraid@gmail.com

Dipak Gyawali
Former Water Resources Minister, Academician, Nepal Academy of Science and Technology and presently Chairman, Interdisciplinary Analyst, Kathmandu, Nepal. Email: ida@wlink.com.np

Dwarika Nath Dhungel
Senior Researcher, Former Executive Director, Institute for Integrated Development Studies (IIDS) and Former Secretary, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal. Email: ddhungel@hotmail.com

Hari Man Shrestha
Former Executive Secretary, Water and Energy Commission Secretariat, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal. Email: n252033@hotmail.com and n252033@yahoo.com

Niva Shrestha
Research Officer, Institute for Integrated Development Studies (IIDS), Kathmandu, Nepal. Email: iids@wlink.com.np

Prachar Man Singh Pradhan
Former Deputy Managing Director, Nepal Electricity Authority, Kathmandu, Nepal. Email: pmspradhan@hotmail.com

Santa Bahadur Pun
Former Managing Director, Nepal Electricity Authority and Former Officer on Special Duty, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal. Email: santapun@ntc.net.np

Som Nath Poudel
Former Executive Secretary, Water and Energy Commission Secretariat Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal. Email: alek@wlink.com.np

Contents

Chapter l
Introduction

Dwarika Nath Dhungel, Santa Bahadur Pun, Niva Shrestha, and Anil Shrestha

The very geography of Nepal and India is such that these two countries must live together and engage with each other in many spheres: social, economic and political. Of all the issues that these two countries have to deal with, water resources is not only the most important one, but also the one that has become a very sensitive matter. It is because water, a scarce resource in south Asia, is the most important natural resource that Nepal possesses, although most of it is yet to be exploited.

The Ganges is the natural drainage of the waters flowing from Nepal. The overall contribution of the rivers flowing from Nepal to this mighty river is 46 percent of its flow, which, during the lean season, is as high as 71 percent. Also, because of her difficult topography, Nepal must cooperate with India and Bangladesh, to obtain optimum benefit from her more than 6,000 rivers with a combined run-off of about 200 billion cubic metres (Sharma 1997, Bhusal 1999 and WECS 2002). Similarly, her neighbours would immensely benefit if this resource were harnessed in such a way that each of the cooperating countries could be in a win-win situation. In other words, if the rivers flowing from Nepal are properly harnessed, they will make substantial contributions to the socio-economic development of not only the people of Nepal but also millions of people living in the Gangetic belts of south Asia, i.e. India and Bangladesh.

Regarding the relationship in water resources between Nepal and India, it exists at both people-to-people and official level. The people-to-people relationship has been there since time immemorial. At the official level, based on available records, the relationship is more than one hundred and thirty years old. Pashupatinath on the banks of the Bagmati river, Barahachhetra on the banks of the Kosi river and Deoghat on the banks of the Narayani river, are some of the places of pilgrimage in Nepal for the people of India. The Ganges in Rishikesh, Haridwar and Prayag (Allahabad) and Gangotri and Yamunotri are the pilgrimage sites in India for the people of Nepal. The peoples of both these countries revere these rivers. They still believe that their lifetime ambition is fulfilled once they take a dip in the waters of

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these holy rivers. Therefore, Jagat Mehta (2004), a former Foreign Secretary of India, has rightly written: 'the Nepalese even aspire to die on the banks of the Ganga'.

Since the time of British India, both countries have engaged in cooperation in water resources at an official level. In this context, reference is made to a letter of 1874 written by the British-India Government to the Government of Nepal during the time of Prime Minister and Maharaja Jung Bahadur Rana in relation to the three *Sagars* (ponds) straddling the Nepal-India border in Kapilvastu district. This is most probably the first official correspondence between the two countries on water resources. Interestingly, the letter treats the pondage sill level issue as an international border dispute. Since then, the two countries have signed a number of treaties, beginning in 1920, when the Sarada Barrage Treaty was signed for harnessing the waters of the Mahakali river. Although instruments of ratification are yet to be exchanged in the power sector, an umbrella agreement exists, called the Electric Power Trade Agreement 1996 (EPTA), between the two countries. There is hardly any rivers left, the water of which the two countries have not reached an understanding. Yet, the relationship between the two countries in this sector is still to satisfy the people of either country.

In order to help both the countries address the problematic issues, to understand each other's sensitivity in the water resources sector and to build a healthy congenial relationship between them so that this 'white gold' could be turned into an engine of development and growth for both of them, different professional and academic organisations have been making professional contributions in the form of track-two exercises, studies, professional articles, public debates and policy inputs.

Over the years, there have been a series of developments in the relationship between the two countries in this sector. In order to capture these developments, an exercise was undertaken with the help of national professionals, with the view of presenting different facets of the relationship between Nepal and India in the water resources sector. This compendium contains 10 topics covering different aspects of the relationship between the two countries in this sector.

In Chapter 2, **Historical Eye View**, Dwarika Nath Dhungel, analyses the relationship from a historical perspective. While doing so, he makes effort to analyse the relationship from the perspectives of both the countries, especially Nepal. For this purpose, he dwells on the relationship since 1874 to the present time and divides the relationship into four phases: i) period of friendly and congenial relationship with British India (till 1947); ii) period of Kosi and Gandaki treaties (between 1950 and 1966), which he calls one-sided treaties, iii) proposals and counter-proposals (1966-1990); period of suspicions and misunderstanding; and iv) post-1990, period of re-emergences of mega projects.

In his analysis of the relationship between the two countries during various periods, Dhungel says that Nepal had a more congenial relationship with British India, which was more fair and transparent than independent India. Furthermore, he cites the example of how the two countries lost more than 24 years (1966-1990) merely forwarding proposals and counter-proposals on mega projects such as the Karnali/Chisapani and Pancheswar multi-purpose projects. As a result, nothing happened during these years. Dhungel goes on to discuss how India put an embargo on Nepal

during the trade impasse in the late 1980s and tried to impose an unfair treaty in 1990. Had Nepal acquiesced, her sovereignty would have been severely limited. Similarly, the contributor feels that Nepal's aspiration to gain access to the sea is far from becoming a reality. Nepal is facing inundation problems all along her southern border due to the construction of embankments, barrages and other structures close to the border. In the post-1990 period, mega projects such as the Pancheswor multi-purpose project on the Mahakali river and the subsequent Mahakali Treaty of 1996, the Karnali Chisapani multi-purpose project and the Sapta Kosi multi-purpose project have once again emerged. Dhungel believes that India has a long-term strategy in relation to its water resources policy with Nepal, and she is moving with the strategy of getting hold of all the rivers of Nepal and to pick up projects as and when she feels the necessity. Nepal is, however, yet to develop a strategy in relation to India. Furthermore, Dhungel feels that water has been made a very sensitive and highly politicised issue in Nepal, so much so that, whenever Nepal takes up something for discussion with India, the response one gets from her people is that 'Nepal would again be cheated by India.' Because of the mindset of both sides, Dhungel concludes that the relationship is far from satisfactory, despite the fact that there exist a host of committees at different levels to deal with various aspects of water resources.

Chapter 3, **Multipurpose Projects**, by Damodar Bhattarai, dwells on Nepal's water-resource development prospects and its contribution to the economic development of not only Nepal but also the south Asia region.

Echoing Dhungel's contention about Nepal's water-resource development potentials, Bhattarai says that Nepal's water resources unfold great possibilities for bilateral and regional cooperation, particularly through the harnessing of the Himalayan waters for irrigation in the lean season, flood mitigation in the wet season, hydropower generation and navigation. However, on account of Nepal's complex physical setting, climate and hydrological characteristics, he points out, that large interventions will have to be made with caution and diligence in terms of the technological, social, political, environmental, institutional and financial factors.

In this chapter, Bhattarai gives us an overview of the water resources of Nepal and refers to Nepal's rivers as major, medium and minor. He points at the significance of minor rivers, as about 41 percent of the Nepalese population inhabit their basins. According to Bharrarai, surface water is the most potential renewable resource in Nepal, followed by groundwater resources, spread across the Terai region (southern part) and some valleys in the hills.

Bhattarai gives us an account of the water availability in Nepal, especially in the different river basins, and the principal uses of water, which constitute agricultural, domestic, industrial and hydropower uses, and future challenges for optimal water use.

The contributor also makes a case for multipurpose storage projects in meeting irrigation water needs and hydropower generation. He also gives us an overview of the Water Resources Strategy 2002 (WRS 2002) and National Water Plan 2005 (NWP 2005), Nepal's water resource agreements and Nepal-India cooperation on multi-purpose projects, and the social and environmental aspects of such projects.

Bhattarai concludes by saying that, in order to harness all the waters of the region in a sustainable and optimal manner, the countries within the Ganges basin will need to cooperate not only bilaterally but also regionally.

Chapter 4, **Water Resources Utilization-Irrigation**, by Som Nath Poudel, discusses the constraints faced by Nepal in developing its water resources for economic progress, the fundamental issue of the agricultural use of water for riparian countries or region, and the prevailing challenges in this sector, which call for a new approach to development.

In this chapter, the water-related issues in the five northern sub-basins (Ghagra-Karnali, Gandak, Burhi-Gandak, Sapta-Kosi and Mahananda) that transport all the transit flows from Nepal to the Ganges river are analysed. Focus is given to water availability, existing use status and future requirements of sub-basin areas, with prime consideration given to irrigation use. However, this writing primarily focuses on the use of water for agricultural purposes. The contributor believes that the agriculture sector of all the riparian countries has been fundamental to economic development and poverty alleviation, as it alone consumes 85 percent of the utilised water resources. He is of the opinion that proper use of irrigation water in an economical, efficient and environmentally sustainable way can significantly solve the problem of severe water scarcity faced, or to be faced, by the south Asia region.

Water augmentation issues are also briefly highlighted in the chapter, and a preliminary benefit-sharing mechanism among the riparian inhabitants floated. Acceptable water pricing and benefit calculation ideas are forwarded and futuristic strategies and plans are presented in brief. A paradigm shift is emphasised and recommended to tackle all the challenges through comprehensive and inter-linked approaches. Poudel concludes with recommendations for the future.

Chapter 5, **Hydropower Development**, by Prachar Man Singh Pradhan, dwells on Nepal's hydropower potential, both at present and in the future, the government's hydropower development policies, private and public sector involvement, challenges and issues of domestic projects and potential for export of power.

Nepal is endowed with huge theoretical hydropower potential (83,000 Mw), but at present only about 1 percent of it is being exploited. Pradhan believes that, while domestic demand should be given the highest priority, efforts also need to be taken to export power to India. The revenue earned from power sales could help in the development of Nepal's own domestic economy.

The chapter highlights the government's three different approaches to pursuing hydropower development in Nepal: development of small and decentralised power projects to meet the local demands in remote and isolated regions of the country; development of medium-sized power projects to meet the national demand and surplus for export and to develop local capacity; and development of large-scale multipurpose projects to meet the regional demand for food, energy and flood control.

Pradhan then discusses the power sector reforms of Nepal Government such as Hydropower Development Policy 2001 and the Water Resources Strategy 2002 prioritization of the hydropower sector in the Tenth Five-Year Plan (2002-7).

Pradhan is of the opinion that financial support and investment from foreign donors and development agencies, private sector entrepreneurs and public-private

joint-ventures are required for the development of this sector. He illustrates the various policy measures adopted to attract foreign and national investors to Nepal such as a one-window policy, repatriation of earnings in foreign currency, fixed royalty payments, import concessions, export potential and non-nationalisation of projects.

Chapter 6, **Power Trading**, by Santa Bahadur Pun, is an in-depth study of the Indo-Nepal power exchange that is now transforming into power trading and its related issues. Pun stresses that Indo-Nepal power trading is intrinsically and irrevocably tied with Indo-Nepal water sharing. Pun believes that the concept of the first Indo-Nepal power exchange was broached in 1950 by the Indian ambassador CPN Singh to the last Rana Prime Minister, Mohun Shumshere, regarding the implementation of the Kosi High Dam Project at Barahachhetra. This project was eventually shifted down to Hanuman Nagar, with the 20 Mw Kataiya hydro station on the canal in India. Nepal's 50 percent power entitlement materialised only in 1971, triggering power exchanges between several Indo-Nepal border towns. The Indo-Nepal power exchange is effected by two more treaties: the 1959 Gandak and the 1996 Mahakali treaties.

Pun analyses the three-and-a-half decades of Indo-Nepal power exchange that has resulted in Nepal importing more power from India than exporting to her. He points out that, despite India's concurrence 'in principle' to upgrade the quantum of power exchange, she insists on long-term commercial arrangements for the construction of Indo-Nepal high voltage transmission lines. He goes on to explain why Nepal's electricity tariff is one of the highest in the region, why private sector entry has not been able to mitigate this high tariff, and how Nepal, in its times of power deficit, is forced to trade power with India at rates near its average selling price. He then goes on to explain some of the 'missed' Indo-Nepal power trading opportunities like Karnali/Chisapani and Arun-III, despite international backing. He also discusses the Bhutan and Laos models of hydropower development.

Pun believes that long-term Indo-Nepal power trading firmly hinges on Indo-Nepal water sharing. India's near double digit GDP growth rate will only mean a greater demand not only for energy but for freshwater as well. Unfortunately, while Nepal has been mesmerised by electricity exports, India wants to solve her water scarcity and flood problems through Nepal's default. Pun believes that, if a sizable quantum of Indo-Nepal power trading is to occur in the future, then India must banish her old 'concessional, goodwill gesture, in principle, subject to etc., etc.' psyche. Pun points out that Indo-Nepal power trading can be a win-win affair for both countries, provided there is transparency and mutual trust, equity and fair play, bereft of any hidden agenda. The onus, he believes, is on India.

Chapter 7, **Access to the Sea: Kosi Canal Waterway**, by Anand Bahadur Thapa, discusses the prospects of developing the Kosi Canal on the Kosi river in eastern Nepal as a navigation link to the sea for landlocked Nepal. According to the contributor, through the Kosi Study Agreement, the two countries agreed in 1997, to conduct a detailed feasibility study for developing a navigable canal waterway extending from Nepal to the meeting point of the Kosi river with the Ganges in Bihar. Thapa feels that, with such a navigation canal, Nepal could overcome its geographical

constraint of being a landlocked country and gain access to the sea, and hence take advantage of the safety, reliability and competitiveness of water transportation for both trade and transit and navigation purposes.

This chapter describes the advantages of using the Kosi canal waterway in place of the natural river course. The distance would be short as the navigation canal would follow the shortest route to the Ganges river. With proper planning, very big river vessels would be able to reach Chatara in Nepal. It could also help to expand the volume of Indian trade with the Tibetan Autonomous Region of China, which would give a big boost to Nepal's economy.

The contributor then writes about the history of waterways in the world, beginning with Europe's, their competitiveness with the railways, and the latest developments in the engineering and construction of waterways around the world.

Thapa concludes by saying that Nepal's aspiration to gain access to the sea through the Kosi canal waterway will not be fulfilled until she is assured that, further downstream, the conditions of the Ganges and Hooghly waterways are equally good for navigation.

In Chapter 8, **River-Linking Concept of India**, Hari Man Shrestha discusses the ambitious river-linking project that India has proposed, and the environmental, social and political implications of such a large project not just for India but also for neighbouring Nepal and Bangladesh. This chapter highlights the factors on which the success of the proposal depends, and presents some examples of success and failure of large-scale water transfer projects conceived in other parts of the world and discusses the issues concerning water prevailing between Nepal and Bangladesh vis-à-vis India.

Shrestha also talks about the problems faced by Nepal and the advantages enjoyed by India in the transfer of water from water surplus basins to water deficit basins. In terms of location and water withdrawal capacity, the projects are disproportionately advantageous to India, providing India with the lion's share of water. Moreover, the various water agreements severely limit Nepal's entitlement over water. During the monsoon season, inundation problems aggravate and increase in the southern lowlands of Nepal bordering India due to the silent acts of river-linking and creation of barrages, affluxes and embankments on the Indian side of the border.

The contributor says that, as the major water sources for the River Linking Project (RLP) are the Ganges flowing from Nepal and the Brahmaputra flowing from the north-eastern region of India, they require actions in Nepal and Bangladesh territories, respectively. These waters are also required for Nepal, the Tibetan region of China, Bhutan and Bangladesh. So, without satisfactory dialogue and cooperation between these countries, transfer of water will not be easy. However, the contributor says, very little technical, economic and socio-environmental details are available on the emerging river-linking project of India, although there seems to be a strong political boost to the project proposal.

Shrestha believes that the key problem of the present RLP lies in meeting the irrigation need, which represents 85 percent of the total withdrawal. Creation of large networks of canals has a number of adverse impacts, including flooding and

water-logging. Unless large storage reservoirs are created, the benefits of river-linking will be minimal. The contributor is of the opinion that water-saving measures such as control of water loss through evaporation, improvement of water use efficiency, changing cropping pattern to suit the water availability of given locations, introduction of pricing policies that attach scarcity value to water, etc., should be emphasised.

In Chapter 9, **Personal Reflections: Nepal-India Water Relations**, Bhubanesh Kumar Pradhan gives us a first-hand account of his experiences while working in the water resources related agencies of the Government of Nepal (GoN) in various capacities, especially in relation to his Indian counterparts.

After graduating from the University of Roorkee, India, in 1959, Pradhan joined the Department of Irrigation (DoI) and, after several years, rose to become Director General of the Department. There, he got the opportunity of dealing with the Indian side on several occasions, sometimes directly and most of the times assisting the Secretaries of the Ministry of Water Resources (MoWR).

The contributor says that, after becoming the Executive Secretary of the newly-created Water and Energy Commission Secretariat (WECS), a staff agency of the MoWR, in 1981, he was given the responsibility of dealing with India on all water-related issues. Then, he played a key role in water resources negotiations held with India, in drafting key issue papers on water resources and in preparing the minutes of official-level talks between Nepal and India.

In 1988, a Secretary of MoWR, he led a delegation to New Delhi for secretary-level talks and similarly received an Indian delegation for talks in Kathmandu. Based on these experiences, Pradhan is of the opinion that, whereas India thinks it has helped Nepal in harnessing her water resources, Nepal feels that it got a raw deal in all the agreements and the treaties signed between the two countries on the development of water resources. He gives the examples of the Chatara canal drawn from the Kosi river in the eastern part of the country and the silt problem there, the Gandak irrigation waters, the West Rapti case and the Manusmara case.

Pradhan then says that Nepal and India should join hands to develop multi-purpose projects, which Nepal cannot develop alone. He concludes the chapter by saying that water talks with India are bound to continue, as water is an important resource for both countries. India will need Nepal's cooperation as will Nepal need Indian cooperation in the implementation of the projects involving the two countries. It is essential that Nepal and India move towards building mutual trust and confidence, and only when such mutual trust and confidence are established can both countries move towards implementing water resources projects of any substance.

Dwarika Nath Dhungel, Santa Bahadur Pun and Basistha Raj Adhikari, in Chapter 10, **Inundation at the Southern Borders**, argue that because of the geo-physical nature of the country, with an elevation ranging from 50 in the south to 8,848 in the north, the natural drainage of almost all the rivers of Nepal is India. According to the authors, 80 percent of the annual surface run-off occurs during the monsoons (June to September), cloudbursts, landslides, mass movement and flash floods are common. After the rivers reach the plains, they burst their banks and spread out, abruptly decreasing their capacity to transport bed load, raising the bed level and thus chang-

ing course and causing floods. Inundations and floods, according to contributors are not only caused by natural factors, but also by human factors such the construction of roads, rails, barrages and embankments. As a consequence of both these factors, almost all the districts of Nepal bordering India suffer from the problem of floods and inundation during the rainy season. It's not only Nepal's Tarai but also the northern areas of India bordering Nepal that suffer from heavy floods with heavy damage and destruction. To deal with this issue, and to cooperate from a broader perspective, the Standing Committee on Inundation Problems (SCIP) was formed after the meeting between His Majesty the King of Nepal and the Prime Minister of India during the 1985 SAARC summit in Dhaka. Its main objective was to deal with the problems of inundation that occur due to the activities in the vicinity of the Nepal-India border and to suggest both short and long-term solutions. But, the contributors point out that, despite SCIP's existence for over two decades, inundation all along the southern border still remains a serious problem, especially during the rainy season, for both countries. To address this problem, the authors stress that Nepal and India must cooperate with each other on the basis of equity, fairness and social justice.

In Chapter 11 **Epilogue**, Dipak Gyawali, having donned three hats (bureaucrat, social activist and minister), recounts his thoughts and experiences on the more pertinent water related issues from a perspective different from that of contributors of the book. Emphasing the point that Nepalese activists call for 'No Bad Dams' rather than the 'No Dams' call of the Northern NGOs, he describes the steps he took to set up a constructive dialogue on the WCD's guidelines through IUCN among Nepal's dam builders, dam managers (mainly the officials of MOWR) and dam critics. Happy that the major outcome of this engagement was the 'large versus small' controversy becoming a non-issue, he feels this has enabled Nepal to focus on 'second generation issues' like sharing of risks and benefits, equity and the legal and institutional mechanisms to tackle water problems.

Gyawali believes that this 'happy state of affairs' was the outcome of the 1990s water debates on Arun-III and Mahakali treaty. According to him, Arun-III was all about bad economics resulting from surrendering development initiatives to an external agency, and not about environment or resettlement. Mahakali, similarly, is not a Nepal-India problem, as depicted by the contributors of the book, but a fundamental 'deep-seated rift in perception between upholders of different development paradigms irrespective of the countries concerned.'

Gyawali then discusses the vibrant debate in Nepal: whether export of hydropower will make the country rich or should hydropower be an input to make national commerce and industry more competitive. No consensus has evolved among the Nepalese political parties on these two divergent paths; but in line with his belief in the latter approach, as water minister he reversed a previous government decision and required of the developer of the export-dedicated 750 MW West Seti to provide 10 per cent free electricity in lieu of money. On his attempts to have the 300 MW Upper Karnali developed by Nepal's Federation of Nepalese Chamber of Commerce and Industry (FNCCI) and India's Confederation of Indian Industries (CII), he reveals an interesting Indian policy of not permitting Indian private sector into

Nepal's hydropower until India's state owned National Hydropower Corporation (NHPC) got the license for Upper Karnali, proving the fears of many that Delhi is less interested in the development of and more interested in control over Nepal's water resources. Gyawali then recounts his efforts at reforming the power sector through the internal unbundling of NEA and the 'communitization' of the oft-ignored electricity distribution end through the Rural Electrification Bylaws 2060 (2003).

On irrigation's irritation, Gyawali calls Nepal's irrigation policy document a 'negotiated text' which the donors wanted as a precondition for further aid where he managed to insert his agenda of farmer-friendliness despite the donors' pressure against the removal of agricultural subsidies. Gyawali feels that the 225 MW Sapta Gandaki multi-purpose project should have been developed as an irrigation rather than a power project. Besides power, this would have irrigated the plains of Chitwan (replacing the existing expensive Lift Irrigation scheme) and Nawalparasi and provided Narayanghat city a second bypass bridge for the east-west highway. But this failed to materialize due purely to 'inherent bureaucratic blindness'.

On addressing riparian debates, he stresses that 'water rights and power trade are never negotiated as elements of charity'. Nepal first needs to be strong on all fronts: her domestic market, her experts on hands-on development issues, her lawyers on sophisticated contracts and her financial sector on the intricacies of project risks. Only then can she hope to advance her position against India's. On the unilateral construction of dams and embankments along the Nepal border by India that the contributors term *fait accompli,* Gyawali shows how Indian insensitivity merely sees these constructions as 'routine additions to her own utilities'.

On the issue of the much debated Article 126 of the 1990 Constitution of Nepal on natural resources, Gyawali, as the Water Resources Minister, came up with a 'situation paper' that had nine criteria which would trigger the provision whereby approval by two-third of both Houses of Parliament will be necessary. Unfortunately, his Prime Minister resigned on the day he was supposed to have a wider consultative meeting on this topic. No further attempt has been made so far by subsequent-governments, though this issue of natural resource is now enshrined in the 2063 (2007) Interim Constitution's Article 156.

Finally, arguing that Nepal needs to move 'Beyond the Age of Aid', Gyawali asserts that hydropower cannot give hydro-dollars in the manner petroleum gives petrodollars. Hydropower needs to be harvested on a sustained basis, developing upstream-downstream linkages and tackling social issues properly. Nepal needs to be pro-active in international fora and their sub-committees so that her hydropower can qualify for funds from the clean development mechanism. With the 'Age of Aid' coming to an end, Gyawali argues that Nepal needs to pursue new financing instruments, both nationally and globally, to develop her hydropower.

Chapter 2
Historical Eye View

Dwarika Nath Dhungel

2.1 Context

Water is the most important natural resource that Nepal possesses, although most of it is yet to be exploited. She has more than 6,000 rivers with a combined run-off of about 200 billion cubic metres (bcm) (WECS 2002; also, see Annex 1). If properly harnessed, this resource could make substantial contributions to the socio-economic development not only of the people of Nepal but also of millions of people living in the countries of south Asia, especially Bangladesh and India. The Ganges is the natural drainage of the waters flowing from Nepal. The overall contribution of the rivers flowing from Nepal to this mighty river is 46 per cent of its flow. During the lean season it is as high as 71 per cent (Bandhopadhyaya 1995 and IIDS 2000). The relationship in water resources between the two countries, i.e. Nepal and India, exists at both people-to-people and official levels. The people-to-people relationship has existed since time immemorial, whereas the official-level relationship, based on available records, dates back by over 100 years.

Pashupatinath on the banks of the Bagmati River, Barahachhetra on the banks of the Kosi River and Devighat on the banks of the Narayani River are some of the places of pilgrimage in Nepal for the people of India. Similarly, the Ganges at Rishikesh, Haridwar and Prayag (Allahabad) and Gangotri and Yamunotri are some of the pilgrimage sites in India for the people of Nepal. The peoples of both countries revere these rivers. They believe that they can meet their lifetime ambition once they take a dip in the waters of these holy rivers, although at present one could question the quality of the water. Jagat Mehta, former Foreign Secretary of India (2004), rightly says, 'Nepalese even aspire to die on the banks of the Ganga'.

D. N. Dhungel (✉)
Senior Researcher, Former Executive Director, Institute for Integrated Development Studies (IIDS) and Former Secretary, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
e-mail: ddhungel@hotmail.com

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Since the time of British India, both countries have been engaged in cooperation in water resources at the official level. In this context, a letter of 1874, addressed by British India to the Government of Nepal (GoN) during the time of Prime Minister Maharaja Jung Bahadur Rana in relation to the three Sagars (ponds) located on the international border in the present-day Kapilvastu district, could be considered as the first official correspondence between the two countries. Interestingly, the letter treats the pondage issue as an international boundary dispute. Since then, the two countries have entered into a number of treaties, beginning in 1920 when the treaty over the Sarada Barrage was signed for harnessing the waters of the Mahakali River. Although instruments of ratification are yet to be exchanged in the power sector, an umbrella agreement exists, called the Electric Power Trade Agreement 1996 (Annex 21), between the two countries. In addition, the two countries have reached a number of understandings on multi-purpose projects, on the navigational possibility on major rivers, and also on the exchange of data for flood forecasting and preparation of a master plan on flood management (Dhungel 2004). There would hardly be any river left in Nepal, the use of the water of which the two countries have not reached an understanding. Yet, the relationship between the two countries in the area of water resources is full of ups and downs.

2.2 Friendly/Congenial Relationship with British India (Till AD1947)

Although the letter exchanged in 1920 in relation to the construction of a barrage over the Mahakali (Sarada) River is considered to be the first treaty on water resources between the two countries, we find reference to correspondence between the two countries long before this treaty was signed. The reference is found in a letter written by Dr W Racy, Commissioner of Gorakhpur, on May 14, 1898 (Annex 2), to the British Resident in Nepal regarding the sill levels of three *Sagars* (ponds)—Jamuwar, Siswa and Marthi—in the then Palhimajkhanda, the present-day Kapilvastu district. According to that letter, there was correspondence between the two countries in 1874, too, regarding this matter. This means that the relationship between the two countries in the water resources sector began during the period of Jang Bahadur Rana, the person who founded the Rana oligarchy and ruled the country as the *de facto* ruler between 1846 and 1877 (Shaha 1996).

The Kosi River is considered to be the 'Sorrow of Bihar'. Since the British days, efforts have been made to tame this river. In this connection, the officials of British India travelled regularly up to the Barahachhetra area (in Nepal) to gauge the flow of this river (Shaha 2003). It was Major Rennel who, for the first time in 1779, surveyed the shifting nature of the Kosi River, and the next person to do so was James Furguson, in 1863. Based on the observation of the movement of the river for 25 years, its oscillation report was submitted by FA Shilling Field in 1893. According to the report: 'the bed of the Kosi oscillates over a vast tract of the country from the Brahmaputra to near the mouth of the Gandak, the oscillation being repeated at long intervals of time...'(GoI nd). Therefore, 'the problem

of vagaries of Kosi had been engaging considerable attention of the Government of India [GoI] and the Government of Bihar in the past... Basically the objective of these attempts in the early period was to construct extensive embankments to control the river' (Ibid.). But it was in 1941 that Sir CC Inglish, Director of the Central Water and Hydro Dynamics Research Station, (CWHDRS) Poona, identified the problem of Kosi as being due to an excess discharge of sand in the river…'(Ibid). These became the basis for British India at first and then for the GoI to start the process of building a barrage on the Kosi River. Devendra Misra (1990) writes that during the time of Prime Minister Bir Shumsher Jung Bahadur Rana (November 22, 1885-March 5, 1901), the British India government had written to the Government of Nepal (GoN) requesting permission for constructing a barrage over the Kosi River in the Chatara area in Nepal.The Prime Minister accepted their request through a wire message sent on February 27, 1897. He even indicated that his government was willing to make arrangements for supplying food to the construction labourers. His only concern was that no damage was done to the Chatara temple and the land in the Saptari district. This scheme, however, 'did not materialise for reasons not known so far' (Misra 1990).

The next was the letter, as mentioned above (of May 14, 1898), Dr W Racy, the Commissioner of Gorakhpur, wrote to the British Resident in Nepal regarding the three water Sagars in the then Palhimajkhanda (Annex 2). Interestingly, the letter treats the problem as a 'Boundary Dispute between Nepal and British Territory with the British Raj' (Pun 2006). The Sagars referred to in the correspondence were Jamuwar, Siswa and Marthi, whose waters were primarily used for irrigation in India. The correspondence reads:

> I have the honour to acknowledge the receipt of your No. 375/143-34 dated the 5th instant and to point out that the basis of the decision arrived at in June 1897, was the maintenance of the existing levels which were admitted to be those of 1874 when the former decision was arrived at between the two governments as to those reservoirs [Jamuwar western reservoir, Siswa reservoir and Marthi reservoir]. (Source: Ministry of Water Resources, GoN) and Annex 2)

From the available documents, it becomes clear that the Government of British India had written to the GoN in the first decade of the twentieth century, seeking the latter's permission 'for the survey of the Sarada (Mahakali) channel in connection with the Sarada–Ganges–Jamuna Feeder project from Baramdeo Mandi to a point one mile below Banbassa ferry'. In response, the GoN gave its permission in 1910. After the river altered its course as a result of the big flood of 1910 and it started showing signs of swinging over towards the Nepal bank below Tanakpur and with the winter supply going to the Nepal side, the headwork's sites had to be changed. It also became necessary to locate the left or eastern flank of the weir in the riverbed, tying it to the higher ground in Nepal's territory by means of afflux bund both upstream and downstream. Because of these requirements, the Government of British India requested the GoN through its Resident, on May 3, 1916 (Annex 3), and it was only in 1920 (Annex 3.1) that the GoN agreed to the request. One could ponder over why it took four years for Nepal to agree to the request. In this regard, Karna Dhoj Adhikary, former Water Resources Secretary and Ambassador to India, in an interview to this writer, and in an article on the Kosi and Gandak treaties

(2003), justified that the then rulers were far-sighted as they first considered the agreements on water resources as a part of foreign policy and then negotiated with British India for the project. While negotiating for the project, the Nepalese side was guided by the feeling that a small country cannot forget the importance of land while granting permission for the construction of a barrage, and decided to get land in exchange for land granted to British India for the construction of the Sarada barrage and associated structures. Above all, the negotiating team was guided by the motive of securing water for Nepal's irrigation purpose, from the proposed barrage. Because of such a stand taken by the then GoN, a lot of discussions, according to him, had taken place between the two sides regarding Nepal's water requirements for irrigation purposes, and it was only when British India agreed to provide the quantum of water mentioned in the letter of 1920 (Annex 3.1.1) that Nepal conceded to the request of British India. Adhikary went on to add that Dilli Jung Thapa and Kishore Narasing Rana were the officials who communicated the demand of Nepal to the British and negotiated with the British India Government.

For a long time, even after the overthrow of the Rana oligarchy in 1951, the areas in the districts of Kailali–Kanchanpur were considered Kalapani—full of jungles and backward areas. One could easily imagine what would have been the situation in these two districts (then one district), during the first decade of the twentieth century. But Adhikary feels that the rulers of those days were aware of the fact that the farmers of the two districts would need the water of the Mahakali (Sarada). He added that, had it not been so, they would not have taken almost four years to reply to the British request of 'providing a strip of land on the east side of the river to India' for tying up its eastern afflux bund to the high land. It was only after receiving Nepal's consent (Annex 3.1) that the British started building the Sarada Barrage on the Mahakali River at Banbasa. Ever since 1928, when the barrage was completed and inaugurated, India has been using the waters of this river for irrigation of land in Uttar Pradesh (UP) state and generation of hydropower through the 40 MW Lohia powerhouse. (Fig. 2.1)

Note: The white line denotes the border which is shown by Google but is not necessarily the actual international border.
Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.1 Sarda Barrage with the Sarda Canal and Tailrace Water of Tanakpur Power House at Tanakpur in the State of Uttarakhand, India

As per the letter of 1920, Nepal was to receive 460 cusecs of water from the barrage and, provided surplus was available, up to 1,000 cusecs of water during the summer season from May 15 to October 15 and 150 cusecs during the winter season from October 15 to May 15 for irrigation. Nepal was able to make use of this water only when the Mahakali irrigation system (both first and second phases of the project with a command area of 11,600 hectares [ha] of land in Kanchanpur district) was built with World Bank assistance and completed in 1997/98 (Pun 2006 and ARMS 2003).

In 1922, Maharaja and Prime Minister Chandra Shumshere Jung Bahadur Rana (JB Rana) had sanctioned the construction of 'the-then-state-of-the-art Chandra canal' (Pun 2006), built on the Trijuga Khola(River) in the eastern part of the country, which 'to this day serves the farmers of Saptari' (Ibid). For the construction of this canal, the GoN requested the British India Government for the services of a British engineer who was on deputation with the United Province (now Uttar Pradesh) Irrigation Department, and the canal was built under the supervision of this engineer. The engineer had not only supervised the construction of the canal, but also prepared a maintenance manual. His service was also used in the survey of the Banganga project in Western Tarai. Although the Nepal government paid for the services of the British engineer, Adhikary feels that this was another example of cooperation between the two countries during the British rule in India.

2.3 One sided Treaties: Kosi and Gandak Treaties 1950-1966

In 1947, India became an independent state. The Rana oligarchy, which had ruled Nepal for more than 100 years, had entered into a peace treaty with independent India in 1950 to retain its power, but it could not last long. They were overthrown in February 1951 through an armed movement launched under the leadership of the Nepali Congress (NC) with the support of the Late King Tribhuvan. After the overthrow, the country witnessed some form of parliamentary system of government. The post-1951 governments concluded two treaties with India between 1954 and 1959: the Kosi Treaty 1954 (revised in 1966) and the Gandak Treaty 1959 (amended in 1964).

- **Kosi Treaty of 1954 (Amended in 1966)**

The Kosi treaty, signed in 1954, envisaged construction of a barrage at Bhimnagar, which was primarily meant to control the Kosi's 'swings', which caused massive floods and devastation in Bihar and is rightly considered as the 'Sorrow of Bihar'. It is exactly because of this reason that the GoI was interested in building a barrage on this river for taming it since the time of the British Raj and had, as already mentioned, commissioned studies for this purpose. Once this river was identified with the problem of excess discharge of sand in 1941, during the Bihar post-War (World War II) plan, it was proposed that the river be controlled 'by building an embankment 3 km (2 miles) or so apart, running parallel from the Nepal foot-hills to the Ganges at a cost of Rs 10 crores [100 million]' (GoI nd). But AN Khosla, the

then chairperson of the Central Waterways, Irrigation and Navigation Commission (CWINC), thought that 'no satisfactory scheme for the control of the Kosi and its damages can be prepared except after a comprehensive survey of the entire field of possibilities, viz. the construction of a high dam across the Chatara gorge, training of the Kosi in the lower reaches and exclusion of floods from the low-lying areas which are susceptible to water-logging' (Ibid). Inspections of the Kosi Basin carried out in Nepal[1] by various teams had also proposed the construction of a high 'dam of 238.7 m (783 ft) above rock foundation across the Chatra gorge 1.6 km (1 mile) above the sacred temple of Barahakshretra... for purposes of power generation[2], irrigation[3] and navigation ...' (Ibid). In the course of time, further investigations were made in different sites at Arun, Sun Kosi, Tamore, Belka hill, nine miles downstream of Barahachhetra, and finally the site proposed by Dr KL Rao (Director, Dams, in the Central Water and Power Commission) at Hanuman Nagar/Bhimnagar was accepted by the GoI. For the time being, the idea of building a high dam[4] was discarded and investigations for constructing a barrage at Hanuman Nagar/Bhimnagar were undertaken between 1946 and 1955.

India decided to have a barrage built at Bhimnagar[5] (Figures 2.2-2.5) and pushed and signed a treaty with Nepal on April 25, 1954 (later amended on December 19, 1966) even before investigations were completed mainly due to the fact that a dreadful calamity happened in 1954 and the GoI felt a lot of pressure to adopt immediate preventive measures (Verghese 1999). So the project was designed basically as a flood control project despite its preamble, which reads as follows:

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[1] Of the different teams, the important ones were those of the AN Khosla headed teams of January 23 to February 2, 1946 (in which Nepal was represented by Lt. Col. Narmardan Thapa, Engineer-in-Chief, Chandra canal and Pt. BN Sharma of PWD Nepal) and January 1947 and other investigations/reconnaissance team of April-May 1947, headed by Balwant Singh Nag. These teams had carried out various studies on the river. (for a detailed list of investigations carried out, see Government of India publication on Kosi High Dam nd).

[2] As per the study report, 'power plant at the dam to generate 1.8 million kW (installed capacity) of cheap hydro-electric power together with a network of transmission lines for distributing power (Ibid). In addition, '90,000 kW hydro-electric power at three power houses located on the canal. A canal taking off at the barrage on the west for similar purposes except that power may or may not be generated on this canal' (Ibid).

[3] A barrage across the Kosi at Chatra to provide facilities for diverting river supplies into canals taking off on either side. 'A canal taking off at the barrage on the east to irrigate 16.6 lakh hac (1.66 million ha) in Nepal and Bihar for flushing drainage and for the siltation of low-lying areas… Measures such as soil conservation, reclamation of waterlogged land and malaria control' (Ibid) would be undertaken.

[4] In this regard, Verghese and Iyer (1993) write that 'A project of this magnitude could not find justification at that time and it was decided to look for more modest alternatives downstream.' So they decided to focus the attention on 'flood moderation and preventing the river from meandering, the choice fell on the construction of a barrage and embankments along both banks to confine the river within a fixed course' (Ibid).

[5] About the site of the barrage, it is perplexing to note that Indian writers Verghese and Iyer (1993) have written that 'India was permitted to construct a barrage just within the Indian border but with

> Whereas the Union [Government of India] is desirous of constructing a barrage, headworks and other appurtenant work[s] about 3 miles upstream of Hanuman Nagar town on the Kosi River with afflux and flood banks, and canals and protective works, on land lying within territories of Nepal, for the purpose of flood control, irrigation, generation of hydroelectric power and prevention of erosion of Nepal areas on the right side of the river, upstream of the barrage... And whereas the Government [Government of Nepal] has agreed to the construction of the said barrage, headworks and other connected works by and at the cost of the Union [Government of India].

The treaty contained 18 articles (Annex 4). The treaty does not say anything about the total area (in both Nepal and India) that would be irrigated from the Kosi barrage nor does it say anything about the quantum of hydroelectric power to be generated from it. It says that

> Without prejudice to the right of Government to withdraw for irrigation or any other purpose in Nepal such supplies of water, as may be required from time to time, the Union will have the right to regulate all the supplies in the Kosi River at the Barrage site and to generate power at the same site for the purpose of the Project.
>
> The Government shall be entitled to use up to 50 percent of the hydro-electric power generated at the Barrage site Power House on payment of such tariff rates as may be fixed from the sale of power by the Union in consultation with the Government (Article 4 proviso I and ii of the Kosi Treaty 1954)

To enable the construction and maintenance of the barrage and other structures, the treaty required Nepal to give permission to quarry the construction materials at Chatara, Dharan Bazaar and other places inside the country on the payment of royalties agreed upon by the two governments; to authorise the use of timber required for the construction from Nepal's forests on payment of compensation; and to allow the Union to use and remove clay, sand and soil without any hindrance from lands used by the GoN.

According to the officials of the Department of Irrigation (DoI), GoN, Nepal made available 13,338 bighas (9,034ha)[6] of land for the Kosi-related construction work. The project also used forest products worth millions of rupees to make slippers in the metre gauge railway built between Chatara and Bhimnagar for carrying construction materials. Till now, the project, although as per the treaty provision, has

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flood and afflux banks, canals and protective works in Nepalese territory on lease for 1999 years'. That is, according to them, the Kosi barrage is within Indian territory and the afflux bunds, etc. in Nepalese territory. But the fact, on the basis of the treaty provision, is different. First of all, the very preamble of the Kosi treaty (both original and amended) clearly states … a barrage, headworks and appurtenant works about 3 miles upstream of Hanuman Nagar Town on the Kosi River with Afflux within territories of Nepal…'. Hanuman Nagar is a Nepalese town and the barrage is located in ward no. 9 of Haripur VDC of Nepal, which is located in the then Musharnia mauja (revenue unit) in Nepal. Secondly, from the attached map of the revised 1966 Kosi agreement the international boundary quite clearly confirms that the barrage is very much within the Nepalese territory. Thirdly, the police post and customs office on the eastern entrance of the barrage are staffed by Nepalese personnel. It is writings like the above by eminent Indian writers/scholars that cause mistrust and suspicion in Nepalese minds .

[6] The figure provided by the Kosi Land Acquisition Office, Biratnagar, does not tally with this figure. According to this office, 15,000 bighas (10,160 ha) [1 hac =1.4765 bigha] and not 13,338

been using millions of cubic metres of Nepalese gravels and boulders for a nominal charge. For example, according to the officials of the Ministry of Water Resources, Government of Nepal (GoN), the project was allowed to procure 130,000 cft for Npr.45.60 per cft in the year 1985/86; 35,000 cft for Npr. 112 per cft in the year 1998; 63,000 cft for Npr.139 per cubic metre in the year 2002/03 (between March 31, 2002 and April 1, 2003). The project had requested thousands of cubic metres of gravels and boulders for the fiscal year 2006/07, for which the rate of Npr.143.74 per cubic metre has been fixed. Also, this contributor was told by a knowledgeable source that, since these gravels and boulders are of high grade and are useful for the construction of roads and other purposes, a greater quantity of gravels and boulders than required for the repair and maintenance of the Kosi dam related works are procured by the Indian side, using the provisions of the treaty. According to the same source, the officials of the GoN are concerned about how to control such use of the provisions of the treaty.

The construction of a barrage at Bhimnagar was completed in 1962. Its eastern main canal irrigates 612,500 ha (Malla 1995) of land in the districts of Purnia and Saharsa of Bihar. The western canal, which passes through 35 km in the district of Sapatri in Nepal before entering the Indian territory, was put in a operation in 1982 and irrigates 356,610 ha of land in Bihar (Ibid). The Katya powerhouse, with a capacity of 20 MW, undertaken on the eastern canal of the Kosi project, was completed by the GoI in 1977 at a cost of Irs.70 million (Paykuryal, Dahal and Adhikari 2005).

Unlike the agreement signed between the two countries for the Sarada barrage, the Kosi treaty did not have any provision for providing water to Nepal for irrigation purpose. In this regard, the then Prime Minister the Late MP Koirala, who negotiated and got the Kosi Treaty signed, had said:

> On the eastern side, the Government of India offered to construct a separate canal, which would entail an expenditure of Rs.3 crores [Rs.30 million]. The Government of Nepal wanted to utilise that money for the Trisuli[7] Hydro-Electric Project, giving it higher priority than irrigational facilities in the east (Bhasin 1994).

But the Nepalese people, especially those from Morang and Sunsari districts, were not happy with the government not paying attention to their irrigation requirements. Therefore, the government was compelled to raise this issue with India in 1964 and, as a result, the GoI was bound to provide support to the tune of Rs.40 million to construct the Chatara canal project in November 1964, which was to provide irriga-

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bighas of land (9,034 ha) was acquired for the project by the Nepal government (Kantipur, January 15, 2007). Thus, we find a difference of 1,662, bighas (1,126 ha) of land in the figures given by the two offices, one the field office and the other DoI, which need to be reconciled for the purpose of maintaining the exact figure.

[7] The Trishuli River takes rises in Tibet and drains a catchment area of more than 2,600 sq km in the Himalayas before it enters Nepal Territory near Rasugarhi [in the district of Rasuwa in the central part of the country] at an elevation of about 1,830 meters. The Trishuli Hydel Project designed with a capacity of 21,000 kW has been built under the Indian cooperation programme at a cost of [I]Rs. 128.8 million…and this project were completed in 1971 (Pyakuryal et al. 2005).

tion support to 66,000 ha of land in these two districts (Agreement of 1964). But the project did not last long and the GoN had to seek the support of the World Bank for the reconstruction of the Chatara canal and increase of its irrigation capacity. Therefore, the project is now called the Sunsari-Morang Irrigation Project (SMIP), for which the government secured US$145.5 million loan from the World Bank and this project provides irrigation facilities for 41,800 ha of land in these two districts (Poudel 2059 [2003]).

It may also be recalled that when India wanted land from Nepal to construct the western canal to bring water to irrigate land in Bihar, it was natural for Nepal to demand water from the proposed canal for irrigation in Saptari district. A few hours before the inauguration of the Kosi barrage on April 24, 1965, for which the Prime Minister the late Lal Bahadur Shastri had come to Nepal, Nepal succeeded in her effort, but only after protracted discussions with India. In this regard, one of the officials who was involved in the negotiation remembers that they left the negotiation room direct for Biratnagar to take part in the inauguration of the barrage (Rimal 2003).

Despite the fact that Prime Minister Shastri had laid the foundation stone of the western canal in 1965, it was only on April 7, 1978 that the two governments signed the agreement. According to this agreement, Nepal was to receive Inr.120.45 million (Npr.180.05 million) from India, to be used for the renovation and extension of the Chandra canal system (8,750 ha of canal renovation and 1,460 ha of Chandra canal extension [10,210 ha]), the construction of pump canal to lift the water from the Western Kosi Canal to irrigate 13,180 ha of land, and the construction of the distribution system direct from Western Canal in Nepal, which was to irrigate 11,300 ha of land. Altogether, Nepal was entitled to use the waters of the Kosi for irrigating 24,480 ha of land, excluding the Chandra canal command area of 10,210 ha. If both the areas are added, it comes to 34,690 ha of land (Bhasin 1994).

It becomes evident from the available figures that the Kosi barrage was built with the sole purpose of channelling the river, through the construction of embankments both upstream and downstream of the Bhimnagar barrage, for flood control and irrigation facilities for the farmers of Bihar. If one compares the total command area that receives water for irrigation from the Kosi project/barrage in Nepal and India (969,110 ha in India as against 24,480 ha in Nepal [Malla 1995]), it becomes clear that it was primarily built for the benefit of India and not of Nepal. If the barrage were built in Barahchhetra or Chatara or Belkahill and not at the present site, i.e. Bhimnagar, Nepal would have benefited more. Jagat Mehta (2004) says that an alternative location 'could have greatly increased the benefits to Nepal'. He further says that 'Nepal authorised the building structures that would benefit Bihar, but one suspects the Indian engineers did not fully explain the consequences in advance to the Nepalese authorities'.

Although now it could be considered as 'grave digging' for what happened so many years ago, when one refers to the provisions of the Treaty, one could easily conclude that 'Nepal agreed to what India wanted' at the cost of inundation of large tracts of land in Nepal and use of her natural resources such as the valuable saal (Shorea robusta) trees and other construction materials. Nepal as per the treaty has

to buy the power produced from the Kataiya powerhouse, built on the eastern canal of the Kosi at Kataiya. Although the supply of power from this powerhouse has been irregular, Nepal has been receiving some power (about 4/5 MW), for which she pays Npr.4.00 per unit, the tariff rate for 2005.

Hence, there is a strong feeling among Nepalese people that, because Nepalese government officials did not play an important role in the negotiation process, she failed to receive the due benefits from the project. But some professionals in India consider that 'the entire cost of the Barrage and appurtenant works were borne by India. Nepal got a measure of flood protection, some irrigation (partly through an inundation canal), an estimated 10 MW of hydel power generated on a canal drop, and a valuable bridge over the barrage, which opened up east-west communications in that sector. In the Indian view, it had not done badly by [to] Nepal.' (Sain1978, quoted in Verghese 1999). The late MP Koirala, under whose government the treaty was signed, defends it and says

> if one is determined to misunderstand a very plain situation, no body ever can help him realise the fact. India could have very well put the barrage a couple of miles below the present agreed site, if it had no consideration for Nepal. The sovereignty and territorial rights of Nepal have not been impaired by the Kosi Agreement and territorial rights of Nepal... The Kosi Agreement ... had the advantage of saving the fertile and good lands on the western side which to the tune of one thousand bighas [677.5 ha] per year, were eaten by the Kosi every year. It would also give irrigation facilities on the southern side of Saptari District, which did not get water from the Chandra Canal in Nepal Tarai. (Bhasin 1994)

Despite these claims of the Late MP Koirala, it should not be forgotten that Nepal has provided over 35 km of her land for the Kosi Western Canal. Because of this and strong persuasion, Nepal succeeded in April 1965 to get an agreement for the extension of the Chandra canal system and the construction of a pumped canal and distribution system of the Western Kosi Canal in Nepal. Whereas, after the barrage opened in 1964, India started receiving irrigation facilities from the Kosi in the eastern sector. In this regard, Leo E Rose, an expert on Nepal, said in 1971

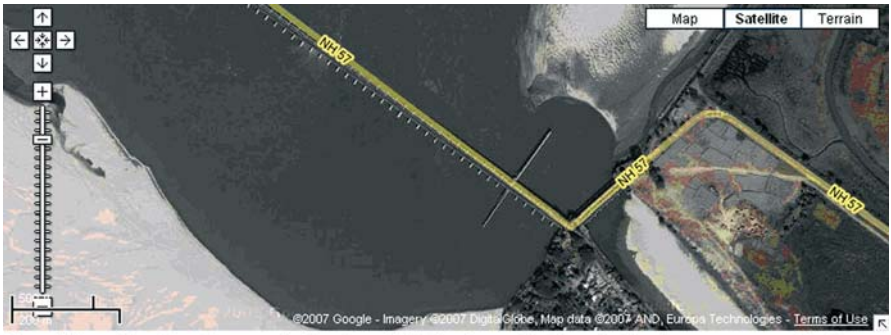
> ... the Kathmandu politicians and press soon discovered any number of flies in the ointment: Nepal received only a minute proportion of the total irrigated land; India would benefit more from the power resources developed than Nepal; the water-storage facilities would ruin some of Nepal's richest agricultural lands in eastern Terai because of the accumulation of silt; and Nepali peasants were discriminated against in the payment of compensation. The greatest volume of invective, however, was directed at the supposed violation of Nepal's sovereign rights in the project areas in Nepal, which, it was claimed, had somehow been ceded to India.

Note: The white line denotes the border which is shown by Google but is not necessarily the actual international border.
Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.2 Kosi Barrage with the Canals: Western (Nepal) and Eastern (India)

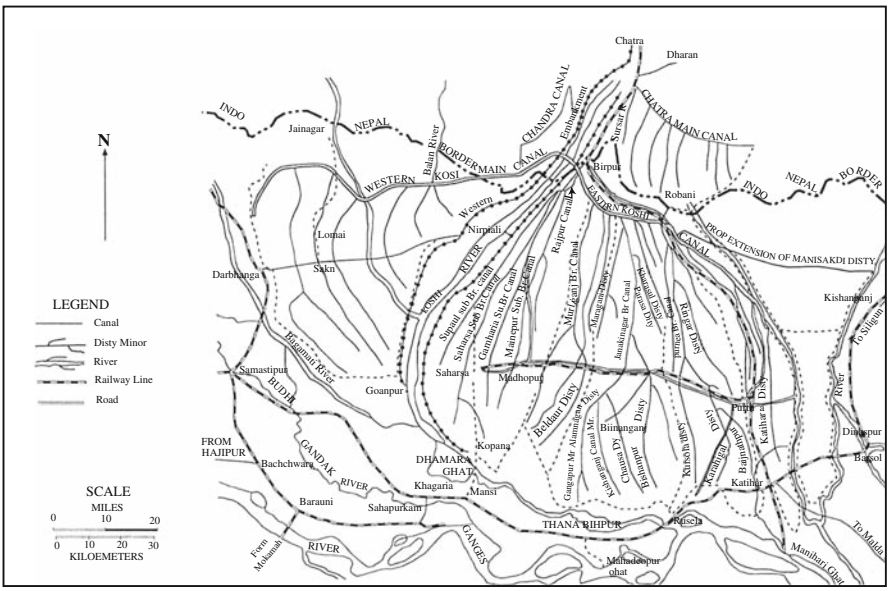
Note: The white line denoted by NH57 is not India's National Highway but part of Nepal's East-West Highway.
Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.3 Kosi Barrage with the Western Canal Passing Through Nepalese Territory



Note: The white line denotes the border which is shown by Google but is not necessarily the actual international border
Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.4 Kosi Barrage with the Eastern Canal (India)



Source: B.B. Thapa and B.B. Pradhan (Eds.): Water Resources Development: Nepalese Perspectives, Konark Publishers Pvt. Ltd. Delhi 1995.

Fig. 2.5 Kosi Barrage Canal and Embankments

- **Gandak Treaty of 1959 (Amended in 1964)**

The Gandak Treaty, signed between the GoN and GoI in 1959, permitted the latter to build a barrage on the Gandak River at Bhaisalotan (Balmiki Nagar) for the purposes of irrigation in Nepal and India and for the construction of a powerhouse for the supply of hydroelectric power to Nepal. (Fig. 2.6-2.9) But from the documents available on the Gandak project, it becomes clear that, in 1871-72, British-India first thought of using this river for irrigation. But it was only in 1896, during an acute famine, earthwork worth several crores [millions] of cubic feet was undertaken to build the Tribeni canal on the Indian side as relief work. This canal was completed in 1909 and, in 1960, with its extensions and expansions in several phases, it had a command area of 400,000 acres (161,871 ha) (Government of Bihar 1960). 'The UP Government had also thought of similar irrigation works for the western side with a head-regulator a couple of miles above Bhaisalotan in the Bhairawa district of Nepal. That proposal was shelved because of ... lack of communications etc.' (Ibid). In 1947, the then Agriculture and Food Minister in the GoI, Dr Rajendra Prasad, took up the issue with the Government of Bihar for undertaking an investigation to explore the possibility of building 'canals from the Gandak for irrigating larger portions of Saran, Champaran and Muzzafarpur districts in Bihar; Deoria and Gorakhpur districts in U.P. and parts of Nepal' (Ibid). As a result, the investigations were undertaken and a report was prepared in 1951, but since the Bihar government

wanted to pursue the Kosi project, the Gandak remained in the background for another couple of years. According to a Government of Bihar publication (1960), after about three years of negotiations, an agreement was signed with Nepal on December 4, 1959 for the project, which was later amended on April 30, 1964. The treaty contains 13 articles (Annex 5)

The Gandak Treaty, unlike the Kosi Treaty, contains detailed descriptions of the irrigation facilities to be provided from the project to Nepal, and construction of a powerhouse with an installed capacity of 15,000 kW in the Nepalese territory on the main western canal. As per the treaty, the GoI was to construct 'the Western Nepal Canal including the distributaries system thereof down to a minimum discharge of 20 cusecs for providing flow irrigation in the gross command area estimated to be at about 40,000 acres (16,187 Ha)' (Article 7 of the Gandak Treaty, 1954). In addition, the treaty says that the GoI shall construct the Eastern Nepal Canal from the tail end of the Don Branch Canal up [the] to river Bagmati, including the distributary system down to a minimum discharge of 20 cusecs at their own cost, for providing flow irrigation in Nepal for the gross command area to be estimated at 103,500 acres [41,884. ha]' (Ibid). However, it has been terminated near Birgunj in Parsa. Both these canals were to be completed 'as far as possible within one year of the completion of the barrage'(Ibid).

The treaty does not say anything about the irrigation benefits India would be receiving from the project. But according to the Government of Bihar publication, the main western canal, with a head discharge of 15,800 cusecs, would irrigate 14.08 lakh acres [569,787 ha][*] in the Saharan district of Bihar and about 8.31 lakh acres [336,287 ha] in UP. Whereas the main Eastern Canal, with a discharge of 14,110 cusecs, would irrigate 17.54 lakh acres [709,805 ha] in the Champaran, Muzaffarpur and Darbhanga districts in Bihar (Government of Bihar 1960). As a consequence of the treaty, the 2,749 feet (837.90 m) long barrage was built right on the international border in Bhaisalotan (Balmikinagar) in Nawalparasi district in Western Terai. The barrage was inaugurated on May 4, 1964, but the construction work on the eastern and western canals continued till the 1970s. According to the officials of the DoI, Nepal acquired and made available about 800 bighas (542 ha) of land to the project for project-related activities.

On the main western canal at Surajpura, in Nepalese territory lies a powerhouse which utilises the head drop in the canal to generate 15,000 kW (15 MW) of power (Government of Bihar 1960). The generation, however, is very poor, generating about 3-4 MW. The powerhouse was handed over to Nepal in 1981 when the Asian Development Bank (ADB) unwittingly financed the 132 kV Gandak-Heutada transmission, fulfilling the Gandak treaty's ownership requirement of a 60 per cent load factor developed in Nepal (Pun 2006). With regard to its life, the treaty is silent. Maybe it is so due to the fact that the barrage is built on the international boundary.

[*] hac = 2.4711 acres

2.3.1 Dissatisfaction over the Treaty Provisions and their Amendments

From the time of signing of the treaties, the people of Nepal were suspicious of India's intention in cooperating in the field of water resources. One of the reasons could be the fact that both the barrages, Kosi and Gandak, were built on or almost on the international border. As a result, India enjoys more benefits, mainly irrigation, from both barrages. Some other provisions of the original Kosi and Gandak treaties (of 1954 and 1959) were also responsible for the development of negative feelings and doubts in the minds of Nepalese people towards these treaties. In this regard, Mihaly (1965) says

> If there was a single conception that permeated the Indian aid programme, it was the almost unconscious view that Nepal was actually part of India, and that Nepal benefited from Indian gains. This attitude was best demonstrated by India's actions in regard to large irrigation and flood-control projects on the Kosi and Gandak Rivers-- projects that India liked to describe as elements of its aid to Nepal. These schemes were intended to harness two of the three major rivers which flow down from the Himalayan watershed through Nepal into India...
>
> In the long run, the harm done by India's moves here [Gandak project] and in the Kosi region may prove to have more than offset the benefits of the Indian aid programme. What made these incidents so striking was that India appeared to act without awareness that it might be overlooking Nepal's interests. India clearly needed flood protection and irrigation water. Nepal had neither the capital nor the skill to take an active role in harnessing the two rivers. So India, in the Indian view, did the sensible and honourable thing in agreeing to take full responsibility and give Nepal both water and power at no cost. No consideration appears to have been given to the fact that India was taking from a sovereign state the water on which its future depended.

Apart from not being able to receive substantive benefits in irrigation and hydel power in comparison to what she lost for the two projects, some of the other reasons for Nepal to feel dissatisfied with the treaties are as follows:

2.3.1.1 Related to the 1954 Kosi Treaty

I. Sovereignty of the Country

The Union shall be owner of all lands acquired by the Government ... which shall be transferred by them to the Union and of all water rights secured to it. Provided that the sovereignty rights and territorial jurisdiction of the Government in respect of such lands shall continue unimpaired by such transfer. *(Article 5)*

II. Use of Water and Power

Without prejudice to the right of the Government to withdraw for irrigation or any other purpose in Nepal such supplies of water, as may be required from time to time, the Union will have the right to regulate all the supplies in the

Kosi River at the Barrage site and to generate power at the same site for the purpose of the Project. (Article 4)

III. Use of River Craft

All navigation rights in the Kosi River in Nepal will rest with the Government. The use of any water-craft like boat launches and timber rafts within two miles of the Barrage and headworks shall not be allowed except by special licence under special permits to be issued by the Executive Engineer, Barrage. Any unauthorised water-craft found within this limit shall be liable to prosecution. (Article 10)

IV. Fishing Rights

All the fishing rights in the Kosi River in Nepal except within two miles of the Barrage shall vest in the Government of Nepal. No fishing will be permitted within two miles of the Barrage and Headworks. (Article 11)

V. Administration of the Project Areas in Nepal

The Union shall carry out inside the Project areas in the territory of Nepal functions such as the establishment and administration of schools, hospitals, provision of water-supply and electricity, drainage, tramway lines and other civic amenities.(Article 13)

2.3.1.2 Related to the 1959 Gandak Treaty

I. Protection of Nepal's Riparian Rights

His Majesty's Government will continue to have the right to withdraw for irrigation or any other purpose from the river or its tributaries in Nepal such supplies

Table 2.1 Schedule of Water Requirements of the Gandak Project in Cusecs (Vide clause 9 of the Agreement)

Months	Western Canal System and Power House In Nepal	Eastern Canal and Power House In India	Total
1. January	6,960	4,540	11,500
2. February	6,100	3,900	10,000
3. March	5,960	3,690	9,650
4. April	5,760	4,340	10,100
5. May	8,270	7,980	16,250
6. June	11,190	14,000	25,190
7. July	15,240	13,980	29,220
8. August	14,980	14,000	28,980
9. September	14,980	14,000	28,980
10. October	16,060	14,110	30,170
11. November	11,070	13,240	24,310
12. December	10,410	9,290	19,700

Source: Agreement on the Gandak Irrigation and Power Project, Kathmandu, December 4, 1959.

of water as may be required by them from time to time and His Majesty's Government agree that they shall not exercise this right in such manner as is likely, in the opinion of the parties hereto, prejudicially to affect the water requirements of the Project as set out in the Schedule annexed hereto. (Article 9)
The Schedule was as follows:

II. Pro Rata Reduction of Supplies during period of Shortage

Whenever the supply of water available for irrigation falls short of the requirements of the total area under the Project for which irrigation has to be provided, the shortage shall be shared on pro rata basis (as discussed above) between the Government of India and His Majesty's Government. (Article 10)

Due to such provisions and increasing disenchantment among the people of Nepal against the treaties, according to Karna Dhoj Adhikary, who was then the Chief of the Irrigation Department (DoID), he 'was instructed by the high level political authorities to identify those provisions that were detrimental for the development of water resources and suggest amendments to be made in the treaties'. According to him, 'he analyzed the treaty provisions and made his own presentation before the late King Mahendra in a royal camp at Bhairahawa, one of the towns in western Nepal's. After that briefing, the late King instructed the government to take up the matter with the GoI for the process of amendments of the Kosi and Gandak treaties. The King also took up the matter at the highest political level in India. Only after these efforts, Adhikary feels that the GoI agreed for the amendment of both the treaties. However, Leo E Rose (1971) feels that if India had not taken a soft attitude to the Royal regime that the late King Mahendra had started after dismissing the first elected government headed by the late BP Koirala, the treaties would not have been amended. He says that the concessions 'to the royal regime, minor though they may have been, had a considerable political impact in Kathmandu, where all political factions were carefully evaluating New Delhi's policy toward the King' (Ibid).

As a consequence, a series of discussions took place at various levels between the two countries which ultimately contributed to the amendment of the treaties in 1964 for the Gandak treaty and in 1966 for the Kosi treaty. The basic consideration that guided the discussions from Nepal's side for the amendment of the treaties, according to Adhikary, was how to safeguard the national interest and assert Nepal's sovereignty over the land and natural resources affected by the Kosi and Gandak barrages and associated structures. He further stated that their main concern during the negotiations with GoI was to control the damage done during the negotiations and finalisation of the treaties, and to safeguard the national interest and sovereignty as far as possible, since there was no possibility of abrogating the treaties.

The exercise for amendment of the treaties was done, according to Adhikary and Dr. Hari Man Shrestha, another eminent water resources expert of the country, with the assistance of Dr. Dante A Caponera—an expert on water-related law, who was working at the Land and Water Division of ECAFE (now ESCAP), for the Food and Agriculture Organisation (FAO), and whose service was secured by the GoN for getting expert advice.

It may be recalled that the Gandak Treaty was amended on April 30, 1964 (Annex 6), whereas the Kosi Treaty was revised on December 19, 1966 (Annex 6.1). The treaty provisions related to the use of water and power, sovereign rights of Nepal on land and resources, etc., were amended and revised. The revised and amended versions of both the treaties are as follows:

- **Revision Related to the Kosi Treaty**

i. Sovereignty of the Country/Lease of the Project Areas

All the lands acquired by HMG... shall be leased by HMG to the Union for a period of 199 years from the date of signing of these amendments at an Nominal Rate. (Article 5)

ii. Use of Water and Power

HMG shall have every right to withdraw for irrigation and for any other purpose in Nepal water from the Kosi River and from the Sun-Kosi River or within the Kosi basin from any other tributaries of the Kosi River as may be required from time to time. The Union shall have the right to regulate all the balance of supplies in the Kosi River at the barrage site thus available from time to time and to generate power in the Eastern Canal. (Article 4)

iii. Use of River Craft/Navigation Rights

All navigation rights in the Kosi River in Nepal shall rest with HMG. Provision shall be made for suitable arrangements at or around the site of the barrage for free and unrestricted navigation in the Kosi River, if technically feasible. However, the use of any water-craft like boats, launches and timber rafts within two miles of the barrage and head-works shall not be allowed on grounds of safety, except by special permits to be issued by the competent authority of HMG in consultation with the executive Engineer, Barrage. Any unauthorised water-craft found within this limit shall be liable to prosecution. (Article 10)

iv. Fishing Rights

All the fishing rights in the Kosi River in Nepal shall continue to rest with HMG. However, no fishing shall be permitted within two miles of the barrage and head-works except under special permits to be issued by the competent authority of HMG in consultation with the Executive Engineer, Barrage. While issuing the special permits within two miles, HMG shall keep in view the safety of the headworks and the permit-holders. (Article 11)

v. Administration of the Project Areas in Nepal/Civic Amenities in the Project Area

Subject to the prior approval of HMG, the Union may, in the project area, establish schools, hospitals, water-supply systems, electric supply systems, drainage and other civic amenities for the duration of the construction of the

project. On completion of construction of the project, any such civic amenities shall, upon request by HMG, be transferred to HMG, and that, in any case, all functions of public administration shall, pursuant to the provisions of clause 5(v) be exercised by HMG. (Article 13)

- **Amendment Related to the Gandak Treaty**

i. Protection of Nepal's Riparian Rights

His Majesty's Government will continue to have the right to withdraw for irrigation or any other purpose from the river or its tributaries in Nepal such supplies of water as may be required by them from time to time in the Valley

For the trans-valley uses of Gandak waters, separate agreements between His Majesty's Government and the Government of India will be entered into for the uses of water in the months of February to April only. (Article 9)

ii. Pro Rata Reduction of Supplies During Periods of Shortage

According to Adhikary, 'Caponera was still not satisfied' even after the amendment of the treaties. One of the reasons, according to him, could be the continued provision on the requirement for the GoN to make reasonable compensation while taking over the project-related property at the end of the lease period of 199 years in relation to the Kosi Treaty. In this regard, the following provision of the letter of exchange made along with the treaty should be recapitulated:

> with reference to sub-clause (iv) clause 5: our two governments have reached an understanding that the Government of India will be reasonably compensated in case the Project properties are taken over by His Majesty's Government at the end of the lease period. The compensation will cover the cost borne to date and such other cost as may be incurred in future by the Government of India with the agreement of His Majesty's Government. In that case the depreciation in the value of the project materials would, of course, be taken into account.

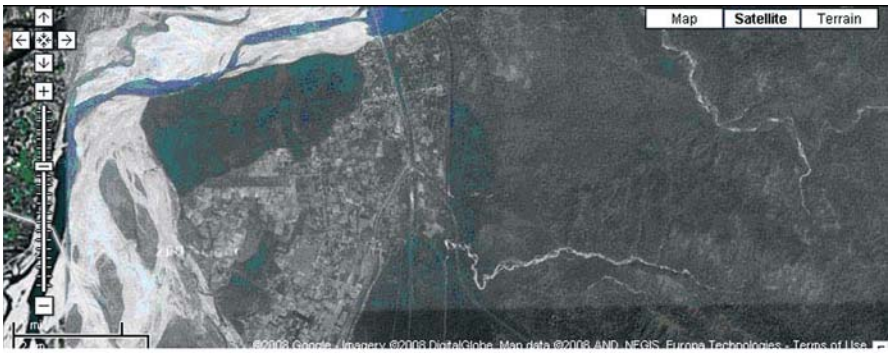
The other reason could be the restriction imposed by the Gandak Treaty on the trans-valley uses of Gandak waters. The amended version of the treaty, as indicated above, does not allow Nepal to transfer the Gandak waters to another basin during lean sessions.

It's not only Caponera who remained dissatisfied. Laxman Rimal, who was the Secretary of the Ministry of Water Resources (MoWR) when the re negotiations for the Kosi treaty took place, also feels dissatisfied. The reason was that they had proposed 99 years as the lease period for the Kosi barrage to GoI, but at the political level the lease period was extended to 199 years (Rimal 2003).

In addition, from the perspective of the implementation of the treaty provisions there are many more reasons for the people of Nepal, especially those living in the command areas, to feel dissatisfied. One of them was their inability to derive benefit, mainly irrigation benefits, from the projects, first, due to the delay in the completion of the construction work and, second, due to the lack of repair and maintenance of canals and non-maintenance of the water level in the barrages/canals, in addition to delays in getting compensation for the land acquired for the projects (for details, see 2.10).

Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.6 Gandak Barrage with Eastern Canal



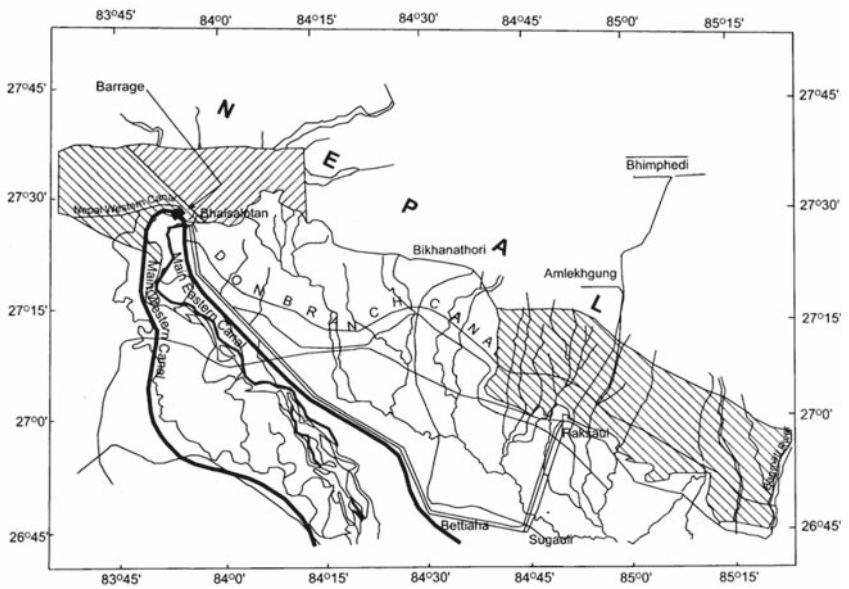
Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.7 Gandak Barrage with Eastern Canals (I)

Note: The white incomplete line denotes the border which is shown by Google but is not necessa the actual international border.

Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.8 Gandak Barrage with Western Canal



Source: Agreement between His Majesty's Government of Nepal and The Government of India on The Gandak Irrigation and Power Project Ministry of Water and Power, HMG, Durbarmarg, Kathmandu, Nepal 1975.

Fig. 2.9 Gandak Barrage and Canal System

2.4 Proposals and Counter Proposals (1966-1990): Period of suspicions and Misunderstanding

The next 24 years, i.e. between 1966 and 1990, following the conclusion of the renegotiations for the amendment to the Kosi and Gandak treaties could be considered the period of submission of proposals and counter proposals by one to the other, resulting in no concrete actions taking place in the sector [Joint communiqués/statements]) (Annex 7). However, while going through the correspondence between the two countries during this period, it becomes clear that the discussions between the two countries mainly hovered around the two multi-purpose projects—the Karnali project and the Pancheswar project. In addition, the other projects that were taken up for discussion were the Rapti/Bhalubang project and the Jalkundi project.

- **Karnali Multi-purpose Project vis-à-vis Pancheshwar Multi-purpose Project**

Since the country already had treaties with India for two of the three major rivers—the Kosi and Gandak, Nepal on its own decided to commission a study for the development of a multi-purpose project on the third major river—the Karnali

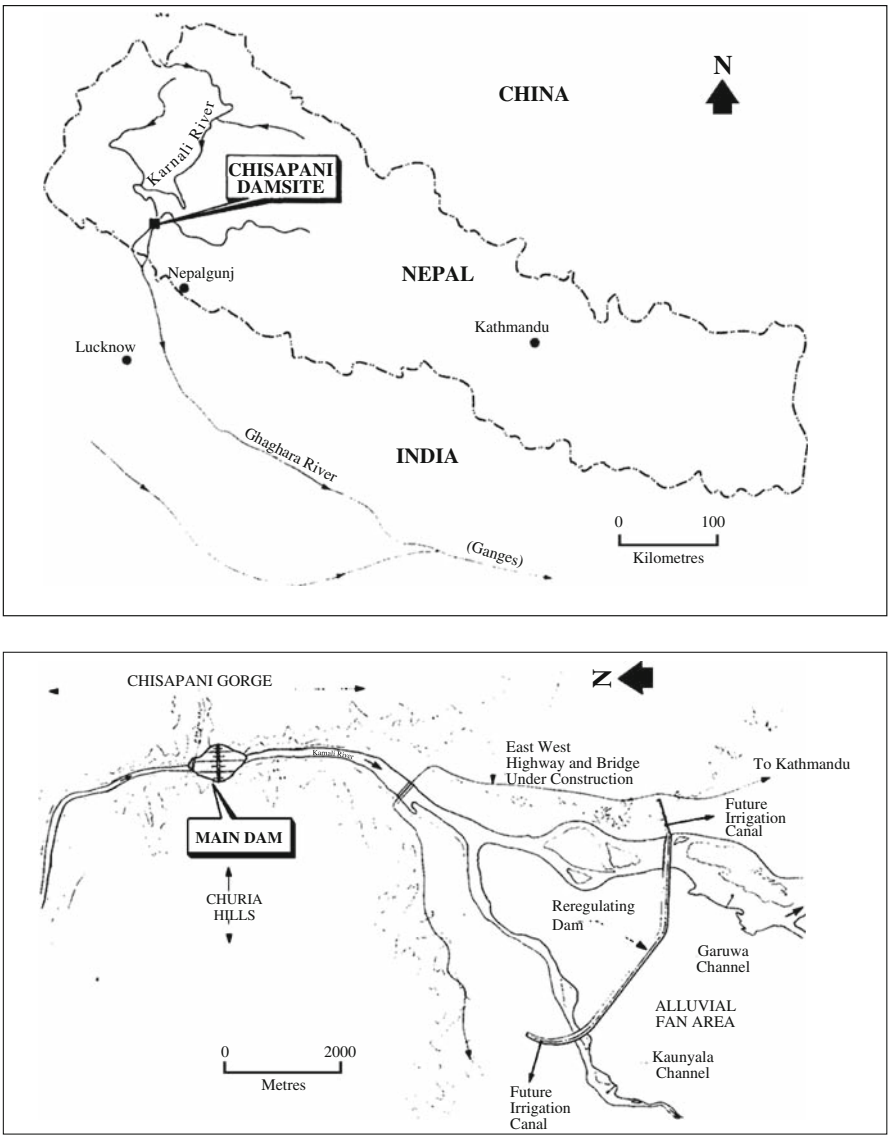
River, located in the western part of the country. For this purpose, she decided to seek the support of an international agency. During the official/state visit of the late King Mahendra to the USA in April 1960, he took up the matter at the highest level US official, i.e. President, the late Dwight D Eisenhower (Adhikary 2003). Through the President's goodwill and support, Nepal, according to Dr. Hari Man Shrestha, succeeded in receiving US$1 million support from the UNDP for the study of this project. Nippon Koei, a Japanese firm, undertook this study and completed it in 1966. After this, a few other studies were undertaken by Australians and Norwegians. 'Yet another Canadian-US consortium was invited in 1986 following an understanding with India and with good offices of the World Bank, to prepare a feasibility report. A preliminary report by the Himalayan Power Consultants of the Ministry of Water Resources (MoWR) 'settled the site and proposed raising the height of the dam to generate 10,800 MW as against the 3,600-4,500 MW earlier contemplated' (Verghese 1999). The final 1990 Karnali Multi-purpose study indicates that the project would generate 10,800 MW of hydropower and provide irrigation facilities for 191,000 ha net of land in Nepal and over 3,000,000 ha in India (Ministry of Water Resources/GoN 1989). Because of these findings, it was natural for Nepal to discuss this project with the GoI, especially at political level. (Fig. 2.10-2.11)

When the first study of 1966 was almost at its final stage, Nepal proposed cooperating with India on the development of the project during the visit of India's Deputy Prime Minister Morarji Desai to Nepal in October 1967. In response, he agreed to arrange an 'early technical appraisal of the…project from the point of view of determining India's interest in it' (Bhasin 1994). At the highest political level, too, the late King Mahendra took it up with President Zakir Hussain during his visit to Nepal in October 1968 and indicated Nepal's 'desire to develop [the] hydro-electric potential of the Karnali River' (Ibid). In return, President Hussain expressed India's willingness to help Nepal in this project if it was found feasible and mutually beneficial (Ibid.).

Before the late King Birendra expressed his interest with Indian journalists, on March 1, 1974, of cooperating with India in this project, Nepal had already taken it up at official level during the visit of DP Dhar, Planning Minister GoI, to Kathmandu in May 1973.[8] In response to this, India agreed 'to purchase Karnali power that may be surplus to the needs of Nepal' (Ibid). But she also added a qualification. That was India would like to be fully associated with the formulation of the projects as she was the bulk purchaser of the power produced from this project (Ibid.).

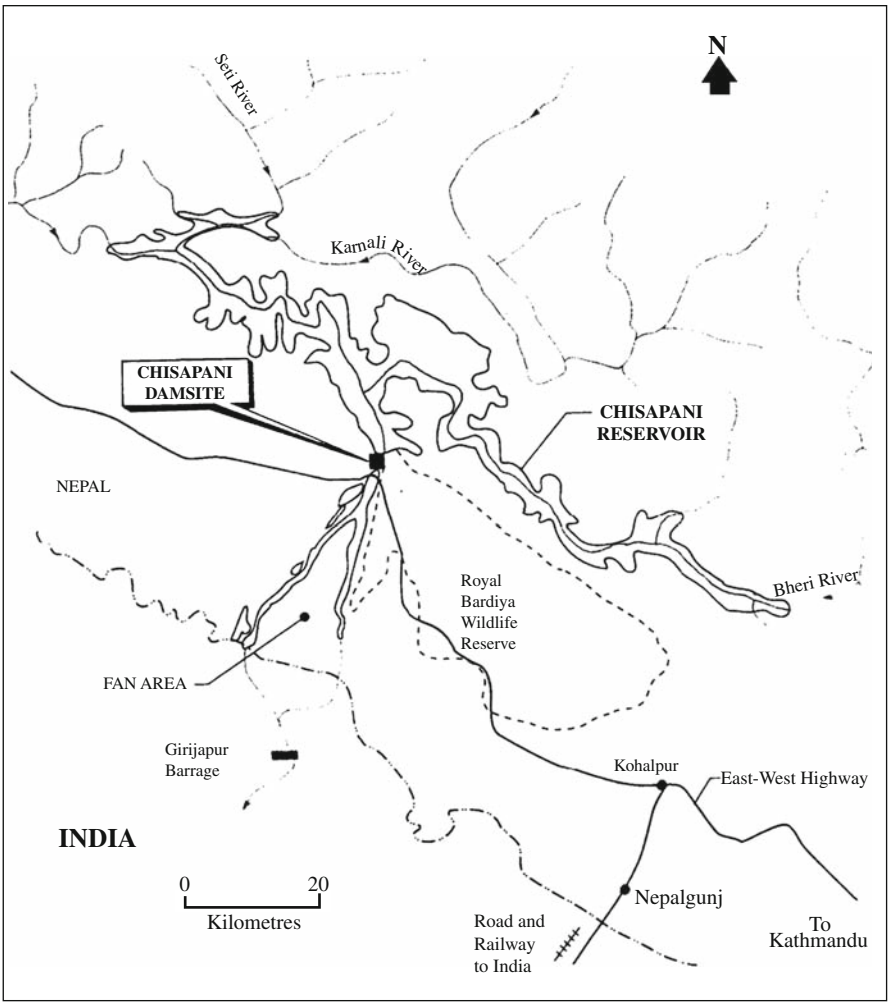
King Birendra, in an interview to Indian journalists (March 1, 1974), viewed that Karnali was beneficial to both Nepal and India. However, he said that 'he was keen

[8] One of the points included in the Joint communiqué issued at the end of the visit indicated that 'the Government of India will purchase Karnali power that may be surplus to the needs of Nepal. Since India will be the purchaser of the bulk of this power, it will be fully associated with the formulation of this project. His Majesty's Government of Nepal will constitute a Committee of Direction, comprising their representatives, a representative of the Government of India and, if His Majesty's Government desires, representatives of international agencies' (Bhasin 1994).



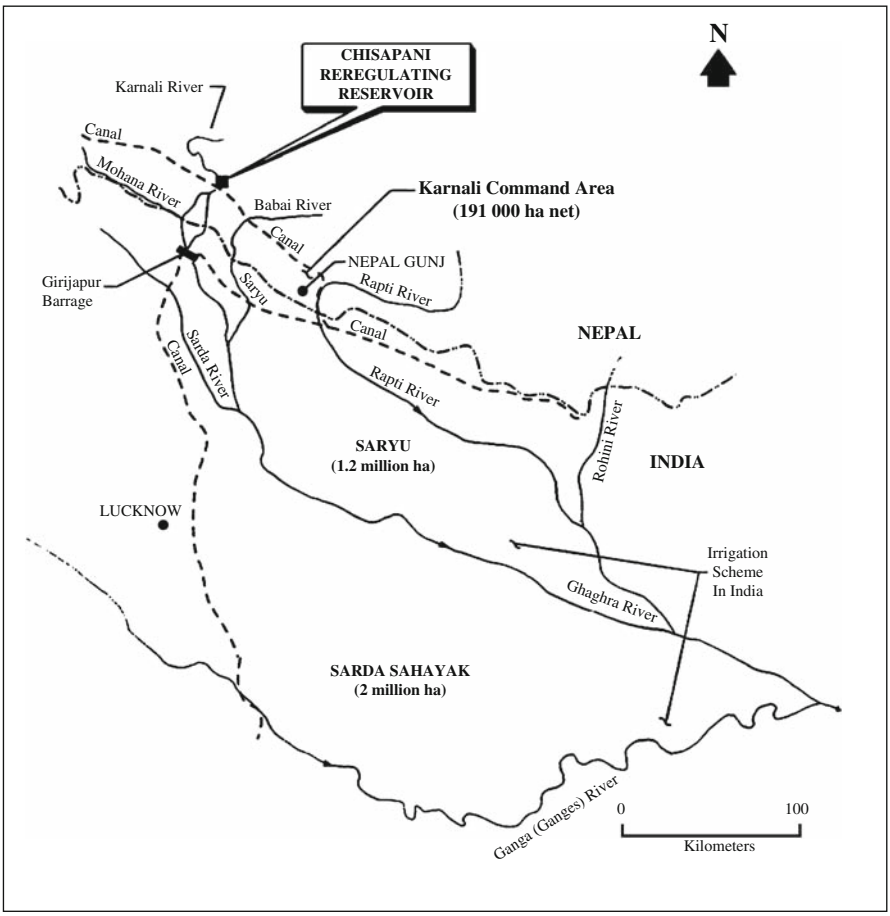
Note: Arrangement of Features
Source: Karnali Chisapani Multi-purpose Project (Feasibility study Executive summary Ministry of Water Resources His Majesty's Government, Himalayan Power Consultants, Kathmandu, December 1989.

Fig. 2.10 Karnali Chisapani Dam Site & Features



Note: Project Area
Source: Karnali Chisapani Multi-purpose Project (Feasibility study Executive summary Ministry of Water Resources His Majesty's Government, Himalayan Power Consultants, Kathmandu, December 1989.

Fig. 2.10A Karnali Chisapani Dam site and Surrounding areas



Source: Karnali Chisapani Multi-purpose Project (Feasibility study Executive summary Ministry of Water Resources His Majesty's Government, Himalayan Power Consultants, Kathmandu, December 1989.

Fig. 2.10B Karnali Chisapani Dam with Irrigation Command Areas (Nepal and India)

to see the project get going'(Ibid). He also expressed confidence that 'experiences of the Kosi and Gandak projects will not come in the way of execution of the Karnali project' (Ibid.). The response of the GoI came through the statement of the Indian External Affairs Minister the late YB Chavan in the Lok Sabha (Lower House of the Indian parliament) on January 27, 1976. In his statement, Chavan had said

> In particular, I would like to mention that both sides agreed to continue the work on the Karnali Project as under the existing arrangement and to undertake, at the earliest possible [time] the joint investigation of the Pancheswar Dam Project and the Rapti Flood Control Project (Ibid.).

It becomes evident from all these statements that ever since the study was initiated and was being finalised, Nepal consistently took up Karnali as her preferred project for collaboration with India.

However, the available evidence show that India followed two strategies with Nepal with regard to this project. One was to show that she was interested in cooperating with Nepal for this project. Secondly, to propose another big multi-purpose project, the Pancheswar Multi-purpose project (Pancheswar project) on the Mahakali River, from its side. Otherwise, this project would not have found a place along with the Karnali project in the official statements jointly issued at the end of the visit of Planning Minister of India DP Dhar to Nepal in May 1973, and that of the Prime Minister the late Morarji Desai in 1977 and in the statement of the External Affairs Minister the late YB Chavan to the Loka Sabha on January 27, 1976, which has been cited above.

The joint statement issued at the end of the visit of Prime Minister Desai states

> India affirmed its desire to purchase the surplus power from the project [Karnali Project]. As a first step, it has already been agreed to establish a committee to examine the preliminary issues with regard to the execution of the project. India has already nominated her representatives for this Committee. It was now decided that the terms of reference would be settled and the Committee will meet within a period of three months and submit its recommendations within one year (Ibid.).

During questions in the Indian Lok Sabha on this project on March 10, 1981, ABA Ghani Khan Chaudhury, Minister for Energy, stated that

> it has been agreed with His Majesty's Government of Nepal that a comprehensive study of the Karnali Hydro-Electric Project will be undertaken and steps taken to prepare a detailed project report. The present cost can be estimated only when the detailed project report is prepared; the extent of benefits likely to accrue from the project relate mainly to (1) power supply; (2) irrigation benefits and (3) flood control benefits. The details of benefits will be available only after the detailed project report is finalised...Questions regarding financial participation in the project by India or by other agencies are yet to be finalised ... At the present moment, what we have agreed with Nepal is the investigating matter. There is no time limit on this. This is bilateral understanding (Ibid).

As a follow-up to the understandings, both governments agreed to constitute a Commission on Karnali (CK) with the secretaries of water resources of the respective governments as co-convenors. In addition, Karnali Coordination Committee (KCC) was established as the technical committee of the CK. Both these committees were constituted in 1977. These committees last met in 1991[9] and 1992[10] respectively. But the two countries have yet to agree on broad parameters for the Karnali project.

Regarding the Pancheswar Multi-purpose project, it was proposed by India to Nepal for consideration. According to a knowledgeable source, India's interest in the Pancheswar project goes back to the 1960s. When Dr KL Rao, Minister for Water Resources, GoI visited Nepal in 1971, he submitted a report on the 'Pancheswar project', prepared by the Water and Power Consultancy Services (WAPCOS), to

[9] The eighth meeting of the Secretary-level committee, Committee on Karnali, met in March 1991 after a gap of four years.

[10] The Karnali Coordinating Committee (KCC), the technical/professional-level committee, had its ninth meeting in Kathmandu in March 1992 after a gap of one year.

Nepalese government officials. The same source said that when this project was submitted to the late King Mahendra, he 'requested India to drop the idea of Pancheswar'. The reason for making such a response was, as told to this contributor by the same source, the importance Nepal attached to the Karnali project.

It may be recalled that by the time Dr Rao came up with the suggestion for the Pancheswar project, Nippon Koei had already completed the feasibility study of the Karnali project in 1966 and the Snowy Mountain Engineering Company (SMEC) of Australia had reviewed it in 1968. In the year 2008, too, it was not possible to undertake two mega projects at the same time on several grounds, one of which is securing the funding support. So, it was natural for Nepal to pursue the Karnali project that she preferred and believed was mutually beneficial to both the countries.

But by the time the Pancheswar multi-purpose project found its place in the joint statements/communiqués, i.e. during the visits of External Affairs Minister Atal Behari Vajpayee in July 1977[11] and Prime Minister the late Desai to Nepal in December 1977,[12] King Mahendra[13], the person who had taken personal interest in the project, was already dead. Hence, it seems that policymakers in Nepal decided to follow a strategy of pursuing the Karnali project and giving consideration to India's interest of the Pancheswar Multi-purpose project. Therefore, whether or not such a strategy was appropriate could be a subject of discussion and debate, neither of the projects would have found a place in the said joint communiqués without Nepal's consent.

As to why the Pancheswar Multi-purpose project was pushed, BG Verghese (1999) says that India became 'impatient at the slow pace of progress on Karnali'. So, she pushed 'Nepal for consideration of the Pancheswar multi-purpose project on the Mahakali, a boundary river, to generate 2,000 MW and provide irrigation benefits in the plains below. Having already investigated the Pancheswar site from its side of the border and being in possession of much of the hydrological and other data, India believed that this might move ahead fast. Nepal did express interest but dragged its feet because it feared that if Pancheswar, a shared Indo-Nepal project, was to get off the ground, then India might slow down on Karnali, the larger and wholly Nepalese project. With the result that, despite India also agreeing to refer Pancheswar to [the] international consultants, this has not been done as the Nepalese are still completing investigations on their side of the border' (Ibid). And it was only in 1996, after a long effort on the part of the Indian side, that they were finally able to get the treaty signed with Nepal on the Integrated Development of the Mahakali River, including Sarada Barrage, Tanakpur Barrage and Pancheshwar Project, 1996, which, among other things, establishes the principles for the prepa-

[11] In the joint statement it has been stated that 'they have agreed to take steps to expedite further joint investigations regarding the Pancheswar Dam Project' (Bhasin 1994).

[12] It has been stated that 'both sides decided to 'nominate their representatives within a period of three months to start the joint investigations relating to the Pancheswar Hydro-electric Project, to be located on the borders of India and Nepal on-river Mahakali (Sarda). It was also agreed that both countries will give all facilities and assistance for the early completion of the investigations' (Ibid).

[13] King Mahendra Bir Birkram Shah Dev died on January 31, 1972, at the age of 51 years.

ration of the detailed project report of the Pancheswar project. The details of this treaty are discussed in subsequent paragraphs related to post-1990 period.

Once again, both the governments have agreed to discuss the Karnali Multi-purpose project along with Pancheswar project (Annex.17, 17.1, 17.2, 17.6 and 17.7). But here, too, one should not forget whether India would give preference to the Karnali project when its entire location lies in another country at the cost of a project which lies on a boundary river. Furthermore, after India was provided with 24 volumes of the 1990 Detailed Feasibility Study (DFS) on the Karnali project by Nepal, she expressed various reservations on the project parameters. Her reservations are particularly on 'the study's benefit assessment (power: 81 %, irrigation: 18.9 % and flood control: 0.1 %)' (Pun 2006). She argued that 'only the power benefits were to be considered as the irrigation and flood control benefits were negligible. On the power benefits also, India argued that the capacity benefit from the project was negligible as it replaced their hydro-generation and not the thermal generation as envisaged in the study' (Ibid). Whereas, 'without questioning India's sincerity on the Karnali multi-purpose project, Nepal in 1981, with UNDP's assistance over a five-year period, went ahead and trained 250 engineers (each year 50 engineers) for the Karnali project at India's own premier Roorkee University' (ibid.). But 'India, with the Girijapur barrage (Fig. 2.11) downstream of the Karnali/Chisapani project already straddling the Karnali on her soil and had her eyes forlornly on the Pancheshwar project' (Ibid). BG Verghese (1999) thinks that 'fear of being too dependent on Nepalese power, in some Indian circles', could be another reason for little interest in this project when in the 1970s Nepal was 'willing to go ahead with the project' (Ibid). Above all, 'India also exhibited an excessive antagonism towards all international consultants or even international interest in the belief that this would necessarily load the dice against it if for no other reason than to favour the smaller country or to foster the sinister designs of that "foreign hand". President Carter, Prime Minister James Callaghan, the World Bank et al. were spurned when they expressed willingness to support Himalayan water resources development. A minority would even quote the Indus Waters agreement, mediated by the World Bank, as being unduly generous to Pakistan, though this has never been a vocal contention. Furthermore, until the mid-eighties, the Indian Planning Commission had never looked at the Himalayan potential in Nepal and Bhutan in terms of long-term energy planning' (Ibid). Thus, 'India ensured that Karnali fizzled out into endless meetings of the Karnali Coordination Committee and the policy-related Committee on Karnali at the secretary level. There were Indo-Nepal problems on the sharing of various data and questions with regard to Nepal's site inspection of the Karnali command areas situated in India' (Pun 2006).

But, BG Verghese feels that Nepal's attitude is also responsible for the lack of progress being made on the Karnali, and says (1999)

> Some would attribute Nepal's diffidence about Karnali and similar projects at various times to an unspoken fear among sections of the ruling elites that a massive development programme of this kind might create alternative power centres and change the political balance within the Kingdom. Mortgaging such a massive investment to a single buyer, India, might also be dangerous were excessive interdependence to erode independence.

Note: The upper white line denotes the border which is shown by Google but is not necessarily the actual international border.

Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.11 Girijapur Barrage on Karnali River in India

However, Jagat Mehta (2004), who could have played a positive role in getting this project going, now regrets and says:

> My greatest unfulfilled ambition was not to have been able to initiate discussion, or at least come to grips on eventual power supply from Karnali …

'There was a brief interlude when the…American multinational, Enron, entered the Karnali scene in 1998. But when Enron returned without a license on Karnali from Nepal, there were genuine heartburns among Nepal's main political parties. Finally, in October 2004, the secretary-level Indo-Nepal Joint Committee on Water Resources decided to 'reactivate the Karnali Coordination Committee to examine the possibility of implementing the Karnali/Chisapani multi-purpose project in Nepal' (Pun 2006). But concrete steps are yet to be taken to materialise the project.

- **Rapti-Bhalubang Multi-purpose Project and Devighat Hydroelectric Project**

In addition to the above mega projects, two other hydroelectric projects, Rapti-Bhalubang and Devighat, find reference in the official statements during this period. The first one, which was to be developed as a multi-purpose project on the West Rapti River, is located in the Bhalubang area in Dang-Deukhuri district in the mid-western region. During the visit of the late Prime Minister Morarji Desai to Nepal in 1977, both governments took note of the feasibility of this project and agreed to an early 'execution of the project for the benefit of the two countries'. For this purpose, they agreed 'that experts of the two sides should meet within one month to finalise the arrangements and to prepare detailed project estimates within two years' (Bhasin 1994). With regard to the other project, Devighat, hydropower was to be developed in the district of Nuwakot in the central region by using the tail water from the Tris[h]uli hydropower project (for details of this project see footnote 7). India agreed to execute this project on a turnkey basis and to sign a formal agreement as soon as possible.

Of the two understandings, so far only one relating to Devighat was implemented. The GoI implemented this project on a turnkey basis at a cost of Inr.290 million (Pyakuryal, et al. 2006). This project was completed in 1983 and produces 14.1 MW of hydropower energy. The Rapti/Bhalubang project is yet to take-off.

The Rapti/Bhalubang project did not take off mainly due to the fact that Nepal had proposed this project against the interest of India, whose interest was to develop a project on the West Rapti River at Jalkundi in the eastern part of Banke district. According to knowledgeable persons of the Ministry of Water Resources of Nepal (MoWR), 'India had proposed to build a barrage of 188 ft (57.30 m) height on the West Rapti River at Jalkundi and a tunnel to bring the water to the Indian border to produce hydropower through a powerhouse built on their side of the border (Annex 8). For the purpose of undertaking the survey of the project, the Indian government had put up a survey camp inside Nepal, without her consent.' Nepal was not happy with such behaviour and expressed, according to Karna Dhoj Adhikary, her unhappiness. As a result, the Indian survey team left the country. Despite the fact that Dr KL Rao, Minister for Power and Irrigation, Government of India (GoI), had urged Nepal to consider the Jalkundi project on humanitarian consideration, Nepal did not agree to their request. Nepal also knew that if India was allowed to build the barrage at Jalkundi, the fertile land in the whole of Deukhuri valley would be submerged. Therefore, she proposed the alternative Bhalubang Multipurpose project on the same river (West Rapti River), whose pre-feasibility study was already available, as Nepal had this study undertaken through the German firm Lahmayer. The Government of Canada (GoC) was willing to support Nepal in preparing its feasibility study. The same source further added that, during the visit of Minister of External Affairs the late YB Chavan to Nepal on January 19-22, 1976, 'India proposed to undertake the joint study of two projects—Pancheswar and Rapti Bhalubang (Rapti flood control project) for which even a memorandum of understanding (MOU) had been drafted at the highest level, but because of the opposition of the professionals it (MOU) was not signed'. But in a statement to the Lok Sabha on January 27 of the same year, Minister of External Affairs Chavan said, as already quoted above, both sides had agreed to continue to work on the Karnali Project and to undertake the joint investigation of the Pancheswar Dam Project and the Rapti Flood Control Project as soon as possible (Bhasin 1994). It also got reflected in the joint communiqué issued at the end of the visit of the late Prime Minister Morarji Desai to Nepal in 1977 as one of the projects to be jointly studied. It is interesting to note why India accepted the proposal when she knew that the Rapti/Bhalubang project was proposed as a counter-proposal to the Jalkundi project.

The acceptance of the Terms of Reference (ToR) by both countries, according to the same source, was the condition to be fulfilled to secure the funding support of the GoC for the feasibility study of Rapti/Bhalubang project. But the Canadian government later decided to withdraw the support since India did not agree on the ToR of such a study. The source further told that India's unwillingness to accept the ToR was mainly due to, first, Nepal did not agree to the Indian proposal of Jalkundi and, second, she had proposed the Rapti/ Bhalubang project as a counter-proposal

to the Jalkundi project. Now again on the same river (West Rapti River), India has come up with a proposal of building a storage project at Namure,[14] which is under consideration of GoN.

- **Efforts to Impose Restriction on the Authority of Nepal**

The relationship between Nepal and India dipped to its lowest ebb at the end of the 1980s, especially after India imposed an economic blockade on March 23, 1989 (trade and transit restrictions) against Nepal after the trade and transit treaty of 1978 lapsed. As to why India imposed economic restrictions after the lapse of the treaties on trade and transit, one could cite the difference between the two countries to have one or two treaties, i.e. the one-treaty proposition of India and the demand of Nepal for two treaties (one for trade and another for transit), as the main reason. But the fact remains that when the negotiations for the renewal of the trade and transit treaty were going on between the two countries, Nepal's political parties, on the one hand, were rising against the active rule of the King under the then Panchayat system and, on the other hand, the relationship between the late King Birendra and the late Prime Minister Rajiv Gandhi was not congenial. There was a personality clash between them. So, in order to provide support, moral and other, to the agitating political parties in their move against the Panchayat system and to teach a lesson to the country for not having a congenial relationship with the serving Prime Minister of India, the latter did not want to extend the period of the trade and transit treaty. With regard to such behaviour of India, Mehta (2004) says

[14] West Rapti is one of the medium rivers that drain Pyuthan, Dang and Banke districts in Mid Western Development Region. In order to produce power or irrigation, different projects at various times were conceived on this river. The first, Jalkundi, located in Dang's Deukhuri valley, was proposed by India. The second was Nepal proposed multi-purpose project at Bhalubang a counter proposal, (according to Karna Dhoj Adhikary) of Nepal to India proposed Jalkundi in Dang district. The third is the Sikta irrigation project undertaken by Nepal at Banke district, downstream of Bhalubang. The fourth is Naumure, located on the Pyuthan and Dang border, 5 to 6 km north of Bhalubang.

The Jalkundi proposed by India many decades ago was not acceptable to Nepal. Neither was Nepal's counter-proposal, Bhalubang, acceptable to India. So, both the projects got shelved in the archive of the respective ministries of water resources. A storage project on the West Rapti River is now being proposed by India at Naumure with a 240 MW capacity and a re-regulating dam at Bhalubang. The proposal is under consideration at Nepal's MoWR.on the plea of reconciling 'the irrigation and hydropower components'. Nepalese MoWR believes that a new study is needed to incorporate the construction of a re-regulating dam at Bhalubang (The Kathmandu Post, March 6, 2008).

Though Nepal seriously needs a storage project to meet her growing energy demand during the dry season, it is clear from above discussion 'why earlier efforts on Jalkundi and Bhalubang did not bear fruits'. Certain quarters assert that India's gratis 240 MW Naumure would come with the string: either concede to prior use right on the Rapti downstream in India or apportion a certain amount of augmented water for India. If this is correct, then Naumure is nothing but a new form of Jalkundi that India had proposed previously. It is learnt from reliable sources that Naumure was proposed to MoWR by India through the highest political executive of the country. As such, the mandarins at the MoWR were caught off-guard when they were told to activate this project.

> …during the 1980's —— many years after I retired —— one heard that personal animosities developed between the Heads of the Governments of India and Nepal. By deliberately staggering the extensions, India contrived that both the Trade and Transit treaties lapsed simultaneously in 1989 and thereafter all the nine designated points of entry were closed. It was an ill conceived exercise in coercive diplomacy (I do not know if it was professionally opposed or endorsed). It created anger and dismay in Nepal and inflicted hardship on the poor especially in the outlying areas'...[Incidentally, the Indian Army wisely allowed holidaying Ghurkhas to take nominally small but nevertheless significant essential items like petroleum, oil and lubricants (POL) and coal as "head loads"]. However, if I am not mistaken, the episode remains embedded in the national memory register of Nepal while it is barely remembered in India, illustrative of the asymmetry of memory.

As a result of the imposition of the economic blockade for more than a year, Nepal faced many hardships. The relationship between the two countries during the period was the most difficult one since the signing of the Sugauli Treaty in December 1815 (ratified in March 1816), the peace treaty signed by Nepal and British India after the Anglo-Nepal War of 1814-16.

Not only did India impose sanctions after the lapse of the treaties on trade and transit, she also wanted to strangle the sovereignty of Nepal by sending a draft treaty entitled 'Agreement between the Government of India and His Majesty's Government of Nepal on Mutual Cooperation' in 1990 to be signed by Nepal. Among other things, the draft contained the following provisions on water resources under the heading 'Economic, Industrial and Water Resources Cooperation':

> the two Contracting Parties being equally desirous of achieving complete and satisfactory utilisation of the waters of the commonly shared rivers, undertake to (i) plan new uses or projects subject to the protection of existing uses on the rivers and (ii) cooperate with each other to formulate and modify the planned new uses or project taking into consideration the water requirements of the Parties. (Part VI: Article III)
>
> the Contracting Parties agree jointly to plan, construct and manage projects of mutual benefit. In this regard, the involvement of a third party, where felt to be necessary and in the common interest, shall be subject to mutual consent. (Part VI: IV)
>
> to facilitate the effective and harmonious implementation of this Agreement, the Contracting Parties shall consult each other regularly, and review the implementation of the Agreement, within the forum of India-Nepal Joint Commission. They shall meet for this purpose at least once in twelve months. (Part VII Article 1 (Bhasin 1994 and Pant 1995)

If these provisions are compared with provision No 4 (given below) of the accompanying letter of the Treaty of Peace and Friendship 1950, one would find no difference in the attitude of India on the natural resources of Nepal, especially water resources. The only difference between the two is that the letter was kept confidential for a long time. Whereas, through the said provisions in the proposed draft, India wanted to let Nepal know openly what she wanted the latter to accept. Provision No 4 of the accompanying letter was as follows:

> If the Government of Nepal should decide to seek foreign assistance in regard to the development of the natural resources of, or of any industrial project in Nepal, the Government of Nepal shall give first preference to the Government or the nationals of India, as the case may be, provided that the terms offered by the Government of India or Indian nationals, as the case may be, are not less favourable to Nepal than the terms offered by any other foreign Government or by other foreign nationals

> Nothing in the foregoing provision shall apply to assistance that the Government of Nepal may seek from the United Nations Organisation or any of its specialised agencies (Bhasin 1994)

Had King Birendra yielded to Indian pressure and accepted the draft, he would have remained an active monarch. But he decided to make concessions to his people rather than to India and did away with the Panchayat system, and restored a multi-party parliamentary system of government in the country in April 1990.

2.5 Post-1990 Period: Re-emergence of Mega Projects

- **Domination of Tanakapur and Pancheswar Projects**

By the time the country got a new political system in April 1990, Nepal was forced to engage with India on the Tanakpur barrage over the Mahakali River (in India, known as the Sarada River). India had built this barrage on a stretch of the river upstream of the Sarada barrage. In this regard, India claimed that the barrage site and its protection works were wholly in Indian territory and 'the afflux of the pond created does not exceed the normal flood level in Nepal territory' (Government of UP 1980 and Annex 9). The construction of the barrage and allied structures between 1983 and 1990 eroded about 36 ha of land in Nepal, but India denied creating such an erosion (Report on the Possible Technical and Financial Implications of Tanakpur Barrage 1993 [known as Baral Committee). It went on to state that it did not cause harm to the Nepalese territory and the tailrace water from the barrage was released into the Mahakali River upstream of the Banbasa barrage. But the project had anticipated that the tailrace water was to be taken to the Sarada Canal (Ibid.). Had that happened, Nepal would have been denied water as per the 1920 agreement. So, when India started preparing for this project in 1983, Nepal raised the issue of the tailrace water and showed her concern at the Secretary-level meetings in 1983 and 1984. It was only in 1987 that India changed the project design to allow the tailrace water of the Tanakpur powerhouse back to the Mahakali River upstream of the Banbasa barrage. In the process of constructing a coffer dam, the water of the river was diverted towards its eastern portion, causing damage to the aforesaid quantum of land in Nepal, i.e. 36 ha of land in the Jimuwa village of Mahendranagar municipality in Kanchanpur district, regarding which the affected people had raised their voices (Lumsali 1996). The barrage has been functional since 1990/91. (Fig. 2.12-2.13)

With regard to the Tanakpur barrage, it should not be forgotten that India's main intention of building this barrage unilaterally was to put in place an alternative for the old 1920 British build Banbassa (Sharada) barrage, which had already outlived its useful life. After having built barrage entirely on its territory, India soon realised the grave danger of the Mahakali River by passing the barrage through its left bank. So India's Prime Minister, Chandrasekhar, wrote in 1990 to Nepal's Prime Minister KP Bhattarai, about the need to tie up the left afflux bund to the high ground in Nepal. The pretext was to prevent erosion and floods in Nepal's

territory.[15] (Annex 10). It was during the tenure of Prime Minister GP Koirala, in 1991 that India was permitted to tie up the Tanakpur barrage's left afflux bund to the high ground in Nepalese territory (Annex 7.1).

India completed tying up this afflux bund in Nepalese territory before the onset of the monsoons of 1992. In return, India initially agreed to provide 10 MW (later converted to 10 million units) of energy annually to Nepal free of cost. But it is interesting to note that India failed to accept Nepal's contribution to the Tanakpur barrage project while framing the language of the Joint Communiqué. Rather, the draft communiqué was produced in such a way that India accepted the demand of Nepal for a power supply as a goodwill gesture to the latter in spite of the fact that the supply 'will add to a further loss in the availability of power to India from Tanakpur Power Station' (Joint Communiqué 1991 quoted in Bhasin 1994).

It was also included in the communiqué that 'India will construct a head regulator of 1,000 cusecs capacity near the left under-sluice of the Tanakpur barrage, as also the portion of the canal upto Nepal-India border for [the] supply of up to 150 cusecs of water to irrigate between 4,000 and 5,000 hectares of land on [the] Nepalese side. The releases from [the] head regulator will be increased as and when substantial upstream storage at Pancheswar, or similar, is developed on the Mahakali river' (Ibid). India constructed this head regulator for Nepal without consulting her, at the sill level of EL 245.0 m when her own sill level is at 241.5 m. India insists that the pond level of EL 246.7 m would be maintained. But if we look at the problems Nepal has been facing on the Kosi Western Canal, Gandak's Don Canal and Western Canal, she has hardly received the promised amount of water due to non-maintenance of water levels in the canals. India so far has not conceded to Nepal's request to have the sill level made at par with hers. It is issues like these that make Nepalese people suspicious of India.

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[15] Verghese and Iyer (1993) also buy this thinking and write that 'the new Tanakpur barrage site is not in the area ceded to India by exchange of territories in 1920 but in what was even earlier Indian territory. However, a short 577 meter long afflux bund (occupying some 2.9 ha of land) has been constructed, with the consent of Nepalese government, tying the barrage to high ground in Nepal as a flood protection measure. This arrangement does not entail any cession of Nepalese territory to India. The afflux bund is in Nepal and remains under Nepalese sovereignty.' But the fact remains that long before the Nepal government gave permission to the use of 2.9 ha of land for the construction of the eastern (left) afflux bund, the back water of the Tanakpur barrage had already submerged a piece of no man's land. It was only during the time of the government of GP Koirala that Nepal gave consent for the use of 2.9 ha of Nepalese land and recognised the submergence of a piece of no man's land. It is the Mahakali Treaty of 1996 (discussed in detail under the heading Mahakali Treaty), which replaced the earlier GP Koirala's 1991 MoU, gave the continuity to Koirala's consent to India to use 2.9 ha of Nepalese land and recognised the submerged piece of non man's land. This treaty is both a subject of criticism and appreciation within the country. Certain sections of the Nepalese society criticise it as an anti-national treaty. While its proponents feel that in the absence of treaty between Nepal and India, the sovereignty of Nepalese submerged land would have, by default, remained under the possession of India. Also, since the main intention of India to build Tanakpur barrage is to put in place an alternative for the old 1920 British built Banbasa (Sharada) barrage and to optimise the power generating capacity of the Tanakpur power house at the cost of submerging Nepalese land, one could challenge the assertions (aforesaid) of Verghese and Iyer.

Note: The white line denotes the border which is shown by Google but is not necessarily the actual international border.

Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.12 Tanakpur Barrage with the Canal in the State of Uttrakhand, India

Prime Minister Koirala's consent to the demand of the GoI became a subject of intense controversy and created much furore within the country, causing mass protests and even the deaths of some people. In addition, the words used in the communiqués also caused furores in Nepal. It was considered to be a treaty, requiring its submission to the parliament for confirmation and ratification as per Article 126 of the abrogated Constitution of the Kingdom of Nepal 1990. The parliament, i.e. House of Representatives (HoR), wanted the government to present the text of the document before the House so that the Nepalese people would be able to know what the government had conceded to India.

Note: The white line denotes the border which is shown by Google but is not necessarily the actual international border.

Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 2.13 Tanakpur and Sarda Barrages on Mahakli River and Command Area in Mahendra Nagar Town in Far Western Nepal

For a while, the government tried to avoid parliament by claiming that it had not entered into any treaty but only an MoU with India. Ultimately, the matter went to the Supreme Court, which ordered the government to get it ratified by parliament. The sitting government of the Nepali Congress failed to get it ratified by parliament and also lost the mid-term election to the HoR in November 1994.

- **Mahakali Treaty 1996**

The construction of the Tanakpur barrage was, as already stated first of all, a unilateral action on the part of India. Second, during the visit of Prime Minister Koirala, India had succeeded in getting Nepal's consent to have its afflux bund tied up in the highlands of Nepal with the supposed purpose of increasing the power generating capacity of the Tanakpur barrage (but the fact is that India realised the danger of river bypassing barrage) without duly recognising Nepal's contribution to the barrage. Koirala accepted India's proposal without taking the people of Nepal into his confidence. Because of these issues, there were, on the one hand, strong sentiments in Nepal against the Tanakpur barrage and the 'MoU' signed by Koirala with India and, on the other hand, there was a section within India that felt her international image was blemished due to her unilateral action on this barrage. So, for them it was inevitable to wait for a favourable time to get the image problem solved. From the available documents, it becomes evident that Nepalese political actors, too, including those who had raised their voices inside and outside parliament against Koirala's consent, knew that they would not be able to continue to oppose India in this matter for long. Hence, they were also waiting for an opportune movement to address this problem. So, for the politicians of both countries, the change of government in Nepal after the mid-term elections of November 1994, especially the emergence of the coalition government headed by Sher Bahadur Deuba of Nepali Congress (NC), with the Rastriya Prajatantra Party (RPP) and Nepal Sadhavana Party (NSP) as coalition partners in 1995, became the most opportune time to address the matter. It was so, because the Communist Party Nepal-United Marxist and Leninist (CPN/UML), which had formed a minority government following its emergence as the single largest party in the mid-term elections to the HoR in 1994, in its nine-month period had proposed 'to enter into comprehensive talks on the Mahakali River as a package' to deal with the Tanakpur issue (Records of talks between the then Deputy Prime Minister of Nepal Madhav Kumar Nepal and the Prime Minister of India the late PV Narasimha Rao 1995). In fact, the CPN (UML) government had prepared a draft treaty on the Mahakali Package, 'Agreement between the Kingdom of Nepal and the Republic of India concerning the Utilisation of the Waters of Mahakali River 1995' (Annex 11), which was discussed with India during the visit of the Prime Minister, the late Manmohan Adhikari to New Delhi in 1995, but for reasons not known, it was not signed. From all indications and the behaviour of the coalition partners before and during the negotiation process in 1995, it was clear that one of the issues they wanted to solve with India the Tanakpur problem. For this, they agreed to reopen the issue in such a way that both countries would be able to save face by taking up all the existing and future projects on the Mahakali River. Whether such an attitude on the part of the coalition partners in Nepal was desirable is still

a debatable point in Nepal. There are people in the country who think that Nepal should have dealt only with the Tanakpur barrage.

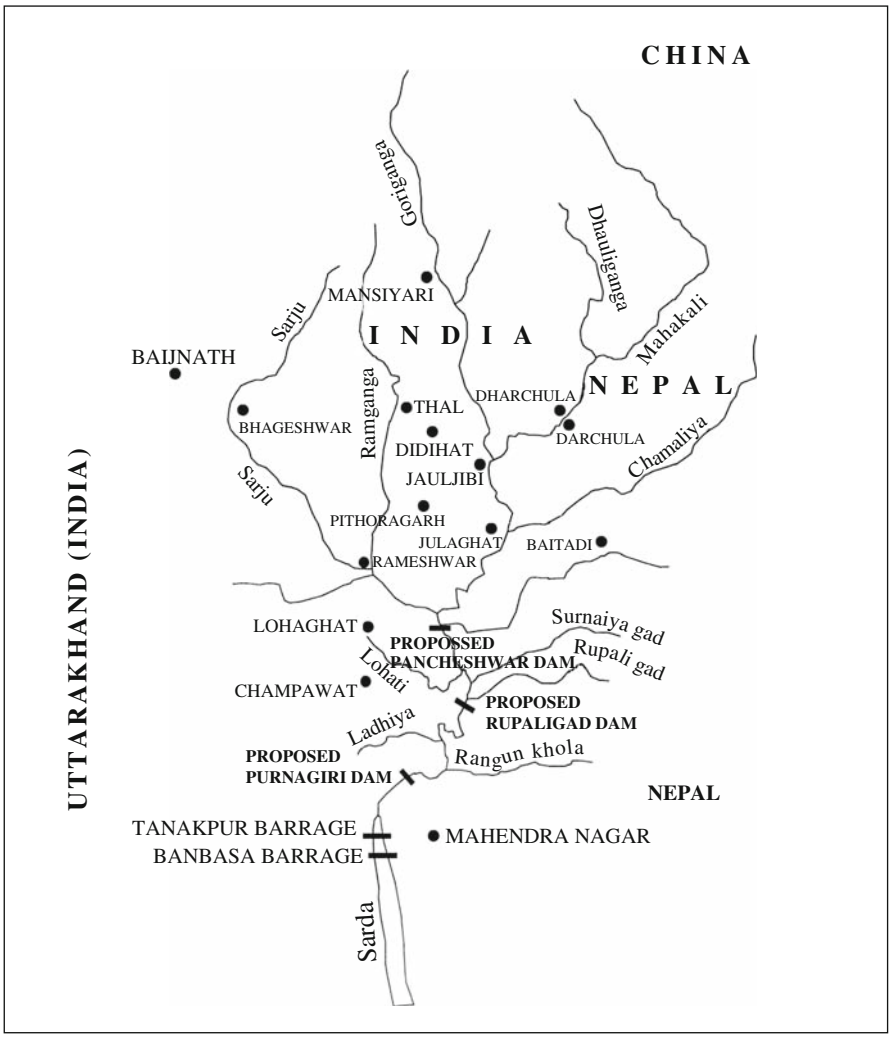
Be that as it may, it is a fact that India, as already stated above, was waiting for an opportune moment to give the impression to the people of Nepal and to her well-wishers and friends that she had done nothing wrong to her northern neighbour in building the Tanakpur barrage. Furthermore, they had the Mahakali package proposal submitted by the CPN/UML government and knew that the new coalition government headed by Deuba was willing to reopen talks on the Tankapur barrage. To such a background, the talks for a comprehensive treaty on the Mahakali River between the two countries began in November 1995 and the two countries initialed the treaty on the 'Integrated Development of the Mahakali River, Including Sarada Barrage, Tanakpur Barrage and Pancheshwar Project (Mahakali Treaty) in December 1995 after the exchange of a couple of drafts and formal talks held in Kathmandu for two or three days during the visit of Pranab Mukherjee, External Affairs Minister of India. Finally, the treaty was signed at New Delhi in February 1996 at Prime Ministerial level.

The treaty contains 12 articles and an accompanying letter (Annex 12). The letter sets out the implementation process and the timetable to give effect to the various provisions of the treaty.

The treaty, from the point of its scope, is very wide. It covers matters concerning the amount of water and energy Nepal was to receive from the Tanakpur barrage, water from Sarada barrage to the Dodhara-Chandani areas of Nepal, and the link road from Tanakpur barrage to the East West Highway at Mahendra Nagar in Kanchanpur district in Far Western Nepal. In addition, the treaty sets out the principles to be followed in the preparation of the detailed project report (DPR) of the Pancheswar project to be developed as a bi-national project on the Mahakali River (Figs: 2.14-2.15). The provision on the formation of the Mahakali River Commission (MRC) and its broad functions is another element of the treaty. Modalities of assessing the benefits accruing from this project and the basis of selling the surplus energy by Nepal to India are also covered.

The treaty was presented to the joint session of parliament under Article 126 of the Constitution of the Kingdom of Nepal 1990 for ratification on September 11, 1996. It was ratified by the joint session of the parliament only on September 20, 1996. During the voting on the treaty, 31 members of parliament abstained and eight voted against the treaty. The treaty came into force on June 5, 1997 when both countries exchanged instruments of ratification during the visit of IK Gujaral Primer Minister of India to Kathmandu. The validity period of the treaty is 75 years.

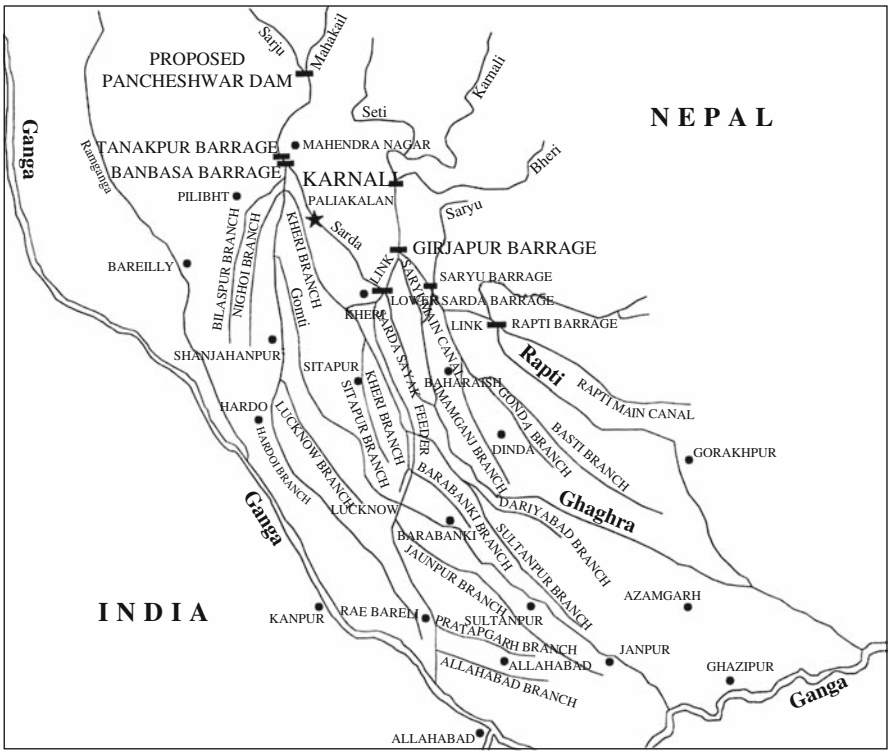
Reflecting on the treaty (see footnote No 18 for the involvement of the contributor in relation to the treaty), it could be said that the treaty helped India to legitimise the construction of the Tanakpur barrage, obtain the principles agreed to for the preparation of the DPR of the Pancheswar multi-purpose project, their preferred project over the Karnali/Chisapani for a long time, and the renewal of the terms on the Sarada Barrage, which the GoN had agreed to in 1920. In the treaty, India also successfully got quantified Nepal's water requirements while leaving her own water requirements open-ended. One of the things that Nepal should have included



Source: Adapted from Operational Navigational Chart ONC H-9 (1:1,1000.000) Defense Mapping Agency Aerospace Centre, USA 1970 on the Basis of Jagat Kumar Bhusal: Mahakali Hydrological Perspective. *The Sunday Post of the Kathmnandu Post*, September 6, 1998.

Fig. 2.14 Mahakali River Basin

or done in the treaty was to include the amount of water India was to use from the Sarada barrage. The absence of this has helped India raise the issue of prior use of water for irrigation purpose in her land situated 160 km away (south-eastern area) from this barrage. This is one of the thorny issues in the finalisation of the DPR of the Pancheswar Multi-purpose project. As such, the treaty signatories are yet to accept the basic parameters of the preparation of the DPR of the Pancheswar Multi-



Source: Adapted from different sources, including Dhurb Kumar, "Domestic Conflict and Crisis of Governability in Nepal", Centre for Nepal and Asian Studies (CNAS), Kathmandu 2000.

Fig. 2.15 Sarada Command Area (India)

purpose project. It may be recalled that it was to be agreed and finalised within six months of the exchange of documents of ratification.

On Nepal's part, through this treaty she retained sovereignty over her land, including the land submerged by the pondage of the Tanakpur Barrage. She also managed to receive 70 million units of power over the previous 10 millions units that was agreed on during the visit of Prime Minister Koirala to New Delhi. Because of these provisions, the proponents of the treaty think that it was a win-win situation for both countries. But Nepal, from the perspective of the implementation of the treaty provisions, except for receiving of power, is yet to receive other benefits from Tanakpur. From all indications, it seems that the treaty provisions on the Pancheswar project and the irrigation facility to Dodhara-Chandani area of Nepal from the Sarada barrage would never be realised. There is a feeling among Nepalese people that Nepal once again lost the game to India in relation to water resources.

Despite the various efforts made by the Ministry of Water Resources, Government of Nepal (MoWR), for having budgetary allocation to fund the different studies and investigations to be undertaken in relation to Pancheswar project, the ministry failed to receive sufficient funds due to the lack of seriousness on the part of the govern-

ment (GoN) to give due importance to the provisions of the treaty. Furthermore, the joint parliamentary monitoring committee (JPMC) on the Mahakali treaty formed under the convenorship of the Speaker of the HoR (its first convenor was the then Speaker Ram Chandra Paudel) to exercise parliamentary oversight and help the government to get the treaty provisions implemented, instead of giving clear and concrete directives to the MoWR in relation to the implementation of the treaty provisions, and giving clear stricture to the government to make the required allocation of resources to meet Nepal's obligations of undertaking studies and investigations, played the game of dilly dallying. As a result, the government had to accept the funding support of the GoI to undertake various studies and investigations. The consequence was opening of a Joint Project Office (JPO) in late 1999 with the funding support of India, which was closed in 2002. At present, Pancheswar-related works are being looked after by a project office under the Department of Electricity (DoED). The JPO faced problems in undertaking the studies and investigations related to reregulating structures at different sites, e.g. Rupaligad and Puragiri, due to political opposition. Indeed, at the end of the day it is the political masters who have to decide where the reregulating dam for the main Pancheswar dam is to be located. So, the JPO should have been allowed to carry out studies. According to an official concerned, except for the environmental study by the Nepalese side, nothing is happening with regard to this project. For all practical purposes, the project is in a state of limbo.

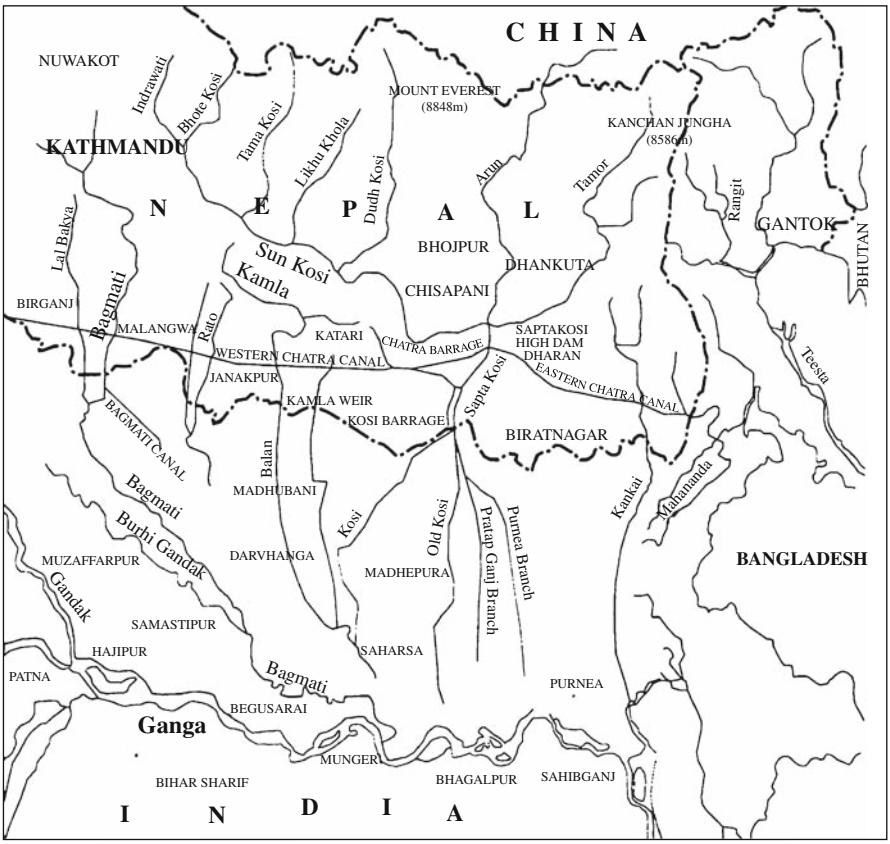
- **High Dam in Kosi River**

From the discussions done elsewhere [above] (see points Nos 2.2 and 2.3), it should be clear that since the time of British India, India had an eye on a high dam at Barahchhetra in Nepal, to deal with the flood issue in Bihar. But from the negotiation process she began with Nepal for a barrage at Bhimnagar in the early 1950s, i.e. the present Kosi barrage and associated structures, and from the conclusion of a treaty in 1954, it is evident that India first wanted a barrage in the plains to immediately deal with the problems of flood control and irrigation so that they could take up the high dam issue in the course of time.

The life of the Bhimnagar barrage is almost over. Hence, India decided to initiate dialogue with Nepal on a high dam inside Nepalese territory and she took up the matter during the visit of Prime Minister GP Koirala in December 1991. The consequence was that Kosi high dam found a place in the joint communiqué issued at the end of the visit. With regard to this, the joint communiqué says

> Joint studies/investigations as are necessary to finalise the parameters of the Sapta Kosi High Dam Multi-purpose Project will be carried out expeditiously. For this purpose, a joint committee of experts shall be constituted to finalise the modalities of the investigations and the method of assessment of benefits. Thereafter, the two sides will start the investigations of the project, with a view to preparing a detailed project report at the earliest. (Nepal Gazette vol 41:36 December 29, 1991)

Until the mid 1990s, this part of the communiqué remained in limbo. But it was revived again during the coalition government of Sher Bahadur Deuba 1995-1998, when both governments agreed to go ahead with detailed studies on the project. The



Source: Adapter from different sources.

Fig. 2.16 Kosi High Dam site and Command Areas

project is now being investigated and its DPR preparation exercise is going on, with the funding support of the GoI[16]. (Fig. 2.16)

[16] One of the subjects agreed on during the visit of Prime Minister Sher Bahadur Deuba to New Delhi in 1996 was to have technical, expert and other level meetings, as necessary, on the Sapta-Kosi High Dam, including Sun Kosi Diversion ... to expedite the progress. At the second meeting of the Joint Team of Experts (JTE), held in January 1997, both sides agreed on the principles to be followed in calculating benefits in terms of power, irrigation, flood control; to undertake the study on the Sun Kosi-Kamala Storage-cum-Diversion along with the study of the Kosi High Dam Project and to undertake the navigation study from Chatara to Khursela at the confluence on the Kosi and Ganges Rivers. Once the fifth meeting of the JTE, held in June 2003, agreed to open the Joint Project Office (JPO), known as Kosi High Dam Multi-purpose and Sun Kosi Diversion Scheme Project Office, it was opened in August 2004. And through the grant support of Inr.290.34 million from the GOI, the JPO started the process of undertaking various studies and investigations. According to the officials concerned, geological and geotechnical studies, gauge discharge recording facilities at the dam site on the river have been established. The entire DPR work was to be completed within 30 months. But according to Bikas Thapa, the water resources

It may be recalled that, due to the strong feeling of not being treated fairly by India during the negotiation of the original Kosi treaty, Nepalese are suspicious of the present study. Also, whether the Sapta-Kosi high dam would see the light of the day is a big question in the context of international opinion against the high dam and a strong lobby within the country that opposes this project on environmental grounds, mainly the submergence of large tracts of fertile land and displacement of over 75,000 people. However, some Nepalese professionals consider this as India's main flagship for her river-linking plan (RLP).

2.6 Use of Water of Other Medium Sized Rivers

The other rivers for which, time and again, both countries talked about cooperating with each other are the Kamala and Bagmati Rivers (Joint Communiqués of October 19-21, 1992, February 11-17, 1996, July 31-August 6, 2000) (Annexes 7 and 7.1). India had tried to get the data on these rivers for many years, while Nepal turned down this request because it had already built its own barrage and weir on these rivers. It is also known that India would like to have high dams built on these rivers in Nepalese territory. Agreeing to such requests means sacrificing large tracts of lands for poundage or submergence to serve India's interests. After many years of their efforts, India succeeded in having a hold on these rivers, too. Under the ongoing Kosi High Dam Multi-purpose Project and Sun Kosi Diversion Scheme investigation scheme, both the Kamala diversion scheme and Bagmati Multi-purpose project are to be investigated. In this regard, the minutes of the second meeting of the India-Nepal JCWR, held in Kathmandu on October 7-8, 2004 (Annex 17.7), states that

> it was agreed that the feasibility study of the Kamala and preliminary study of Bagmati Multi-purpose Projects would also be carried out by the Joint Project Office of Sapta Kosi-Sun Kosi Projects to ascertain the likely constraints in implementation of these projects so that these could be appropriately addressed.

2.7 Inundation and Flood Forecasting

The topography of the country is such that Nepal's rivers flow southward and drain into rivers that ultimately feed the Ganges River. Furthermore, maximum precipitation occurs during the four months of the year, June to September. Therefore, what is required is that the natural flows of the rivers are not obstructed. To deal with the problems of river flow obstruction and inundation that occur or are likely to occur

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correspondent of the Kantipur daily, only 20 percent of the work was finished and the governments of Nepal and India are working to extend the period of the study by another 20 months (Kantipur national daily, February 19, 2007). According to another source, the DPR would be completed by September 2007 (Nepal Samacharpatra, April 1, 2007). But by December, 2007, it was yet to be completed (Kantipur national daily, December 12, 2007)

due to activities in the vicinity of Nepal-India border and suggest both short- and long-term solutions, a Standing Committee on Inundation Problems (SCIP) between Nepal and India was established in 1985 following the understanding to create a formal cooperating mechanism at the highest level. The committee comprises representatives of both governments and is co chaired by the Director General of the Department of Water Induced Disaster Prevention (DPWIC) for Nepal and chairperson of the Ganga Flood Control Commission (GFCC) for India. So far, the committee has met 14 times, its last meeting being held on August 30-September 1, 2006.

However, the southern districts of Nepal bordering India, such as Saptari, Siraha, Dhanusha, Mahottari, Sarlahi, Rautahat, Parsa, Nawalparasi Rupendhehi, Kapilvastu and Banke etc., suffer from problems of inundation due to the construction of barrages and other structures like roads and embankments in India along the international border. These structures have adversely affected the natural flow of the rivers, thereby causing inundation problems every year in these districts. Indeed, both countries realise that problems exist in this field (Minutes of the 14th meeting of SCIP [Annex 23]) and have appointed nodal officers for each of the hotspots. But the problems remain as they are and the people in the bordering districts continue to face inundation problems during the rainy season. The details of Indo-Nepal inundation-related issues with hotspots as examples are discussed in Chapter 10.

The issue of the inundation and flood control is not only related to undertaking preventive and curative measures but also related to the development of an early warning system. Therefore, cooperation in flood forecasting is an equally important area and both countries have agreed to collaborate with each other. The mechanism through which they are cooperating is the formation of a Committee on Flood Forecasting (CFF and Annex 13), which has so far met three times. Its main functions are to review the existing flood forecasting system and prepare a comprehensive flood forecasting master plan (FFMP), (Ministry of Water Resources, GoI (http://www.wrmin.nic.in/index3asp]). The master plan 'was also to include the upgrading of data transmission system and exchange of hydrological and meteorological data for an integrated flood management' (ibid). In addition, a scheme namely, 'Flood Forecasting and Warning System (FFWS) on rivers common to India and Nepal which has 42 meteorological/hydrometric sites in Nepalese territory is in operation since 1989' (Ibid). The CFF has, so far among other issues, finalised the draft FFMP and agreed to increase the number of stations to 47 from the existing 42. 'Further, for qualitative improvement of flood forecasting in Indian side, the Nepalese side has also agreed to transmit hydrological data in respect of the 5 key stations located on the rivers Ganga, Kosi, Rapti, Bagmati and Mahananda twice a day' (Ibid).

2.8 Seeking Access to the Sea

For Nepal, to explore access to the sea through navigational means is a natural desire. Ever since the Treaty of Sugauli 1815 was signed, Nepal had maintained friendly relations with both the British and British India governments. Therefore,

when leaving India, the British government could have thought of including some provisions to provide Nepal with access to the sea in the instrument that granted independence to India. But they did not think of it; nor has any document showing Nepal requesting such a facility to the British Government been found. Only in the Kosi treaty is there a provision on navigation, although not from the point of view of providing Nepal with access to the sea. In its Article 10 (Amended version of 1966), it is mentioned that 'provision shall be made for suitable arrangements at or around the site of the barrage for free and unrestricted navigation in the Kosi River, if technically feasible'. In the Gandak, there is a navigational lock which is yet to be used (Karki 1995). So, seeking access to the sea remains one of the major expectations of Nepal, which she wants India to take note of seriously. After much persuasion, she succeeded in getting this matter included in the official statements issued at the end of the visit of some dignitaries to each other's capitals, for example, in the joint communiqué issued after the visit of the Prime Minister the late PV Narsimha Rao to Nepal in October 1992, the joint press statement issued at the end of the visit of Prime Minister IK Gujral to Nepal in June 1997 and the Joint Communiqué issued at the end of the visit of the Water Resources Minister of Nepal to New Delhi in November 1996. In these documents, one can find references to conducting studies on the Kosi, Gandak and Karnali Rivers for navigation purposes and providing Nepal with access to the sea.

Regarding the navigation route, BG Verghese (1999) writes 'with Nepalese cargo being handled through an inland container depot-cum-port and using inter-modal systems would be of benefit to India as well in sustaining any waterway developed for this purpose through its territory. But apart from [any] its technical feasibility, any waterway must be economically viable in terms of a minimum volume of traffic to support its development and maintenance along with the related infrastructure.' As to the actual developments, this contributor was told by some officials of the MoWR that the study on the navigation possibility on the Kosi River would be undertaken as a part of the study of the Kosi High Dam Multi purpose and Sun Kosi Diversion Scheme. But the same source did not know if the Gandak and Karnali Rivers would also be studied along with the study of the Kosi River. As to the possibility of the use of the waters of the Kosi for navigation purpose, BG Verghese writes (1999): 'the proposed Kosi High Dam may or may not by itself be sufficient to rescue the present Kosi barrage. There has been discussion earlier about constructing a second barrage across the Kosi below the first, at Dagmara, to flatten the gradient of the river as a means of dealing with continuing siltation and erosion problems. Should this be built at any time, an improved waterway might be a by-product. The Himalayan component of India's National Perspectives on a water grid may be a long way away. But should it ever materialise, a diversion barrage is envisaged across the Ganga below Patna, which would cause the pondage to back up the Gandak. Navigable links could be constructed to complete a continuous waterway if warranted by overall regional transport economics.' Since the navigation possibility in these rivers is of importance to Nepal, she should pursue the matter vigorously and get the studies done. BG Verghese (1999) agrees that the matter 'remains to be studied'.

2.9 Bilateral Committees

In order to oversee the implementation of the provisions of the treaties and understandings, as well as helping overcome the related problems, both countries have agreed to establish a number of bi-national committees and have done so. Probably, the water resources sector may be the only sector for which Nepal and India have agreed to establish the largest number of committees. In all, exist nine bi-national committees, excluding the committee on power exchange. They are: (1) Joint Committee on Water Resources (JCWR); (2) Standing Committee on Inundation (SCIP) Problems between Nepal and India; (2.1) Sub-committee on Embankment Construction, (3) High Level Technical Committee on Rasiawal-khurd-Lotan and Laxmanpur Barrages, (4) Coordination Committee for Kosi and Gandak Projects; (5) Committee on Karnali (6) Karnali Coordination Committee (7) Joint Group of Experts of Nepal and India on Pancheswar Multi-purpose Project; (8) Joint Team of Experts on Kosi High Dam Project (9) Committee on Flood Forecasting (Annex 13).

All these committees are important from the point of view of overseeing the implementation of the provisions of the treaties or understandings. But the JCWR coheaded by the water resources secretaries of Nepal and India, which is the latest innovation, is the most important committee, as it has the power to oversee, review and approve the decisions/work of all the technical and expert-level committees. This committee is to meet every six months.

2.10 Overall Scenario

From the foregoing historical survey, it should be clear that, since time immemorial a relationship between the two countries exists in the water resources sector at the people-to-people level. At governmental level, too, the relationship is already more than 100 years old. There is hardly any river left for the development of which the two countries have not reached an agreement or understanding. They have cooperated with each other in building or implementing various water resources-related projects (Annex 14). However, one could hardly feel satisfied at the progress made so far, when considered from the perspective of actual implementation of signed treaties or understandings. For example, the implementation of the provisions on Kosi and Gandak treaties has not been satisfactory. The Mahakali treaty provisions are yet to be fully implemented and new issues have cropped up in the implementation process. There are problems in the inundation sub-sector.

At the Prime Ministerial level, too, there is acceptance that the progress in cooperation in water resources between the two countries is far from satisfactory. For example, even if it has been indicated in the context of hydropower, it is stated in the joint press statement issued after the visit of Prime Minister GP Koirala to New Delhi in July/August 2000, that

> The two Prime Ministers noted that the huge potential for development of hydro power resources in Nepal and the projected demand for power in India in the coming decades offered rich opportunities for cooperation to bring about rapid, environmentally sustainable economic growth on both sides of the border. However, the process of achieving concrete results had been relatively slow and needed to be accelerated.

Long before such realisation at the political level, during the second meeting of the Indo-Nepal Subcommittee on Water Resources, held in New Delhi during April 15–18,1991(Annex 17.1), the then Water Resources Secretary of Nepal, BK Pradhan, said

> So long as words and understandings of both the sides were not translated into real actions, both the sides would not be able to show to their two peoples that they had moved towards the goal of harnessing the water resources for mutual benefit… In this context … reminded both the sides of the several decisions that had been taken during… meetings of Kosi Coordination Committee, Karnali Coordination Committee, Joint Group of Experts on Panchewsar Project and lastly the Committee on Karnali. These decisions needed to be followed and the targets that had been set up for both the sides met within the scheduled time.

The overall situation, thus, is that of suspicion between the two countries with regard to cooperation in this sector. Despite the talk of cooperation, there is also doubt as to whether these two countries are really interested in, or would cooperate in this sector to the satisfaction of both. Especially in Nepal, issues relating to water are taken so emotionally that whenever this subject is taken up with her southern neighbour, it is assumed that Nepal would be treated badly or decision-makers would compromise on national interests. Such was the attitude when the Kosi treaty was signed in 1954, and the same feeling still prevails. It is because of such sentiments that the Mahakali treaty of 1996 is a deshghati sandhi (anti-national treaty) to different quarters of Nepalese society. In India, too, especially those who deal with water resources in the official corridors of New Delhi and the people living in the bordering areas may have reasons to feel dissatisfied with Nepal. The Indian mandarins and political decision-makers may want Nepal to feel obliged for all the assistance India provided to her in different sectors, including water. However, the following reasons could be considered responsible for the unsatisfactory relationship between the two countries, especially to Nepal, in the water resources sector.

2.10.1 Lack of Clear-cut Strategy for Cooperation

When making reference to the different periodic plans from the First Plan (1956-61) to the Tenth Plan (2002/07), one would come across detailed descriptions in terms of the objectives and programmes for the water resources sector. Within the last decade, Nepal has prepared the Water Resources Strategy (2002) and the National Water Plan (2005). But the fact remains that the country does not have any strategy paper on Nepal's water-resources relationships with India. Nor has there been any national debate on this matter, save the occasional national outcries. Such outcries were observed when the country negotiated and signed the Kosi, Gandak, Tanakpur

and Mahakli treaties or MoUs with India. Indeed the civil society or water activists have played an important role in making the people aware of the country's relations with India in the sector, including analysing and highlighting the weaknesses of the treaties. But a sustained effort is yet to be made in terms of coming up with a strategy that the country needs to follow in dealing with India. Both the government and the parliament should be more proactive in involving civil society and national professionals in relation to dealing with India on water resources.

In the absence of such a strategy, whatever project or river is thought of by the mandarins at Singh Durbar (the seat of the central secretariat) and Sital Niwas (the seat of the Ministry of Foreign Affairs), seeking India's support is proposed during official visits. While selecting the project/s or drawing up a list, the sitting mandarins forget to dig out the old documents to find out what was agreed upon in the past and the achievements made. This is the reason why most of the treaties or understandings, after being signed, become subjects of controversy and criticism, and political leaders, whether MP Koirala or BP Koirala or GP Koirala or Sher Bahadur Deuba, have to travel miles to defend their decisions. But, BP Koirala (2055 BS [1998/99]) is the only leader who has gone to the extent of taking all the responsibility for his decisions, i.e. on the Gandak Treaty. In this regard, he states that 'he alone is responsible for the treaty and he would not pass the ball to others' courts'.

Because of such a working style of Singha Durbar and Sital Niwas, if one goes through the list of water resource projects that have found a place in the joint communiqués issued at the end of the visit of dignitaries to one another's capitals, or press releases made by the respective governments, one would find that the list of projects covering practically all the rivers. The list, thus, becomes nothing but a shopping list from which India would prefer to pick up those that would best serve her interest.

The style of Indian mandarins, tutored by the colonial British, is, however, different from that of Nepalese mandarins. They seem to be always working with a long-term strategy and pursuing those projects that fulfil their strategy, whether one takes the Kosi or Gandak or Tanakpur barrage or Sapta-Kosi High Dam Multi-Purpose project (despite the fact that Nepal was able to get the Sun-Kosi-Kamala Diversion Scheme included in the feasibility study along with the Sapta Kosi High Dam). In addition, their interest is in having a hold on all the major rivers of Nepal and to ensure that Nepal does consult India before making funding requests to international/other agencies for their support in undertaking any water resources project. They have been consistent in their policy towards Nepal right from the Treaty of Peace and Friendship 1950 (known as the 1950 Peace Treaty) to the other treaties India has signed with Nepal. And had India succeeded in getting the approval of the late King Birendra to the treaty in 1990 they had proposed, she would have virtually controlled the natural resources of Nepal, including water resources.

2.10.2 Unsatisfactory Implementation of Commitments

When considered from the point of view of the implementation of the treaty provisions or understandings, the implementation status of all the major treaties—Kosi,

Gandak and Mahakali is far from satisfactory. First of all, as already indicated above, the Kosi treaty had no provision for irrigation benefits for Nepal. But India was pursued to agree to offer assistance in building the Chatara canal, which was built to provide irrigation facilities for 66,000 ha of land in Sunsari and Morang districts. But the project did not provide the service for a long time and Nepal had to approach the World Bank for credit to rehabilitate the system, which is now known as the Sunsari Morang Irrigation Project (SMIP). Second, it took some years for Nepal to begin to provide irrigation benefits from the Kosi project to the farmers of Saptari district through the rehabilitation of the Chandra Canal and the construction of Kosi Western Canal Pump Irrigation Scheme (WCPIS). It was only in 1989 that these irrigation schemes were completed (Malla 1995). With regard to the actual contribution of the WCPIS, it is not satisfactory. Above all, pumping is expensive and it is at Nepal's cost, while India uses the gravity flow. So, the WCPIS is nothing but a white elephant for Nepal.

During the third meeting of the Joint Committee on the Kosi and Gandak projects, held in June 2006, Nepal raised the issue of not receiving the allocated quota of water in the command area of the WCPIS from the Kosi barrage due to non-maintenance of the gates at the barrage. Similarly, according to a publication (Kantipur Daily, January 15, 2007), Nepal is yet to receive compensation for the 10,000 out of 15,000 bighas (10,159 ha) of land acquired for the project.[17]

Similarly, according to some project-affected persons, they have yet to receive compensation for the standing crops of the land acquired. Some claim that they have to receive compensation for the physical structures that existed in the areas acquired. The validity of such claims should be studied and sorted out. Similarly, 'compensation for the 1,516 bighas (1,027 ha) of land, which was eroded in 1961-64' is yet to be received. The verification of 4.400 bighas (2,980 ha) of land eroded in 1965-68 is yet to be completed (Minutes of the Third Meeting of the Joint Committee on the Kosi and Gandak Projects 2006). Another interesting fact told by some DoI officials is that the GoN is yet to receive the land revenue for the land acquired for the project. They told this contributor that, as of 2061 BS (2004), Nepal was to receive Nrs.1,508,118 from India under this heading.

Narayani irrigation scheme, which was undertaken by Nepal with an International Development Agency (IDA) loan and was to be fed by the Gandak barrage, has failed to provide the desired benefits, mainly due to lack of proper maintenance of the Don canal by India. In this regard, the Nepalese have raised the issue with India, including at the third meeting of the Joint Committee held in June 2006. At that meeting, Nepal raised the issue of 'not receiving the agreed discharge of 850 cusecs' of water. Similarly, due to non-maintenance of the pond level of RL 362.00 ft, Nepal has not received the agreed amount of water for her western canal. Like in

[17] In this regard, first of all, as already mentioned (foot note: 6), firstly it should be noted that the figures supplied by the two offices of the GoN do not tally with each other. Secondly, if we accept that Nepal is yet to receive compensation for 10,000 bighas (6,773 ha) out of 15, 000 bighas (10,159 ha) [1 Ha=1.4765 Bigha] (i.e. 66.66 per cent of the acquired land) from the GoI, it is a serious issue. Therefore, it is advisable on the part of both countries/governments to go into this matter in detail without a further lapse of time.

the Kosi project, according to officials of DoI, Nepal is yet to receive land revenue from the GoI for the land acquired for the Gandak project and related construction works. This revenue runs into thousands of Nepalese rupees, requiring urgent resolution.

In addition, Nepal is yet to receive from India the reimbursement of the salaries and allowances that were paid to the employees of the Kosi and Gandak Projects. For example, as of end of May 2006, Nepal was to receive the reimbursement of Npr.7,539,164.23 as administrative expenditures incurred for running the Liaison Office of the Kosi Project (Ibid).

Nepal is yet to receive benefits from the Mahakali treaty, mainly irrigation benefits. As per the treaty, Nepal is to receive water from the Sarada barrage in two villages of the Dodhara and Chandani areas. Similarly, she is yet to receive water from the Tanakpur barrage for the Mahakali command area. In these matters, the problem lies not only with India, but also with Nepal. The treaty is 10 years old. But Nepal is yet to mobilise and start the construction of the canal that is to receive water for irrigation as per the treaty. So far, the government has not taken any concrete step to develop the irrigation system in the Dodhara and Chandani areas in order to receive water from the Sarada barrage and development of the infrastructure in the Mahakali command area to use the water due to Nepal from the Tanakpur barrage.

In addition, both Nepal and India have raised new issues that were not raised during the Mahakali treaty negotiation process, causing implementation problems. For example, the demand for charging India for the unused portion of Nepal's share of the value-added water that would be available downstream after the Pancheswar Multi-purpose project. Whereas, in this regard the accompanying letter attached to the treaty, i.e. Mahakali Treaty, has the following provision:

> It is understood that Paragraph 3 of Article 3 of the Treaty precludes the claim, in any form, by either Party on the unutilised portion of the shares of the waters of the Mahakali River of that Party without affecting the provision of the withdrawal of the respective shares of the waters of the Mahakali River by each Party under this Treaty.'

Each and every member of the negotiating team, including this contributor and[18] other bureaucrats, will have to take the responsibility for including such a provision in the accompanying letter, no matter at what level the decision to include it was made during the morning and final sessions when the deal for the treaty was struck. Accordingly, the then policymakers, especially political personalities, while piloting the ratification of the treaty and taking part in parliamentary discussions, should have stood by the provisions of the treaty or should have had the courage to accept the lapse and proposed for renegotiation or forgotten the treaty when it faced opposition in Parliament. Rather, the political parties, both the Treasury and Opposition benches in the Parliament, decided to ratify the treaty with an addendum,

[18] This contributor used to be the Secretary at the Ministry of Water Resources of the Government of Nepal, when Nepal started the process of negotiation on the Mahakali treaty, was one of the negotiating team members when the treaty was negotiated with the Government of India and was involved when the treaty was ratified by the joint session of the Nepalese Parliament under the provision of the Constitution of the Kingdom of Nepal 1990.

what we call the parliamentary strictures to the government in relation to the treaty. Therefore, the question arises as to whether the treaty signatories have the right to make a unilateral addition without the concurrence of the other treaty signatory. Nevertheless, the Government wrote a formal letter to the GoI about the strictures passed by the parliament (Annex 15). And at the time of exchange of instruments of ratification, which took place during the visit of Prime Minister IK Gujral to Nepal in June 1997, Nepal, with skill and hard work, succeeded in getting the strictures acknowledged by India. In this regard, the joint press statement or communiqué, issued at the end of the visit of Prime Minister Gujral, states that

> The Prime Minister of Nepal drew the attention of the Prime Minister of India to certain issues raised during the Joint Session of the Parliament of Nepal, at the time of Ratification of the Mahakali Treaty. The Prime Minister of India took note of the same. It was agreed that these issues would receive attention while the DPR for the Pancheswar project is prepared.

Despite this, India time and time again raised the aforesaid provision of the accompanying letter during the talks held at different levels to discuss the parameters of calculating the benefits accruing from the Pancheswar Multi-purpose project, and this might again emerge during future rounds of discussion.

It's not only Nepal that brought up a new concern after the treaty was signed, India, too, raised a new issue. It was related to the prior right of use of the waters of the Mahakali 160 km downstream of the Banbasa barrage, with the sole purpose of gaining more in relation to cost-sharing for the proposed Pancheswar Multi-purpose project (Unofficial notes of the Nepal-India Secretarial Meeting [Dhulikhel meeting] on Progress Review of the Mahakali Treaty, January 1998). In other words, India wanted Nepal to accept the prior use of the waters of the Mahakali for irrigation purpose, 160 km downstream of the Banbasa barrage. It seems that India raised this issue to counteract one of the strictures of the Nepalese Parliament. Probably, India would back out from this claim provided Nepal would not link Kalapani,[19] the presumed source of the Mahakali River which is under India's control, after the Sino-Indian border clash of 1962 because of its strategic location.

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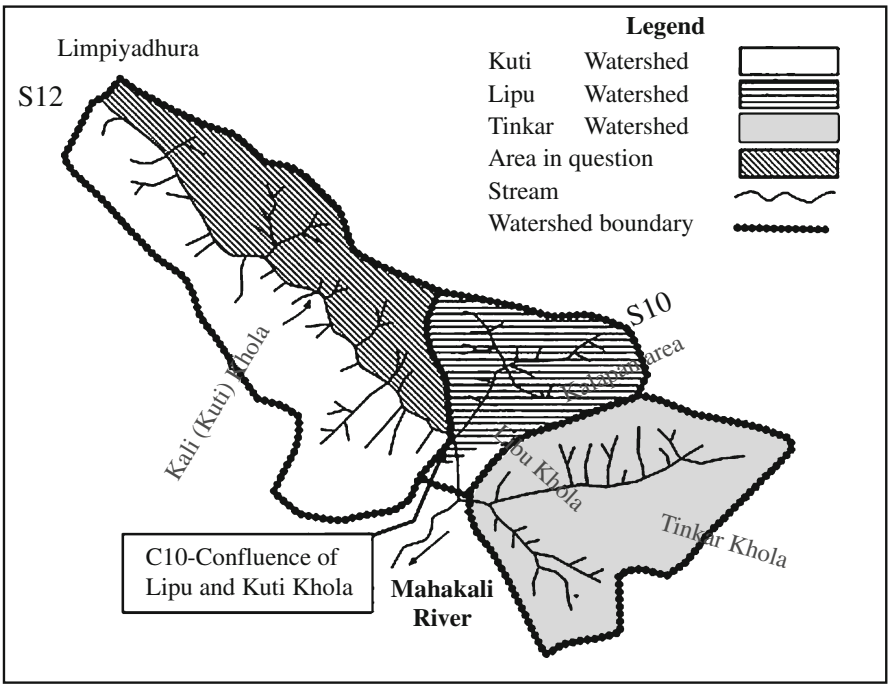
[19] A Nepali historian, Rishikesh Shaha, writes (1996) that 'by the beginning of the 19th century, the expansion of the Gorkhas in the hills was running parallel to that of the British in the northern and eastern parts of India, and they had evolved a common land frontier extending along a distance, of at least 700 miles... Between 1808 and 1814 several disputes arose between Nepal and British India all along their common border—on the frontier of Purnea in the east, on those of the frontiers of Gorakhpur and Saran to the south of central Nepal and on the frontiers of Bareilly in the west. But the most serious differences were those regarding the borders of Gorakhpur and Saran where the Butwal and Syuraj incidents and the Gorkhas' capture of 22 Saran villages triggered the war of 1814-16 between Nepal and British India'. And the two countries actually went to war when the East India Company government declared war against Nepal on November 1, 1814. As a result of the war, there were a series of skirmishes between the forces of the two countries. Finally, Nepal signed the peace treaty, which is known as the 'Treaty of Peace between Honourable East India Company and Maha Rajah Bikram Sahah, Rajah of Nipal' (settled between Lt. Colonel Bradshaw on the part of the Honorable Company, in virtue of the full powers vested in him by His Excellency the Rt. Honorable Francis, Earl of Moria,… and by Sree Gooro Gujraj Misser and Chandra Seekur Opedeea on the part of Maha Rajah Girman Jode Bikram Saha Bahadur…in virtue of the powers to that effect vested in them by the said Rajah of Nipal), December 1815 (popularly



Source: Jagat Kumar Bhusal: Mahakali Hydrological Perspective, *The Sunday Post of The Kathmandu Post*, September 6, 1998.

Fig. 2.17 The Uppermost part of Mahakali River

known as the Treaty of Segowlie (Sugauli), which was ratified in March 1816). As a result of this treaty, Nepal lost most of the concurred territories in the eastern as well as western hills and the territories in the Tarai area. This treaty decided the western boundary of Nepal with British India through its Article 5. This article reads

> The Rajah of Nipal renounces for himself, his heirs, and successors, all claim to or connexion with the countries lying to the west of the River Kali and engages never to have any concern with those countries of the inhabitants thereof.

The Kali River is known as the Mahakali River for the Nepalese, whereas Indians call it Sarada River in the plain area and Kali in the mountainous area. Although challenged by some people, both countries accept that the Mahakali/Kali River as the boundary between the two countries. But its source remains a bone of contention between the two countries. According to the Nepalese geographers and geologists, the source of the Kali River is Lympiadhura [Lympia range]. Most of the Nepalese believe the arguments of the geographers and geologists. But so far, India accepting the fact that the issue got to be resolved between the two countries, has been pursuing Kalapani as the source of the Kali River and has maintained security forces in this area, thus occupying 196 sq km of Nepalese land. (Lumsali 1996) (Fig. 2.17).

In the course of handing over land to India for the construction work of the Sarada barrage after the 1920 treaty, Nepal had handed over 36.68 acres (14.84 ha) of additional land. This fact was accepted by the then British-India Government in 1944 and it had agreed to return the land to Nepal (Annex 16). But Nepal is yet to get back that piece of land and this remains a thorny issue between the two countries. Since that small piece of land is not under the ownership of the two countries, it remains an island between the two.

2.10.3 Unilateral actions

During its rule in India, Great Britain was a world power. She could have demonstrated her power and behaved accordingly while dealing with Nepal. But the government of British India, from the example cited somewhere above, that is related to the three ponds in Kapilvastu district, did not want to take any unilateral action for matters that were of the concern to Nepal. Independent India has not followed this precedent. Salman Haider, one of India's former foreign secretaries, accepts this fact, although in a different context. On the Tanakpur barrage, Haider (2004) says that 'if one contrasts Tanakapur with the Banbassa project which came at the end of the 1920s, one would find that there had been far more extensive consultations between the British colonial regime and Nepal than had taken place in the case of Tanakpur between independent India and Nepal'. He further says that 'some Nepalese territory was inundated as a result of this project. It was a small area but had a considerable impact on Nepali opinion. India's effort to overcome these negative perceptions by offering a certain amount of power from Tanakpur as a compensation were unavailing, largely owing to the lack of transparency'. Hence, had India continued to follow the British policy, she would not have built structures across the border, causing inundation in bordering districts.

It may be recalled that India announced an Inr.5,600 billion River Linking Project (RLP) when Nepal prominently figures with five key river links: Kosi-Mechi, Kosi-Karnali, Gandak-Ganga, Karnali-Yamuna and Mahakali-Yamuna. It is around these five critical river links that future Indo-Nepal water resources relationships would revolve (Pun 2006). Therefore, Nepal naturally needed to be informed about the proposed river link project. But, so far, according to knowledgeable sources, India has not formally communicated this to the GoN. Nepal, too, should have been pro-active with regard to the Indian proposal. Also, Nepal needs to make an in-depth analysis of the implications of the proposed project and prepare herself for providing or making her position clear, when the time comes.

2.10.4 Strangling Nepal's Efforts to Develop Medium-Sized Rivers

While referring to the available documents, it becomes clear that the relationship between the two countries in the case of the five medium-sized rivers, viz Kankai, Kamala, Bagmati, West Rapti and Babai, has also been uneasy. Nepal's effort to receive funding support from donors, in general, for the use of the waters of these rivers has not been successful, mainly due to the objections raised or problems created by India. For example, 'following the completion of a feasibility study of the Kankai multi-purpose project in eastern Nepal in 1978 with West German funding, Nepal posed this to the Asian Development Bank (ADB) for project financing to develop about 38 MW of energy and extend irrigation to over 57,000 ha. The ADB suggested consultation with India as it was already using Kankai waters for irrigation in Bihar. On such a reference being made, India sought a formal project report on the basis of which it might evaluate the impact of the Nepalese project on its existing Kankai uses' (Verghese 1999). 'The industrial towns of Biratnagar and Dharan were suffering from extremely erratic power supply, fed by the Indian grid under the Kosi treaty. Nepal, thus, diverted the funds for Kankai to the 60 MW Mulghat project on the Tamor. India again intervened, stating that Mulghat would be submerged if a high dam were constructed on the Sapta Kosi' (Pun 2006). The consequence was 'neither Kankai nor Mulghat went through and the Nepalese felt doubly deprived'(Verghese 1999).

Another example was that of the Babai River irrigation scheme, located in the western part of the country, to which India again objected. India Irrigation scheme voiced concerns in 1980 on the grounds that the Babai project would reduce the downstream flow and would have an adverse impact on her two projects in UP (Saryu Pumped Canal and Saryu Nahar Pariyojana), 'when the project brief in 1983 had noted that there would be no "significant adverse impact" downstream' (Pun 2006). Rather, India suggested 'building a reservoir on the Babai in Nepal for the benefit of both the riparians' (Ibid). When this was not accepted by Nepal, the World Bank informed 'Nepal of its decision to "postpone" work on the Babai project, citing HMGN's budgetary constraints' (Ibid). Ultimately, Nepal had to make funds available from its own resources for the construction of a weir/barrage over the Babai River. She is still grappling with the problem of completing the main irrigation canals.

Regarding the development of the multi-purpose West Rapti/Bhalubang project, as already stated above, Nepal and India reached a deadlock in the submission of proposals and counter-proposals. As a result, CIDA that had agreed to provide funding support for the detailed study of the project, finally withdrew its offer.

For producing power and irrigating lands in Rautahat and Sarlahi districts, Nepal had carried out a prefeasibility study of the Bagmati River with the support of the German Government. The study had indicated that the construction of a 117 m rock-filled high dam over the river could generate 140 MW of power and provide irrigation facilities for 120,000 ha of land in these districts (Poudel 2003). As a first phase effort, the government constructed a diversion barrage over the river with its

own resources, which has been providing irrigation facilities for 30,000 ha of land in the two districts as 'external funding…was initially discouraged on account of Indian objections, though Saudi funding was available at a later stage' (Verghese 1999). If a high dam were built as per the pre-feasibility study, Poudel writes (2003) the fertile Marin valley plus 12,000 ha of fertile land would be submerged. Thus, the construction of the high dam is an environmental challenge to Nepal. But the Indian side stressed the need 'to take up…Bagmati dam project since the existing irrigation in India has been seriously affected due to the construction of [a] diversion structure for irrigation in Nepal. There was a need to augment the flows by constructing multi-purpose projects' (Minutes of Meeting between Nepal and India 1996 (Annex 17.4). Nepal resisted India's request for some time but India succeeded pursuing Nepal to have the Bagmati high dam studied as part of the Kosi High Dam Multipurpose Project and Sun Kosi Diversion Scheme study in 2004.

To utilise the waters of the Kamala River and to provide irrigation facilities to Dhanusha and Siraha districts, Nepal has constructed a weir system barrage and for the development of the distribution system and command area, she received the help of the ADB under the Sagarmatha Integrated Development Project (SIRDP). India feels that this has caused an adverse impact on the existing irrigation system in her territory. She wants, as she suggested for the Bagmati, to have a new dam constructed on the Kamala River that would be beneficial to both countries (Ibid). However, Nepal informed India that a high dam project in the Kamala, like on the Bagmati River, is not feasible at the present stage and 'has serious environmental problems' (Ibid). But, as already stated, India succeeded in getting this project, included in the study as part of the studies of the ongoing Kosi High Dam Multi Purpose Project and Sun Kosi Diversion Scheme (Minutes of Meeting of JCWR 2004 Annex 17.7).

The Sikta irrigation project in Banke district in the Mid-Western Development Region is one of the unimplemented projects. This project was put forward long ago with a view to building a barrage over the West Rapti River to provide irrigation facilities for 34,000 ha of land in this district. For this purpose, a prefeasibility study had been undertaken and the government wanted to take up this project. The GoI has already raised objections to this project on the plea that its construction would adversely affect the irrigation facility in the downstream area, i.e. in Indian Territory. She wants Nepal to discuss with her this project before Nepal starts work on it. In this regard, she wrote a letter to Nepal on June 1, 2004. (Kantipur Daily June 25, 2004).

From all these examples, and as mentioned by BG Verghese (1999), India wants Nepal to consult her 'before taking up projects on various boundary and border rivers so as to protect prior use or adjust conflicting demands'. But he goes on by adding that 'Nepal complains that it was not consulted by India in regard to the major Sharda-Sahayak project or the Kamala- Jayanagar barrage... 'At the same time, he writes that Nepal protests 'India's claims to prior appropriation, especially on the smaller and medium rivers on which it is able to design and undertake projects on its own for local benefit without running into the engineering and financial complexities attending the harnessing of the bigger rivers. The Indian response is that it

cannot prevent Indian villagers from using available stream flows for local uses nor deprive them of these waters to favour a smaller neighbour as the Indian villager is as poor and deprived as his Nepali counterpart just across the border.'

2.10.5 Disagreement over Benefits-Calculating Formula

The preparation of the DPR of the Pancheswar multi-purpose project has not moved ahead as scheduled and, as a result, the people are raising the question of whether the provisions of the Mahakali treaty are still valid. But it cannot be denied that both governments had signed the treaty to jointly engage in the development of the waters of the Mahakali River. They have jointly been engaged in the DPR exercise for the Sapta Kosi High Dam Multi-purpose Project and Sun Kosi Diversion Scheme. Also, they have agreed to restart discussion for the Karnali multi-purpose project. But, based on the discussions the two countries have had so far on the Pancheswar Multi-purpose project, the two governments are likely to face a very difficult time in coming to an agreement on the principles as well as on the assessment of the benefits accruing from the proposed projects.

Indeed, both countries would benefit from power and energy produced from the projects in Nepal. But it is also a fact that India is in need of water and her water requirements will increase over time (Subba 2002). To meet her increased requirement in the Gangetic plains, India is interested in high dam sites in Nepal, which would immensely benefit India, especially in flood control and irrigation. For this, she has already built the required infrastructures all along the border. She has, as already stated above, even planned an inter-basin transfer of water through her proposed RLP.

But while considering the available facts and the discussion notes of the meetings between the two countries, it becomes clear that a difference of opinion exists about the irrigation benefits accruing to India. India feels that there would be no incremental and/or additional benefits from the proposed projects. For example, she has been claiming that there will be no substantial additional and/or incremental benefit from the Karnali Multi-purpose project, as claimed by the studies. In the case of the irrigation benefits accruing from the Pancheswar Multi-purpose project, too, she has been claiming that there has been prior use of the waters of the Mahakali/Sarada River 160 km downstream of the Sarada barrage. Acceptance of these arguments means India will have to bear less cost in the proposed Pancheswar Multi-purpose project. Similarly, she does not believe that there will be substantial benefits in flood control from either of the proposed Karnali and Pancheswar Multi-purpose projects.

As long as these issues are not sorted out, the DPR of the Pancheswar Multi-purpose project will not be finalised. Similarly, Nepal would not be able to garner the required funding support for the Karnali Multi-purpose project. Once the DPR is ready for the Sapta Kosi High Dam Multi-purpose project, it can be assumed that both countries will be locked in long and protracted negotiations for an agreement

on irrigation and other benefits accruing to India from the project. Without these agreements, why should Nepal agree to the submergence of a large part of her fertile land and relocation of over 100,000 people who will be affected by the project: Sapta Kosi High Dam? Also India has a number of sub-offices of Joint Project Office (JPO) in Nepal for this project, whereas Nepal has no such sub-offices in Bihar to assess either flood control or irrigation benefits to India.

On the whole, so far India seems to be denying the notion that she would be receiving additional benefits in irrigation and flood control from the storage projects built in Nepal. But BG Verghese (2004) does not deny the fact that 'Hydel storages in Nepal could yield India downstream benefits…irrigation, flood moderation or navigation. These benefits would need to be quantified and compensated.'

2.10.6 Apprehension on Article 126 of the Abrogated Constitution of 1990

This article is related to the 'the ratification of, accession to, acceptance of or approval of treaties or agreements to which the Kingdom of Nepal or HisMajesty's Government is to become a party shall be as determined by law. The laws to be made pursuant to clause (this) shall, inter alia, require that the ratification of, accession to, acceptance of or approval of treaties or agreements on the following subjects be done by a majority of two-thirds of the members present at a joint sitting of both Houses of Parliament', provided treaties or agreements that would affect the nation extensively, seriously and or in the long run One of the subjects included for this purpose is natural resources, and the distribution of their uses. The treaty of Mahakali (TREATY Between HIS MAJESTY'S GOVERNMENT OF NEPAL AND THE GOVERNMENT OF INDIA CONCERNING THE INTEGRATED DEVELOPMENT OF THE MAHAKALI RIVER INCLUDING SARADA BARRAGE, TANAKPUR BARRAGE AND PANCHESHWAR PROJECT, 1996) signed by then government of Nepal with India in 1996 was the first and last treaty ratified by the joint houses of the parliament under this provision. The constitution had made this provision on the basis of the past experiences of the country had in relation to Kosi and Gandak and to ensure that the government of the day would take the parliament into confidence on natural resources development. The government would, thus have to be totally transparent in dealing with the country's natural resources and their development for the benefit of the country. It was also expected that all the parties represented in the parliament would support the government and own the treaty or agreement signed by the government on natural resource development. Former Water Resources Secretary S N Upadhyay writes (1991) that the article was necessary due to earlier water resource agreement that had 'unfairly benefited India more than Nepal'. However, Verghese and Iyer (1993) saw it as 'yet another political variable which could cause some delay and uncertainty in the decision making process'. They claimed 'this article is so widely cast as to include any kind of arrangement concerning water resources, power distribution and transmission and

environmental impacts that any critique might seek to question because of its pervasively grave or long term implications'. But Nepal perceives this article as being so important that she has incorporated it in her Interim Constitution of 2063 (2007). The provisions of this constitution made in Article 156, are similar to the provisions of the Constitution of the Kingdom of Nepal 1990. Furthermore, having such provision in the constitution that would be drafted by the Constituent Assembly for which the elections have been on April 10, 2008, would remain a major agenda on natural resources.

2.10.7 Ineffectiveness of Institutional Mechanism

Indeed, Nepal and India have the largest number of committees to oversee the implementation of the treaties and understandings on water resources. The high-level committee headed by the water resources secretaries of the two countries and constituted to provide guidance and solve the issues faced by other committees, has very wide ToR in terms of its functions and responsibilities (Annex 13). But, from the point of view of their actual performance, most of the committees have not met for years. And whenever they have met, it is only for the sake of maintaining formalities. From the minutes of the meetings it becomes clear that the committees, instead of taking concrete steps, are postponing decisions on the plea that further studies or investigations are needed (Annexes: 17, 22, 23, 25 and 25.1). The secretary-level committee (JCWR), which is supposed to meet every six months, has met only two times since its formation, the first time in 2000 and the last time in October 2004. Similarly, when referring to the decisions it has made, there are more reasons to feel dissatisfied than to feel optimistic, since all the decisions are vague and time-buying in nature. In addition, during the visit of Prime Minister GP Koirala to India in August 2000, it was agreed that the revived Nepal–India Joint Commission (NIJC) constituted at the level of Foreign Ministers would oversee the entire gamut of bilateral relations and provide directives on measures to further strengthen them. It was also to review and rationalise the existing inter-governmental mechanisms. But this committee, too, is yet to become effective in relation to water resources matters.

2.11 Conclusion

Due to their geophysical location, the social, cultural and religious relationships between the peoples of Nepal and India, and the benefits that could be derived from the development of water resources, both countries could gain immensely by cooperating in this sector. In this regard, BG Verghese (1999) rightly says that 'delay in developing Nepal's vast water resources is a denial of the Kingdom's own best interest, and equally denies India optimality in the development of its shares in water resources.' Yet, the relationship is not satisfactory. The primary reason for

such a state of affairs is the strategies adopted in dealing with each other in the water resources sector. Nepal does not have a long-term strategy as to how she should deal with India in relation to this sector. Furthermore, knowingly or unknowingly, she has made water a very emotional and politically sensitive issue, especially in relation to India. Moreover, political parties follow one line of thinking while in power and just the opposite while in opposition. The most important lacuna on the part of Nepal is that she has always followed an ad hoc policy in reaching an understanding or signing a treaty or in picking projects for cooperation with India. Whenever a political-level visit to each other's capital is decided, the Singha Durbar and Sital Niwas mandarins get together and pick out projects for cooperation without going into the details of what has already been proposed in the past and the projects for which understandings have already been reached or their implementation status.

Compared to such a situation in Nepal, India is found to be guided by her long-term strategy and, based on such a strategy, she has been taking up projects for cooperation with Nepal. Her strategy seems to be to get optimal benefits from the waters flowing from Nepal in meeting her own requirements, mainly irrigation requirements and control of floods, although lately she has been giving the impression that she is interested in getting power/energy from Nepal to meet her growing energy deficit. That country has also been following another strategy, i.e. to have a hold on all the rivers in Nepal through treaty regimes, or understandings, or joint communiqués, and take up projects one by one whenever she thinks that her goals would be achieved. This is the reason why, despite a long list of projects agreed for cooperation, only a few have been taken up so far. To ensure that this goal is not obstructed or challenged by Nepal, she has also followed the policy of raising objections to multi-lateral or other funding agencies whenever they decide to extend support to Nepal in the water resources sector on the plea of prior use or on the grounds of causing adverse effects to the downstream flow from the proposed project(s). The examples are the inability of Nepal to secure external funding for the Kankai, Babai and Sikta projects.

In spite of the unsatisfactory relationship, both Nepal and India could benefit from the development of water resources if they cooperate with each other in the sector with a changed mindset. The changed mindset in the case of Nepal has to be the development of a strategy on water-resources development, in relation to cooperation with India. Another thing she will have to do is to neutralise water resources from extreme politicisation and give a true picture to the people and educate them about the benefits and loss of cooperating or not cooperating with India. National professionals and civil society should also initiate nation-wide dialogue and debate as to how the country should cooperate with India, and based on such dialogue, propose policies and strategies to be pursued by the country in the sector, help build a national consensus on the proposed policies and strategies, and lobby with the government to translate them into national policy to be followed while negotiating with India. In India's case, it is desirable that she be more transparent in dealing with Nepal, honour the commitments already made, and not be swayed by the idea of holding the rivers of Nepal for possible use in the future by enlarging the list of projects for cooperation. She should also not object to Nepal's desire to

secure funds from a third party, multi-lateral or other agencies for the development of water resources projects.

Change in the mindset and a new style of cooperation between the two countries would:

> help to build new blocks of cooperation without compromising the rights of the future generation and facilitate optimal utilisation of the huge potential that exists in the water resources sector. If properly used, this resource, which is going to be extremely scarce in the days to come, could substantially contribute in improving the quality of life of the people of two countries as well as that of the people of the region as a whole. (Dhungel 2004)

Salman Haider, former Foreign Secretary of GoI, says (ORF 2004): 'Lack of consultation, and the way the project [in relation to Tanakpur] was structured, did not show the regard for Nepalese sensibilities and interests as any fair minded person would say that they had a right to expect.' Similarly, Verghese and Iyer (1993) says that ' Nepal's sense of ancient wrongs on the Banbassa (Sharada), Kosi and Gandak barrage projects need critical and open examination so that misperceptions are corrected or any real damage done is suitably compensated in the future. It is important to get over this psychological hurdle. A similar rigorous examination of the water transport link from Nepal to the sea should be jointly undertaken so as to establish whether it is techno-economic viability or Indian "obduracy" that stands in the way of immediately realising this otherwise worthwhile goal in the fullness of the time.' They further say that 'the real stumbling blocks lie elsewhere-in political suspicions stemming from collateral issues: from a sense of grievance regarding past wrongs in relation to water issues; fear of Indian domination; and conceptual doubts on such matters as the wisdom of taking up mega projects that are beyond Nepal's financial, technical, social and political capacity to manage or absorb at this stage of its development. All these issues or apprehensions must be addressed.'

Chapter 3
Multi-purpose Projects

Damodar Bhattarai

Nepal's water resources development prospects are not limited to its own development, but can also greatly contribute to the promotion of regional economic development. The potential of Nepal's water resources unfolds great possibilities for bilateral and regional cooperation, particularly through the harnessing of the cascading Himalayan waters for increased regulated flow for irrigation purpose in the lean season, flood mitigation in the wet season, generation of hydropower and facilitation of navigation. There are numerous locations where these resources could be tapped for Nepal's own benefit as well as that of the cobasin partner states. However, on account of the complex and not yet fully comprehended nature of its physical setting, climate and hydrological characteristics, large interventions will have to be made with caution and diligence in terms of the technological, social, political, environmental, institutional and financial factors.

3.1 Water Resources of Nepal: An Overview

Surface water is the greatest potential renewable resource associated with the economic development of Nepal. It is estimated that some 225 billion m^3 of surface water flows through Nepalese territory annually, which amounts to about 118,200 m^3/km^2. This is about four times the world average. The available surface runoff flows through more than 6,000 rivers and rivulets, totalling about 45,000 km in length, and eventually draining into the Ganges River in India through several river systems. These rivers have a total drainage area of about 194,471 km^2, 76 per cent of which is within Nepal. Thirty-three rivers have a drainage area exceeding 1,000 km^2. The drainage density expressing the closeness of spacing of channels is about

D. Bhattarai (✉)
Former Deputy Director General, Department of Electricity, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
e-mail: bhattaraid@gmail.com

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0.3 km/km^2 (Gyawali 2003). The dominant feature of Nepal's water resource is that, even though the country occupies only about 13 per cent of the catchment of the Ganges River, it contributes as much as 70 per cent in the lean season and around 40 per cent of its average annual flow to the Ganges River (IIDS 1995).

Nepal's rivers originate from the Himalayas, Mahabharat mountain ranges and the Siwaliks. Based on the average annual flow, the rivers originating from these areas are also referred to as major, medium and minor rivers respectively. The Mahakali, Karnali, Gandaki and Kosi are the four major rivers, the Mahakali being a border river. As they originate from the Himalayas, these snow-fed rivers are perennial and carry significant discharges even in the dry season and, hence, possess promising prospects for year-round irrigation and hydropower generation. The medium rivers such as the Kankai, Kamala, Bagmati, West Rapti and Babai, are all rain-fed, and originate from the Mahabharat range below the snowline. These medium rivers are also perennial and are sustained by groundwater and springs even in the lean season, though their seasonal fluctuations are higher than the major snow-fed rivers. The minor rivers originating from the Siwaliks, also called the southern rivers, are much smaller in size and most of them have insignificant or no flow in the dry season. The significance of these minor rivers is now being realised as about 41 per cent of the Nepalese population inhabit the basins of these minor rivers.

The groundwater resources in the country are spread across the Terai region and some valleys in the hills. The annual estimated groundwater recharge is about 11.6 billion m^3 (Gyawali 2003). The land under perpetual snow is 15 per cent of the total land area. River hydrographs clearly indicate that snow holds about 12 per cent of the total rainfall and supplements the low flow of the major rivers during the dry season by melting (Sharma 1997).

3.1.1 Water Availability

The country has two rainy seasons: one during the summer, from June to September, due to the southwest monsoon rain and the second in the winter, brought about by western disturbances. Eighty per cent of the rainfall occurs during the monsoon season. In the hydrological cycle, about 64 per cent of all rainfall drains immediately as surface runoff. Of the remaining, some is retained in the form of snow and ice in the high Himalayas, some percolates through the ground as groundwater, and some is lost as evaporation and transpiration.

Mean annual precipitation ranges from more than 6,000 mm along the southern slopes of the Annapurna Himalayan range in the central part of the country to less than 250 mm in the north central portion near the Tibetan plateau. The average annual precipitation is around 1,530 mm. Nepalese rivers display remarkable temporal and spatial variations in the availability of water resources. The distribution of river flow is uneven over time and space. The hydrology of the rivers follows

the rainfall pattern. About 80 per cent of the total annual flow occurs from June to September and 20 per cent during the remaining months. This results in a scenario of alternate cycles of excess and scarcity (Gyawali 2003 and Water Resources Strategy 2002).

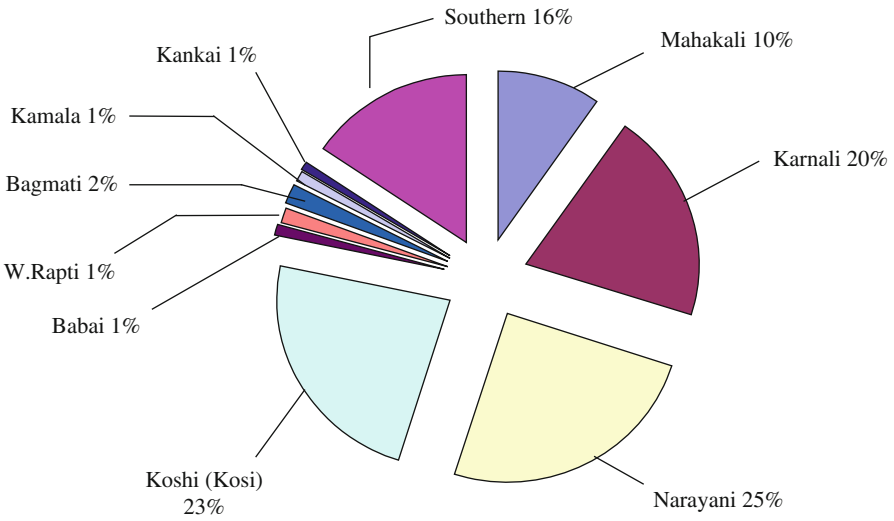
The magnitude of the average availability of the water resources of the country can be misleading in terms of their actual utilization. The variations of resource availability in terms of time and space are very different. To make it worse, the demands for water for domestic, industrial, irrigation, hydropower generation, environmental requirements, etc do not necessarily match temporally or spatially, or both, with the available water supply. This may lead to the resource being categorized as 'scarce' rather than abundant in terms of its temporal and spatial variations. Around 78 per cent of the average flow of the country is available in the four major basins, 6 per cent in the medium basins and 16 per cent in the numerous small southern rivers of the Terai (River Basin Planning 2003). The water availability in different basins is depicted in Table 3.1 and Figure 3.1 below.

3.1.2 Water Uses

Agricultural, domestic, industrial and hydropower constitute the principal uses of water. Of these, agriculture consumes the maximum quantity, followed by domestic use. Most of the water used for hydropower has been in a run-of-river type system, and this use has been classified as non-consumptive. Even in storage hydropower projects, it is non-consumptive use, though there could be inter-basin diversions, like in the Kulekhani, from Bagmati to Gandaki basin.

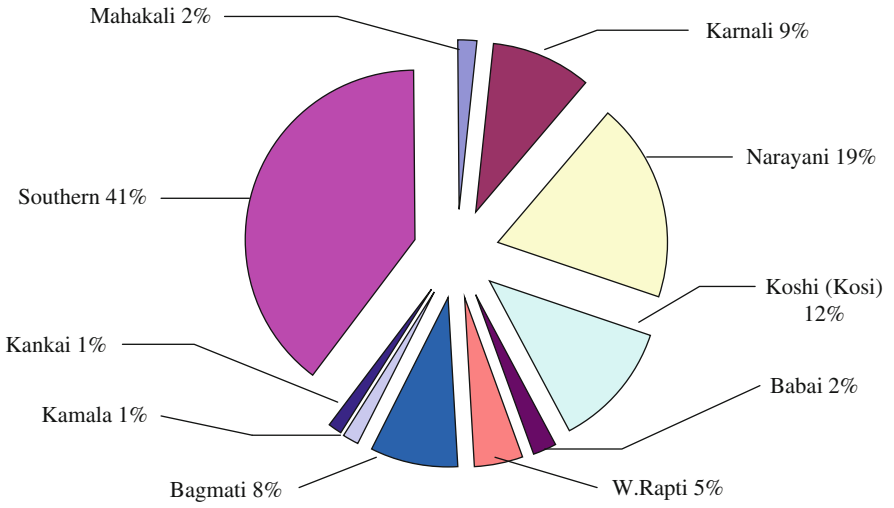
Table 3.1 Water Availability in Different Basins

S.N.	River	Drainage Area (km^2)		Population In 2001 (,000)	Annual Flow m^3/s	Per Capita m^3	% of Total Flow Population	
		Total	Within Nepal				Flow	Population
1	Mahakali	15,260	5,410	444	698	24,519	9.8	1.8
2	Karnali	44,000	41,890	2,166	1,441	20,553	20.2	9.4
3	Narayani	34,960	28,090	4,377	1,753	12,491	24.6	18.8
4	Kosi	60,400	31,940	2,816	1,658	18,600	23.3	12.2
5	Babai	3,000	3,000	489	88	5,418	1.2	2.1
6	W. Rapti	3,380	3,380	1,046	100	3,100	1.4	4.5
7	Bagmati	2,700	2,700	1,935	138	2,015	1.9	8.4
8	Kamala	1,450	1,450	336	74	4,333	1.0	1.5
9	Kankai	1,148	1,148	266	60	6,798	1.0	1.2
10	Southern	28,173	28,173	9,274	1,113	3,880	15.6	40.1
	Total	194,471	147,181	23,151	7,125	9,580	100	100



Source: River Basin Planning, 2003 Water and Energy Commission Secretariat, Government of Nepal. Kathmandu

Fig. 3.1 Surface Water Availability



Source: River Basin Planning, 2003 Water and Energy Commission Secretariat, Government of Nepal. Kathmandu

Fig. 3.2 Population Distribution

3.1.2.1 Agriculture

The total cultivated (agricultural) land in the country is about 2.641 million ha, out of which 1.765 million ha is considered irrigable.

At present, about 1.129 million ha of land is under some form of irrigation, equal to 64 per cent of the irrigable cultivated area or 52 per cent of the total irrigable area, of which only 41 per cent has year-round irrigation facility (River Basin Planning 2003). Of this, about 74 per cent of the irrigated area is under farmer-managed irrigation systems (FMISs). The remaining 26 per cent falls under agency-managed irrigation systems (AMISs). Except for about 0.2 million ha, which uses groundwater resources, the area is irrigated by run-of-river type of irrigation systems. As irrigation water use varies with crop, soil and climate, the total abstraction of water for irrigation ranges from 337 m^3/s in January to 1,417m^3/s in October. It is estimated that by 2027 irrigation demands will be about 37,000 million m^3/year (Gyawali 2003 and River Basin Planning 2003).

It is reported that about 15 billion m^3 of surface water and 2.5 billion m^3 of groundwater is used for irrigation on an average annual basis (WECS 2003).

3.1.2.2 Domestic Use

Domestic use is another major area of consumptive water utilization in the country. The source of drinking water supply is primarily groundwater in the Terai and springs or streams in the hills. It is reported that the water supply coverage at the end of the Ninth Plan (2002) is 71.6 per cent, and basic sanitation coverage is 25 per cent (NWP Draft 2004). The current domestic water use is estimated to be 800 million m^3/year, which is estimated to grow to 1,800 million m^3/year by 2027 (Gyawali 2003).

3.1.2.3 Hydropower

Out of the theoretical potential of 83,000 MW and the technically and economically feasible potential of about 43,000 MW, the storage type of projects constitutes about 49 per cent while the remaining are run-of-river projects (Ibid). However, with increased demand for system regulation, peaking storage plant capacities could be increased significantly.

As of 2006, the installed hydropower capacity within the Nepal Electricity Authority system, including private and others, is 556.50 MW (NEA Review 2005/06), of which the Kulekhani Reservoir (Kulekhani I: 60 MW, Kulekhani II: 32 MW) is the only seasonal storage reservoir project in the Nepali power system.

3.1.2.4 Industrial Use

As industrial development is still in its infancy, water consumption is nominal. It is estimated that the current consumption of the industrial sector is about 80 million m^3/year, and this is expected to increase to 180 million m^3/year by 2027 (Gyawali 2003).

3.1.2.5 Other Uses

Nepal's water sector generally focuses on only three sub-sectors (water supply, irrigation and hydropower), which account for the majority of uses and investments. However, other uses are likely to conflict or compete with the main uses (like rafting and fisheries on the Kali Gandaki River after the completion of the Kali Gandaki A hydropower dam), as the country diversifies and expands its development activities. Such uses include:

- Recreation and tourism: rafting, pleasure boating, bathing, aesthetic values of rivers, lakes and glaciers (for example, trekking, mountain climbing, sightseeing);
- Traditional and commercial fishing;
- Navigation: mainly crossings but some rivers could be made navigable in the future. Access to the sea is also an important concern for land-locked Nepal;
- Natural aquatic habitats and wetlands: often associated with parks and wildlife reserves;
- Culture and religion: temples, *ghats*, sacred waters;
- Sand and gravel extraction from river beds, and;
- Unique water sources for the bottling of spring water (Gyawali 2003)

3.2 Challenges for Optimal Water Use

Even though Nepal appears to be well endowed with freshwater per capita, a number of factors limit the spatial and temporal availability of water and exemplify the challenges the country has to face in harnessing its water resources for optimal use and maximum benefits. These factors include:

- The volume of runoff into the country's streams and rivers varies greatly from place to place, on account of the large variations in climate and topography.
- The seasonal variation is considerably large. In an average year, around 80 per cent of the annual river flow occurs from June to September. Even in large rivers, the lean season flow in an average year is only 12.5 per cent of the annual flow.
- The locations where water can be usefully tapped do not always coincide with the locations where the water is easily available.

- The patterns of desired water use in terms of the times of the day and seasons of the year may or may not be compatible with the natural supply pattern.
- The natural condition of most rivers, with their variations in water levels, river discharge and sediment load, is a kind of dynamic equilibrium. Sedimentation due to the long-term geological origin of Himalayan rivers poses a challenge for the design of hydraulic structures.
- Water-induced disasters are a regular feature of the natural flow regime. For this reason, some significant investments may have to focus on reducing the risk of disasters.
- Large storage reservoirs, which would be features of some of the proposed hydroelectric power or multi-purpose projects, would increase the amount of water available downstream in the dry season for year-round irrigation as well as for activities of a higher value. These projects will also have the capability to reduce flood risks by impounding and delaying the passage of floodwaters. Such benefits, including increasing the amount of the lean season flows, may have great value a considerable distance downstream from the reservoir. The main concerns are, however, social and environmental problems such as inundation of valleys, displacement of people and loss/damage to terrestrial and aquatic habitats (Ibid).

3.3 Water Resources Strategy 2002 and National Water Plan 2005

The Government has adopted the Water Resources Strategy 2002, which formulates a comprehensive water strategy over a period of 25 years. The Strategy identifies 10 key strategic outputs and defined activities with indicators for each of them for the short, medium, and long terms. A National Water Plan in the form of an action plan, to translate the strategy output into ground action, is now in place.

The National Water Plan 2005 envisages providing all people with access to potable water supply and basic sanitation facilities by 2017. It also envisions providing 97 per cent of the potential irrigable areas with irrigation by 2027, including year-round irrigation to 67 per cent of the total irrigated area, develop up to 4,000 MW of hydropower to meet the projected domestic demand in the base case scenario, excluding export, and export substantial amounts of electricity to earn national revenue by 2027.

Moreover, the Strategy and the National Water Plan focus on mainstreaming integrated water resources management (IWRM) with the river basin concept, together with required policy and institutional arrangements.

The Water Resources Strategy emphasises the integration of irrigation development with multi-purpose storage projects and inter-basin transfers.

3.4 The Case for Multi-purpose Storage Projects

For meeting year-round water needs within the country as well as in downstream neighbouring countries, flow regulation with storage schemes is essential. Therefore, the need for attaining flow regulation for various uses of water through multi-purpose storage projects is discussed below.

3.4.1 Meeting the Irrigation Water Needs

All the existing surface water irrigation systems in the country are dependent on run-of-river diversions, i.e. transit flow availability at the source. Therefore, the irrigated cropping area varies from location to location and from season to season. In some of the systems, the winter cropping (irrigated) area falls to 20 per cent of that of the summer season (Shrestha 1995).

As irrigation is the major consumptive use of the available water resources, the major factors determining irrigation requirements are the land available for cultivation, its cropping patterns and agro-climatic conditions, including field application and system delivery efficiencies. It may not be economically feasible to irrigate the remaining land in the hills and mountains on any substantive scale due to the mismatch of water and land available and other physiographic difficulties. Hence, the potential to expand round-the-year irrigation lies in the Terai plains of Nepal. At present, only 64 per cent of the total irrigable land (1.36 million ha) in the Terai has irrigation facilities, with a large portion of it being seasonal. Development of surface irrigation systems through the run-of-river type schemes has almost been exhausted in the Terai. Moreover, the southern river systems are mostly dry in the dry season and are not suitable for year-round irrigation. Similarly, the natural flow available in the medium-scale river basins is also not sufficient to meet the irrigation requirements during dry months (River Basin Planning 2003).

A notable feature of Nepal's rivers is that the volume of monsoon flow to the total annual run-off is between 73 per cent and 75 per cent for large Himalayan rivers and 83 per cent for medium-sized rivers. This demonstrates that the water available in the large and medium rivers during the non-monsoon period, which is two-thirds of the time of the year, is only 27 per cent and 17 per cent respectively. Despite this fact, on account of Nepal's very limited utilization of its water resources, the Water Resources Strategy formulation exercise has assessed the four major river basins, the Kosi, Gandaki, Karnali and Mahakali, in terms of water demand as 'surplus' basins. The medium-scale river basins such as the Kankai, Kamala, Bagmati, West Rapti and Babai are mainly rain-fed and have a substantial annual flow but are 'deficit' in the dry season. The Siwalik rivers are seen to be highly ephemeral and are, therefore, not suitable for year-round irrigation.

The contemplated major irrigation areas amount to more than 900,000 ha (53.1 per cent of the total irrigable land of Nepal), as depicted in Table 2. The total water

Table 3.2 Irrigation and Hydropower Potential of Some Planned Multi-purpose Projects

	Project	Irrigation Potential (ha)	Installed Hydropower Capacity (MW)	Remark
1	Kankai Multi-purpose Project (MP)	67,000	60	Nepal
2	Saptakosi High Dam MP	68,850 (1,522,000 ha-India)	3,489	Nepal-India-Bangladesh
3	Sunkosi-1 High Dam MP	200,000	1357	do.
4	Sunkosi-Kamala Diversion MP	135,600	61.4+32.0 (Kurule, Chisapani)	Nepal-India
5	Bagmati MP	120,000	140	Nepal
6	Kaligandaki-Tinau Diversion	40,000	1600	Nepal
7	Sapta Gandaki MP	40,000	225	Nepal
8	West Rapti MP	76,076	62+45 (Bhalubang, Surainaka)	Nepal
9	Karnali (Chisapani) MP	191,000 (3,200,000 ha-India)	10,800	Nepal-India
10	Bheri-Babai Diversion MP	38,400	24-48	Nepal
11	Pancheswar MP	93,000 ha-Nepal 1,610,000 ha-India	6,480	Nepal-India
	Total (potential irrigation area in Nepal and India not excluding overlap and power)	1,70,3000	24,397	

Sources: River Basin Planning 2003 and GIF Proceedings 1996.

requirement for these areas is the highest (1360 m^3/s) in the month of April. This constitutes about 92 per cent of the combined transit flow of the four major and four of the medium rivers, the West Rapti, Bagmati, Kamala and Kankai. This shows that, based on the transit flow of the rivers alone, even the contemplated and potential irrigation areas could not be served on year-round basis (Shrestha 1995). Hence, flow regulating reservoirs or inter-basin diversions, like Sunkosi-Kamala, Gandak-Tinau, Bheri-Babai, West Rapti Multi-purpose Project, etc., have been contemplated to irrigate this vast area of land in the Terai. The irrigation and hydropower potential of the planned multi-purpose projects are indicated in Table 3.2 and Figure 3.2. The contemplated inter-basin diversion projects, like the Sunkosi-Kamala Diversion (potential irrigation: 138,000 ha), Kali Gandaki Diversion to Kapilvastu, Bheri-Babai Diversion, etc., are envisaged to transfer water from 'surplus' basins to 'deficit' basins.

The Water Resources Strategy emphasises the integration of irrigation development with multi-purpose storage projects and inter-basin transfers. It states that the main advantages of storage projects for irrigation include management of sediment load and regulated water availability with reduced risk of flood damage and assured dry season flows. Therefore, irrigation water supply must be considered as one of the primary purposes of storage project (s) in the planning and approval of all stor-

age reservoirs. Similarly, the National Water Plan states that multi-purpose projects, which minimise the unit costs of services or products, have been envisioned in irrigation and hydropower development as the country has good potential for them. It has considered four irrigation projects, viz Sunkosi Kamala Diversion, West Rapti, Kankai and Bheri-Babai Diversion as multi-purpose projects to be developed. The Plan further states that, in evaluating the cost of multi-purpose projects, the common dam is split into serving both the sectors: 28 per cent to irrigation and 72 per cent to hydropower (based on feasibility studies and supporting norms). In case of benefit, they are counted separately in the sector concerned.

Nepal has been contemplating the aforementioned projects for the past several decades. The problem of building storage reservoirs or inter-basin transfers in the medium rivers has emanated from the stand taken by India that the contemplated projects would cause adverse effects on the existing water use in the downstream riparian areas. The Babai Irrigation Project has not been able to deliver water at farm level due to Nepal's inability to complete even the main canal. Due to India's objection, the World Bank withdrew its financial assistance from the year 1986, even when the Bank became convinced that the implementation of the project would have no adverse effects on India. Similarly, the Kuwait Fund for Arab Economic Development withdrew its assistance after the signing of the draft Loan Agreement, due to India's objection. External funding for the Sikta Irrigation Project, envisaged to draw water from the West Rapti River, met the same fate on account of India's objection. Under these circumstances, would India ever agree to implement the West Rapti Multi-purpose Project? The Kankai Multi-purpose Project, the feasibility study of which was conducted with West German funding, was presented to the Asian Development Bank (ADB) for project financing, but was stalled for similar reasons. In this context, Mr Surya Nath Bastola, a veteran Engineer, writes: '… We worked hard to produce a good feasibility report. But at the later stage of my life, I was disheartened to find that a project found most economical by 1965 was not even executed up to the writing of these lines in 1993, due to the various political reasons and objections from India not to execute it under the pretext that it will harm the water users' interest in the lower riparian areas' (Bastola 1994). The Sunkosi Kamala Diversion, legally permitted by the Kosi Agreement, is now under joint study by Nepal and India as part of the studies required to be carried out for the preparation of the detailed project report (DPR) of the Saptakosi High Dam Multipurpose Project and Sunkosi Storage-cum-Diversion Scheme.

3.4.2 Hydropower Generation

Interventions in the form of multi-purpose storage projects in the large and some medium river basins will provide irrigation facilities not only to major land areas in Nepal but also to enormously greater areas in India. In fact, the implementation of reservoirs in the major basins would provide a substantial degree of low flow augmentation and flood attenuation, which are more beneficial to India than to Nepal. Obviously, the hydropower benefits from these reservoir projects, like the Kosi High Dams, Kali

Gandaki-2, Burhi Gandaki, Karnali Chisapani and Pancheswar, are also enormous and could be utilised only by exporting to India and/or neighbouring countries.

3.4.3 Other Benefits

Apart from water supply, irrigation water and hydropower generation from multi-purpose projects, other benefits such as flood control, navigation where possible, and low flow augmentation for environmental and ecological purposes, including recreation, tourism, etc can also be derived from the planned multi-purpose projects.

Regarding flood control benefits, the concern for the control of the Kosi River began as early as the British colonial rule in India. Every year its floods destroyed thousands of acres of land and caused loss of many human lives in the plains, mostly in India. Its banks were subject to abrupt oscillations (Pokharel 1991). Work on the Kosi embankments started in 1955 after Nepal and India entered into the Kosi Agreement amidst a controversy that any barrage that might be built would rapidly silt up. Nevertheless, the barrage was taken up in 1959 and the canals were opened for irrigation in 1964, by when flood protection over an area of 210,000 ha had already created a sense of security and triggered a process of asset-formation. The river stood anchored and its westward migration arrested (Verghese 1990). Verghese further states that the engineering view is that a high dam would additionally moderate a 100-year Kosi flood to a quarter of its value. The 1981 Kosi High Dam Feasibility Report, prepared by India, envisages a flood moderation of up to one-third of the live storage of the reservoir to be created by the 269 m high dam with a flood cushion capacity of 2.436 billion m^3.

3.4.4 Options to Meet the Demand and Supply Gap

An assessment of the availability of and demand for water in the various basins during the Water Resources Strategy formulation process has revealed that interventions in the form of single purpose/multi-purpose storage projects have to be made in order to meet the future demand for water for various purposes. Flow regulation is needed for altering the natural flow regime into the most advantageous pattern within a given hydrological cycle depending on project objectives such as irrigation, hydropower, flood mitigation, navigation, etc, and the predominance of the priority accorded to each objective. Studies conducted at different levels to date have identified around 31 reservoir sites, of which 28 are listed in Table 3. Consideration of 28 storage dams alone indicates a gross storage potential of about 138 billion m^3, of which about 82 billion is live volume—about 41 per cent of the total annual run-off flowing out from Nepal. The area of submergence from these storage dams would be about 1,878 km^2 (Shrestha 1995).

Some of these storage projects will not only generate power and provide irrigation facilities to major land areas in Nepal, but will also provide major downstream

Table 3.3 Indicative Parameters of Identified Storage Dam Projects

S.N.	Reservoir Name	Catchment Area (km^2)	Dam Height (m)	Storage Capacity (million m^3)		Submergence Area (km^2)
				Gross	Live	
A. Large						
1.	Saptakosi	61,000	269	13,450	9,370	195
2.	Kali Gandaki-1	9,150	260	6,900	5,200	76
3.	Kaligandaki-2	11,340	144	5,100	3,400	108
4.	Trishuli Ganga	16,260	230	11,000	6,700	341
5.	Karnali (Chisapani)	42,890	270	28,200	16,200	170
6.	Bheri-3	9,111	262	15,200	9,000	195
7.	Bheri-4	8,120	278	10,600	5,700	110
8.	Karnali-1B	14,417	294	7,400	4,200	65
9.	Pancheswar (Nepal-India border)	12,100	315	12,260	6,560	134
B. Medium						
10.	Kankai	1,190	85	1,130	730	44
11.	Tamur-1	5,085	153	1,890	760	32
12.	Sunkosi-1	16,200	147	1,500	40	31
13.	Sunkosi-2	10,396	166	4,300	3,040	63
14.	Sunkosi-3	5,520	140	1,220	550	25
15.	Bagmati	2,700	117	3,000	2,100	10.5
16.	Central Seti-1	2,740	165	4,000	1,900	52
17.	West Rapti (Bhalubang)	3,680	93	1,390	970	28
18.	West Seti-1	4,250	225	1,240	800	18
19.	West seti-6	6,418	230	2,500	1,750	40
20.	Poornagiri (Nepal-India border)	15,000	156	3,400	1,240	65
C. Small						
21.	Mai-Loop	670	65	54	35	3
22.	Kamala	1,450	51	713	493	5
23.	Kulekhani (Existing)	126	107	85	73	2
24.	Andhi Khola	420	130	940	800	30
25.	Sapta-Gandaki	30,800	60	342	120	18
26.	Langtang	250	130	180	100	4
27.	Uttarganga	220	140	25	190	6
28.	Sharada	860	85	260	220	7.5

Source: WECS Bulletin, Volume.7, No.1; December 1995.

benefits to India and most likely to Bangladesh as well in terms of low flow augmentation, irrigation water and flood control benefits.

3.4.5 Problems Associated with Large Storage Projects

Large dams have been opposed in many parts of the world on account of their attendant problems of ecological and environmental sustainability, including the highly sensitive social problems of displacement and rehabilitation of a large number of people, accompanied by loss of valuable prime agricultural and forest land in a country like Nepal with limited land resources to feed its population. It is also indispensable that in the Himalayan rivers issues such as siltation and economic life of reservoirs, seismicity and dam safety, and the likelihood of glacial lake outburst floods be analysed, studied and mitigated very meticulously in order to avoid potentially disastrous decisions. Similarly, the macroeconomic impact of mega multi-purpose projects and the institutional mechanisms they necessitate must be accounted for very thoroughly, apart from the intricate issues of cost-sharing, apportionment of benefits/losses, and capital investment and appropriate technological choices.

3.5 Nepal's Water Resource Agreements

So far, Nepal has entered into four bilateral treaties/agreements with India. They are:

- Exchange of letters in 1920 relating to the Sarada Barrage with British India, now subsumed within the 1996 Mahakali Treaty;
- The Kosi Agreement of 1954 and the subsequent revision of 1966;
- The Gandak Agreement of 1959 and the subsequent amendment of 1964;
- The Mahakali Treaty of 1996;

Nepal's experience with the past bilateral agreements have been far from pleasant in promoting confidence in and better understanding of benefit-sharing. The revised Kosi and amended Gandak agreements had re-established Nepal's lost ground by recognizing the principle of the country's full sovereignty over its waters and overriding the principle of prior use to a great extent; in fact, entirely in the case of the Kosi agreement. In the case of the Gandak, trans-valley uses of Gandak waters in the months of February to April would need a separate agreement with India. In the Mahakali Treaty, however, only Nepal's water rights have been specified and not India's. The subsequent so-called stricture or *sankalpa prastav* by Nepal's Parliament has attempted to redefine water rights on a 50-50 basis and instructed to determine the price of electricity to be sold to India on the basis of the 'avoided cost' principle. Regarding the provision of not prejudicing the existing consumptive uses as stated in Article 3 of the Treaty, as India has so far exhibited an intransigent

stand over the Lower Sarada barrage, 160 km downstream of Pancheshwar, Nepal does not recognise it as falling within the purview of the Treaty. On the issue of locating the re-regulating dam at Poornagiri or Rupaligad, India appears to have taken stock of Nepal's difficulties on Poornagiri and acquiesced to consider the Rupaligad option also for further investigation. Attempts are now being made by both countries to 'expedite' the DPR even after 10 long years following the conclusion of the Treaty in 1996.

3.5.1 Nepal-India Cooperation on Multi-purpose Projects

Historical Perspective

Cooperation between Nepal and India in water resources development began as early as 1920 during the British rule in India with the exchange of letters relating to the development of the Sarada canal project on the boundary river, the Mahakali. Multi-purpose projects constructed in the Nepali territories under bilateral agreements between Nepal and India are the Kosi Project in 1954 and the Gandak Irrigation and Power Project in 1959. More recently, the Treaty Concerning the Integrated Development of the Mahakali River, including Sarada Barrage, Tanakpur Barrage and Pancheshwar Project, was signed between the two countries in 1996.

3.5.1.1 Kosi Project

The agreement on the Kosi Project was signed between the governments of Nepal and India on April 25, 1954. The main purpose of the Kosi Project has been flood control caused by this river in Nepal as well as in the plains of India (Sain 1970). The agreement, revised on December 19, 1966, included the following main features:

- Nepal's right to withdraw for irrigation or for any other purposes water from the Kosi River and from the Sunkosi River or within the Kosi basin from any of the Kosi tributaries.
- Clause 5 of the earlier agreement had conferred on India the ownership of all lands acquired by Nepal and subsequently transferred to India for the purpose of the project. Clause 5 (i) of the revised agreement changed 'ownership' to 'a lease for a project 199 years at an annual nominal rate'.
- The Project had been conceived primarily to yield flood control and irrigation benefits even though the agreement does not say anything about the costs and benefits of the project.

A barrage of 1,150 m has been constructed at Bhimnagar, from which two canals take off from either side. The eastern main canal, entirely in the Indian territory, provides irrigation for 612,500 ha of land in India. The western main canal provides irrigation water for 11,300 ha of land in Nepal and 356,610 ha of land in India. The

pump irrigation project, lifting 400 cusecs of water from the Kosi main western canal, irrigates 13,800 ha of land in Saptari district of Nepal. The Chatra Irrigation Project, originally defined for irrigating 66,000 ha in Nepal, delivered reliable water supplies to less than one-third of the designated command area, necessitating the construction of a new headwork and major improvements by Nepal with World Bank support under the Sunsari Morang Irrigation Project. A powerhouse with an installed capacity of four units of 5,000 kw each is located along the eastern main canal at Kataiya, 11 km from the barrage. Nepal is entitled to use 50 per cent of the electricity generated by any powerhouse within a 10 mile radius of the Kosi barrage, but must pay for this power at a price fixed by mutual consent. There is also the provision for Nepal to obtain royalties with respect to the power generated and in India at rates to be settled by agreement, even though this provision has never been effected in practice.

3.5.1.2 Gandak Project

The Gandak Project agreement was signed between the governments of Nepal and India on December 4, 1959. An exchange of letters on April 30, 1964 had amended clause 9 of the agreement, deleted clause 10 and added an extra provision under clause 7 (v) of the original agreement.

The amended clause 9, even though restricting the trans-valley use of the Gandak waters by Nepal from February to April, provides Nepal with the exclusive right to withdraw for irrigation or for any other purpose, from the river or its tributaries, such supplies of water as may be required from time to time. A supplemental agreement of October 1971 specifies that 24.1 m^3/s (850 cusecs) of water would be delivered through India's Don Branch canal to the districts of Parsa, Bara and Rautahat of Nepal at all times, apart from those times necessary for repair and maintenance.

A barrage has been constructed on the Gandak River on the Nepal-India border near Bhaisalotan to regulate water for irrigation and power. The main Eastern canal irrigates 920,520 ha of land in India and 37,200 ha in Nepal. The main western canal irrigates 4,700 ha of land in Nepal and 930,000 ha in India. The Nepal Western canal irrigates 16,000 ha wholly in Nepal. Hence, in aggregate, canals serve the irrigation needs of 57,900 ha of land in Nepal and 1,850,520 ha in India (IIDS 1995). The areas in Nepal actually irrigated are reportedly far less on account of much less than satisfactory maintenance works on the part of India, and Nepal never having received an adequate volume of water for irrigation. The Master Plan for Irrigation Development in Nepal 1990 puts the present net command area (NCA) of the Narayani Irrigation Project as 34,300 ha against a planned NCA of 40,100 ha and the estimated present irrigated crop in summer at 22,600 ha. It also puts the present NCA of the West Gandak Irrigation Project as 10,300 ha against a planned NCA of 13,400 ha and the estimated present irrigated crop in summer at 6,000 ha. Both draw water from the canals of the Gandak project, as mentioned above. A 15,000 KW powerhouse at Surajpura on the main western canal in Nepalese territory was handed over to Nepal in 1981. It has, however, never generated more than 10 MW.

3.5.2 Nepalese and Indian Perspectives of the Kosi and Gandak Agreements

The Kosi agreement does not mention the irrigation benefits that Nepal and India are to get from the project. The Gandak agreement specifies the irrigation benefit to Nepal, but makes no mention of the benefit to India. In hindsight, the Nepalese feeling is that both projects have involved substantial submergence of scarce agricultural land with corresponding social and economic costs to Nepal but only marginal benefits in terms of irrigation, flood protection and power. A more optimal design would have resulted had the barrage been located further upstream nearer Chatra in the case of Kosi and nearer Dev Ghat, in the case of Gandak. Greater areas of Nepal could be irrigated with only marginal changes in the benefits accruing to India. It is possible, however, that India wanted to have the barrages located as near the border as possible to maintain operational control over the barrages, which she fully enjoys now.

India holds the view that Nepal has received from the projects, without any financial investment, benefits like irrigation, flood protection, some hydropower and a bridge across the Kosi River.

3.5.2.1 Merits of Revision of the Kosi and Gandak Agreements

A lot of resentment and furore was experienced in Nepal as a reaction to both the Kosi (MP Koirala's premiership) and Gandak (BP Koirala's premiership) agreements. "It was in the early stages of a trusting relationship that the Kosi and Gandak Projects were negotiated between India and Nepal. The belief in Nepal that it did not get all the benefits it might have from these projects led to a disenchantment which engendered the feeling that until it could marshal its own technical capabilities wherever possible, it should avoid turning to India for support and advice" (Verghese and Iyer 1993). Nevertheless, the revised treaties, however, deserve some mention on the recognition of the following principles:

1. Country's full sovereignty over its territory
2. The right of prior use has been over-ridden, establishing Nepalese right to withdraw water from the rivers or their tributaries within its territory, the only caveat being the trans-valley use of the Gandak waters from February to April for which a separate agreement would be required (Thapa 1997). It is worth noting here the observation made by Dr. Jagdish C. Pokhrel: 'The use of a serendipitous event by Nepal to enhance its negotiating power was evident during 1960-63 when it attempted to revise the Kosi and Gandak agreements. It used new international opportunities to reduce India's influence over its economic and political affairs ... All this, combined with a skilful linking of interests, led to Nepal's success.'

'A serendipitous event significantly helped Nepal change India's position. The Indo-China war enhanced King Mahendra's ability to influence India's actions in

several ways …' (Environmental Resource Negotiation Between Asymmetrically Powerful Nations, Power of the Weaker Nations, PhD Dissertation, Cambridge, Massachusetts, June 1991).

3.5.3 Post Kosi/Gandak Period

Following the Kosi and Gandak agreements of the 1950s, Nepal entered an era of international cooperation at bilateral and multilateral levels from the mid-1960s. In both economic and technological terms, Nepalese dependency on India declined, while linkages with other neighbouring countries, donor countries and multilateral institutions, like the World Bank and ADB expanded. The Master Plan and feasibility studies funded by various donor agencies abounded in water resources projects. The World Bank funded the study of the Master Plan for Irrigation Development and feasibility studies of the Karnali (Chisapani) and Pancheswar Multi-purpose projects. Donor nations like Japan funded master plan studies on the Kosi, Karnali and Mahakali rivers. The Snowy Mountain Engineering Corporation (Australia) conducted the Gandak River Basin Power Study, Basin Master Plan.

3.5.3.1 Karnali (Chisapani) Multi-purpose Project

The proposed Karnali (Chisapani) Multi-purpose project in western Nepal envisages an installed capacity of 10,800 MW in terms of power and irrigation of 191,000 ha in Nepal and 3,200,000 ha in India, as per the Detailed Feasibility Report in 1990 by Nepal under a World Bank loan. The project comprises a 270 m high rock-fill dam with reservoir capacity of 28,200 million m^3 and an effective volume of 16,200 million m^3. The project cost at the 1989 price is US$4,890 million.

Verghese (1990) states that there was a time when Nepal may have been willing to go ahead with the Chisapani Project in the 1970s, but in some Indian circles there was the fear of being too dependent on Nepalese power. He further states that India also exhibited excessive antagonism towards all international consultants or even international interest in the belief that this would necessarily load the dice against it for no other reason than favouring the smaller country or to foster the sinister designs of that 'foreign' hand. As a result, Verghese adds that President Carter, Prime Minister James Callaghan, the World Bank, and others were spurned when they expressed their willingness to support Himalayan water resources development. Pun (2005) says that though Nepal was interested in the Karnali Chisapani Project, having trained, with UNDP's assistance, 250 engineers at India's premier Roorkee University, India veered to the Pancheswar project on the border river, Mahakali. He also mentions then India's Foreign Secretary, Jagat Mehta, as having now said that his greatest unfulfilled ambition was not having been able to initiate discussion, or at least, come to grips on eventual power supply from Karnali.

Despite Indo-Nepal discussions for over three decades on the various sizes of the proposed project, negotiations over the Karnali Multi-purpose project have not succeeded to date on account of the mutual disagreement over allocation of benefits and costs.

The Nepalese contention is that India refuses to recognise the downstream benefits of the project and wants to buy the generated electricity from the project on a marginally 'cost plus' basis as opposed to the 'avoided cost' principle that Nepal insists on.

While Nepal insists on the apportionment of downstream benefits from the multi-purpose project along the principles built into the US-Canada Columbia River Agreement, India feels that, in respect of irrigation, Nepal appears to be asserting ownership of waters stored behind its dams, which is not a principle in international law and is unacceptable to India. With regard to flood moderation, India insists that it has already ensured complete flood protection along the Gaghara (Karnali) in normal years by building and maintaining embankments that jacket the river.

Some water experts in Nepal allege/charge that no macro economic impact analysis has been carried out for such a mammoth project, the repercussions of which would be fraught with great risks and uncertainties for a country the size of Nepal, environmentally, socially and economically. Others contend that the Nepalese stand on the project, a Nepali project on Nepali soil, *vis-à-vis* the Indian insistence on control of management of the project, has not been conducive for both countries to reach an agreement over the Karnali.

'If work on the Karnali had been started in the sixties and been completed by the seventies, it could have added something like Rs.1,000 *crores*[1] annually to Nepal's revenues. Even after allowing fully for Nepal's domestic consumption, Karnali might have saved India billions of dollars on oil imports after the hike in oil prices. Future generations may well wonder why this compact of self-destruction was not overcome with sagacity, foresight and sensitive diplomacy on the part of the two countries' (Verghese and Iyer 1993).

Even though the Nepal-India Joint Committee on Water Resources (JCWR) had decided to initiate consultations in respect of development of the Karnali Multi-purpose Project, for which the Karnali Coordination committee already exists, no steps appear to have been taken so far.

3.5.3.2 Saptakosi Multi-purpose Project

The Saptakosi High Dam-cum-Sunkosi Storage-cum-Diversion Scheme envisages power to the tune of 3,897 MW and an irrigation potential of 546,000 ha in Nepal, and 9,76,000 ha in India, as per a JICA study completed in 1985. The project envisages a high concrete dam, 269 m, high at Barahkshetra. The Sunkosi Storage-cum-Diversion Scheme, with an installed power capacity of around 93 MW, is estimated to irrigate 175,000 ha in Nepal. The total project cost would be around US$ 3 billion at 1985 prices. The attraction of this project for Nepal is to gain access to the sea

[1] One crore = 10 million (Rs. here refers to Rupees, the currency of India).

by utilizing the navigational benefits to be accrued from the project in addition to the large area of land that could be irrigated from the Sunkosi-cum-Kamala Diversion Scheme. Many in India, particularly in Bihar, view this ambitious project as a way to tame the braided and ever-shifting Kosi river, which is called the 'Sorrow of Bihar', causing large-scale flood damage there.

An MOU was signed between Nepal and India on January 9, 1997 to initiate a joint DPR study for the Kosi High Dam as well as the Sunkosi Storage-cum-Kamala Diversion Scheme. However, it was in mid-2004 that the joint study of the project was undertaken by Nepal and India. This is expected to be completed within three years, with the cost of investigation and studies for DPR to be borne by the Government of India. The final DPR is to be prepared after incorporating the comments of both governments.

The Inception Report states that the benefits to be studied are flood control, irrigation, hydroelectric power and navigation. Even though the benefits may not have been necessarily mentioned in this order in the Inception Report, it is true that the preamble of the Revised Kosi Agreement (1966) mentions that the construction works would be undertaken for the purpose of flood control, irrigation, generation of hydroelectric power, and prevention of erosion. The Saptakosi and Sunkosi are to be optimised in relation to each other and the development of Kosi Inland waterways is to be done for linking it with National Waterway No. 1 (Kolkata-Allahabad) of India.

3.5.3.3 Pancheshwar Multi-purpose Project

The project comprises a 315 m rock-filled high dam at Pancheshwar and a total installed capacity of 6,480 MW. By regulating the river with the help of a re-regulating dam at Rupaligad, it is possible to provide 240 MW of additional power and year-round irrigation of up to 93,000 ha in Nepal, together with about 1.61 million ha in India. The total implementation cost as per Nepalese DPR is US$2,980 million at 1995 prices. The economic marginal production cost has been estimates at 3.4 US cents/KWh.

This project comprises the major component of the treaty between Nepal and India concerning the Integrated Development of the Mahakali River, including Sarada Barrage, Tanakpur Barrage and Pancheswar project. Some of the major provisions of the treaty include:

- Mahakali River is a boundary river in major stretches between the two countries.
- Both countries have equal entitlements to the utilisation of the waters of the Mahakali River without prejudice to their respective consumptive uses.
- The project would be designed to produce the maximum total net benefit. All benefits accruing to both the parties in the forms of power, irrigation, flood control, etc., shall be assessed.
- The project shall be implemented or caused to be implemented as an integrated project, including a power station of equal capacity on each side of the Mahakali

River. The two power stations shall be operated in an integrated manner and the total energy generated shall be shared equally.
- The cost of the project shall be borne by the parties in proportion to the benefits accruing to them.
- A portion of Nepal's share of energy shall be sold to India.
- The quantity and price of such energy are to be mutually agreed upon between the parties.
- Water requirements of Nepal shall be given prime consideration in the utilisation of the waters of the Mahakali River.
- The DPR shall be finalized within six months from the date of the treaty coming into force.
- Project benefits shall be assessed on the basis of, *inter alia*, savings in cost to the beneficiaries as compared with their relevant alternatives available. Irrigation benefits shall be assessed on the basis of incremental and additional benefits due to augmentation of river flow and flood control benefits shall be assessed on the basis of the value of work saved and damage avoided.
- The treaty precludes the claim in any form by either party on the unutilised portion of the shares of the Mahakali River of that party.

The Mahakali treaty was ratified by a two-thirds majority in Nepal's Parliament on 20 September 1996. In principle, the treaty has for the first time established India's recognition of downstream benefits such as irrigation and flood control. Similarly, the assessment of project benefits on the basis of, *inter alia*, savings in cost as compared with relevant alternatives (avoided cost, or alternative Indian hydropower projects?) has also been recognised. The treaty has also resolved the Tanakpur imbroglio, which was embarrassing to India. Furthermore, it has provided continuity to India's prior use of the Mahakali waters since the 1920 Exchange of Letters relating to the development of the Sarada canal project in the boundary river, particularly in light of the fact that the Banbassa Barrage was about to come to the end of its useful life. There have been ardent supporters of the treaty as well as those who are critical of it. Here are some opinions put forward on the defects of the treaty:

- 'A treaty is now in effect wherein Nepal's rights have been specified but not India's, where a joint detailed project report (DPR) was not prepared beforehand, where the ownership status of the head and tail reaches of the Mahakali remain contested and in which nothing is clear either about the price at which generated electricity will be bought and sold or the principles by which such a price is to be fixed.'
- 'Have Nepal's water rights saved in Tanakpur been further protected by the Mahakali Treaty or has it been eroded? Because Nepal's rights over the waters of the Mahakali have been limited to as low as 4 per cent, it is quite clear that much has been lost in the agreement' (Gyawali 2001).
- The most singular and significant element of the 1996 ratified Mahakali Treaty is Nepal's acquiescence to '...without prejudice to their respective existing con-

sumptive uses of the waters of the Mahakali River'. Unlike Nepal, India has already developed vast irrigation canal networks that can be used to justify any quantity of existing consumptive uses. Also, the letter of exchange between the two Prime Ministers '... the Treaty precludes the claim, in any form, by either party on the un portion of shares of the waters of the Mahakali River...' gives free and unfettered control over Nepal's portion of the waters to be impounded by the Pancheshwar Dam'. (Pun 2001).

Protracted Non-Concurrence over the Pancheswar DPR

According to the Treaty, the joint DPR of the Pancheswar Multi-purpose Project should have been prepared within six months of the effective date of the Treaty, i.e. June 5, 1997. However, on account of some fundamental differences that could not be resolved solely at bureaucratic level, the protracted exercise has to date failed to bear any fruit. Some of the outstanding issues that have stymied the progress of the DPR for the past 10 years in spite of further joint study and investigation are:

- Bilateral treaty versus unilateral decisions; for instance, Nepal's parliamentary strictures after the signing of the treaty, which may not be binding on the party;
- Existing consumptive uses of the waters of the Mahakali in regard to the pre- and post-Pancheswar scenarios;
- Unutilised portion of the Nepalese share of water;
- Issue of Kalapani entangled with the preparation of the DPR.

Use of the Mahakali (Sarada) river water during four months of the rainy season by the Lower Sarada Barrage in the Sarada Sahayak command area (2 million ha) claimed by India as prior use has not been acceptable to Nepal. On the issue of the effective date of the Treaty, June 5, 1997, however, on account of some fundamental differences that could not be resolved solely at the bureaucratic level, the protracted exercise has to date failed to bear any fruit. Nepal believes that some of the existing water use from the Lower Sarada Barrage, located 160 km downstream of the Sarada Barrage, lies beyond the purview of the Mahakali Treaty.

While India wants the reregulating dam to be located at Purnagiri, some 61 km downstream of the main dam, Nepal wants it to be located at Rupaligad due to socio-environmental issues and investment problems. However, India has agreed to examine both options.

Sharing of Benefits and Costs

The DPR prepared by Nepal assesses the annual benefits in terms of power at US$626.7 million (75 per cent), irrigation benefits at US$204.9 million (24.6 per cent) and flood control benefits at US$3.7 million (0.4 per cent). It also allows the

sharing of power benefit at 50:50 and the irrigation benefit at 81.5 per cent for India and 18.5 per cent for Nepal. In terms of cost sharing, of the total cost of US$2,983.1 million (100 per cent), Nepal's DPR estimates the cost of power at US$1,776.1 million (59.5 per cent) and irrigation and flood control at US$1,207.0 million (40.5 per cent). Therefore, Nepal's portion of the overall cost has been estimated at US$1,111.34 (37.25 per cent) and that of India at US$1,871.76 (62.75 per cent).

The economic evaluation criteria adopted by India suggest the irrigation cost sharing between Nepal and India at 40 per cent and 60 per cent respectively. It also assesses the cost allocation between power and irrigation at US$2,601.2 million (87.2 per cent) and US$381.9 million (12.8 per cent). This amounts to the overall cost sharing between Nepal and India at US$1,300.64 million (44 per cent) for Nepal and US$1,682.46 million (56 per cent) for India.

Thus, it is evident that there is a divergence between the two countries on a common methodology of cost sharing of the project in proportion to the benefits.

In general, India's stand is that it does not obtain much irrigation and flood control benefit from storage reservoirs constructed in Nepal. Moreover, India does not allow independent research and investigations into the downstream benefits within its territory. This was demonstrated when studies were being conducted for the Multi-purpose Karnali Project under World Bank funding. At the moment**,** it seems that an irrigation command area study on the Indian side will also be undertaken in the case of the Saptakosi High dam study.

Nepal's objective from such developments is to be able to generate power as cheaply as possible and to sell electricity at as high a price as it can get. For this, Nepal would need to ensure (assure India) that the non-power benefits of multi-purpose projects should be fully evaluated in contrast to India's just-mentioned prevailing stand.

Nepal has incorporated the well-known Article 126 into its constitution that requires a two-thirds majority parliamentary approval for projects of a 'pervasive, serious and long-term nature'. The inclusion of this provision compels the need for a national consensus for large-scale development projects where sharing of natural resources is involved. This is thought to improve Nepal's bargaining position on large multi-purpose projects of bilateral nature.

3.6 Other Multi-purpose Projects

In the case of projects on those medium rivers that that have been fully by India in downstream reaches, India's tendency is to prevent international agencies from taking part in any of Nepal's development efforts, let alone multi-purpose projects. India is thus perceived to be playing a restrictive role in Nepal's effort to develop her water resources on medium-sized rivers, through its influence on international financial institutions whose support Nepal desperately needs. This has been felt particularly in the case of the Kankai and West Rapti multi-purpose projects.

The following is a description of some other identified multi-purpose projects:

3.6.1 Kankai Multi-purpose Project

The Kankai Multi-purpose project has been studied to feasibility level in 1978, 1985 and more recently in early 2000. The project is located in the south-easternmost part of Nepal, in the district of Jhapa of Mechi zone. The irrigation command area is located in Jhapa while the reservoir and its catchments lie in llam. Under the project development programme, a net area of 67,450 ha will be irrigated under a gravity system. Besides, the water resources of the project will allow construction of a power plant with an installed capacity of 38 MW, associated with an annual power generation of 194 GWh. The reservoir has been planned to hold an active storage of 730 million m^3 with additional flood storage capacity of 350 million m^3, and would have submerged an area of about 50 km^2.

The feasibility study of the Kankai Multi-purpose Project for developing 38 MW of power and extending irrigation over 57,000 ha, completed in 1978 with West German funding, was proposed to the ADB for project financing. The project was stalled because India, wanting to protect its uses downstream, questioned the project. The Kankai River forms a part of the Koshi-Mechi Link of India's proposed River Linking Project, which originates from the proposed Saptakosi High Dam and travels east to the border river Mechi, catching the Kankai River en route (Ibid).

In 1985, Electricite' de France (EDF) produced a Further Feasibility Study Report of the project, which suggested a 85 m height sand-gravel type dam to a capacity of 60 MW and provide year round irrigation water to 67,450 ha (Association for Research and Management Services Pvt. Ltd. 2006).

3.6.2 Kamala Multi-purpose Project

The Kamala Multi-purpose project would involve the construction of a storage dam on the Kamala River, on the boundary between the eastern and the central development regions straddling the districts of Dhanusha and Siraha. The water from the Kamala River would be enough to irrigate about 33,000 ha, which would encompass the existing 25,000 ha Kamala irrigation project and a few farmer-managed schemes. All of these schemes now have monsoon capabilities—the project is intended to provide them with year-round water supplies. The project would also generate about 75 GWh per year of hydropower with an installed capacity of 30 MW. This is also a project on a medium river where India insists on the need for consultation with respect to its downstream prior uses. This river is regarded as important for both Nepal and India from the irrigation, power and flood control point of view and forms part of the Sunkosi Storage-cum-Diversion Scheme, which involves diverting water from the Sunkosi River to the Kamala River to augment lean season flow. This project has been conceived to be viable both as 'stand alone' and as the first stage of the Sunkosi-Kamala Diversion Scheme as described above under the Saptakosi Multi-purpose Project. The ongoing Saptakosi High Dam and

Sunkosi Storage-cum-Kamala Diversion Scheme joint study is envisaged to conduct a feasibility study of the Kamala Multi-purpose Project.

3.6.3 Sunkosi-Kamala Multi-purpose Project

The Sunkosi-Kamala diversion project would involve some 72 m^3/s of water to be diverted from the Sunkosi River to the Kamala river, enabling a total NCA of 138,000 ha, to be provided with year-round water supplies. The service area would extend from Saptari district in the east to Mahottari or possibly Sarlahi district in the west, providing opportunities for enhanced agricultural production on a large scale. A small weir across the Sunkosi River near Kurule would divert the water through a 16.6 km tunnel and a 61.4 MW associated powerhouse to the Kamala River. The diverted water, together with its natural water, would be re-regulated with the help of the Kamala dam, located about 20 km upstream of Chisapani village, to provide irrigation facilities and further power generation of 32 MW. Considering that the Sunkosi River has a 90 per cent reliable flow of 126 m^3/s, there is scope for increasing its command area to 160,000 ha, which would overlap some areas that would be covered by the Bagmati Multi-purpose Project. The ongoing Joint Indo-Nepal study is undertaking the feasibility study of this project.

3.6.4 Bagmati Multi-purpose Project

The Bagmati Multi-purpose Project was first identified and studied at pre-feasibility level by Nippon Koei Ltd. between 1967 and 1972. In 1977, the German Mission for Water Resources Development in Nepal carried out an identification and appraisal study of the project (Association for Research and Management Services Pvt. Ltd. 2006).

The Bagmati Multi-purpose Project calls for the construction of a 117 m high rock-fill dam on the Bagmati River, upstream from the Bagmati barrage. The powerhouse would have an installed capacity of 140 MW, and would generate 540 GWh/yr of firm energy. The regulated flow released from the dam would permit a total NCA of 120,000 ha to be provided with year-round irrigation if the system is operated to meet irrigation needs as the first priority. If the need is for hydropower dominant-operated conditions, the viable NCA would be reduced to 76,200 ha. A compromised operating pattern could well permit the NCA to be increased to over 100,000 ha. The proposed command area encompasses the run-of-river Bagmati irrigation project, which is now being implemented to provide mainly monsoon irrigation for about 68,800 ha.

The present Saptakoshi-Sunkoshi joint Indo-Nepal study has been directed to undertake a preliminary study of the Bagmati Multi-purpose Project.

3.6.5 Sapta Gandaki Multi-purpose Project

The Sapta Gandaki Hydroelectric Power project was studied in 1983 as a hydropower-only project. However, considering the fact that there are no water resources to provide water to the irrigable land in adjoining Chitwan and Nawalparasi districts, it has now been considered as a multi-purpose project. The irrigation potential of this project is estimated to be about 40,000 ha. The project would involve construction of a 60 m high rock-fill dam with installed capacity of 225 MW, associated with an annual energy generation of 757 GWh. This project would encompass agency-managed irrigation systems like the Chitwan Lift, Khageri and Pithuwa irrigation projects, etc., and numerous farmer-managed irrigation systems. This was a project that was in Nepal's generation expansion plan but it was unfortunately overruled in favour of the 402 MW Arun III that was also aborted by the World Bank after an eight year exercise.

3.6.6 West Rapti Multi-purpose Project

The West Rapti Multi-purpose Project was studied in 1976 by Lahmeyer International Ltd. It comprises three irrigation sub-project areas, viz Kapilvastu (30,500 ha), Deokhuri (9,500 ha) and Banke (40,000 ha), totalling a year-round irrigation potential of about 80,000 ha from the regulated flow of a storage dam of about 90 m high that would be constructed at Bhalubung on West Rapti river. Apart from the irrigation benefits, it would generate hydroelectricity of about 107 MW (Bhalubang 62 MW, Surahi Naka 45 MW). The reservoir would be situated across the Rapti downstream of the confluence of the Jhimruk and Madi rivers and would have a storage capacity of 640 million m^3. Bhalubang power station would be located at the toe of the dam. The water from this power station would be to irrigate Deokhuri and Banke areas. A power channel consisting of tunnels, intermediate ponds and open canals would lead a part of the water from the reservoir to the east to feed the Surahi Naka powerhouse. The tailrace water would be utilised to provide irrigation to Kapilvastu area. This is also a medium river project where differences exist with India, as has been evidenced by India's objection to the external funding of the Sikta Irrigation Project, as already mentioned. India's interest is more on flood control rather than on irrigation and power development. It is because the construction of a dam on the Rapti would lower India's downstream benefits (Upreti 1993). The Indian stand is that its interests would be suitably accommodated through appropriate phasing so that planned diversions in Nepal coincide with and do not precede the construction of a projected dam which will provide the storage to meet the requirements of both countries (Verghese 1990). As of now, this project does not feature at all on the agenda of the Joint Committee on Water Resources (JCWR) meetings.

3.6.7 Bheri Babai Multi-purpose Project

This project was originally identified for providing year-round irrigation to about 40,000 ha in Bardiya district of Mid-western Development Region by diverting the flow of about 35 m^3/s from the Bheri River to the Babai River associated with power generation of about 24 MW. Another study indicates that a diversion of flow of 58.2 m^3/s is possible, which would generate firm energy of about 233 GWh annually and provide irrigation to about 72,000 ha in the area of the Sikta Irrigation Project. However, the diversion of the Bheri River would reduce the energy that would be available from the Karnali project. Without implementing the Bheri-Babai diversion scheme, the Karnali project would produce average annual energy of 21,218 GWh/year. With a diversion of 58.2 cumecs, the energy would be reduced to 20,736 GWh/year, implying an average reduction of about 392 GWh/year. However, the early benefits that would be obtained from the energy generated and from the increased agricultural production possible due to the early implementation of the project compared to the Karnali Multi-purpose Project, would outweigh the value of the energy loss. Therefore, the Master Plan Study for Water Resources Development of the Upper Karnali River and Mahakali River Basins conducted by JICA has given the highest priority to the implementation of the Bheri-Babai diversion project.

3.7 Social and Environmental Aspects of Multi-purpose Projects

Environmental and social issues in water resources projects gained attention during the 1990s with the study of the Arun-3 project. During that period, Nepal put in place the EIA Guidelines 1993, the Environmental Protection Act (EPA) and the Environmental Protection Rules (EPR) 1997, and the EPR was later amended in 1998. The Water Resources Strategy 2002 and the National Water Plan (NWP) 2005 focus on social and environmental concerns as a key component of water resources development. With respect to the strategic environmental issue of land acquisition, displacement and resettlement, the Environmental (Management) Plan under the NWP envisages finalising the compensation and resettlement guidelines at a strategic level and developing project-specific compensation and resettlement action plan at the project level under mitigation measures. With respect to implementation, it aims to develop practical guidelines of compensation and resettlement (ACRP) at the strategic level and implementation of compensation and resettlement action plan at the project level.

The Pancheswar, Karnali and Saptakosi high dams, if constructed, will be amongst the highest in the world and will submerge large areas of scarce agricultural and forest lands and displace tens of thousands of people and substantially alter the ecology of the country. There are also the attendant problems of

seismicity and the high rate of sedimentation of the Himalayan rivers to be seriously considered.

For instance, the Pancheswar high dam is envisaged to be one of the highest in the world. Apart from considerations of the geology, seismicity and topography of the dam site, there are also issues of economics and ethics delimited by social and environmental concerns in building a 315 m high dam that will store almost 12 billion m^3 of water, displace more than 15,000 people in Nepal and twice that number in India.

For both Pancheshwar and Saptakosi Multi-purpose projects, it has been agreed that the EIA study within Nepalese territory will be carried out as per Nepal's legal provisions and in India as per India's legal provisions.

In large multi-purpose projects, the social and human dimensions of land acquisition, displacement and resettlement of people affected by the project is likely to generate the biggest controversy in Nepal as anywhere else in the developing world. In this connection, the population estimated to be displaced by some of the identified storage projects at the time of study (the number of people likely to be displaced at present could be a lot higher) is given in Table 4:

Consideration of environmental effects on projects of significance and mitigation of significantly adverse impacts was introduced in Nepal only during the 1990s, at first due to donor requirements, and later through the country's own legislative and regulatory measures with the enactment of the Environment Protection Act (EPA) and its Rules (EPR). Apart from the barrage diversion projects constructed by India on the major rivers in the past, the first significant water-resource projects implemented by Nepal for itself that have caused population displacement were the 60 MW Kulekhani-I and 69 MW Marsyangdi hydroelectric projects, completed in 1979 and 1989, respectively. Both Kulekhani and Marsyangdi handled the issue of relocation of the population in the conventional cash compensation way. The population displaced by the projects was 3,500 and 1,776, respectively (WIDP/WECS 1998). Later studies have revealed that in both these projects, the displaced persons

Table 3.4 Population Likely to be Displaced by Various Projects

Name of Project	Installed Capacity (MW)	No. of People Likely to be Displaced
Karnali Chisapani	10,800	60,000
Pancheswar	6480	50,000
Saptakosi High Dam	3,489	75,000
Kali Gandaki-2	660	40,000
Buhri Gandaki	600	11,000
West Seti	750	4,250
Naumure	245	5,500
Bagmati	140	10,000
Kankai	60	2,000

Source: Electricity Development Centre, 1998.

have been worse off than before and compensation and rehabilitation issues had been insensitively handled in a callous manner.

The 144 MW Kali Gandaki-A Hydroelectric Project had applied the concept of environmental management rather rigorously. A post-construction environmental audit conducted in 2003 revealed that the majority of the 1,013 project-affected families (PAFs) and 160 seriously project-affected families (SPAFs) are now better off in terms of livelihood and economic standing than in the pre-project situation. This is attributed to rural electrification, appropriate compensation for the loss of assets, job training, employment opportunity, community support programmes with micro-credit facilities, together with the provision of housing for relocated indigenous *Bote* (fishermen) families. Similarly, in the ongoing 70 MW Middle Marsyangdi Project, among the 435 PAFs, 65 families have been relocated, whereas 160 SPAFs are employed by the project. Along with rural electrification, the Neighbourhood Support Programme supports schools and health posts, along with implementing skill-oriented training programmes, in the affected area.

With the rather mixed and limited experience in dealing with the social and environmental aspects of water resources projects to date, the country will have to prepare itself in earnest to incorporate within the economics of large dams, values that respect human rights and ecology, if and when multi-purpose storage projects are undertaken in the future. For this, further legislative and regulatory reforms would be necessary to address the trauma of affected people apart from the large-scale and difficult-to-predict ecological upheavals that could be triggered.

3.8 Nepal's Dialogue on Dams and Development

A national dialogue on dams and development has been underway in Nepal since January 2003 with the following mission:

'To carry out national consultations on dams and development to consider the relevance of the recommendations of the World Commission on Dams (WCD) and other bodies in the Nepalese context with the ultimate aim of recommending the development and adoption of a national guideline for improved decision-making, planning and management of dams and alternatives for Nepal.'

The World Conservation Union (IUCN)-Nepal is currently facilitating these dialogues amongst government agencies and other stakeholders, including the Nepal Water Conservation Foundation (NWCF), supported by the International Centre for Integrated Mountain Development (ICIMOD).

At a national seminar held in the course of the Dialogue on Dams and Development held on September 12, 2003 in Kathmandu, it was revealed that, amongst the 152 decisive topics suggested by the WCD Report, 28 per cent are similar to Nepal's Acts and Regulations, 48 per cent could be adjusted within the present regulatory framework, 16 per cent might be viewed academically and resolved in the long term through dialogue and 8 per cent are being practised even without specific mention in the rules and regulations. Overall, Nepal could be said to have moved considerably

forward at least with respect to its written rules and regulations regarding many of the 26 advisory guidelines supporting the five principles and seven strategic priorities mentioned in the WCD Report. However, in relation to the seventh strategic priority, i.e. sharing rivers for peace/development and security, Nepal-India treaties are, apparently, not based on international standards.

3.9 Bilateral/Regional Cooperation: Way Forward for Multi-purpose Projects

In spite of the obvious potential benefits of multi-purpose projects, very little progress has been achieved so far and may not be achieved at all unless Nepal and India, in collaboration with other coriparians, evolve and develop a practical and better framework for cooperation, particularly with respect to the apportionment of downstream benefits in a realistic and equitable manner.

The major issues that need to be agreed upon by Nepal and India for the promotion of bilateral and regional cooperation in developing large multi-purpose storage projects in Nepal appear to be the following:

- India's propensity to undervalue or even refuse to concede downstream benefits in terms of irrigation and flood control that could accrue to it from projects on larger rivers needs to be reoriented towards a more positive and equitable approach. That regulated water is a value-added product and must carry a price against the benefits enjoyed by a coriparian state must be recognised as a fair principle. India has to be more forthcoming and accommodating in regard to these matters (Verghese 2003).
- India should recognise the fact that storage in Nepal beneficially regulates the timing of water delivery to match the crop cycle during the lean season. Nepal, therefore, legitimately deserves a royalty on stored water in its territory to compensate for the dam site, which has resulted in loss of scarce natural resource, and the consequent submergence and displacement of its land and people.
- There could be a broad trade-off, with India accommodating a larger measure of Nepalese interest in the so-called local and medium rivers in return for greater leeway on the four major rivers, an arrangement that would appear to fit well with geo-national development interests. India's interest in the Kosi High Dam, for instance, must obviously exceed the stakes it has in the smaller rivers in the eastern Nepal region (Verghese 1990).
- A consensus on the power pricing principle that would result in a win-win situation for both countries with due consideration for market forces.
- Other major fundamental issues regarding multi-purpose projects in Nepal such as ownership of project, its security and sovereignty, water rights, submergence, displacement, compensation, etc., all need to be transparently discussed and agreed upon (Pun 2005).

- The proposal for what has been loosely termed an inter-linking of rivers is not a 'project' but a concept (Verghese 2003). It is 'necessary' for India to 'consult' Nepal in a transparent manner on its river-linking project that has five components within Nepal (Pun 2005).
- In keeping with the transnational nature of the Himalayan rivers, India must rethink its historical insistence on bilateralism in relations between cobasin states and not shy away from regional cooperation amongst all cobasin states concerned. In this context, it may be pertinent here to recall that India and Bangladesh had formed a Joint Committee of Experts (JCE) following an MOU in 1985, which conducted a visit to Nepal in October 1986 under the "joint-approach" concept towards Nepal. The Committee was primarily set up to deliberate on the sharing of rivers common to the two countries and the augmentation of the dry season flows of the Ganga at Farakka. 'India saw this not as a tripartite study or a trilaterisation of the Ganga waters issue, but as a bilateral Indo-Bangladesh approach to Nepal for the information needed for arriving at a preliminary finding…The 'joint approach' to Kathmandu had produced no results, and the matter was not pursued seriously thereafter.'(Verghese and Iyer 1993).

3.10 Conclusion

The geographical setting of Nepal is such that all the rivers originating from or flowing through Nepal drain into the Ganges system. Nepal, Bangladesh, China and India share a substantive portion of the waters of the Ganges Basin. Eventually, in order to harness all the waters of the region in a sustainable and optimal manner, the countries within the Ganges Basin will need to cooperate not only bilaterally but also regionally.

Nepal, with its limited consumptive and also investment capacity, cannot venture into multi-purpose storage projects of a substantial scale in the foreseeable future. Nepal will have to sacrifice a lot of prime agricultural and forest land and confront the problem of displacement and rehabilitation of tens of thousands of people, if it is to store monsoon water for the sake of downstream benefits, most of which will be accrued beyond its borders. At the same time, hydropower energy and downstream benefits arising from reservoir regulated flows in terms of irrigation, flood benefits and even navigational use will be of immense value for the people of the Ganges Basin and may not be ignored for long. A genuinely regional/sub-regional joint effort would, therefore, need to be pursued earnestly to bring the riparian stakeholders together in order to deliberate and work out a common strategy to arrive at a win-win situation for each member country. Hence, it is the need of the hour that the cobasin countries establish an inter-governmental institution, not only bilaterally but also regionally, to plan and set parameters of identified storage dam projects based on optimisation/maximisation of net total benefit derivable from the multi-purpose uses of regulated flow (Shrestha 1995).

Chapter 4
Water Resources Utilisation: Irrigation

Som Nath Poudel

4.1 Background

For almost half a century, Nepal's economic development efforts have centred on its water resources. The available potential figures have been providing a distorted image to the wider population as well as to planners. The bountiful water resources available within the country are turning out to be more of a curse than a blessing. Despite the gifts of fertile land, warm climate, abundant water and a vast hydropower potential, the quality of life is still very poor, with high incidence of poverty, unemployment and a degrading ecosystem. All the prevailing challenges call for a new approach to water-sector development.

Water has multifarious uses, the most important ones being irrigation and drinking water supply, including sanitation. In addition, one should not forget the industrial needs. Other uses like hydropower generation, navigation, recreation, etc., are basically non-consumptive ones (if trans-basin diversions are not carried out during the process). This writing primarily focuses on the use of water for agricultural purposes. The agriculture sector of all the co-riparian countries has been fundamental to economic development and poverty alleviation. More than 85 per cent (in Nepal's case, this figure could be much higher, above 90 per cent) of utilised water resources within the sub-basins are consumed by this sector alone. Proper use of irrigation water in an economical, efficient and environmentally sustainable way can solve most of the problems of severe water scarcity faced or to be faced by the South Asia region. Hereunder, water-related issues in five northern sub-basins, namely Ghagra (Karnali), Gandak, Burhi Gandak, Kosi and Mahananda of the Ganges, which transport all the transit flows from Nepal, are analysed. Water availability and needs of co-riparian states are also discussed in brief.

S. N. Poudel (✉)
Former Executive Secretary, Water and Energy Commission Secretariat Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
e-mail: alek@wlink.com.np

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Table 4.1 Basic statistics of the Ganga basin up to Farakka

Country	Population (Million)	Catchment Area (M ha)	Cultivable Area (M ha)
China	0.20	3.74	0.10
Nepal	24.00	14.72	3.30
India	360.00	83.14	58.0
Total	384.2	100.58	61.4

Sources: Rao (1979), Verghese and Iyer (1994), and Poudel (2003);
Note: M ha: million hectares.

4.2 Profile of the Ganga Basin and Related Sub-basins

The Ganga basin extends from the Himalayas in the north to the Vindhyas in the south and from the Aravallis in the west to Bangladesh and West Bengal (India) in the east, and finally forms a sprawling, integrated Ganga-Brahmaputra-Meghna international drainage system with a common terminus at the Bay of Bengal. The discussion of the Ganga basin here is limited only up to the Farakka barrage. This basin is spread out in three countries, viz China, Nepal and India, and covers approximately 100.58 million ha (up to Farakka) in total. The distribution of the population, catchment areas and cultivable area within the basin is shown in Table 4.1.

After the confluence of the Bhagirathi and Alakhnanda, the Ganga river traverses north India before bifurcating into two main arms below Farakka. There are nine big sub-basins, three (Yamuna, Son and Pun Pun) in the south and six (Gomti, Ghagra, Gandak, Burhi Gandak, Kosi and Mahananda) in the north. Except for the Gomti, all the five northern tributaries flow through or begin from Nepal and meet the main stem of the Ganga at different locations. Salient features of these five sub-basins are provided in Table 4.2.

The five sub-basins related to Nepal include 32.4 per cent of the population, 29.6 per cent of the catchment area and 23.1 per cent of the cultivable area of the Ganga basin as a whole. But water availability within these five sub-basins is 270 billion m^3 (bcm), which is 55.8 per cent of the total amount of 484 bcm. This shows that all these sub-basins are two times richer in water resources and two times poorer in economic indicators than other parts of the basin. In comparison to other parts of

Table 4.2 Features of Five sub-Basins of Ganga Flowing through Nepal

Country	Population (Million)	Catchment Area (M ha)	Cultivable Area (M ha)	Irrigable Area (M ha)
China	*0.20	3.74	0.10	0.10
Nepal	24.00	14.72	3.50	2.20
India	*100.00	11.32	10.50	8.00
Total	124.20	29.76	14.10	10.30

Sources: Rao (1979), Verghese and Iyer (1994), Poudel (2003) and assessment.
* These figures are tentative estimates and should be cautiously interpreted.

Table 4.3 Average Annual Share of Water Availability in Five Sub-Basins

Country	Water Availability (bcm)			
	Five Sub-basins		Ganga at Farakka	
China		13.0	13.0	2.7%
Nepal		185.0	185.0	38.1%
India (Upstream of Nepal)	16.0	72.0	286.0	56.9%
India (Downstream of Nepal)	56.0			
Total		270.0	484.0*	100.0%

Sources: Rao (1979), Verghese and Iyer (1994), Poudel (2003) and assessment.

the Ganges basin, both surface and groundwater are poorly utilised. Annual shares of water availability in proportion to the catchment areas in the respective state boundaries are given in details in Table 4.3, and the locations of the river systems and their capacities are shown in Fig. 4.1.

The Ganga basin is endowed with extensive groundwater resources as well. The rechargeable groundwater potential of the basin is 128.7 bcm, of which the figure for the five sub-basins is estimated to be about 40 bcm.

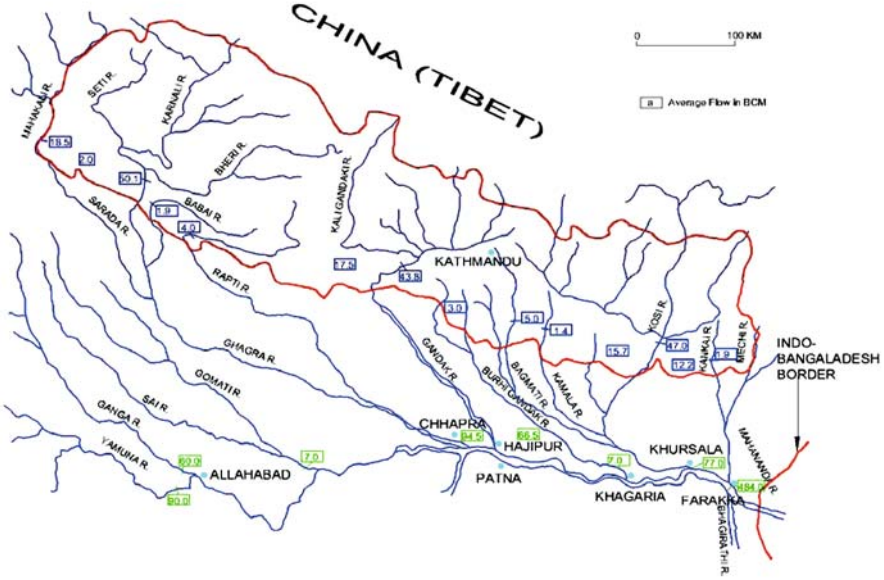


Fig. 4.1 Average annual flows (in billion cubic meters) of the Ganga and its tributaries

4.3 Hydrology and Climate of Sub-Basin

Numerous (more than 6,000) rivers and rivulets culminating into five sub-basins with a total drainage area of 298,471 km² flow into the Ganges basin. About 49.3 per cent of the drainage area is contained within Nepal. Out of the five sub-basins, three (Ghagra, Gandak and Kosi) originate in the Himalayas and carry snow-fed flows with significant discharge, even in the dry season. The Mahananda originates in the midlands of the Mahabharat range and is fed by precipitation as well as groundwater regeneration, whereas Burhi Gandak originates in the southern Siwalik (Churia) range. These two rivers are characterised by wide seasonal fluctuations in discharge. Details of the catchment area and annual runoff are given in Table 4.4.

In the catchment areas of these rivers, the climate varies widely from the summer tropical heat and humidity of the flat plains (Terai) to the cold dry continental and alpine winter climate in the middle and northern mountainous regions. The amount of precipitation and range of temperature vary considerably. The sub-basins have two rainy seasons: one during the summer from June to September, when

Table 4.4 Catchment Area and Runoff

River System	Tributary	Catchment Area (km²)					Av. Annual Runoff (bcm)	
		China	Nepal	India	Bangladesh	Total	Nepal Border	Ganga-Confluence
Ghagra (Karnali)	Sarada, Karnali, Babai, Rapti, Others	1,110	60390	u/s9,850 d/s56,600 66,450	-	127,950	76.5	94.5
Gandak (Narayani)	Naray-ani, Others	3,860	34,920	7,620	-	46,300	61.3	66.5
Burhi Gandak	Smaller Area Birgunj Area	-	3,500	6,650	-	10,150	3.0	7.0
Saptakoshi	Kosi, Bag-mati, Kamala, Others	32,260	40,383	20,920	-	93,463	69.1	77.0
Mahananda	Babai, Mechi, Others	-	8,088	11520	1,000	20,608	14.1	25.0
Total		37,320	147,181	103,310	1,000	298,471	224.0	269.8

Sources: Rao (1979), Verghese and Iyer (1994) and Poudel (2003).
Note: u/s: -upstream; d/s: -downstream and bcm: billion cubic metres.

the monsoon brings about 80 per cent of its total annual rainfall, and the other in winter. Average annual rainfall of all the five sub-basins is about 1,830 mm. In the hydrological cycle, about 60 per cent of all rainfall drains off as surface runoff. Of the remaining 40 per cent, some are retained in the form of snow and ice in the Himalayas, some percolate through the ground as groundwater and some are lost due to evaporation. In addition to abundant surface water resources, the area is also endowed with more than 40 bcm of rechargeable groundwater, of which Nepal's share in the Terai is well above 8 bcm.

4.4 Present Status of Agriculture and Irrigation

The five sub-basins have all the resources that make for agricultural abundance and prosperity, but the agriculture population (more than 80 per cent of the total) living therein is amongst the poorest, even in South Asia. The gap between the potential and actual development in this area is probably the greatest in the world. In ancient times, basically when Buddhism was flourishing in the plains of these basins, agricultural produce was plentiful and people enjoyed the highest moral and economic standards. People from far-off countries used to visit the area for learning and scholarly activities. Substantial parts of this land of culture were under irrigation and growing of two crops during the year was a normal phenomenon. During the last two centuries, the situation in these sub-basins has gradually worsened into an agriculturally, economically and even politically backward hinterland and its impoverished people exposed to food scarcity and poverty. The green revolution that spread mostly over the northwest and south India was rarely replicated in this neighbouring country.

The huge water potential of the area has been neither properly harnessed for productive purposes nor regulated to prevent floods, landslides, erosion and waterlogging. Small land holdings of the majority of the farmers are another bottleneck to necessary developmental efforts. While 33 per cent of the total agricultural land is operated by the top 6 per cent of the elite population, the bottom 40 per cent of the population operates only 9 per cent of the total agricultural land. Over 40 per cent of the agricultural households own less than half an hectare of land (Ahmad et al. 2001). Crop production in this area is substantially lagging behind, even in comparison to other parts of the Ganges basin.

Expansion of the areas under cultivation has already more or less halted. The increase in cropping intensity has not kept pace with the population growth for the past three or four decades. The impoverished population is migrating in large numbers to other parts of India or abroad. Irrigation has already suffered neglect and very little attention is paid to agricultural research aimed at raising yield levels and to the introduction of new and more remunerative crops. Status of agriculture and irrigation in the discussed area is shown in Table 4.5.

Table 4.5 Present Status of Agriculture and Irrigation

Country	Net Sown Area ('000 ha)	Irrigation Infra structure Potential ('000 ha)	Irrigation Facility Utilised ('000 ha)	% of GW in Irrigation	Yield of Aggregate Food grains (tons/ha)
China	30	Under Planning	-	-	NA
Nepal	2,640	1,250	1,050	18	1.99
India	9,500	4,150	3,450	45	1.55
Total	12,170	5,400	4,500		

Sources: Verghese and Iyer (1994), Subba (2001), WRS (2002), Poudel (2003) and assessment.

The yield levels given in the table can be compared with the average yields recorded in Indonesia, Japan and South Korea in the year 1990, which are 3.6, 5.5 and 5.7 tons respectively. These yields are to be compared with 3.3 tons obtained in Punjab and 2.9 tons in Haryana. As things stand at present, the five sub-basin areas are among the poorest in South Asia.

4.5 Role of Irrigation in Nepalese Agriculture

Agriculture is the largest sector in the Nepalese economy. It contributes 39 per cent of GDP and 80 per cent of employment (2002/03), while the investment in agriculture amounts to some 12-15 per cent of gross domestic investment. Production figures (from both irrigated and un-irrigated land) are given in Table 4.6 and plan expenditure on irrigation and agriculture in Table 4.7. Average yields of principal crops are given in Table 4.8.

The role of irrigation in Nepalese agriculture is not up to expectations. Gross irrigated area (currently about 1.5 million ha, including double cropping) is about 35.2 per cent of the total cropped area, and the production of principal crops is only 45.5 per cent of the total. Irrigation should enable higher productive potential from land and significant production response from associated use of high yielding varieties, fertilisers and other inputs. The production impact of irrigation occurred

Table 4.6 Production of Principal Cereals from Irrigated and Unirrigated Land

Year	Net Sown Area ('000 ha)	Net Irrigated Area ('000 ha)	Principal Crop Production (Metric Tons)			Cropping Intensity (%)	Irrigation Intensity (%)
			Irrigated	Un-irrigated	Total		
1957	1,392	496	1,092	1,749	2,841	133	120
1962	1,502	545	1,145	1,989	3,134	134	120
1970	1,980	570	1,461	1,827	3,288	126	125
1980	2,326	690	2,157	1,672	3,829	124	130
1992	2,597	950	2,899	2,134	5,033	141	135
1997	2,640	1,030	3,083	3,248	6,331	158	140
2002	2,640	1,050	3,300	4,147	7,247	163	144

Sources: Shah and Singh (2001), Poudel (2003) and Economic Survey (2003/04).

Table 4.7 Plan Expenditure in Agriculture and Forestry

Plan Period	Total Budget (NRs Million)	Expenditure % of Total Budget	
		Irrigation	Agri .+Irr.+Forestry
First (1957-62)	479.1	7.1	12.1
Second (1963-65)	985.5	8.0	11.1
Third (1966-70)	2,538.7	5.4	14.7
Fourth (1971-75)	5,520.9	3.6	14.3
Fifth (1976-80)	13,408.7	6.3	17.8
Sixth ((1981-85)	32,264.1	7.3	20.1
Seventh (1986-92)	122,995.6	7.1	17.2
Eighth (1993-97)	200,822.0	6.8	15.6
Ninth (1978-2002)	371,582.0	4.3	12.2
Tenth (2003-08)	287,703.2	2.6	7.2

Sources: Shah and Singh (2001), Poudel (2003) and Economic Survey (2003/04).
*Targeted.

through four routes: cultivated area, expansion during 1960-80, cropping pattern shift from 1980 onwards, productivity enhancement, and increase in reliability in the '1990s and thereafter. Ascertaining irrigation's precise contribution is, however, difficult. Over 70 per cent of irrigation being of a supplemental nature, its contribution to the agricultural growth is estimated to be on average about 21 percent. With nearly all the arable land now under cultivation and limited progress in technological breakthroughs for rain-fed crops, irrigated agriculture in future will remain a key contributor to agricultural development.

Inability to implement agricultural programmes through the identification of irrigation systems with and without year-round water resources; lack of appropriate repair and maintenance of irrigation systems; lack of expected development of shallow tubewells; damage to irrigation structures and irrigated areas due to unexpected floods and landslides; and inability to increase productivity from available irrigation facilities due to poor coordination between agricultural and irrigation agencies are the main challenges facing this sector.

To address these problems, the government plans to take measures to support agricultural productivity growth through the development of new irrigation systems and expansion of existing ones, and enhancing water utilization capacity of irrigation systems through appropriate repair and maintenance, technology and training.

Table 4.8 Average Yield Levels of Principal Crops

Crops	Irrigated Segment (tons/ha)				Un-irrigated Segment (tons/ha)			
	1957	1980	1992	2002	1957	1980	1992	2002
Paddy	2.10	2.90	3.00	3.50	1.80	1.90	1.95	2.00
Wheat	1.25	1.30	1.60	1.80	1.20	1.20	1.25	1.30
Maize	2.10	2.50	3.00	3.20	1.85	1.80	1.70	1.70
Others	1.40	1.50	1.60	1.60	1.00	0.95	1.00	1.00

Sources: Shah and Singh (2001), Poudel (2003) and Economic Survey (2003/04).

Also, self-reliant beneficiary groups are also to be developed by involving consumers in participatory irrigation development.

Although the pivotal role of irrigation in production enhancement has been recognised by everyone, recent trends in the sub-sector are surprisingly moving away from the priority list. The maximum budget expenditure figure of 7.3 per cent of average total planned expenditure in the Sixth Plan has already reduced to 2.6 per cent of the total yearly allocation in recent years. In addition, it would be pertinent to mention here that, in the Fifth and Sixth Plan periods, less than 15 per cent of the total expenditure was spent on overhead costs while in recent years almost half of the budget is indirectly spent as overheads. A limited amount is spent on the development of infrastructure and the rest on institutional development and operation and maintenance (O&M).

In terms of the relative share in irrigation potential that has been created, surface water in the canals accounts for 81 per cent, groundwater (with a major private sector involvement) for 18 per cent and other irrigation technologies for less than 1 per cent (2002). The irrigation potential created and utilised over different plan periods is given in Table 4.9.

Over the 1957–2003 period, irrigation potential increased by 2.52 times while the use of groundwater began only in 1980. The expansion of irrigation from the mid-1970s provided an enabling environment for the use of new high-yielding varieties of seeds and fertiliser, pushing the production frontier to a new height. The major gainers in terms of both productivity and share of area under cultivation were wheat and rice. Between 1957 and 2002, the average yield of food grains in irrigated land increased from 2.04 to 2.75 tons/ha, and in unirrigated land from 1.95 to 2.6 tons/ha. Irrigation expansion has also imparted a greater degree of stability to farm production. It should also be noted here that, even with the huge increase in population, the country has been largely self-sufficient in food grains. In 1957,

Table 4.9 Irrigation Potential Created and Utilised over the Plan Periods ('000 ha)

Plan Period	Irrigation Type						Management Type			
	Surface		Groundwater		Total		AMIS		FMIS	
	P	U	P	U	P	U	P	U	P	U
Pre-plan (up to 1957)	496	496	-	-	496	496	6	6	490	490
First (56/57-61/62)	546	545	-	-	546	545	11	10	535	535
Second (62/63- 64/65)	577	575	-	-	577	570	12	10	565	565
Third (65/66-69/70)	590	575	-	-	590	570	25	20	565	550
Fourth (70/71-74/75)	655	600	-	-	655	600	68	40	587	560
Fifth (75/76-79/80)	834	688	6	2	845	690	172	90	673	600
Sixth (80/81-84/85)	945	-	25	15	970	820	205	140	765	680
Seventh (85/86-91/92)	1021	885	102	65	1123	950	286	200	837	750
Eighth (92/93-96/97)	1000	910	165	120	1165	1030	292	250	872	780
Ninth (77/78-01/02)	980	900	220	150	1200	1050	320	260	880	790
Tenth (02/03- 03/04)	1025	900	225	150	1250	1050	320	260	930	796

Sources: Shah and Singh (2001), Poudel (2003) and Economic Survey (2003/04).
Notes: P: Potential; U: Utilised; AMIS: Agency Managed Irrigation System, FMIS: Farmer Managed Irrigation System.

for a population of 9 million, crop requirement was 2,862 tons (about the same as production), but the corresponding figure for 2002 is 23.5 million of the population and 7,423 tons of crops (about 2.4 per cent less than the output), respectively (see above Table 4.6).

4.6 Water Availability, Existing Use and Future Requirements

Estimated total average monthly natural flow of all the five sub-basins and existing irrigation water use within the river basins are provided in Table 4.10. During the driest period of the year, i.e. January-April, almost 50 per cent of the natural monthly average flow is already used for irrigating agriculture in the sub-basins. This scarce situation has been partially addressed by the increasing use of groundwater. Other existing uses could be calculated using the figures of 5 per cent for urban and rural domestic water supply, 10 per cent for industry and 1 per cent for various other purposes of the total net uses. This provides net 84 per cent for irrigation use alone. Thus, the figure of total net water use calculated in the catchments of the five sub-basins comes out to be 37 bcm, of which about 14 bcm is the share of groundwater.

Table 4.10 Average Natural Flow Available and Existing Irrigation Use

Months	Nepal-India Border (bcm)	Ganga Confluence (bcm)	Existing Water Use			
			Per ha (1,000m³)	Nepal 1.05 M ha (bcm)	India & Bangladesh 3.48 M ha (bcm)	Total (bcm)
January	4.4	5.3	0.60	0.63	2.09	2.72
February	3.5	4.2	0.65	0.68	2.26	2.94
March	3.7	4.5	0.30	0.32	1.04	1.36
April	4.4	5.3	0.20	0.21	0.70	0.91
May	7.4	8.9	0.50	0.53	1.74	2.27
June	19.2	23.1	1.20	1.26	4.18	5.44
July	50.3	60.6	0.61	0.64	2.12	2.76
August	59.5	71.7	0.47	0.49	1.71	2.20
September	41.2	49.6	0.31	0.33	1.15	1.47
October	16.0	19.3	0.47	0.49	1.71	2.20
November	8.6	10.4	1.00	1.05	3.48	4.53
December	5.8	7.1	0.50	0.53	1.74	2.27
Total	224.0	270.0	6.81	7.16	23.92	31.08
Groundwater				1.29	10.76	12.05
Surface Water				5.87	13.76	19.03

Sources: Verghese and Iyer (1994); Shah and Singh (2001); Poudel (2003) and assessment.
Notes: Existing use is net use excluding return flow, Irrigation intensity assumed to be 144 per cent only and average water requirement for second crop adopted only half of the actual.

For the purpose of assessing the future water requirements of the sub-basins, the following assumptions have been taken into consideration. At present, Nepal has 1.8 M ha of irrigable land out of a total of 2.64 M ha of area under cultivation. If the agricultural land is expanded to a limit of 3.5 M ha by clearing existing suitable forest area, the gross irrigable land would be about 2.2 M ha (IMP 1990). Thus, for the assessment of future requirements, net 2.0 M ha of irrigable land has been taken into consideration. Similarly, other coriparian sub-basin states have an area of 10.7 M ha of cultivable land, out of which 8.0 M ha is considered to be irrigable. With these command area figures and monthly average water requirement figures for modern farming adopted from the Bhairawa-Lumbini Groundwater Project, funded by the World Bank, future need assessment has been done and presented in Table 4.11.

Available average monthly natural flow figures provided in Table 4.10 indicate that only one-third of the irrigable land of the sub-basins could be irrigated through surface water diversion if the natural flow is unregulated. It is envisaged that, in the future, domestic water use figures could go up to 6 per cent, industrial use to 20 per cent and other uses to 2 per cent of the total water consumption. This brings the total water requirement figures to 139.3 bcm for the areas of the sub-basins. If all the groundwater potential is apportioned between domestic and industrial uses, irrigation need could be met for about 80 per cent of the available irrigable land, with the total available storage regulations.

Investment to capture additional surface runoff will become increasingly more difficult and expensive in the future. This is a natural consequence of

Table 4.11 Average Water Requirements for Future ('000m^3)

Months	Water Requirements	Future Water Requirement		
		Nepal (2.0 M ha)	Other States (8.0 M ha)	Total
January	1.11	2.22	8.88	11.1
February	1.18	2.36	9.44	11.8
March	0.60	1.20	4.50	6.0
April	0.40	0.80	3.20	4.0
May	1.11	2.22	8.88	11.1
June	1.73	3.46	13.84	17.3
July	0.61	1.22	4.88	6.1
August	0.47	0.94	3.76	4.7
September	0.31	0.62	2.48	3.1
October	0.47	0.94	3.76	4.7
November	1.23	2.46	9.84	12.3
December	0.81	1.62	6.48	8.1
Total	10.81	20.06	80.24	100.3

Sources: BLGWIP (1999); Poudel (2003) and assessment.

past successes in developing irrigation systems in sub-basins. Although significant expansion potential remains feasible, the development options are usually technically and socio-economically more complex, difficult and costly, with the predominant coriparian concerns.

For Nepal, substantial under-utilisation and considerable development potential of groundwater resources seem the only economical option left in the foreseeable future. Surface-water development through diversion of low flows of small and medium rivers and conveyance by gravity was the basic mode of irrigation development during the last five decades or more. Irrigation development policy focused on major infrastructure development and area expansion for many decades. The need for appropriate technology, effective management and proper institutional arrangements was realised only recently. The policy in this direction has already been formulated and future requirements to provide adequate, timely and dependable water supplies for sustainable development has been focused on.

4.7 Water Augmentation Issues and Impact

Optimal utilisation of water resources calls for large-scale technological interventions. Future development efforts are basically intended to alter the spatial and temporal availability of water with or without quality modification. Thus, the studies conducted so far in Nepal at different levels (master plan, pre-feasibility and feasibility) have identified about 28 reservoir sites, including two on the Mahakali, a border river. The total effective water-holding capacity of these storage schemes has been estimated to be some 77 bcm. This constitutes about 68 per cent of the total monsoon flow, which, if ever implemented, will definitely play a very effective role in meeting riparian irrigation demands, partially mitigating floods, generating colossal quantity of hydro-electricity, and connecting inland river navigation with the sea. Statistical figures related to storage capacity and other figures are provided in Table 4.12.

Table 4.12 Flow Figures of Proposed Storage Schemes in Nepal

Sub-basin	No. of high dams	Reservoir Storage (bcm)		Monsoon runoff (bcm)	Retention %	Submergence area (ha)	Av. Annual silt flow (Mm^3)
		Gross	Live				
Kosi	5	22.4	13.8	30.9	54.6	37,600	110
Gandaki	9	26.9	17.8	32.4	55.1	45,900	100
Karnali	6	72.2	34.3	27.7	123.7	89,900	126
Mahakali	2	10.2	6.0	14.0	43.2	11,250	60
Others	8	8.0	5.4	8.8	61.6	25,100	60
Total	30	139.7	77.3	113.8	68.0	206,750	456

Source: Report on Flood Mitigation Measures and Multipurpose Use of Water Resources, 1989.
Note: 1. Monsoon means from June to September (4 months); 2. Two of them are already completed.

The table, in addition to the storage capacity, contains figures on submergence area and average annual silt flow. Flow regulation has been recommended for changing the natural flow pattern to meet multi-purpose requirements. But the regulations have to be adjusted by taking into consideration the conflicting situations of all the purposes. These issues are beyond the scope of this chapter. The benefits/losses of flow regulation potentiality in terms of flood mitigation, dry season augmented water use in irrigation and/or navigation, electricity generation, etc., have to be assessed on a case-by-case or project-by-project basis. In general, however, it could definitely be said that among the 28 identified sites for reservoir creation, not all are technically, economically or environmentally feasible. The dry season (December to May) flow augmentation potential of these reservoirs, taken together is in the vicinity of 4,950 m^3/s. This constitutes more than 269 per cent of existing average dry season natural flow.

The major benefits of flow regulation are briefly discussed hereunder:

i. Irrigation: In terms of water for irrigation use, particularly that of dry season augmented flow, Nepal, being the upper riparian and land limited country, should get the priority right to irrigate her available irrigable land (1.8 M ha). The surplus available after the flow regulation, use in Nepal and environmental releases will have to be utilised by the downstream riparian states. It is estimated that the surplus (after Nepal's use) could be sufficient to irrigate about 4 to 5 M ha of land in India or Bangladesh. The remaining additional land should partially rely on the use of the existing groundwater potential. Besides, the benefits that will be derived in each country will have to be properly assessed. Depending on the assessed benefits and costs required for such utilisation, the available flow could either be used for irrigation or be allowed to flow in the river for facilitating dry season inland navigation or a mix of both.
ii. Navigation: Flow regulation opens opportunities for inland river navigation in the downstream reaches. The three large rivers (viz Kosi, Gandaki and Karnali) can be used for inland navigation and be connected to the sea. This aspect also needs to be carefully examined. This issue will be discussed in a separate chapter.
iii. Hydropower Generation: If the hydroelectricity generated from these reservoir sites could be interconnected with the national grids of neighbouring countries, the benefits would further increase due to the opening up of opportunities for more effective utilisation of different energy resources available in all these countries. The total hydropower installation potential at different capacity factors is in the order of 36,600MW (13,530 MW continuous), while the annual average energy generation potential will be of a magnitude of 118,600 GWh/annum.
iv. Flood Mitigation: After a detailed study of identified reservoir sites, one can precisely estimate the monsoon flood mitigation capability. It is also a matter of great concern that the study of the trade-off between the different uses should be carried out during the reservoir simulation study.

The indicative figure of the cost of development of all 28 reservoir sites comes out to be about US$40 billion. Whatever figures appear in the report on flow regula-

tion need to be considered as preliminary because, after the detailed study, all the parameters could be substantially changed. Total benefits accrued by these storage projects would be to the tune of US$100 billion, of which about 78 per cent is estimated to come from hydro-electricity, 20 per cent from irrigation and the remaining 2 per cent from other uses. These benefit figures are tentatively (with preliminary method) assessed using 10 per cent discount rate and are based on the Karnali (Chisapani) principle. This 'thumb rule' Karnali principle may not be applicable to the Kosi High Dam and other similar projects that could enjoy immense irrigation and flood control benefits. The widely acclaimed Pancheswar Project has been delayed principally due to the hassles of calculating downstream benefits and their equitable sharing and other pertinent issues. Figures discussed only in this paragraph are just indicative and quite preliminary and should be interpreted cautiously.

The various impacts on water quality and quantity are other major issues which may substantially change the ecosystem of the study area. The issues to be seriously studied are water quality, ranging from agro-chemical; industrial and domestic pollution; impact of water use on groundwater levels, including depletion or conversely waterlogging and salinity; soil erosion and siltation; degradation of wetlands; impact on fauna and flora; and various health issues, and are, therefore, the concerns not only of the sub-basin dwellers but also of the international community at large. Before making decisions on the implementation of the storage proposal, a study of the adverse impact and mitigation measures of some of the following environmental and health-related issues have to be done in detail:

- Agricultural pollution
- Industrial pollution
- Domestic pollution
- Environment-related health problems
- Groundwater degradation
- Groundwater depletion
- Watershed and catchment degradation
- River, reservoir and canal siltation
- Bio-diversity loss and wetland reduction
- Waterlogging and salinity, etc.

The health costs associated with the use of polluted water are staggering. These and other issues are to be dealt with separately.

4.8 Water-sharing Issues among Coriparian States

The preceding discussion shows that there is still unexploited potential for irrigation, whether by storage, diversions, lift, or by any other techniques in appropriate combinations. In regulating flows from the above-mentioned storage schemes, we could encounter technical, economic, legal and environmental problems of huge dimensions which are practically insurmountable for a single country. These issues must

be optimally seen and the project should be designed as having many components of a larger water-sharing plan and watershed management, river valley sub-basin or basin plans. There should be a great deal of openness and transparency among the coriparian states. Some of the sub-basin plans and design studies, namely Mahakali, Karnali and Kosi, have been jointly carried out by Nepal and India, or by Nepal in full cooperation and coordination with India.

Here, we have to make a serious note of India's grand vision of long-distance water transfers from one basin to another, for sharing of water as an 'inter-linking of rivers' concept. Being one of the largest river transfer schemes, it has many flaws and difficulties. These issues are beyond the scope of this chapter, and I will basically concentrate on the catchment area of sub-basins only and declare the riparian as beneficiaries, residing within the stipulated framework.

The inter-linking proposal has identified 30 link schemes. The 16 links of the peninsular component are not much of our concern, whereas five of the 14 links of the Himalayan component are directly related with Nepal's 28 storage schemes suggested earlier. These are:

- Kosi-Mechi
- Kosi-Gandak
- Gandak-Ganga
- Sarada-Yamuna
- Ghagra-Yamuna

All the five links are trans sub-basin diversions and intended to divert surplus water to the water-scarce areas of North-Western India, thus creating a substantial deficit flow to the Ganga at Farakka. Thus, to-be-created deficiencies are to be supplemented by other means. A major quantum of deficiency supplementation is envisaged to come from the two Brahmaputra links. The proposed idea, if it ever materialises, permanently alters the geography and transforms the geomorphology of basins/sub-basins concerned and, as a result, the whole of South Asia will suffer from the adverse impact of climate change of colossal dimensions. This project will have global ramifications and should be debated and discussed at many levels and numerous times.

Furthermore, the water-sharing issue is also a tricky one. Quarrels over the utilization or distribution of water of inter-nation rivers have characterised the history of not only the major countries of the world but also of South Asian countries. Even within the country, water-sharing disputes are quite serious in nature. Only the Nepal-India friction over water-sharing will be our principal concern here. The intensity of disagreements and quarrels between two sets of coriparian communities should be avoided or minimised. A clear-cut and regionally or bi-nationally accepted water-sharing mechanism should be developed. This issue will be discussed separately.

In addition, modifying the courses of almost all the substantial rivers in Nepal will greatly alter the existing condition of dynamic equilibrium of the Himalayan landscape. The present landforms of the north Indian subcontinent were shaped by all these rivers and rivulets over millions of years. Human interventions through

these large storage schemes might bring unprecedented ecological disasters to Nepal and also to the adjoining north Indian states. The magnitude of disasters could supersede the world's greatest environmental tragedy of Central Asia--the substantial drying up of the Aral Sea through large diversions of water from Amu Darya and Syr Darya that fed the sea. The irrigation schemes built on these rivers at one time irrigated almost 8 M ha of the Karakul desert land, and cotton and citrus fruits are still harvested there, but in largely reduced quantities. This gigantic endeavour of the bygone Soviet era planners and developers was, and will be, short-lived. Within half a century (starting from the 1960s) the whole efforts of a generation and large amounts of capital are going to be wasted, wreaking havoc in that part of the world (Postal 1994). We should also learn lessons from others and not repeat the same mistakes.

However, meeting the legitimate food, water and material needs of the increasing population of the area will certainly require additional storage dams to be built to store available surplus monsoon water. The proposed storage schemes are well within Nepalese territory and the primary adverse impacts are to be borne by Nepal alone. Hence, value-added augmented water would be the sole resource of Nepal, and the question of shared entitlement with other riparians, as in the case of Mahakali, a common border river, does not arise. That is why those who want to benefit from the use of this precious resource have to pay a reasonable price to Nepal. This issue has to be clearly spelt out to our riparian neighbours.

The challenge, however, is for the governments and the riparian communities of the basin/sub-basins to build proposed reservoir schemes, based on proper analysis of the full range of benefits and costs, including economic, environmental, health and social costs, and to ensure effective compensation to those people affected by these projects. A thorough evaluation of alternatives, including conservation, efficiency, improvements of existing facilities and available small-scale options should be carried out before embarking on such grandiose schemes.

4.9 Water Pricing and Proper Benefit Calculation

The proposed 28 reservoir schemes are quite popular among the coriparian technocrats, planners and policy makers and even the general public at large. It is a well known fact that in all the countries of the region, the general public is fed with the notion that the benefits of large-scale projects outweigh the limited adverse impacts; and eventually Nepal's economic status will be substantially enhanced. In the end, this myth or dream could end up in a fiasco like the Amu Darya-Syr Darya irrigation schemes in Central Asia (largest environmental disaster of the twentieth century--drying up of the Aral Sea). Thus, it is the responsibility of policymakers and technocrats to provide accurate information to the public and make them aware of all the positive and negative aspects of the proposed proposal that could affect many generations.

Bangladesh is of the opinion that the project in totality could augment the Ganga flow during the lean period and alleviate the problem of ever-increasing salt intrusion in the Sundarban area—a wildlife habitat and the largest mangrove forest reserve in the world. It could also partially mitigate or reduce the recurring catastrophic flood damage. On the other hand, Indian planners are of the opinion that, with the harnessing of surplus water available in the five sub-basins, it could provide adequate, timely and dependable supplies for the sustainable development of large parts of northern states for irrigation, domestic and industrial water uses. Above all, Nepal for its part wants to earn huge amounts of money by selling its surplus regulated water resources, develop modern irrigation systems in its territory to cover all available 1.8 M ha of irrigable land, meet all energy needs, and have free access to the Bay of Bengal through the proposed inland navigational facilities.

Here, one should not forget the long list of serious charges against these storage schemes raised by national and international intellectuals and those beneficiaries who would be affected by these schemes. First of all, with the blocking of the flow of all these rivers by high dams, the fertile sediments will be arrested in the reservoirs and the lower plain lands will face adverse impacts on natural fertility and the environment. Besides, it will cause soil erosion and the reservoirs behind the dams will be filled with mud and other particles, severely limiting their lifespan. Most of all, it submerges more than 210,000 ha of populated and fertile river valley land; and also permanently displaces more than half-a-million people, who are seldom fairly compensated.

From international experiences, we can comfortably deduce that dam economics are questionable and rarely reflect long-term realities. Here, we have to pay particular attention to all the accruable benefits/losses. These are to be properly calculated and equitably shared or compensated (which is rarely done), to actually make the dams feasible and acceptable to all the inhabitants of the basin. The need of the future generation should also be seriously taken care of. Besides, all the countries concerned should be committed to sustainable use of resources, through appropriate policies and investments. Above all, we should have technically, socio-economically and environmentally justified proper scientific designs of the proposed infrastructure. All the riparian countries must understand that only proper development policy measures can lead to a secure South Asia in terms of food and water.

First of all, the riparian countries have to recognise the existing consumptive uses in their respective territories. Here, interpretation of the existing uses should be done cautiously. India has already developed large capacity irrigation canal networks all along the downstream of the Indo-Nepal border. Here, the author wants to mention only the use of existing natural outflows provided Nepalese needs are not compromised. Let us be clear here that pricing of water of existing uses is within the purview of individual states and beyond the scope of this chapter. It has been roughly assessed that the cost of infrastructure development for the net regulating volume of 77.3 bcm from the 28 reservoirs could be more than US$40.0 billion; hence, the value-added water should be properly priced. Earlier, in this chapter, power benefits have been apportioned to be 78 per

cent of overall total accrued benefits. The irrigation benefits of 20 per cent and other uses benefits of 2 per cent of the total benefits have to be recovered from the respective uses categories. (These figures are only indicative and actual figures are to be derived at on a project-to-project basis.) It is worth mentioning here that it is very difficult to assess flood mitigation benefits since assessing the cost of lives and property becomes quite subjective—no universally recognised method exists. This could become a serious issue while finalizing the DPR of the Sapta Kosi High Dam—primarily a flood control project. If the dams are operated to reduce flood intensity, then the benefits from other uses like hydropower, irrigation, water supplies, etc,. have to be sacrificed in a proportionate manner. In this case, reservoirs are to be emptied during the pre-monsoon period and once the flood season starts, they should be filled up. It might even be necessary to spill out the water from the reservoirs towards the end of the monsoon when they fill up. Moreover, throughout the year hydropower stations will be releasing very large quantities of water into the rivers after generating power. These issues are to be properly investigated and benefits maximised.

Here, a rough estimate of the incremental agricultural benefits accruing from the regulated flows from the storage schemes is presented. This assessment is more or less based on the feasibility study of the Karnali (Chisapani) storage project. After significant augmentation of the dry season flows, it would be possible to adopt improved cropping patterns, and as a result the agricultural benefits would greatly increase. The increased areas to be covered by the enhanced flows are assessed to be 1.3 M ha (only in terai regions) in Nepal and about 5.0 M ha in India.

In almost all the rivers flowing through Nepal, India has already built diversion structures to irrigate its land with the available natural flows, and in a legal sense there is a tendency to interpret this as established water rights. It would be pertinent to mention here that, except on three small ponds (sagars) and Kosi, Gandaki and Mahakali, India has never consulted Nepal while building these diversion structures. They were built unilaterally. Similarly, Nepal has also reciprocated in the same way on the Babai, Bagmati, Kamala, Kankai and other smaller rivers. It should be stressed here that the situation in Nepal is quite different. The diversion structures are constructed only on small and medium sized rivers, where water is scarce. The four large rivers, Kosi, Gandaki, Karnali and Mahakali, are substantially untouched except for a few inundation canals. For the construction of diversion structures and appurtenant infrastructures on these large rivers, Nepal needs to invest substantial amounts of capital, which is beyond its capacity at present. Besides, these types of large projects demand a large territory to become optimally feasible. That is why good regional cooperation is a must for these schemes. We have to understand that the net benefits to be accrued from irrigation in Nepal from these large storage would be only nominal, despite the fact that the gross margin might be high. In addition, to stimulate water conservation and free agricultural water for environmental, domestic and industrial uses, the effective pricing of water for agricultural uses should be done.

The widely publicised proposed ‘inter-linking of rivers project of India’ is being planned unilaterally without seeking any confidence-building measures and without

sharing information with the principal riparian. This could be interpreted as a regional cooperation issue being pushed into the hind side, and optimists are frustrated.

The efficiency of irrigation systems and sub-basin water uses will have to be substantially enhanced. With the rapidly escalating cost of building new high dams and the increasing environmental and resettlement problems, the construction plans have to be properly assessed with comprehensive analysis of costs and benefits, including adverse impacts and long-term effects.

The Karnali Project feasibility study report mentions that it would be possible to obtain net irrigation benefits discounted at 10 per cent for the project life up to US$9 million for each cubic metre per second of regulated flow, if such water is efficiently utilised. It comes out to be one cubic metre of value-added water and should be priced at about 0.7 US cents or about NRe0.5 per cubic metre, mainly for irrigation purposes. Out of 2,450 m³/s of continuous regulated flows, additional use in Nepal could be in the range of 450 m³/s and the remaining 2,000 m³/s could be utilised downstream in either India or Bangladesh. In this way, benefits accrued from the regulated flows downstream could be in the range of US$18 billion for the whole project life period, which is estimated to be 50 years for the purpose. The apportioned 2 per cent of the total benefits for other uses are to come mainly from flood mitigation and almost 90 per cent of this goes to the lower riparian. Thus, to materialise these storage schemes there should be a great deal of cooperation among the riparian countries. All the parties concerned should agree on a common approach on the methods of calculating benefits and equitable cost-benefit sharing. True regional cooperation in the water sector, as envisaged by the arguments of the preceding paragraphs, needs a long gestation period—it could be more than a decade or two. The following paragraphs principally deal with Nepal's self-reliance strategy on water uses and not on massive storage schemes for downstream riparian requirements.

4.10 Futuristic Strategies and Plans

There are four basic documents of the government which give futuristic visions and long-term sub-sector plans on irrigation. These are

- Nepal Agriculture Perspective Plan (APP) 1995
- Water Resources Strategy (WRS) 2002
- The Tenth Five Year Plan 2003
- National Water Plan (NWP) 2005

The APP was developed with the support of the Asian Development Bank (ADB). All the latter plans and strategies are basically guided by the principles set out in the APP document with some timely revisions thereafter. In the APP, the engine of growth is the agriculture sector and for its growth seven follow-up strategic components have been set. First, it is done through acceleration of agricultural

growth; second, through large, concentrated investments in a small number of input priorities; third, those input priorities are irrigation–primarily shallow tube-wells in the terai, agricultural roads, fertilisers, and technology, including research and extension; fourth, a small number of high-value priority commodities to facilitate intensification of agriculture, especially in the hills; fifth, those priorities are citrus, vegetables and vegetable seeds, apples, apiculture and sericulture; sixth, strong multipliers from increased farm incomes to growth of output and employment in the rural non-farm sector as the principal means of solving the problem of employment, poverty, environment and rapid urbanisation; seventh, an implementation mechanism that operates at district and national levels and is complemented with an analytical body to facilitate reinforcement and adjustment of the plan over time. The details of the strategy are quite different for the terai and for the hills and mountains. By far, irrigation has been considered the most important contributing factor for the growth of Nepalese agriculture, and also to facilitate the above-mentioned goals.

Although the APP received enthusiastic but lip service support from all the previous and existing ruling parties and governments, external development partners were ready to help Nepal in this endeavour. Several important steps were initiated under the support of the donors. But many constraints, primarily institutional ones, have greatly retarded the implementation of the APP. These constraints can broadly be categorised into three groups:

i. Physical
- Poor maintenance and ineffective control structures in the existing systems.
- Poor design and planning of new systems.
- Predominance of large and sophisticated structure-mania in the psychology of influential technocrats.

ii. Institutional
- A public sector approach without accountability and a highly centralised decision-making structure.
- Limited specialization and staff skills primarily oriented to construction activities.
- Lack of coordination among the related public sector agencies.
- Weak agriculture–irrigation linkages.
- Minimum involvement of farmers in irrigation management.
- Ineffective decentralisation mechanism.

iii. Financial, Economic and Social
- Insufficient or almost non-existent cost recovery;
- Reliance on subsidies for O&M.
- Inadequate O&M allocations.
- Poor incentives for efficient use of water and conservation.
- Drastic reduction in funding of new constructions.
- Removal of subsidy on private shallow tube-well development.
- Conflict/war-like situation lasting for an extended period.
- Rampant corruption in all stages of development efforts.

The second document, the Water Resources Strategy 2002, has been developed and approved by the government with the support of the World Bank (WB) and Canadian International Development Agency (CIDA). In this strategy the development approach is slightly different. The primary engine of growth has been envisioned to be effective and timely utilisation of available abundant water in terms of annual surface flow and groundwater reserves. Poor and slow utilisation of the only natural resource of the country has been considered to be the major factor in impeding developmental efforts. Thus, the government and development partners provided support in preparing the long-term water resources strategy, which will be able to guide the water sector activities towards sustainability while providing for hazard mitigation, environmental protection, economic growth and constructive methods of resolving water use conflicts.

The Water Resources Strategy has defined its national goal as 'living conditions of Nepali people are significantly improved in a sustainable manner'. The strategy output will contribute to this goal through the achievement of short-, medium- and long-term purposes. These purposes are to be fulfilled by the irrigation sub-sector in the following manner:

i. Short-term (5 years) purpose: Implement and promote sustainable and efficient irrigation systems based on opportunities to intensify and diversify agricultural production and to establish new sustainable conditions of improved prosperity for individual farmers and the rural communities they support.
ii. Medium-term (15 years) purpose: Focus on achieving reliable irrigation services and expansion of these services based on sustainability and creation of wealth.
iii. Long-term (25 years) purpose: Avail appropriate and efficient irrigation for the optimal use of irrigable land in a sustainable manner.

The third document, the National Water Plan, sets policy principles that are being used to guide Nepal's water sector development and include:

- Development and management of water resources shall be undertaken in a holistic and systematic manner, relying on the principles of Integrated Water Resources Management (IWRM).
- Water utilisation shall be sustainable to ensure the conservation of the resource and protection of the environment. Each river basin system shall be managed holistically.
- Delivery of water services shall be decentralised with the involvement of autonomous and accountable agencies (e.g. public, private, community- and user-based agencies).
- Economic efficiency and social equity shall guide water resources development and management.
- Participation of, and consultation with, all stakeholders shall constitute the basis of water sector development and management.
- Sharing of water resources benefits among the riparian countries shall be on equitable basis for mutual benefit.
- Institutional and legal frameworks for coordination and transparency shall be an essential feature of water sector management.

- Wider adoption of the best existing technologies and practices, and rapid innovation and adaptation of both institutional arrangements and new technologies shall be ensured.

To meet the goals set by the APP, WRS and NWP, the Tenth Five Year Plan (2003-8) has fixed corresponding targets. Total area targeted for infrastructure development for new irrigation expansion is 178,000 ha, of which about 120,000 ha has been apportioned for groundwater projects, 10,000 ha for new technologies and the remaining area for traditional surface schemes.

4.11 Dilemma for Future Course of Action

The agriculture sector, where irrigation is only one of the inputs, is performing far below its potential. Improvement in the productivity of existing irrigation schemes, which already cover about two-thirds of the irrigable area, could be a major source of future agricultural growth. This strategic need has been discussed in various plans, policies and other relevant documents. The opportunities available would be to realise the hidden irrigation and agricultural potential prevalent in existing irrigation projects: better water utilisation and larger irrigated area in the irrigation commands, and higher crop productivity per unit of land and water. This is relevant to groundwater irrigation as well. The applicable technologies and associated agricultural practices are still largely rudimentary to the majority of farmers. The key point to be noted here is that productivity enhancement could have a significant impact on intended development. Performance enhancement could also come from modernisation and system improvement, community involvement or management transfer, land consolidation, etc. Hence, it has become extremely urgent for a 'paradigm shift in emphasis'. From a high emphasis on physical expansion in the past and present, the effort now needs to turn to a much greater emphasis on productivity enhancement; above all, the challenges are to be tackled through a comprehensive and inter-linked approach.

The Nepalese irrigation sub-sector is riddled with problems in all three areas: physical, institutional and financial. These problems are operationally inter-related and affect others and, in turn, are affected by others. This 'vicious circle' is keeping the irrigation sub-sector at a low level of performance. The poor quality of agricultural extension work and irrigation service has discouraged the government and development partners, who are generally shying away from funding this sector. The end result is low yields and then low incomes, which in turn lead to farmers' dissatisfaction with the irrigation systems, bureaucracy and government. Under this condition, revisions in water rates are resisted and irrigation service fees are not paid. Low-cost recovery, in turn, is linked to under-funding of the operation and maintenance of the system, and compounded with inappropriate structure, policies and staff skills. This closes the circle by perpetuating poor quality service. The following are the suggested key changes in creating an enabling and incentive-based environment in the future:

- Transfer irrigation management to farmers
- Reform the Department of Irrigation
- Achieve financial viability
- Upgrade irrigation systems
- Improve agricultural services
- Monitor performance with a transparent and participatory approach

Planners in Nepal are still of the view that across the border in India free electricity for pumping water and subsidised fertilisers, etc are the biggest hurdles for Nepalese farmers. They simply cannot compete with those across the border. The end objective would be high-quality services provided to commercially, managerially and financially autonomous irrigation systems, and transitioned gradually to a private operator rather than the government sector. With the limited financial resources available in the nation, this is the only option left for the foreseeable future.

The other important issue that has not yet received proper attention is the harnessing of the abundant water-resource potential of Nepalese rivers. For this purpose, the only rational and economically feasible option available is the strong and committed regional or, more importantly, bilateral cooperation among the riparian countries. Water augmentation and hydro-electricity potential is mainly available in Nepal, while large irrigable areas, demand for other uses and a huge market lie on the other side of the border. The waterways that could provide cheap and easy access to the sea and eventually to international overseas markets also have developmental and transit problems. For beneficial and optimal use of the long wasted water resource, preferably regional or at least two neighbouring countries, Nepal and India, should have a common approach and understanding. Only joint and concerted efforts could eradicate the rampant poverty spread across the earlier-mentioned five sub-basins. This might take a long time and substantial efforts from both sides. One should be optimistic and the need for time should eventually dictate us to be rational and pragmatic and we could move away from existing sentimentalities.

The long drawn out and protracted negotiations between Nepal and India on the Mahakali, Karnali, Narayani, Kosi rivers and other water issues have not yet found a solution that is reasonable and acceptable to both parties. Resolution of water disputes should be done in a holistic and comprehensive manner. Negotiations on a project to project basis have created misgivings and misunderstanding on both sides. Some of the smaller sub-basins are severely water stressed and have no capacity to meet the requirements of even one country—that is Nepal. All the facts and figures pertaining to these attractive and most necessary projects should be open and transparent. The government bureaucracies on both sides are reluctant to share facts and information with the public.

While taking decision on such large and long-lasting (for generations to come) projects, the governments should seek strong support of the general public of both countries. First of all, political decision-makers, administrators, planners, technocrats, academia and the media should be properly briefed on the facts, issues, complexities, opportunities, problems, long-lasting impact, possible risks and their solutions, and available options in harnessing the potentials of Nepalese rivers. This

should be done with a sense of commitment and urgency. Both governments should stop doing business behind closed doors and should take the main riparian into confidence. It is time to encourage rational debate and bring forth the advantages and disadvantages of implementing these large schemes through regional or bilateral cooperation.

The most important point here is that, first of all, the existing possibilities are to be properly studied with accurate and scientific assessment of the advantages and disadvantages of the propositions. In agreement with all the parties concerned, a mechanism for water pricing and benefit sharing has to be developed, taking into consideration the earlier international practices in the sector. With the past experiences of our joint endeavour, we can definitely forecast that it would take at least a decade or more before we could embark on the implementation of some of the larger identified projects for multi-purpose uses, including irrigation.

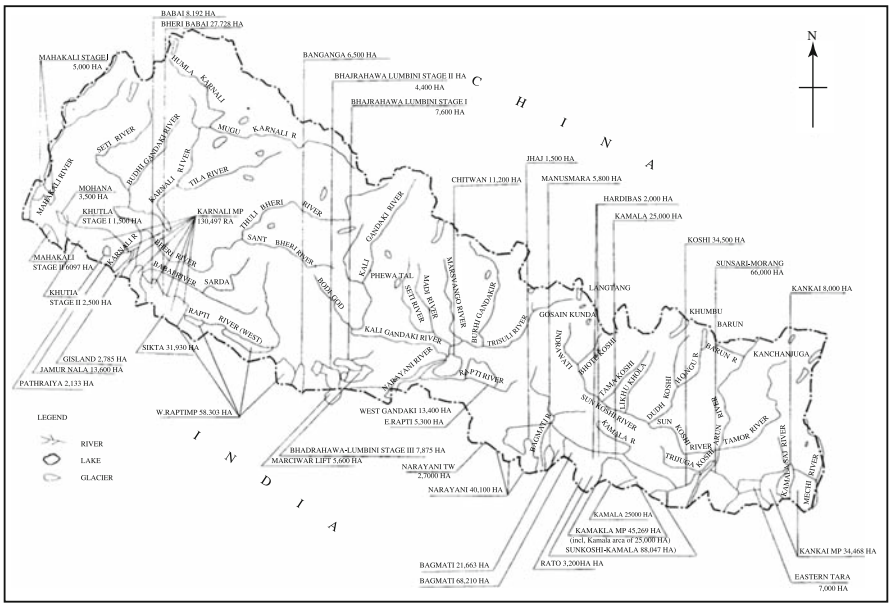
If Nepal is to carry out business as usual in the irrigation sub-sector, then the only way to rational development is to enhance the performance of existing systems, implement new small and medium projects, and rely heavily on groundwater in the terai region.

The idea of inter-linking of rivers floated by India is not in the favour of the inhabitants of the five sub-basins. As a matter of fact, there is no surplus water to share with other adjoining basins' or sub-basins' riparian. If this proposal is ever implemented, it will create water disputes of a global dimension for generations to come. The concept is flawed with so many irresolvable issues. Primarily, it will have a devastating impact on the Himalayan ecology and the principal beneficiaries will be debarred from their rightful use of resources.

It is not easy to find a unique solution to resolve the above-mentioned problems and constraints. Therefore, technocrats, planners and intellectuals are facing a big dilemma. A generally acceptable way that could be followed in the future in irrigation development is not yet in sight. A wider public and the informed bureaucrats/technocrats and decision-makers of all the political parties are to be properly consulted and future course of action charted.

4.12 Recommendations for the Future

For improvement in the productivity of irrigation water, the South Asian region has to spend a substantial amount of money and efforts in scientific research, technological breakthroughs and appropriate infrastructure development. These have to cover all the categories, i.e. technical, managerial, institutional and agronomic, and different location-specific options or measures are to be identified. The ability of crops to use water more efficiently—to yield more food from every litre of water available (getting more crops per drop) should be largely increased. Either we have to reduce the area planted with paddy or grow water-efficient and high-yielding varieties of rice. Also, options should be explored to improve water productivity through water recycling.



Source: Progress Report (1) for the Study on the National Hydro-Meteorological Management Project (Annexes) Ministry of Water Resources, Department of Hydrology and Meteorology, Kathmandu 1991

Fig. 4.2 Irrigation Schemes

Nepal's poorest farmers have not benefited from large public irrigation schemes (Fig. 4.2). Very high costs (more than US$5,000 per ha) for infrastructure development and concerns about social and environmental sustainability have already slowed efforts for further expansion of large irrigation schemes. Raising the production potential of small poor farmers, who are in absolute majority, requires irrigation technologies specifically geared to their farm sizes. A spectrum of irrigation technologies that are custom-designed for small plots and affordable for the poor is already available within the country. These small, affordable and efficient technologies are to be extensively proliferated.

It is possible to envision a modern form of irrigated agriculture that is resource-renewing rather than resource-depleting and that preserves the Himalayan ecology for generations to come. The application of ecological principles combined with new information and irrigation technologies is the only pragmatic and sustainable solution in this twenty-first century. It is recommended to initiate national irrigation efforts urgently in the following manner:

- Lay special emphasis on the identification and development of systems with year-round facilities.
- Encourage consumptive use of surface and groundwater in the terai.
- Rapidly expand less water-consuming irrigation technologies (sprinkle, drip, water harvesting, etc.) in the hills and mountains.

- Rapidly implement shallow tube-well programmes in clusters to make electrification easier.
- Make consumer participation mandatory in irrigation development and management.
- Make operation and maintenance cost recovery and irrigation service fees payment compulsory.
- Establish and promote land consolidation practices on a priority basis.
- Make water distribution system sustainable, reliable, efficient, equitable and timely.
- Approve and implement a system operation regulation that is easily understandable to all.
- Develop effective and sustainable public organisations.
- Carry out studies and research on water-market expansion.
- Design and implement large storage schemes to derive optimum benefits, with the mechanism to share downstream benefits in collaboration with other riparian.

These are just some of the key recommendations. This list could be substantially extended further.

Chapter 5
Hydropower Development

Prachar Man Singh Pradhan

5.1 Introduction

Theoretically, Nepal is endowed with a huge hydropower potential of 83,000 MW, of which the technically feasible capacity is about 45,000 MW and the economically feasible capacity is about 43,000 MW. Potentially, Nepal could be a large net producer and exporter of power to neighbouring countries. At present, only about 1 per cent of Nepal's hydropower potential is being exploited.

5.1.1 Historical Background

Hydropower development in Nepal started with the commissioning of the Pharping Power Plant, located on the right bank of the Bagmati river, south of Kathmandu valley, in 1911. This power plant, with a capacity of 500 kW, was inaugurated on Jestha 9, 1968 BS (May 22, 1911) (Annex 18). This power plant is not in operation at present. However, its water is being pumped and used for the Kathmandu valley. The second hydropower plant, with an installed capacity of 900 kW, was established after a gap of 23 years, in 1934, at Sundarijal, north-east of Kathmandu valley. This power plant is still in operation and is producing 640 kW after its frequency was converted from 60 to 50 cycles. The water of this plant is now being used for the production of power and supply of water. The third hydropower plant, with a capacity of 1,600 kW, was constructed at Chisang Khola. Run by the private sector Morang Hydroelectric Company, it was damaged by several landslides at the head pond near the powerhouse area in 1942.

P. M. S. Pradhan (✉)
Former Deputy Managing Director, Nepal Electricity Authority, Kathmandu, Nepal.
e-mail: pmspradhan@hotmail.com

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After 1960, all hydropower stations were constructed with grant aid from friendly countries, like the then Union of Soviet Socialist Republic USSR) (Panauti: 2.4 MW, 1965), India (Trisuli: 18 MW, 1967; Devighat: 14.1 MW, 1984, Gandak: 15 MW, 1979, Koshi/Kataiya: 20 MW, 1971) and China (Sunkosi: 10 MW, 1972). In 1970, hydropower development took a turn with bilateral and multilateral funding. The major donor countries in the period were Japan, Norway, Germany, South Korea, Canada, Finland, Denmark, Sweden and the USA. Canada, Sweden and the USA were involved only in studies. The lending agencies were the World Bank, Asian Development Bank (ADB), Japan Bank for International Cooperation (JBIC), the former Overseas Economic Cooperation Fund (OECF), Saudi Fund for Development, Kuwait Fund and others. From the 1990s, subsequent to the adoption of the policy of economic liberalisation, hydropower development took another turn with the private sector entering the arena.

Nepal's integrated power system is currently predominantly based on hydropower with mainly run-of-river type hydropower plants, which is meeting the domestic power market demand. Nepal also has plans to develop hydropower plants with storage capacity, which will provide inherent advantages to Nepal for delivering reliable and good-quality saleable energy. There are two basic markets for the power generated under Nepal's hydropower development programme: domestic demand and India's power market. While a power supply to cater for domestic demand is the highest priority, Nepal needs to make efforts to take advantage of market opportunities for power export to India. Based on the above, there is ample opportunity for Nepal to become a major power exporter to India and at the same time earn revenue from power sales to help develop its own domestic economy.

5.2 Hydropower Potential, the Existing Status and the Forecast in 2020

5.2.1 Hydropower potential

As mentioned above, Nepal's theoretical hydropower potential is estimated at about 83,000 MW and technically and economically feasible potential at about 45,000 and 42,000 MW, respectively. Table 5.1 summarises the theoretical hydropower

Table 5.1 Theoretical Hydropower Potential

River Basin	Potential in MW		Total
	Major river courses having catchment areas above 1000 km^2	Small river courses having catchment areas of 300-1000 km^2	
Sapta Kosi	18750	3600	22,350
Sapta Gandaki	17950	2700	20,650
Karnali and Mahakali	32680	3500	36,180
Southern rivers	3070	1040	4,110
Country Total	72,450	10,840	83,290

Source: Water and Energy Commission (WEC), Kathmandu

Table 5.2 Technical Hydropower Potential

River Basin	Number of Project Sites	Technical Potential/ Capacity in MW
Sapta Kosi	53	11,400
Sapta Gandaki	18	6,660
Karnali	30	25,410
Mahakali	4	1,160
Southern rivers	9	980
Country Total	114	45,610

Source: Water and Energy Commission (WEC), Kathmandu

potential classified within the major river systems in Nepal, while Tables 5.2 and 5.3 illustrate technically and economically feasible potential as estimated by the Water and Energy Commission (WEC). The Karnali and Mahakali river systems represent approximately 43 per cent of Nepal's theoretical hydropower potential and 55 per cent of the technical/economic potential.

The above estimates are based on Dr Hariman Shrestha's doctoral thesis prepared in the early 1960s. More information on hydrology, topography and other site-specific data is available; so, more accurate estimates of the hydropower potential of Nepal could be carried out.

5.2.2 Existing Status of Hydropower Generation

The total installed capacity of the Nepal Electricity Authority's (NEA) integrated system is 611 MW, including the 148.3 MW hydro plants owned by the private sector and the NEA's thermal power (diesel) of 55 MW. Although the total hydropower capacity of the system is 556 MW, only about 452 MW can be generated from hydropower stations during the winter season when the demand for power is at its peak. During power deficits, about 50 MW is imported from India in accordance with the Indo-Nepal power exchange agreement. Nepal and India have agreed in principle to increase this level of exchange from 50 to 150 MW. Nepal is also entitled to 70 million units of energy annually from Tanakpur in the Far West under the

Table 5.3 Economical Hydropower Potential

River Basin	Number of Project Sites	Economic Potential/ Capacity in MW
Sapta Kosi	40	10,860
Sapta Gandaki	12	5,270
Karnali	7	24,000
Mahakali	2	1,125
Southern rivers	5	878
Country Total	66	42,133

Source: Water and Energy Commission (WEC), Kathmandu

Mahakali Treaty. The NEA continues to be the sole purchaser of the power generated by independent power producers (IPP). To date, 22 power purchase agreements (PPAs), totaling 217,175 MW, have been concluded, of which 148.283 MW have already been commissioned as of June 2006.

5.2.2.1 Hydro plants in operation

There are 10 major existing hydro projects being run by the NEA, with a total installed capacity of 389.15 MW. These are shown in Table 5.4.

There are several private power plant operators in Nepal, having total installed capacity of 148.283 MW, from which NEA purchases power (Table 5.5).

The NEA also has 40 small hydro plants, of which nine are grid connected (12.55 MW) and the rest (6.4 MW) are running in isolation. Thus, the present installed hydropower capacity in the national system, including private power plants and others, is around 556 MW.

In recent years, Nepal's remote villages have seen a surge in small turbines with capacities ranging from 1 to 100 kW, which are used to electrify isolated settlements on mountain slopes and in valleys, and to run water mills. It is estimated that there are over 2,000 such turbines, which generate about 7 MW of electricity as well as providing valuable mechanical power.

5.2.2.2 Hydro plants under construction

There are several hydro plants, totalling 139.923 MW, currently being constructed by the NEA and private companies. These are presented in Table 5.6.

Table 5.4 Major Hydropower Plants Run by NEA

1	Trisuli	24 MW
2	Sunkosi	10.05 MW
3	Gandak	15.00 MW
4	Kulekhani I	60 MW (Storage)
5	Devighat	14.100 MW
6	Kulekhani II	32 MW
7	Marsyangdi	69 MW
8	Puwa Khola	6.20 MW
9	Modi Khola	14.80 MW
10	Kali Gandaki A	144 MW
	Total	389.15 MW

Source: Nepal Electricity Authority (NEA) Annual Report

Table 5.5 Hydropower Plants Run by Private Companies

1	Andhi Khola	5,100 kW
2	Jhimruk	12,000 kW
3	Khimti-1	60,000 kW
4	Upper Bhotekoshi	36,000 kW
5	Chilime	20,000 kW
6	Indrawati III	7,500 kW
7	Syange Khola	183 kW
8	Piluwa Khola	3,000 kW
9	Chaku Khola	1,500 kW
10	Sunkosi Khola	2,500 kW
11	Rairang Khola	500 kW
	Total	148,283 kW

Source: Nepal Electricity Authority (NEA) Annual Report

Table 5.6 Projects under Construction

Project	Capacity	Developer
Middle Marsyangdi	70.00 MW	NEA
Upper Modi	14.00 MW	GITEC
Gamgad	0.40 MW	NEA
Heldung	0.50 MW	NEA
Daram Khola	5.00 MW	Gorkha Hydropower
Pheme Khola	0.995 MW	Khoranga Khola Hydropower
Khudi Khola	3.50 MW	Khudi Hydropower Limited
Mailung Khola	5.00 MW	Molnia Power P. Ltd.
Langtang Khola	10.00 MW	Kantipur Hydropower Co.
Baramchi Khola	0.98 MW	Unique Hydel Co.
Lower Indrawati	4.50 MW	Sunkosi Hydropower Co.
Thoppal Khola	1.40 MW	Thoppal Khola Hydropower
Mardi Khola	3.10 MW	Gandaki Hydropower Devt.
Lower Nyadi	4.50 MW	Bavarian Hydropower Nepal
Madi-1	10.00 MW	Annapurna Group P. Ltd.
Sisne Khola	0.75 MW	Gautama Budha Hydropower
Tadi Khola	0.97 MW	Aadhisakti Power Dev.
Upper Mai Khola	3.10 MW	East Nepal Dev. Endeavour
Sali Nadi	0.232 MW	Kathmandu Small Hydropower
Pati Khola	0.996 MW	Unified Hydropower
Total	139.923 MW	

Source: Nepal Electricity Authority (NEA), Planning Department

5.2.3 Power Demand Forecast by 2020

The power demand projection for Integrated Nepal Power System (INPS) has been carried out by the NEA, considering the power consumption date of FY2006, macro-economic indicators and rural electrification programmes. The peak demand is projected to grow from 603 MW in FY2006 to 1,804 MW in FY2019/20 (Table 5.7).

Table 5.7 Load Forecast

Fiscal Year	Total Generation Requirement (GWh)	System Peak Load (MW)	Peak Load Growth (%)
2005/06	2,774.0	603.28	-
2006/07	2,897.1	642.2	6.5
2007/08	3,136.6	695.3	8.3
2008/09	3,428.1	759.9	9.3
2009/10	3,698.4	819.8	7.9
2010/11	4,057.1	890.6	8.6
2011/12	4,423.3	971.0	9.0
2012/13	4,815.0	1,057.0	8.9
2013/14	5,231.2	1,148.4	8.6
2014/15	5,673.8	1,245.6	8.5
2015/16	6,144.7	1,336.1	7.3
2016/17	6,645.9	1,445.1	8.2
2017/18	7,179.6	1,561.1	8.0
2018/19	7,719.4	1,678.5	7.5
2019/20	8,296.7	1,804.0	7.5
Average Growth			8.14

Source: Nepal Electricity Authority (NEA), Planning Department

5.2.4 Power Generation Expansion Plan

A power generation expansion plan study was carried out by the NEA for the planning period FY2006/2007 FY2019/20. The results of the study with the sequence of projects in the pipe line up to FY2014/15 are presented below (Table 5.8).

5.2.5 Private Involvement in Power Generation

The NEA is a public utility with a mandate for generation, transmission and distribution of electric energy in the country. Apart from the NEA, there are several IPPs, some of which have already established hydropower plants. The IPPs falling

Table 5.8 Projects in the Pipeline up to FY2014/15

FY	Projects	Installed Capacity (MW)	Comments
2006/07	Baramchi	0.99	IPP, PPA Concluded
	Khudi	3.45	IPP, PPA Concluded
	Sisne Khola	0.75	IPP, PPA Concluded
	Sali Nadi	0.232	IPP, PPA Concluded
2007/08	Middle Marsyangdi	70.00	NEA, Under Construction.
	Pheme	0.95	IPP, PPA Concluded
	Thoppal Khola	1.40	IPP, PPA Concluded
	Tadi Khola	0.97	IPP, PPA Concluded
2008/09	Lower Indrawati	4.50	IPP, PPA Concluded
	Lower Nyadi	4.50	IPP, PPA Concluded
	Mardi	3.10	IPP, PPA Concluded
2009/10	Kulekhani III	14.00	NEA, Action Plan Project
	Daram Khola	5.00	IPP, PPA Concluded
	Maillung	5.00	IPP, PPA Concluded
	Upper Modi	14.00	IPP, PPA Concluded
	Madi-I	10.00	IPP, PPA Concluded
	Upper Mai Khola	3.10	IPP, PPA Concluded
2010/11	Chameliya	30.00	NEA, Action Plan Project
	Mewa	18.00	Private
	Hewa Khola	10.00	Private
	Lower Modi	19.00	Private
	Upper Madi	20.00	Private
	Sanjen	11.00	Private
2011/12	Kabeli-A	30.00	Private
	Upper Marsyangdi-A	50.00	Private
	Upper Trisuli 3 A	61.00	NEA, Action Plan Project
2012/13	Upper Tamakoshi	309.00	NEA, Action Plan Project
2013/14	Tamor	83.00	Private
	Upper Seti (Storage)	122.00	NEA, Action Plan Project
	Kankai (Storage)	90.00	NEA, Action Plan Project
	Upper Karnali	300.00	NEA-Private Joint Venture
2014/15	West Seti	750.00	Private

Source: Nepal Electricity Authority (NEA), Planning Department

in this category are Himal Power Limited, Bhote-Koshi Power Company, Chilime Power Company, National Hydropower Company, Butwal Power Company, Syange Vidyut Company and Arun Valley Hydropower Development Co. Foreign investors such as ABB, Panda Energy Group, which has now sold its stakes to the Soaltee Group, Statkraft are also involved in some of these companies. The Snowy Mountain Engineering Corporation (SMEC) of Australia is another company working in Nepal for the West Seti Project (750 MW) intended to export power to India. PPA has been initiated with India for the purchase of power from the West Seti project.

There are several other IPPs that are working in the domestic sector and that have concluded PPAs with the NEA. A list of IPPs is presented in Annex 19.

Of the 31 small plants constructed by the NEA, 12 are now being operated by private sectors in isolation, in remote villages, on lease.

5.2.6 Power Development Fund

A Power Development Fund (PDF), assisted by the International Development Association (IDA), is being established with the aim of providing long-term debt financing for power projects and promoting hydropower development in Nepal. PDF will act as a catalyst to facilitate the inflow of private capital. The purpose of the fund is to supplement private financing available for the development of the power sector to meet the demand for electricity. The Fund will constitute US$35 million.

5.2.7 Power Sector Reform

The Government of Nepal (GoN) has expressed its commitment towards power sector reforms through various policy initiatives, and accordingly a number of activities are being undertaken.

The process of internal restructuring has been initiated by the NEA with the creation of discrete entities of generation, transmission and system operation, distribution and consumer services and engineering services as core business groups in its corporate structure. It has formally launched 18 distribution centres with increased independence, authority and accountability in its operations. It is in the process of signing performance agreements with other core business groups. The NEA has also adopted a Distribution Centre Operation By-law and a separate Community Rural Electrification By-law 2003, and is in the process of formulating a grid code and putting in place a wheeling charge or transfer price.

With assistance from the ADB, a study has been undertaken with the objective of evaluating options and preparing a general plan for reforming and restructuring the NEA and its distribution system in order to improve accountability and efficiency, and to reduce the cost of power supply.

Under USAID's assistance programme, a study has been carried out on the establishment of the Nepal Electricity Regulatory Commission (ERC) and prepara-

tion of a roadmap for the role and strengthening of the Department of Electricity Development (DoED). A detailed implementation plan for the roadmap is expected in a separate package.

The Japanese Bank for International Cooperation (JBIC) is currently carrying out a study on sustainable energy sector development, including the restructuring of the NEA.

All the above studies are being coordinated with each other.

5.2.8 Previous Government's Proposed Ordinances on Power Sector Reform

The previous government's drafted two ordinances: (1) National Electricity Regulation Act 2062 and (2) Electricity Act 2062*.

The draft National Electricity Regulation Act 2062 mainly deals with the establishment of the Electricity Regulation Commission, whereas the draft Electricity Act 2062 deals with the unbundling of the NEA. In the present context, the government should act immediately for the promulgation of the National Electricity Regulation Act so that the ERC will be established and it will take a few years for the proper functioning of the ERC with the application of a grid code and distribution codes in the system. Until the ERC is well established and properly functioning, the unbundling of the NEA should be postponed. A strong independent regulating mechanism is a must for an unbundled utility to be successful. So, the draft Electricity Act should be promulgated with the provision that the NEA shall not be unbundled until the regulatory commission becomes fully functional.

5.2.9 Development of the Grid System

At present, the INPS consists of 2,076 ckt/km of 132 kV, 593 ckt/km of 66 kV and 2,485 ckt/km of 33 kV transmission lines. The total substation capacity of the system is 1,089 MVA.

5.2.10 Community Participation in Rural Electrification Schemes

- The GoN has announced that it will provide 80per cent of the capital cost of rural electrification to the community if the community-based organization (CBO) contributes 20per cent of the cost. Similarly, considering the expansion and

* Nepali calendar (Bikram Sambat) is 57 years ahead of Gregorian calendar.

operation of rural electrification under the concept of peoples' ownership, the government has made a provision of capital grant of NRs.75,000 per kW to the community that plans and designs small hydropower projects to generate up to 500 Kw of electricity.

- The CBO with legal status can purchase electricity in bulk from the NEA and sell power within its area, utilizing the existing distribution network.
- The rate of bulk purchase of electricity by the community will be determined through negotiation between the NEA and the CBO, and the retail tariff rate for the end consumer will be fixed by the Electricity Tariff Fixation Commission (ETFC).
- With the above government policy in place, the rural population is showing a keen interest and has started investing in rural electrification schemes. Three rural electrification schemes are envisaged, namely:

i. Community-based rural electrification
ii. Community-based operation and maintenance
iii. Community-based generation.

According to the NEA's annual report of 2005/06, altogether 391 communities have applied for generation, electrification and distribution schemes till June 2006. So far, 176 proposals have been approved and agreements with 137 community groups signed. Out of the 137 community groups, 107 RE schemes are already in operation and 28 communities have already taken over the distribution system for operation and maintenance. In the scheme of community-based generation, only four applications have been received.

- To cope with the overwhelming enthusiasm from rural communities, the government allocated NRs.890 million for FY2063/64 in comparison with NRs.590 million the year before. With this budget allocation in FY063/64, 54 schemes, for which communities have already collected their contributions, will be completed and another 54 schemes will be initiated.

5.2.11 Ongoing Projects with Donor Support

Apart from the IDA-funded Power Development Fund Project and the Power Sector Reform initiatives that have already been mentioned, GoN has undertaken the following programmes in cooperation with different donors.

The USAID has extended cooperation for the feasibility study of five small hydropower projects. An agreement has recently been signed between the governments of Nepal and Norway for the feasibility study of up to 10 small and medium-size hydropower projects. Preliminary arrangements are being made for the joint study of the Saptakoshi Multi-purpose Project in cooperation with the Government of India (GoI). The GoI has agreed to conduct the study of the 600 MW Budhi Gandaki Storage Project.

Slated for commercial operation at the end of 2007 is the 70 MW Middle Marsyangdi Project, undertaken under a German government grant assistance. There are a number of projects of different sizes in the pipeline at various stages of development. PDF with World Bank funding is expected to be a milestone for promoting private-sector investment in power generation. One medium (30 MW) and a number of small (total 10 MW) projects are expected from private investors with support from the PDF. The feasibility study of the Upper Tamakoshi (309 MW) has been completed with grant assistance of Norwegian Kroner 14.8 million from NORAD. Financial assistance is being sought for the detailed study and implementation of the Upper Seti (122 MW) storage project and Upper Modi A (42 MW) project. In generation expansion, the government intends to rely more on the private sector and public-private joint ventures than on public initiative alone. Until the private sector comes out to meet the current demand adequately, the Government may have to continue to take up some projects.

In the field of transmission, the NEA is operating at the system voltage levels of 132 and 66 kV. Rising load demands have created load saturation in some sectors of these transmission lines, leading to poor regulation and reliability at supply terminals and resulting in an increase in technical losses. The completion of projects, like the Middle Marsyangdi, would require augmentation of the current carrying capacity of the major 132 kV network and construction of some 220 kV lines. The urgently needed 220 kV sections are Hetauda–Bardghat and Khimti–Dhalkebar. The Khimti–Dhalkebar 220 kV transmission line is going to be constructed with loan assistance of the World Bank, while efforts are underway with donors for the implementation of the 220 kV Hetauda–Bardghat section. The NEA is also constructing three power exchange links, namely Butwal–Sunauli, Parwanipur–Birgunj and Dhalkebar–Sitamarhi at the 132 kV level to enhance the transfer capability of the Nepal-India cross-border interconnections.

The Nepal Power Development Project includes a component for the NEA, which carries a total assistance of US$32.6 million (US$15.4 million as credit and US$17.2 million as grants) for expansion of transmission lines to strengthen the national grid and reinforcement and expansion of the distribution system. This will enhance the quality of grid connected supply to 34,000 consumers, including 17,000 new connections. In the area of distribution system expansion in the Mid Western and Far Western regions of the country, the Swedish government has conveyed its commitment to provide concessionary credit of about US$20 million. The ongoing rural Electrification in Kailali Kanchanpur under Danida's assistance will be completed in BS 2063/64.

The Rural Electrification, Transmission and Distribution Project, aided by the ADB and the Organization of Petroleum Exporting Countries (OPEC), has five different components, which will, in addition to providing transmission and institutional support, develop the distribution system to connect about 123,000 rural households in the areas of 277 Village Development Committees (VDCs).

5.3 Government's Hydropower Development Policy and Institutional Arrangements

5.3.1 Hydropower Sector Strategy

The government is at present implementing the Tenth Five-Year Plan from July 2002 to June 2007, which coincides with the first five years of the 25 year Water Resources Strategy-Nepal 2002.

5.3.2 National Water Resources Strategy 2002

Realising the fact that the development and management of water resources should be undertaken in a holistic and systematic manner aimed at the sustainable use of resources, ensuring conservation and protection of the environment, Nepal had adopted the National Water Resources Strategy (NWRS) 2002. Acknowledging the prevailing issues and the constraints in the water resources sector, the NWRS has identified 10 different strategic outputs and defined strategies for each of them. Regarding hydropower development, the strategic outputs define Nepal's strategy to achieve 'cost-effective hydropower developed in a sustainable manner'. The NWRS further defines the activities required to meet the following objectives:

- Develop cost-effective small (including micro- and mini-) and medium hydropower projects to meet domestic demands at an affordable price.
- Encourage private investment in hydropower development and power distribution.
- Provide increased government support to accelerate rural electrification.
- Integrate improved social and environmental mechanisms into hydropower development.
- Encourage Nepal's power-based industries and transportation system to create markets for large hydropower generation plants.
- Facilitate the flow of funds from the domestic financial sector to the hydropower sub-sector.
- Restructure the power utility company.

The NWRS then prescribes indicators for short (five years), medium (15 years) and long (25 years) terms for achieving the outlined output. However, according to the National Planning Commission (NPC) census, of the population already 40 per cent has access to electricity for the Tenth Plan period of up to 2007/08, and the target to supply electricity services to 55 per cent of the population is set. Therefore, the following revisions are set in the NWRS.

- by 2007, 820 MW (revised to 700 MW) of hydropower capacity to be developed to meet projected demand;

- by 2007, laws making national contractors/consultants' participation mandatory in all types of projects promulgated;
- by 2007, 55 per cent of population supplied with electricity;
- by 2017, 2,230 MW hydropower developed to meet projected demand of 2,230 MW, including 400 MW for export;
- by 2017, 65 per cent of population supplied with electricity;
- by 2027, 75 per cent of households have access to grid supplied electricity; and
- by 2027, Nepal is exporting 15,000 MW of electricity to earn national revenue.

5.3.3 Hydropower Development Policy 2001

The GoN is pursuing water resources development in Nepal from three different approaches. First, to develop small and decentralised hydropower projects to meet the local demands in remote and isolated regions of the country. Second, to develop medium-sized power projects to meet the national demand within the national grid, including surplus for export, and to develop local capacity. Third, large-scale multipurpose projects to meet the regional demand for food, energy and flood control. With this vision, the GoN has adopted the new Hydropower Development Policy (HDP) 2001, which is designed to attract both local and foreign private developers.

Through the HDP 2001, Nepal has expressed its commitment to bring about institutional reforms in this sector. The HDP is keen on establishing a strong regulatory body that would not only fix electricity tariffs but also oversee the qualitative aspects such as safety, quality of supply, reliability, safeguarding of consumers' interest, criteria for load dispatch, etc. The existing ETFC would be expanded to act as a regulatory body. Similarly, clear roles have been given to the existing WEC to act as a policymaking and planning body and the DoED to act as a study and promotional body. The HDP has also clarified its intention to go for multi-users' and multi-buyers' mode from the current monopoly enjoyed by the NEA. The NEA will be restructured with necessary reforms, leading to the formation of an autonomous national grid accessible for wheeling energy to all buyers and suppliers in order to create a favourable situation for foreign investors and for the competitive market necessary for consumers to obtain electricity at affordable prices.

The following policy measures have been adopted to attract foreign and national investors in Nepal:

- One-window policy
- Attractive investment features
- Repatriation of foreign exchange
- Fixed royalty payments
- Import concessions
- Export potential
- No nationalization of projects

5.3.4 Tenth Five-Year Plan (2002/03–2007/08)

Based on the long-term vision and to achieve the long-term targets set out by the NWRS, the objectives, targets and strategy for the Tenth Five-Year Plan (2002/03–2007/08) have been fixed. These are described hereunder:

5.3.4.1 Plan Objectives

During the Tenth Plan period, electricity will be developed to achieve the following objectives:

- To generate electricity at low cost by utilising the available water resources of the country.
- To extend reliable and good quality electricity services all over the country at a reasonable price.
- To tie-up electrification with economic activities.
- To support the development of the rural economy by extending rural electrification.
- To develop hydropower as an exportable commodity.

5.3.4.2 Plan Targets

The following targets have been set for the Tenth Plan.

- Installed capacity of hydroelectric project in the National Electricity Grid will be increased to 700 MW (revised to reflect present reality) from the present capacity of 556 MW.
- Electricity services will be provided to 55 per cent of the population from the present coverage of 40 per cent.
- Per capita electricity consumption will be increased to 100 kWh from the present value of 60 kWh.

5.3.4.3 Plan Strategies

In order to meet the objectives and achieve the targets of the Plan, the following strategies will be adopted:

- Electricity services will be made available to the rural economy from the viewpoint of social equity.
- Clear, simple and transparent procedures will be adopted to increase the participation of the private sector in electricity development.

- Small, medium, large and storage hydroelectric projects will be implemented by harnessing the water resources of the country for national interest, environment conservation and maximal benefit.
- Hydroelectric projects will be implemented by attracting investment from the private sector and joint ventures of private and public sectors, and also from the public sector, as required.
- River basin planning approach will be made the basis for the development and management of some rivers.
- A strategy will be adopted to develop hydroelectricity with bilateral/regional co-operation.
- Risks arising from hydroelectric projects will be minimised with the joint efforts of the government and the private sector. Those risks that cannot be eliminated will be borne by either the government or the private sector that can afford to bear it at a lesser cost.
- Transmission interconnections with the Indian power grid will be done.
- Overall power sector reform will be carried out along with the restructuring of the NEA.

5.3.5 Specific Policies and Actions for Rural Electrification

Recognising the importance of rural electrification in poverty alleviation, the government has adopted some specific policies and actions for the development of rural electrification. They are presented below.

5.3.5.1 Specific policies

- In remote areas, electrification programmes will be encouraged by implementing small and micro hydroelectric projects at local level.
- Rural electrification programme will be expanded to provide electricity services for the maximum number of people.
- Use of surplus electricity during the off-peak period will be encouraged in rural water supply, irrigation, industry and tourism sectors.

5.3.5.2 Specific actions

- The government will gradually expand the rural electrification programme. By the year 2017 it has plans to achieve the target of providing 65per cent of Nepalese with access to electricity. A ‚Rural Electrification Fund‘ will be established for micro-hydropower development and a rural electrification programme

by apportioning some of the royalties amount. One per cent of the royalties obtained by the GoN from a hydropower project shall be provided to the VDCs that are directly affected by the hydropower infrastructure, with the sole purpose of expanding electrification of these VDCs.

- Reasonable provision will also be made to include rural electrification while granting electricity distribution licences.
- Electrification will be encouraged in the rural areas directly affected by the electricity generation projects. Energy royalties will be exempted on electric energy consumed in such areas. Such exemption will be allowed for the first 15 years from the date of commercial operation of the project.
- The government will provide subsidies through the Alternate Energy Promotion Centre for electricity generation and distribution through the construction of micro-hydroelectric stations of up to 100 kW at rural levels by domestic private sector.
- Electricity will be supplied to hilly rural areas that are away from the reach of the national electricity grid through small and micro hydroelectric projects. Operation and maintenance of such projects will be given to local cooperatives and such cooperatives will be associated right from the project planning and implementation stages.

5.3.6 Institutional Arrangements to Implement Hydropower Projects

The HDP 2001 has made several institutional provisions for the development of hydropower.

i. Regulatory body**:** The existing Electricity Tariff Fixation Commission (ETFC) shall be developed as a regulatory body. The main functions of the regulatory body will be to fix electricity tariffs, to monitor and supervise the safety of the electric system, maintain reliability and quality standards of electricity as well as to service the PPAs concluded between the generators and purchasers of power.

ii. National Electricity Regulatory Commission (NERC):

The National Electricity Regulatory Act, delineating the functions of the NERC has been drafted by the previous government, but yet to be promulgated. The functions of the NERC as per the draft will be:

- Efficient operation and regulation of the National Power System.
- To make electricity generation, transmission, distribution and supply reliable and efficient.
- To monitor, review and approve the least cost generation expansion plan for the development of power system for internal use. It will not be applicable for power plants with less than 10 MW capacity.
- To develop technically sound and standard power security system.

- To determine the standards and rules for system operation and maintenance.
- To determine the basis, priority and conditions for termination of power supply.
- To approval grid codes, distribution codes and other related documents.
- To fix electricity tariffs and other related rates.
- To review the PPAs between purchasers and sellers and give necessary directions.
- To fix the wheeling charges for transmission and distribution lines.

iii. Water and Energy Commission (WEC): The WEC provides policy advice to the GoN on technical, legal, environmental, financial and institutional matters related to water resources planning and development.

iv. Study and Promotional Body: DoED shall carry out feasibility studies, issue study and generation licences to private and public sectors, and conduct activities related to the promotion of hydropower development in the country. The DoED is one of the departments under the Ministry of Water Resources (MoWR). The main functions of the DoED are:

- Study and development of multipurpose, bilateral and major hydropower projects.
- Promotion and development of private investment in the power sector, including licensing.
- Preparation of standards and guidelines for generation, transmission and distribution of electricity.
- Inspection and monitoring.
- Advisory assistance to the MoWR.
- One window for providing incentives and facilities to power producers.
- Act as Secretariat of Tariff Fixation Commission.

The DoED is headed by a Director General and has three main divisions headed by Deputy Directors General with a total staff of 109 (60 Gazetted and 49 non-Gazetted).

v. Provision for Electric Energy Management Research Institute has also been made in the policy. This research institute will carry out studies and research on the financial, legal, environment and technical aspects of electrical energy and also provide training. This research institute has not yet been established by the GoN.

vi. Unbundling of the NEA: The functions pertaining to the power generation operations, national grid operation and electricity distribution owned by the NEA shall be gradually unbundled and appropriate institutional arrangements shall be made.

5.3.7 NEA's Past, Present and Future

The NEA's financial performance has not been encouraging and the authority is suffering a loss for the fifth year in a row for various reasons. The NEA suf-

fered a net loss of NRs.2.472 billion in FY2005/06. Past performance indicators (technical and financial) of the NEA for the last six years are presented in Annex 20.

From Annex 20 it is evident that, taking the year 2000 as the base year data, in the six-year period ending in 2006, the number of customers has increased by 89.9 per cent and the total sale of electricity increased by 62.8 per cent. The average price of electricity remained almost the same throughout the six-year period. The peak load of the NEA system increased by 71.4 per cent, and total energy also increased of 63.2 per cent. The technical features of the NEA system such as installed capacity increased to 611.53 MW, an increase by 222 MW, which is 57.0 per cent of the year 2000 figure of 389.57 MW. The length of transmission lines of the different voltages, 132 66 and 33 kV, increased by 508 104.7 and 979 km, respectively. Substation capacity also increased by 275.4 MVA, from 813.6 to 1089 MVA, in the period of six years.

However, the net system loss could not be reduced, but it slightly increased to 24.7 per cent from 23.9 per cent. The financial loss of the NEA system is drastically growing year by year, which is a matter of grave concern. The NEA's past performance has been encouraging. However, the financial condition is not satisfactory. Future investment requirement of the NEA is huge. For generation, transmission and distribution and other related activities, for the next five years, the investment requirement will be in the range of NRs45 billion, as per the NEA corporate plan. Such a huge amount cannot be invested by the public sector alone. So, private investment will also be required. The private sector alone will not be interested in investing in the power sector, Therefore, public-private joint ventures may be the right model for power development. The generation requirement of the system, even after the commissioning of Middle Marsyangdi, cannot be fulfilled; the unbundling of the NEA at this juncture is not appropriate, but it should be postponed until sufficient generation capacity is added to the system. Moreover, the regulatory commission is not yet established. Hydropower projects, like Upper Tamakoshi, Upper Karnali, and other projects in the pipeline, should be constructed within the public-private partnership model within the next five to ten years. Only after that the unbundling of the NEA should be taken up, i.e. in the year 2015.

5.4 Mode of hydropower development

5.4.1 Private-sector development

From the 1990s, subsequent to the adoption of the policy of economic liberalisation, hydropower development took a new turn with the private sector entering the arena. In order to attract private sector involvement, the GoN, along with other relevant policy and regulatory reforms, approved the Hydropower Policy 1992. One of the major thrusts of this policy was to attract private-sector investment at that time. As a consequence, private sector projects such as Khimti, Bhotekoshi and Indrawati

III were materialised. In order to encompass projects of various scales intended for domestic consumption as well as for the export of power, the policy was updated, revised and replaced by Hydropower Development Policy 2001 to impart further impetus to the active participation of the private sector.

At present, the SMEC has been successful in signing a PPA with India for the 750 MW West Seti Project. This heralds a good beginning for potentially export-oriented power projects.

Similarly, several Indian private companies have shown interest in developing Upper Karnali and all the three projects (Upper Arun, Arun III and Lower Arun) in the Arun valley.

5.4.2 Joint-Venture Development (Public-Private Partnership)

For the development of larger hydropower projects, as envisaged in the Hydropower Policy 2001, joint-venture investment has to be encouraged. The National Hydropower Corporation (NHPC) of India has expressed its interest in taking up the 300 MW Upper Karnali Project in joint venture with the NEA. Similarly, other projects like Upper Tamakoshi (309 MW), Chamelia (30 MW), Upper Modi A (42 MW), could also be developed through joint ventures.

The Upper Karnali Hydroelectric Project is a peaking run-off-river project with an installed capacity of 300 MW. The NHPC has shown interest in developing this project jointly with the NEA. This project is located in the Far Western Development Region of Nepal and the average production cost of energy will be around 3-4 US cents/kWhr. A Memorandum of understanding for the joint development of the Upper Karnali between the NEA and the NHPC has yet to be signed. It is proposed that the equity shareholding between the NEA and the NHPC will be 70:30. It is a good opportunity for developing a cheap hydropower project through this joint venture, which will be beneficial to both Nepal and India.

5.4.3 Public Sector Development

The investment required for hydropower development from the public sector is shrinking as the grants, aid and funding from bilateral and multilateral agencies have reduced substantially. Thus, the recent trend of focusing on private–sector investment in hydropower development has got impetus. However, public sector investment is equally needed in the form of joint ventures with the private sector for hydropower development.

Several megaprojects could be developed through the public sector. Some of them are described below.

i. Pancheswor Hydroelectric Project: This project is located on the Mahakali river, a boundary river between Nepal and India. It should not have taken such a long

time for the preparation of the detailed project report (DPR). It seems that both the countries are not yet prepared to develop this project. The issues in contention are the difference of views in benefit assessment. The differences are as follows.

- Use of the Mahakali (Sarada) river waters during the four months of the rainy season by the Sarada barrage in the Sarada Sahayak command area (2 million ha) has been claimed by India as prior use, but the Nepalese side is not accepting this view. According to the Nepalese version, the Lower Sarada Barrage, which is 160 km below the Sarada barrage on the Mahakali (Sarada) river, is outside the ambit of the Mahakali Treaty. Nepal is not accepting the logic that the lower Sarada barrage used to draw less silty water from the Mahakali river during the four months of the rainy season, thus the increase of its share of prior use of water and thus the decrease of irrigation benefits from the project.
- Nepal is not accepting the Indian view of treating hydropower projects as alternative projects to thermal projects. Hydropower projects and thermal power projects cannot be treated on the same footing.
- India's view to locate the re-regulating dam at Poornagiri, some 61 km downstream of the main Pancheswor dam, is not acceptable to Nepal. The present location of re-regulating the structure at Rupaligad is technically not feasible due to insufficient storage capacity for daily regulation and for sediment storage volume. Nepal's view is to locate it at a new suitable site between Rupaligad and Poornagiri in order to fulfil the requirement of total storage volume for the reregulating dam.
- No methodology has been agreed on for sharing the cost of the project according to the benefits accrued. India's view is that the assessment of benefits is very complicated and one's method of assessment may not be acceptable to the other; hence, another suitable method should be adopted for sharing the costs. India is informally proposing using the live storage volume of the reservoir as the basis for cost sharing, i.e. Nepal and India should share the costs according to their share of use of the live storage volume. India contends that the live storage volume can be treated as a form of benefit from the project without going into the details of benefit assessment. Nepal's view in this regard is that the treaty clearly mentions the methodology to be adopted in the assessment of benefits. Any method of sharing of costs other than that based on benefits is a clear departure from the treaty and its revision will be required to adopt any such method.
- The above issues have to be resolved for finalisation of the DPR and, unless a joint DPR is prepared, no further action for the implementation of the project could be made.

ii. Sapta-Koshi Project: This is a multipurpose project to be built on the Koshi river. This project will provide multiple benefits such as flood control, irrigation, power and navigation. Those benefits will be shared by both Nepal and

India. India will be the major beneficiary in terms of flood control and irrigation, whereas Nepal will benefit in terms of power, irrigation and navigation. The feasibility study for this project has already been approved by the governments of both Nepal and India. It is expected that the DPR will be available within the next years.

5.5 Role of Different Players

The role of donors, Governments of Nepal (GoN) Nepal Electricity Authority (NEA) Independent Power Producers (IPPs) , local engineers/contractors and local financial institutions in mitigating the constraints and limitations of hydropower development may be defined as follows.

5.5.1 Donors' Support for Hydropower Development

The investment requirement for hydropower development is huge. Without the financial support of bilateral and multilateral donors, the development of this very important sector of the economy is not possible. At present, the energy requirement of the country is fulfilled by importing costly petroleum products and gas, which requires scarce foreign exchange. Indigenous resources, like hydropower, which is available in abundance in the country, should be developed in a cost-effective manner. If this hydropower resource could replace the imported energy from petroleum products and gas, the national economy could grow rapidly. Therefore, all aspects of energy requirement of the country could be based on hydropower development. That way, the domestic market for hydropower will be enhanced and efforts for production of affordable hydroelectricity will be initiated.

5.5.2 Role of Government of Nepal (GoN)

- Policy of the GoN for hydropower development has to be reformulated, giving priority to renewable and sustainable hydro energy.
- Energy policy for the country has to be formulated and energy from indigenous resources such as hydropower has to be given priority and its importance over imported petroleum products and gas emphasised. In the last two years or so, the cost of a barrel of oil has jumped from about US$20 to over US$70 (by the end of March 2008, it is US$110). Energy produced from petroleum products and gas should be replaced by producing cost-effective hydropower.

5.5.3 Role of the Nepal Electricity Authority (NEA)

The NEA, as the sole public utility, has been entrusted with the generation, transmission and distribution of electricity all over the country. With the limited capacity of financing resources, the NEA is facing a tremendous task in fulfilling the power and energy requirements of the country. It is struggling hard to overcome the financial crunch and to maintain the system requirement for the generation, transmission and distribution of power. The electricity tariff of the NEA is already one of the highest in the region. Furthermore, multilateral donors such as the ADB and World Bank are putting pressure on the NEA to raise the electricity tariff to meet their loan covenants (SFR and ROR). Therefore, the NEA will have to find ways and means to not raise the electricity tariff but to make the electricity tariff affordable to general consumers.

5.5.4 Role of Independent Power Producers (IPPs)

IPPs should produce cheap power, which should be saleable to the NEA consumers. The NEA should be able to purchase the power produced by the IPPs and it should match the system requirement. At present, the NEA has excess energy/capacity during the rainy seasons, whereas it has a deficit during dry seasons. Therefore, IPPs should select those projects that can produce more power and energy.

5.5.5 Role of Financial Institutions

As the investment opportunities in the domestic market are shrinking, the hydropower sector is emerging as a lucrative area for investment. In a long-term scenario, the hydropower sector provides a very good opportunity for profit-making. Although initial investment in the hydropower sector is high, the running cost is very low compared to thermal power plants. Nepal, being a mountainous country with numerous rivers, has a huge hydropower potential. With the development of indigenous hydro resources with locally available financial resources, Nepal has to develop its economic potential in all other sectors of the economy, such as agriculture, transport, industry and tourism. Therefore, the local financial institutions will have to play a catalytic agent's role by investing in hydropower development.

5.5.6 Role of Local Engineers/Contractors

Local engineers/contractors should play a major role in reducing the present hydro generation costs. With knowledge of the terrain and physical features of the Nepalese

mountain rivers, the local technicians/contractors can substantially reduce the generation costs in comparison to the expensive expatriate engineers and contractors. Therefore, the GoN's policy should encourage local technicians and contractors. Even in the donor-financed projects, priority to national technicians and contractors should be emphasised and donors should be persuaded to replace expatriate consultants and contractors with local ones.

5.6 Challenges and Issues on the Domestic Project and Perspective on Export Projects

5.6.1 Challenges and Issues on Domestic Project

Around 40per cent of the population has access to some form of electricity, the majority of energy consumption taking place in urban areas. In a steep terrain country like Nepal, full of hills and mountains, electrification is a very costly affair. This situation poses challenges in managing the financial resources to expand the electrification network.

Electricity tariffs in Nepal are high, and are beyond the affordable capacity of many consumers. The reasons are manifold. The basic infrastructure is not well developed, which often includes long approach roads, transmission lines and so on. The majority of the equipment and materials also have to be imported, which requires foreign currency and transportation overland for a long distances from the port. The major share of financing projects is external loans and investments, which are to be paid back in foreign currency, which further escalates the tariff. The challenges lie in developing cheap and reliable hydropower projects so as to keep the tariff within the reach of everyone. The GoN is, therefore, undertaking power-sector reform measures with a view to bringing about improvements to remedy the situation.

It is encouraging to note that the private sector is gradually entering the power market. The local banking sector's interest in forming consortiums with private developers, as in the case of the Piluwa, Indrawati and Sunkosi small projects, also heralds a new dawn on the horizon despite the present security situation. The main challenge to the private sector is the transfer of technical know-how and easy access to international markets for financing mechanisms.

The domestic demand over the forecast period of 25 years is relatively small, limiting development. The challenge lies in the ability to establish a number of energy-intensive industries and transport systems within the country for creating greater demand for hydroelectricity, which will lead to a higher energy growth rate than the load forecast. A breakthrough along this line will provide ample opportunities for development of this clean and renewable energy.

Nepal' own resources in both public and private sectors cannot meet the financial investment needed for hydropower development. Large investment is

required from foreign development agencies and private-sector entrepreneurs. Although significant foreign investment has been attracted in recent years, much still remains to be invested for meeting both internal demand and for exporting power, which has significant potential.

5.6.1.1 Potential for Cost/Efficiency Improvement

There is significant potential in Nepal for improving the cost and efficiency in the harnessing of hydropower. The major features of such an improvement are:

i. There is a need for increased use of local financial resources in project development. Project development for domestic power needs through indigenous resources will reduce the vulnerability and risk of foreign exchange to a large extent.
ii. Project selection based on screening and ranking with sufficient alternatives would make the project more efficient. In the past, some projects in Nepal had to be selected due to lack of sufficient alternatives. At present, a number of projects have been studied for their feasibility, which provide sufficient alternatives.
iii. Enhanced use of domestic human resources and a manufacturing base for planning, design and construction of hydropower projects will not only improve human resource skills but also reduce the cost that Nepal is currently incurring in obtaining such services from outside. Now, Nepal has more than 600 engineers that have multiple skills and vast experience in such activities. Local construction and manufacturing skills have considerably improved after the successful completion of a number of medium-sized projects in recent years in the public and private sectors. This capability needs to be effectively utilised on a wider scale for future project development.
iv. Transmission line development, particularly along the north–south corridors, will enhance the attractiveness of hydropower schemes, which are located mainly in the remote north of the country. In this regard, the NEA has studied six north–south corridors, of which the Shivpur–Tamghas–Modi and the Damak–Phidim–Hile corridors are studied at the feasibility level.
v. The creation of a regional grid will immensely help the project development of export-based projects in Nepal, which will also have regional benefits.
vi. Project development of higher capacity will have benefits of economies of scale if a sufficiently competitive institutional environment can be fostered.
vii. The need to delink the costs of road access to the project site from the cost of the project can help to lower the costs of generation.

5.6.2 Perspective on Export Projects

5.6.2.1 Potential export projects

Apart from the projects listed in the Generation Expansion Plan, a number of projects have been identified and studied for development. Annex 20 lists some of them. Local developers in Nepal have been involved mostly in smaller power plants. For larger projects involving huge capital and international agreement, it is beyond the national investment capacity and requires external financial support. Foreign investors are showing interest in the market in the region, particularly in India, before committing to energy development. At present, the SMEC has been successful in signing a PPA with India for the 750 MW West Seti Project. This heralds a good beginning for future potentially export-oriented power projects. A Nepal-India joint committee is also working on the preparation of a DPR for the 6,480 MW Pancheswor Project on the Mahakali river.

5.6.2.2 Regional/Bilateral perspectives

Nepal's hydropower development prospect is not limited to its own development but it can also be helpful in the promotion of regional economic development. The potential of Nepal's hydropower has unfolded the possibilities of bilateral and regional cooperation. This development is associated with other multiple benefits, such as flood control, increased regulated flow facilitating navigation, and increased area under irrigation in the lean season, which opens up the possibility of ultimately ushering in a new cycle of economic growth in the poverty-stricken areas of the food plains of the Ganges basin. Significant in the regional perspective is Nepal's policy that allows financing by both private and public sectors at national, bilateral or multilateral levels. Nepal has several storage as well as cascade projects suitable for development under a regional umbrella of cooperation. Some initiatives involving the sub-regional countries, Nepal, Bangladesh, Bhutan and India have taken place. Inspired by the Mekong River Commission, the ADB has introduced the concept of the South Asia Growth Quadrangle (SAGQ) and has initiated the South Asia Sub-regional Energy Cooperation (SASEC). Similarly, USAID has initiated the South Asia Regional Initiative/Energy (SARI/E), playing a catalyst role in fostering sub-regional cooperation in the energy sector.

At bilateral level, the GoI has expressed its willingness to conduct a study of the 600 MW Budhi Gandaki Storage Project. The NHPC of India has expressed its interest in taking up the 300 MW Upper Karnali Project in a joint venture with the NEA. Under the ongoing power exchange arrangement with India, Nepal exported to India around 101 GWh of energy and imported around 266 GWh of energy in 2005/06.

5.7 Way Forward for Domestic and Export Project

5.7.1 Domestic Projects

For increasing the power demand in the domestic market, power generation should be tied up with the power-consuming industries. At present, the energy policy of the GoN is non-existent. The energy policy of the GoN should be geared towards the prioritisation of hydro energy than towards the import of fossil fuel energy.

- For increasing the power demand in the domestic market, the electricity tariff has to be reduced drastically. For reducing the electricity tariff, the generation cost of new projects has to be reduced substantially and the distribution losses of the system have also to be reduced.
- The cost of development of hydropower projects could be reduced substantially only with the efforts of national technicians, local manufacturers and contractors. The government should formulate a policy to encourage national technicians and contractors by reducing the role of expatriate consultants and contractors.
- Medium-scale hydropower projects should be developed by national technicians and contractors, and local financial institutions should be mobilised for financing small- and medium-scale hydropower projects. The involvement of foreign consultants should not be required in small projects. The mode of development could be private-public partnership (joint venture).
- Financing required for medium-scale projects could be mobilised through domestic financial institutions as well as through foreign donors/banks.

5.7.2 Export Projects

- Hydropower development should also be directed towards the export market in India. India needs huge power requirements, which can partially be fulfilled by Nepal's mega hydropower projects.
- In the short term, Nepal should enter the Indian power market on isolated mode (i.e. not synchronised to the Indian power system) for saleable energy by enhancing the current exchange mode of operation by increasing the generation capacity from Nepal in order to reduce net energy imports. Power transmission will continue to be on a radial basis only.
- In the medium-long-term scenario Nepal should focus on meeting India's hydro generation targets of around 50,000 MW needed by 2011-12 via displacement of capacity 5,000 to 10,000 MW from large-scale hydropower projects in Nepal.

5.8 Conclusion

- Nepal, with its tremendous potential for hydropower, is always facing problems of load-shedding during the winter and excess energy during the summer seasons. This situation will not arise if a sizeable storage project (200-300 MW) can be introduced in the Nepalese power system, or peaking power plants like Upper Tamakoshi (309 MW) and Upper Karnali (300 MW) can be constructed. At present, Nepal's power system (611 MW) consists of run-off-river plants, with the exception of the Kulekhani project (92 MW).
- The present level of power exchange between Nepal and India is only 50 MW. However, it was agreed in the power exchange committee meetings between Nepal and India that it will be enhanced up to 150 MW, but it could not materialise due to the unavailability of high voltage transmission lines connecting Nepal and India and also due to unsuccessful negotiations on the tariff rates.
- The past grievances between Nepal and India on water resources development should not be an obstacle for moving further ahead. Nepal's experiences in Koshi and Gandak should not be the basis for exploitation of our vast water resources potential. India, with the huge demand, and Nepal, with the vast water resource potential, must find ways and means to harness this potential for the benefit of both the countries. With regard to the Pancheswor bilateral project, both countries have to quickly resolve the contentious issues, prepare a joint DPR and implement the Pancheswor Project under the Mahakali Treaty at the earliest possible date.

Chapter 6
Power Trading

Santa Bahadur Pun

6.1 Indo-Nepal Power Exchange

6.1.1 Genesis of Power Exchange

The concept of Indo-Nepal Power Exchange was first broached in BS2006 (AD1950) by the newly arrived ambassador of independent India, Chandreshwar Prasad Narain Singh (CPN Singh), during discussions with Mohun Shumshere, the last autocratic Rana Prime Minister of Nepal. Mohun Shumshere confided (Pande 1982) in CPN Singh of his Rs1.8 crore plan to generate electricity at 6 paisa per unit from the 22 MW[1] Gaidakot hydropower-cum-irrigation project in Nawalpur/Nawalparasi by diverting the Kali Gandaki waters through a tunnel. The shrewd Indian ambassador advised Mohun Shumshere that he was making a big mistake as the Indian government was soon executing the large Kosi High Dam Project at Barahchhetra (incidentally inside Nepal) that would avail electricity at 2 paisa per unit for Nepal, North Bihar and Bengal. Mohun Shumshere swallowed this bait and roundly chided the 22 MW project initiators[2] for 'nearly wasting his Rs 2 crores on a useless project!' Many Nepalese now believe that if this Gaidakot hydropower project of 1950 had

S. B. Pun (✉)
Former Managing Director, Nepal Electricity Authority and Former Officer on Special Duty, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
e-mail: santapun@ntc.net.np

[1] By 1950 standards, 22 MW was indeed a large project as the then prevailing hydropower stations were the 0.5 MW Pharping, 0.8 MW Sundarijal in Kathmandu and the 1.6 MW Letang in Morang/Biratnagar. The transmission line envisaged Nawalpur-Kathmandu, Nawalpur-Butwal and Nawalpur-Janakpur also. By queer coincidence, the installed capacity of Chilime hydropower station is also 22 MW.

[2] Prime Minister's son Bijaya SJB Rana, Bhim Bdr Pande, Lt/Colonel Yagya Bdr Basnet, Kashi Raj Pande, Mr. Kilburn/Bijuli Adda, Bharat Bdr Pradhan and even Dr. Bharat Raj Vaidya whose job was to eradicate Malaria from the project area/Nawalpur!

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been implemented, then this would have done what the 20 MW Chilime has done to the nation 50 years later—mobilise scarce local skills and resources.

CPN Singh's Barahchhetra project of 1950 moved down over 30 miles to 'about 8 miles upstream of Hanuman Nagar town' in the Indo-Nepal Agreement on the Kosi Project, signed on April 25, 1954. As soon as the Kosi agreement was signed with Nepal, immediately in May/June 1954, India sent a team of two engineers, Mr Kanwar Sain and Dr KL Rao, to communist China to study the embankments built to control the floods on the Yellow river and other rivers in China. The Revised Kosi agreement of December 19, 1966 indicates that the barrage again moved further down to 'about 3 miles upstream of Hanuman Nagar town' where actual construction of the barrage occurred. Without having even finalised the barrage location technically on the drawing board, this 'southward movement of the barrage location' in the two agreements tells the story of how desperate India was to tame the Kosi, Bihar's *'River of Sorrow'*. The 1954 Kosi Agreement was signed during the premiership of MP Koirala and analysts note (Rose 1971) **'**It was CPN Singh, for instance, who was generally credited with having arranged MP Koirala's appointment as prime minister in November 1951, whereas it had been generally assumed that his more popular half-brother, BP Koirala, would head the first non-Rana government**.'** Security of the barrage, plus the operational and maintenance 'convenience' to the Indian personnel staffing the barrage, may have necessitated the construction of the barrage as close to the Indo-Nepal border as possible.[3] And, of course, India's aim was to maximise her irrigation command area by pushing the barrage as far upstream as possible.

However, Indian diplomats[4] to this day maintain **'**If the Indians had built the Koshi barrage a little downstream in Bihar, then Nepal's advantage would have been zero. And Indian irrigation instead of nine and a half lakh hectares would have been nine lakh and thirty five thousand hectares**.'** Sober Indian ex-bureaucrats like Jagat Mehta (2004) now concede that '… one suspects the Indian engineers did not fully explain the consequences in advance to the Nepalese authorities'. At the 1991 Secretary-level meeting of the Indo-Nepal Sub-commission on Water Resources held at New Delhi, India contended that the Kosi Barrage is a joint Indo-Nepal asset and that the barrage has ***'outlived its life and Kosi Multi-purpose Project can only protect this asset'.*** Interestingly, India further mooted at the meeting that the 'utility of the project for flood control will be mainly confined within Nepal and India, and will not extend to Bangladesh'. Hence, India did not deem it '*necessary to involve Bangladesh on the consideration of the Kosi Project'*. Due to Kosi's proximity, Bangladesh badly wanted to be a partner in the Kosi multi-purpose project. In fact, in October 1986, a Joint Committee of Experts from India and Bangladesh had come to Nepal '*hunting'* for

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[3] Though the entire length of the Kosi barrage is within Nepal, even reputed authors like BG Verghese and R Iyer (Verghese and Iyer 1993) claim that '… *to construct a barrage* ***just within the Indian border*** *but with flood and afflux blanks (sic bunds), canals and protective works in Nepalese territory on lease for 199 years.'*

[4] Ambassador, Deb Mukherjee, Face-to-Face Programme at the Reporters' Club, May 26, 2001 Kathmandu: and B Pyakuryal, MK Dahal and D Adhikari (2005) *India and Nepal Partnership in Economic Development: An Enquiry into the Indian Aid Policy to Nepal.* Kathmandu B.P. Koirala Foundation.

river data, wherein it was Bangladesh that proposed seven storages[5] in Nepal to augment the dry season flows of the Ganga at Farakka. As Nepal, despite her request, was not included in that Joint Committee, she was forced not to comply with the Committee's request for data on Nepalese rivers. CPN Singh's 1950 Barahchhetra project has reared its head 50 years later as the Indo-Nepal Sapta Kosi High Dam Multi-purpose Project-cum-Sun Kosi Kamala Diversion Scheme, which is being investigated with NRs.46.8 crores of Indian funds (Pyakuryal, Dahal and Adhikari 2005).

6.1.2 'Concessional' Kosi Power

The preamble to the 1954 Kosi Project states '… for the purpose of flood control, irrigation, generation of hydroelectric power and prevention of erosion of Nepal areas on the right side of the river…' Note the correct order of priority: flood control, irrigation and generation of power! India does concede (Ibid) that this first joint venture was 'originally conceived as a flood control scheme'. This meant flood control and irrigation far outweighed power generation. 'The powerhouse on the eastern Kosi canal has been designed to produce 20,000 kW, of which Nepal's share would be 10,000 kW… The barrage was completed in 1962 at a cost of Rs.236.2 million IC and flood embankments of 146 km and 123 km respectively were completetd at a cost of Rs.450 million IC' (Ibid). Many both in Nepal and India believe that Nepal's 10,000 kW power is '*gratis'* but the treaty stipulates '*on payment of such tariff rates as may be fixed*' by mutual agreement. With the commissioning of the barrage in 1962 and the eastern canal in July 1964, Nepal's 10,000 kW of power entitlement was to power the industrial towns of Biratnagar, Dharan and Rajbiraj in 1965. Unfortunately, the 1965 Indo-Pakistan war broke out and the ship carrying the Kataiya powerhouse's Fuzi Electric Japanese electro-mechanical equipment were captured (Mishra 1990) and confiscated by the Pakistan navy on the Bay of Bengal, thus delaying the powerhouse commissioning[6]. The Barahchhetra power that CPN Singh promised and the 50 per cent power reiterated[7] by the 1954 Kosi Agreement materialised on October 31, 1971 (Records of Discussion between Nepal and India, 1983) when the first two units of the four turbines at the Kataiya powerhouse started generation. While the Kosi power tariff promised at 2 paisa per unit turned out to be a '*concessional'* IC 10 paisa per unit in 1971, power exchanges at a number of Nepalese border towns[8] were pegged at IC 14 paisa per unit.

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[5] Karnali/Chisapani, Kaligandaki: 1, Kaligandaki: 2, Trisulganga, Seti, Sapta Kosi and Pancheshwar

[6] 4.8 MW – April 1970, 4.8 MW – March 1971, 4.8 MW – October 1973, 4.8 MW – October 1978 : Power Generation Status – Bihar; http://www.bseb.org/bseb.Generation.htm#top

[7] 1954 Agreement on Use of Power states 'The Government (Nepal) shall be entitled to use up to 50 percent of the hydro-electric power generated at the Barrage site Power House on payment of such tariff rates as may be fixed for the sale of power by the Union (India) in consultation with the Government (Nepal)'.

[8] Siraha, Jaleshwar/Janakpur, Gaur, Raxual/Birgunj, Bhairawa, Krishnanagar, Nepalgunj, etc.

India terms the Kosi power to Nepal *'concessional'*. But if one is to look at the 1.1 km (3,770 ft) barrage on Nepalese territory and the impounded water with the afflux bunds submerging 41 km^2 (16 miles^2) of Nepalese land in perpetuity, providing huge flood control and irrigation benefits entirely for India, then one must say that it is Nepal that has provided 'huge concessions' to India. But Nepal has utterly failed to articulate these concessions and use them as a bargaining chip. The *'concessional'* Kosi power, even if it had been like the *'free goodwill 70 million units Tanakpur power'*, would have been too paltry a sum for the huge tracts of land that Nepal leased to India for 199 years. Even after 199 years of operation, the Letters of Exchange stipulate that India 'be reasonably compensated in case the Project properties are taken over by His Majesty's Government at the end of the lease period'.

As early as 1988, India's position on the *'concessional'* Kosi power was that 'though the original capacity of the Kosi Power Station was 20 MW it has been generating only to the extent of 1 to 2 MW that also intermittently…the agreed tariff applicable for other locations should also be applicable to the power exchange at Kataiya….' Nepal, however, explained that 'since decisions on the mode, quantum and related tariffs for supply of power under Kosi Agreement can not be taken at this level, the issues should be referred for a decision at the level of the two Governments'. Later in 1994 at the Second Power Exchange Committee meeting, India again '…made a strong plea for discontinuance of the concessionality in the tariff for power supply at Kosi point…generation from Kosi project should be at the rates applicable for supply at other points…' This Kosi '*concessional power'* to be upgraded at par with the higher power exchange rate has been repeatedly and consistently brought up by India at the Indo-Nepal Power Exchange Committee meetings to this date. Some fatigued Nepalese officials even started to argue in India's favour stating that the quantum of Kosi power is very small and Nepal might as well concede. The Water Resources Ministry, fortunately, took the stand that it was not the '*quantum of power*' in question but the '*principle*' under which the two countries signed the Kosi Agreement. By 1999 under India's persistent requests 'revision of Tariff for power exchange under the Kosi Agreement' was agreed to be referred to their respective governments. At the Secretary-level Indo-Nepal Joint Committee on Water Resources in 2004, though the Nepalese side took the stand that the 'subsidised rate of power supply should be continued', India argued that '*in view of shortfall in generation from Kosi Project, power had actually been obtained from other sources for supply to Nepal. Continuance of this arrangement was not sustainable*'. Despite the lame 'shortfall in generation from Kosi Project' and the unsustainability excuses, India successfully constituted a joint group to analyse the issue under the Kosi Project Agreement and submit its recommendations. Many believe that India would wait for an opportune political climate to wrangle from Nepal the discontinuance of this concessional Kosi power. One can only marvel at the 16 years' (1988–2004) consistency and obduracy of the Indian bureaucracy. That India does her homework well and Nepal does not is amply illustrated by this case!

Nepal needs to analyse why India has been arguing that the 'Continuance of this arrangement was not sustainable.' Analysts believe that India probably wants to 'untangle' herself before Nepal 'entangles' this '*concessional Kosi power*' with

the 3,300 MW power from Sapta Kosi High Dam Multi-purpose Project. As of June 2006, this '*concessional*' Kosi power tariff at the 33 kV voltage level is IC Rs2.70 (NC Rs4.32) per unit escalated at 8.5 per cent per annum. India buys Bhutan's Chukha power at the commercial tariff of IC Rs 1.50 per unit. The '*concessional tariff'* that India provides to her own farmers for irrigational needs is merely IC Rs0.40 per unit at the low voltage level. Nepal's '*concessional Kosi power'* off-take in the last five years is given below:

Fiscal Year	Kosi Power Amount (million Units)	Kosi Tariff (IC Rs)	Kosi Power Amount (IC Rs)
2005/06	31.23	2.70	8.01 Crores
2004/05	19.80	2.49	4.81 Crores
2003/04	17.03	2.29	3.81 Crores
2002/03	11.76	2.11	2.37 Crores
2001/02	14.25	1.95	2.61 crores

Source: Nepal Electricity Authority.
Note: *As the Kosi tariff escalates each new year (January), the total Kosi power amount (July to June) does not tally with the fiscal year's energy multiplied by tariff.*

On the subject of this '*concessional Kosi power'*, there are two very important issues for Nepal: i) Nepal's contractual entitlement to receive 10 MW of Kosi power on a continuous basis (50 per cent of the installed capacity of 20 MW) at the 'concessional rate', which works out to be 87.6 million units per annum (ADB/Norconsults 1998), should be fully utilised. This withdrawal should not be limited to the three 33 kV feeders (Biratnagar I and II and Rajbiraj) as is being done now, but the 132 kV line must also be utilised. ii) Nepal needs to undertake '*due diligence*' on Article 6 of the Kosi Agreement where *'HMG will receive royalty in respect to power generated and utilised in the Indian Union at rates to be settled by agreement hereafter: Provided that no royalty will be paid on the power sold to Nepal.'* For the last 35 years since the commissioning of the Kosi hydropower station, Nepal has not received nor bothered to claim any royalties for the electricity generated and used by India on her soil through water impounded in the Nepalese territory.

6.1.3 '60 per cent Load Factor' Gandak Power

The preamble to the 1959 Gandak Agreement states '...to construct a barrage, canal head regulators… about 1,000 feet below the existing Tribeni canal head regulator and of taking out canal systems for purposes of irrigation and development of power for Nepal and India ..' Like the Kosi barrage, the Gandak barrage also moved 'southward'. While the Kosi barrage was entirely on Nepalese soil, the Gandak barrage was designed to straddle the Indo-Nepal border fifty-fifty.

Just before BP Koirala became the Prime Minister, he told a press conference that Nepal had lost out from the Kosi project and that his government would be careful before concluding an agreement on the Gandak. (Halkhabar June 12, 1959) But, after the Gandak agreement was signed on December 4, 1959, BP Koirala, on June 11, 1960, defensively argued (Nepal Quoted in Mihaly 1965) *'India would have constructed the dam in her own territory if Nepal had not given permission. Nepal would…thereby have been deprived of much benefit.'* Forty-one years later, in 2001, Indian ambassador (Pyakuryal, Dahal and Adhikari), Deb Mukherjee, at the Reporters' Club/Kathmandu forwarded the same lame argument: 'In fact, after the experience of Koshi, the Bihar Government was unwilling to have its project in Nepal to avoid any hassles. And if it had been constructed in India then instead of the 34 lakh acres, which India gets, by having the project in Nepal, India would have got 29 lakh acres. By having these projects inside in India, there would have been no benefit to Nepal.' That is why the American scholar EB Mihaly was constrained to state (Mihaly 1965) '…the almost unconscious view that Nepal was actually part of India, and that Nepal benefited from Indian gains. This attitude was best demonstrated by India's actions in regard to large irrigation and flood-control projects on the Kosi and Gandak Rivers – projects that India liked to describe as elements of its aid to Nepal'.

The 15 MW powerhouse was constructed inside Nepal on the Western Main Canal feeding UP and Western Bihar. Because the powerhouse was located on Nepalese soil, this necessitated an innocuous inclusion of the clause: *'The ownership and management of the Power House shall be transferred to His Majesty's Government… after the full load of 10,000 kW at 60 per cent load factor has been developed in Nepal from this Power House'.* Kathmandu in 1959 had an installed capacity of only 2,800 kW. The possibility of evacuating Gandak power to the capital was totally out of question for several decades. However, India built the 132 kV Gandak-Ramnagar link on her side to evacuate the entire Gandak power. With this deft *'60 per cent load factor'* clause, India aimed to keep the Gandak powerhouse in Nepal well under her control for a considerable length of time while Nepal had to purchase power for all her uses.

The barrage was completed around 1969 and Gandak waters flowed into the main Eastern Canal to irrigate the fields of Bihar. Nepal's entitlement of 850 cusecs to the districts of Parsa, Bara and Rautahat, unfortunately at the tail-end of the Don Canal, materialised only in 1976. Partial flow of Gandak waters to the main Western Canal started in 1972 but the three 5 MW Gandak turbines were commissioned only in 1979. The Asian Development Bank's first US$5.3 million power project to Nepal, the 154 km long 132 kV Gandak-Hetauda transmission line, fortunately by 1979 fulfilled the *'60 per cent load factor'* clause of the Gandak agreement. Till the powerhouse was handed over in 1981, Nepal had to pay India for all the energy she took from the powerhouse that ironically was on her own soil. Gandak suffers the same fate as the Kosi's 'low and intermittent power' due to trash choking the intake. Though the designed annual generation of this power house is 106 million units (Nepal Electricity Authority, 2006), the following are the annual generation in the last five years:

Fiscal Year	Generation in Million Units (MU)
2001/02	19.0
2002/03	30.1
2003/04	8.3
2004/05	20.7
2005/06	27.0

Source: NEA, *Generation* Fourth Issue, Bhadra 2063 (August 2006).

India has also installed a similar 15 MW powerhouse on the Eastern Gandak Canal with Japan's ODA loan of 4,226 million Yen. Though the project started in 1984, generation[9] materialised only in 1996. Like her sister plant in Nepal, India's Gandak power plant generates only 6 to 7 MW despite the 15 MW capacity.

6.1.4 'Goodwill 70 Million Free Units' Tanakpur Power

With the twin projects, Pancheshwar/Mahakali and Chisapani/Karnali, figuring simultaneously in the Indo-Nepal talks, India's 1920 Sarada/Banbasa barrage badly needed an alternative, having '*outlived its useful life*'. Thus surfaced the Tanakpur Project in 1984, in the guise of the 120 MW 831 MUs Tanakpur Hydroelectric Project. In order to avoid negotiations (Annex 9 – 1980 Note on Tanakpur) with Nepal for concurrence of project execution, India built the '*barrage and its protection works wholly in the Indian territory'* so that the '*pond created does not exceed the normal flood level in Nepal territory*'. Even Nepal's own Water Resources Minister, Laxman Pd. Ghimire, vouchsafed that Tanakpur was 'very much within Indian territory and Nepal had nothing to object' (Bhasin 1994). Nepal, in December 1987, had put in her objection to the project and India, as a result, agreed that 'The tailrace of Tanakpur hydro-electric project will be directly connected to Mahakali River upstream of Banbasa barrage instead of connecting it with Sarada Canal, which will ensure the agreed supply of water to Nepalese irrigation system on the left bank at Banbasa'. Nepal also made it very clear that *'construction of Tanakpur Barrage would not in any way entitle India for claim of more than fifty percent of the water by way of its* ***prior use****'*. India, however, clarified that the fifty-fifty sharing was not a '*settled matter*' and reminded Nepal that the Tanakpur project was '*based on non-consumptive use of water*'. Tanakpur, evidently, is the alternative to Banbasa barrage that has the capacity to divert 14,000 cusecs (397 cumecs) of Mahakali waters entirely for consumptive irrigational uses. One should note that the average lean season flows of Mahakali for February, March and April is only 5,720 cusecs (162 cumecs).

[9] 1996: 7.6 MUs, '97: 22.3 MUs, '98: 27.4 MUs, '99: 20.2 MUs, '00: 25 MUs, '01: 25.8 MUs, '02: 26.5 MUs

The April 1991 second Indo-Nepal Secretary level Sub-commission on Water Resources took the mundane minute note that '*no concrete decisions could be arrived at*' on the Tanakpur project and the matter was referred to the Joint Commission. The sequence of events that followed the sub-commission's meeting now indicate that India moved fast to close the deal on Tanakpur. In May 1991, a mere month after the inconclusive Secretary-level meeting, India formally requested Nepal (Annex 10 – Letter of PM Chandra Shekhar to PM KP Bhattarai) *'While the unresolved issue could be formally taken up in the Joint Commission meeting,* ***in view of the approaching monsoon****, the work of the left afflux bund has to be completed at the earliest. The areas at the border on the left side of the river at Tanakpur (i.e. Nepal territory) are subject to inundation and erosion, and tying the felt afflux bund with high banks in the Nepalese territory, as proposed by us, will bring permanent solution. A large area of Nepal will also become flood free and usable for irrigation and development'.*[10] Ironically, under the guise of protecting Nepalese territory and not her Tanakpur barrage, India decided to act. Without any representative from the Ministry of Water Resources in his entourage, the unwary Prime Minister GP Koirala went down to New Delhi seven months later in December 1991 and initialled the controversial Tanakpur MOU. India had worked hard for an opportune moment and this MOU permitted India to tie up, in an unprecedented haste, the '…Left Afflux Bund, about 577 metres in length (with an area of about 2.9 hectares) to the high ground in the Nepalese side…' Most illuminating is the notification in the Nepal Gazette (December 29, 1991): '*The availability of land for construction of bund will be effected in such a way by HMG/N that the work could start by 15th of December 1991*' i.e. permission to work was given to India prior to Gazette notification in Nepal. While Nepal's parliament belatedly realised the constitutional implication (Article 126 of 1990 Constitution) of this MOU, Prime Minister GP Koirala's '*work could start by 15th of December 1991*' consent gave India the right to work on the Left Afflux Bund in the Nepalese territory on '*a war footing*'. The 1991 MOU unwittingly rescued India from imperil and embarrassment: Tanakpur barrage being left high and dry by the outflanking manoeuvre of the Mahakali '*in the approaching monsoon'*!

The above same Nepal gazette continued: *'In response to a request from Nepalese side,* ***as a goodwill gesture****, the Indian side agreed to provide initially* ***10 MW of energy annually free of cost*** *to Nepal in spite of the fact that this will add to a further loss in the availability of power to India from Tanakpur Power Station'*. This 'as a goodwill gesture in response to a request from Nepalese side' and not in lieu of Nepalese lands submerged by India for perpetuity sounds very magnanimous. Many believe that the tactful drafters of Tanakpur MOU's ***'10 MW of energy annually'*** really meant, in let-

[10] This 1991 argument of India (*PM Chandra Shekhar's letter on May 17, 1991 to his counterpart PM KP Bhattarai*) has a striking similarity to the 1916 British-Indian argument put forward by J Manners Smith, British Resident/Nepal, in 1916 for constructing the Sarada/Banbasa barrage within Nepalese territory due to the eastern 'swings' of the Mahakali towards Nepal. This resulted in the mutual exchange of 4,093.88 acres of land. The only difference then and now was that while British-India settled the issue prior Banbasa barrage construction, Independent India preferred to settle the issue post Tanakpur barrage construction.

ter and spirit, 87.6 million units[11]. India's shrewd bureaucrats, realizing their blunder, quickly converted 10 MW into 10 million units annually. This then got doubled to 20 million units during PV Narasimha's visit to Nepal in 1992. Ultimately the original *'10 MW of energy'* ended up as the oft-repeated '*goodwill 70 million free units*' of the Mahakali treaty. Seventy million units is a mere 8.4 per cent of the annual generation at the 120 MW Tanakpur powerhouse. Incidentally, during that period in 1991 Nepal was pursuing the World Bank-led 402 MW Arun III with 200 MW clearly identified for sale to India through the Duhbi-Purnea link. Some, therefore, point out that Nepal badly erred in not taking the strategic partnership stand of '*sale of 200 MW of Arun III power in lieu of the 2.9 hectares of Left Afflux Bund of the Tanakpur barrage*' with India. This sale of 200 MW of power to India from the 402 MW Arun III would have immediately kick-started the 309 MW Lower Arun and the 330 MW Upper Arun.

Because of the unsynchronised radial mode of system operation, Nepal has never been able to avail of this '*goodwill 70 million free units annually*'. The following are the availed units annually:

Fiscal Year	Nepal's Withdrawal in MUs	Tanakpur P/H Generation MUs
1999/00	34.56	409
2000/01	57.12	436
2001/02	56.99	415
2002/03	64.87	422
2003/04	51.83	511
2004/05	47.08	495
2005/06	57.40	483
Average over 6 years: 55.88 MUs per annum		

Source: Nepal Electricity Authority (NEA) and http://nhpcindia.com

The 120 MW Tanakpur powerhouse was in full generation from 1992, after Nepal, through the controversial 1991 MOU, permitted India to tie up the left afflux bund to her territory. But India offered Nepal the '*old*' 20 million free units per annum with effect from July 7, 1992 and 70 million free units became effective only from June 5, 1997, the date of exchange of the instruments of ratification of the Mahakali treaty. As the 132 kV Indo-Nepal transmission line became operational only from December 1999, India provided cash in lieu of energy for the previous period.

As indicated by the above figures, Nepal belatedly realised that she was not in a position to fully utilise this *'goodwill'* Tanakpur power. Nepal, hence, requested India that the 'balance Tanakpur power' be provided from other power exchange points. But India maintained that 70 million units of free power were being supplied to Nepal as per the provisions of the Mahakali treaty and every effort was being made to accommodate Nepal's seasonal requirement. This matter is 'under consideration' by India since 2004.

[11] 10 MW of energy annually, in technical parlance, means 87.6 million units.

6.1.5 Indo-Nepal Group on Exchange of Power to Power Exchange Committee

Despite the 1954 Kosi and 1959 Gandak agreements that promised power to Nepal, the first Indo-Nepal power exchange materialised only on October 31, 1971 (Record of Discussions between Nepal and India, 1983). The historic 1971 Indo-Nepal meeting pegged the Kosi power at IC paisa 10 per unit while the power exchange tariff at various border points was fixed at IC paisa 14 per unit at the 33 kV voltage level. The Kosi power was initially supplied to the major towns of Biratnagar/Morang, Dharan/Sunsari and Rajbiraj/Saptari. As of 1983, Nepal imported Indian power for the following border district towns: 1) Bhadrapur/Jhapa: 1 MW, 2) Sirha/Sirha: 0.2 MW, 3) Jaleshwar-Janakpur/Dhanusha-Mahottari: 1 MW, 4) Malangwa/Sarlahi: 0.2 MW 5)Gaur/Rautahat: 0.3 MW 6) Bhairahawa/Rupandehi: 0.5 MW 7) Krishnanagar/Kapilavastu: 0.8 MW 8) Koilabas/Dang: 0.2 MW 9) Nepalgunj/Banke: 1MW 10) Dhangadi/Kailali: 0.3 MW and 11) Mahendranagar/Kanchanpur: *0.5 MW.* Nepal imported about 6 MW from these 11 power exchange points and exported about 5 MW from the one and only Birgunj-Raxual point. Later, three more power exchange points were included: 1) Gulariya/Bardiya: 0.5 MW 2) Baitadi/Baitadi: 0.5 MW and 3) Darchula/Darchula: 0.2 MW.

The following discussion in January 1988 in New Delhi during the first meeting of Indo-Nepal Group on Exchange of Power, 1988 gives the flavour prevailing at that time:

'The 10 years tariff for supply of power under the Kosi agreement expired on 31st October, 1981. Under the Kosi Agreement, the tariff for supply of power to Nepal was 10 paise/unit and for exchange of power between Nepal and India the tariff was 14 paise/unit. Subsequently, in March 1985, it was agreed that supplies at the two new points would be made at a tentative tariff of 60 paise/unit, pending finalisation of the tariff for Indo-Nepal exchange of power'. While India's strategy, as an exporter then, was to upgrade the tariff to IC 60 paise per unit to reflect 'actual pooled cost of supply with a suitable 12 per cent escalation' to recover increases in cost, Nepal, as an importer, argued for IC 50 paise per unit tariff with escalation 'of the order of 5 to 6 per cent'. The minutes of the same Indo-Nepal Power Exchange Group finally notes that 'after considerable deliberations both sides agreed to the following:

(a) To recommend the following tariffs for exchange of power between Nepal and India:

1985–86		60 paise (per unit)
1986–87	-	65 paise "
1987–88	-	70 paise "
1988–89	-	76 paise "
1989–90	-	82 paise "
1990–91	-	90 paise "

Source : Nepal Electricity Authority (NEA)

The issue regarding the date from which the revised tariff would be given effect and its period of applicability is being left for the two governments to decide.

(b) No agreement could be reached on the tariff for the intervening period prior to 1985 and the matter is being left for the two Governments to decide.

(c) In the meanwhile the current billing for exchange of power, effective from January 1, 1988 would be at the rate of 60 paise per unit, both by UPSEB and BSEB pending the decision by the two Governments. The tariffs suggested are at 33 kV supply. For 11 kV supply a surcharge of 7.5 per cent would apply and for supply at 132 kV, a rebate of 7.5 per cent would be admissible. The tariffs are in Indian currency.'

Clearly, the tariff battle then was India arguing for an increase and Nepal arguing against it, as Nepal then did have a lower tariff than that of India. The two governments finally decided to implement the tariff as recommended by the 1988 Indo-Nepal Group on Power Exchange. An annual escalation of the tariff to the tune of 8.5 per cent was also agreed.

On April 18, 1991 the two governments decided to convert this Group on Power Exchange into Indo-Nepal Power Exchange Committee. Despite having the east/west (Anarmani-Mahendranagar) 132 kV transmission line within Nepal by 1997, Indo-Nepal power exchange has been providing valuable power to the border towns of Nepal. Similarly, some of the Indian border towns like Ramnagar, Raxual, Jogbani and Thankurgunj have also benefited from Nepal's power.

6.1.6 150 MW 'in Principle' Power Exchange Agreement

In anticipation of the surplus power from the 144 MW Kali Gandaki power plant, Nepal requested India, at the Third Power Exchange Committee (PEC) meeting in 1997 at Delhi, for an increase in the quantum of power exchange from 50 to 150 MW. India suggested that the matter be explored by the Power Exchange Coordination Unit and thereafter examined by PEC. The Fourth PEC meeting held in Kathmandu in 1998 'after examining various proposals/formulations, suggested the following 132 kV **single circuit lines on double circuit towers:**

i. Butwal (Nepal)–Anandnagar (UP): 31 km in Nepal and 45 km in UP
ii. Birgunj (Nepal)–Motihari (Bihar): 25 km in Nepal and 45 km in Bihar
iii. Dhalkebar (Nepal)–Sitamarhi (Bihar): 23 km in Nepal and 40 km in Bihar'.

The meeting also mentioned that these lines could be operated only on radial modes. Nepal already has three 132 kV links with India: two with Bihar (Gandak-Ramnagar and Duhbi-Kataiya) and one with UP (Mahendranagar-Tanakpur). It was only four years later, in 2001, at the Sixth PEC meeting at Kathmandu that '*The Indian side conveyed that the Government of India had* ***agreed in principle*** *to enhance the quantum of power exchange between the two countries from 50 to 150*

MW'. Many fail to note the qualified 'in principle' agreement. At the same meeting, while Nepal requested India to expedite the construction of the three agreed 132 kV links, India stated that '*it would be desirable that all aspects including* ***commercial arrangements be finalised*** *and settled between the two sides expeditiously*.' Nepal, keen to export its surplus power, pre-empted itself by embarking on the construction of the 132 kV Butwal-Sunauli line in its territory. India, however, stuck to its settlement of 'commercial arrangements' first. In 2004 at the Secretary-level Joint Committee on Water Resources meeting, India indicated that the two Birgunj-Motihari and Dhalkebar-Sitamarhi links be put on hold, citing transmission constraints. On Butwal-Anandanagar link, India pointed out that 'all preparations for taking up the construction of this line on the Indian side had been completed – subject to finalisation of the long-term commercial arrangement for sale of power from Nepal to India'. Thus, when Nepal was in the export mode, India insisted on finalisation of long-term commercial arrangements prior to construction of transmission lines on her territory. Yet, Nepal's Water Resources Minister (The boss 15 March - April 14 2007) states '*At present, despite India's desire to provide us with electricity, we have not been able to channel any because of the absence of good power grids*'! There is no mention why 'good power grids' were not constructed despite Nepal's repeated requests to India since 1997.

Nepal's intention to increase the quantum of power exchange from 50 to 150 MW to export available wet season power could not materialise. India, at the June 2007 power exchange meeting, ensured that 'The additional power over the energy corresponding to peak import of 50 MW by Nepal would be at market determined commercial rates outside the existing power exchange tariff'. Thus, Nepal's import was to be at the higher market determined price and Nepal's seasonal export at the market determined price lower than the power exchange rate.

6.1.7 From Power Exchange to Cross-border Power Trading

India clearly exhibited her displeasure in importing Nepal power under the existing power exchange modalities and she wanted tariff negotiation based on the following three categories (Thakur 2004) (i) share of power from existing projects (Kosi, Tanakpur) according to the treaty between the two countries; (ii) supply of power by India or by Nepal in the area adjoining the border and (iii) sale of surplus power by India or Nepal as and when the supplier has a surplus of power, subject to technical feasibility for transmission of power or, in other words, power trading.

With Nepal floating 1,300 MW of hydropower for export purposes (Arun III: 402 MW, Budhigandaki: 600 MW and Upper Karnali: 300 MW) on competitive bidding (The Kathmandu Post December 4, 2006), India has made a strategic change of perceptions on construction of cross-border transmission links that were ***'subject to finalisation of the long-term commercial arrangement'.*** Now the buzzword is cross-border power trading through strengthening of transmission links. According to a January 2007 NEA press release (The Kathmandu Post, January 6, 2007), an

MOU between the Nepal Electricity Authority (NEA) and Infrastructure Leasing and Financial Services of India (IL&FS) was signed to form a joint venture company, in both Nepal and India, to construct transmission lines necessary for Indo-Nepal power trading. The company in Nepal would have a 50 per cent NEA share, IL&FS 26 per cent and the remaining to be held by national and international financial institutions. On the formation of the company in India, the press release merely states the company in India would have NEA's share 'limited up to the amount' shared by IL&FS in Nepal. The press release adds: 'As per the MOU, presently Butwal-Gorakhpur, Duhabi-Purnia, Dhalkebar-Mujaffarpur and Anarmani-Silgudhi 220 kV transmission lines shall be constructed in the Nepal-India border area… In the first phase, construction of Butwal-Gorakhpur and Duhabi-Purnia 220 kV transmission lines shall be commenced immediately'.[12] Thus the previous conditionality '***subject to finalisation of the long-term commercial arrangement'*** has mysteriously disappeared.

The MOU has, in the initial stage, evinced positive responses. For Nepal, the upgrading of the 132 kV links to 220 kV and that the Butwal-Gorakhpur plus the Duhabi-Purnea links '*…shall be commenced immediately*' are definitely on the plus side. These two links are indeed the top priority for Nepal. However, three of the four links are unfortunately in the Eastern Regional Grid, which has a power surplus and is expected to have in the foreseeable future. During the deficit period, access to the surplus region is a necessity but three links to the same region and particularly the Anarmani-Silghudi are excess baggage. The Anarmani-Silghudi link is India's strategic move to bypass the sensitive and already congested chicken-neck corridor through Nepal, to wheel power to the west from Bhutan and the hydropower rich North-eastern States of India. Nepal's transmission links should be focused more towards the power hungry Northern Regional Grid which is nearly three times larger than her eastern sister and has a faster growth rate.

6.1.8 Tala-Delhi Transmission Company

This is something that Nepal needs to bear in mind. In 2003, the Asian Development Bank provided a US$62 million loan for establishing the first public-private venture, the Tala-Delhi Transmission Limited, to evacuate Bhutan's 1,020 MW Tala power whose estimated generation tariff is IC Rs1.60 per unit. The transmission line would evacuate other surplus power from the Eastern Grid to the Northern Grid. This involved construction of 1,133 km of 400 kV and 20 km of 220 kV lines costing US$249 million. The Power Grid Corporation of India has 49 per cent equity, Tata Power 49 per cent and Tata Sons 2 per cent, thus permitting Tatas to take the majority equity on Build-Own-Operate and Transfer (BOOT) basis for 30 years. Of the 70 per cent debt financing, 25 per cent is from ADB and the remaining 45 per

[12] NEA and IL&FS have upgraded these four 220 kV interconnections to 400 kV double circuit lines to be initially charged at 220 kV.

cent from commercial lenders. The Tala-Delhi transmission line got commissioned when Tala started commercial operation from July 31, 2006. Initially, in the first phase 1,000 MW would be transmitted but this would later rise to 3,000 MW. The State-wise allocation of Tala power to the hungry northern states is very illuminating: Delhi: 200 MW, Haryana: 100 MW, Jammu & Kashmir: 120 MW, Punjab: 200 MW, Rajasthan: 100 MW and UP: 300 MW. Perhaps, Nepal could learn a few things from this set-up.

6.2 Power Exchange and Transmission Line

6.2.1 Indo-Nepal Power Exchange Profile

Prior to 1990, World Bank reports indicate the annual energy sold at the only export point Raxaul/India through Birgunj as being five and six million units in 1982 and 1983, and for 1984, 1985, and 1986 six million units were assumed (World Bank 1985). The accompanying power exchange profile indicates that in the last 16 years, Nepal imported 2,659 million units while it exported a mere 1,546 million units. This is indeed a sad reflection on the hydropower-rich Nepal perennially boasting 'to export 22,000 MW electricity generated from the development of Pancheshwar, Karnali and Saptagandaki multi-purpose projects'[13] to India.

If one is to further analyse the power exchange profile, there are some very revealing milestones. The commissioning of the World Bank financed 69 MW Marsyangdi power plant quadrupled the export component in 1991, thus slashing down the import burden. But sadly this export momentum lasted only for a mere two years, when in 1993 the Kulekhani I penstock pipe disaster struck, heralding again the import era, which continued for nearly a decade. The slight export surge in 1996 and 1997 are the *'spill-over effects'* of upgrading of the Trishuli and Devighat under the World Bank-financed Power Sector Efficiency Project (PSEP), the stop gap precursor of the ill-fated Arun III project. The PSEP had another small component, the Duhbi/Kataiya 132 kV Indo-Nepal link. In the aftermath of the collapse of the Arun III, this link contributed immensely to a 'win-win' mode for both countries. While Nepal suffered an acute power deficit, courtesy of the World Bank's macroeconomic management of Nepal for its Arun III project, India's Eastern Regional Grid fortunately had a glut of excess power. For India, this was the time to make hay while the sun shines.

With the phase-wise commissioning (NEA 2006) of 60 MW Khimti in July 2000, 6.2 MW Puwa in April 2000, 14 MW Modi in October 2000, 36 MW Bhotekoshi in January 2001, 7.5 MW Indrawati in October 2002, 20 MW Chilime in August 2003, the export component also began to rise. Finally, when the ADB

[13] Nepal's Tenth Five-Year Plan: the Plan mentions Saptagandaki when in fact it is presumed to be Saptakoshi whose DPR is currently being prepared jointly with India.

Indo-Nepal Power Exchange Profile – Energy and Tariff

Year	1990	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	Total
Export (MUs)	23	81	85	46	51	40	87	100	67	64	95	126	134	192	141	113	101	1,546
Import (MUs)	61	34	55	82	103	114	73	154	210	232	232	227	238	150	187	241	266	2,659
Kosi Tariff (IC Rs.)	0.71	0.77	0.83	0.89	0.97	1.05	1.19	1.29	1.40	1.52	1.65	1.79	1.95	2.11	2.21	2.32	2.44	
PE Tariff: (IC Rs.)	0.98	1.06	1.15	1.25	1.36	1.47	1.67	1.81	1.97	2.13	2.31	2.51	2.72	2.96	3.10	3.26	3.42	

Note: Only the 2006 import and export figures are provisional, subject to final audit. The Kosi and Power Exchange tariffs are at the 33 kV supply level with a surcharge of 7.5 per cent for 11 kV supply and a discount of 7.5 per cent for 132 kV supply and annually escalated at 8.5 per cent. The Power Exchange Committee decided to lower the 8.5 per cent annual escalation to 5 per cent from 2004 till 2008 which then increases to 5.5 per cent. The Kosi and Power Exchange tariffs are still maintained at the 1971 historical 10:14 ratio.

Source: NEA's Annual Reports - A Year in Review and NEA Finance & Accounts Department

and Japan-financed 144 MW Kali Gandaki A came on stream in August 2002, Nepal's export exceeded the import from India in 2003. When India realised this, she immediately put the brake on imports from Nepal. This is depicted by the 2004 statistics wherein Nepal's export took a downward dip from 192 million to 141 million units while Nepal's hydro plants spilled over 700 million units (ADB/Norconsult 1998).

6.2.2 Mechi to Mahakali 132 kV Transmission Line

For a decade and a half, from 1975 to 1990, Nepal concentrated on building the 969 km 132 kV transmission line from Mechi to Mahakali. As indicated by the chart below, the credit goes entirely to the ADB and the French Government that helped to finance the construction of Nepal's east-west power backbone along the Terai. This was instrumental in turning over 15 India-dependent border power exchange points from Bhadrapur in the east to Mahendranagar in the west to Nepal's own grid power supply (**see power map of Nepal)**.

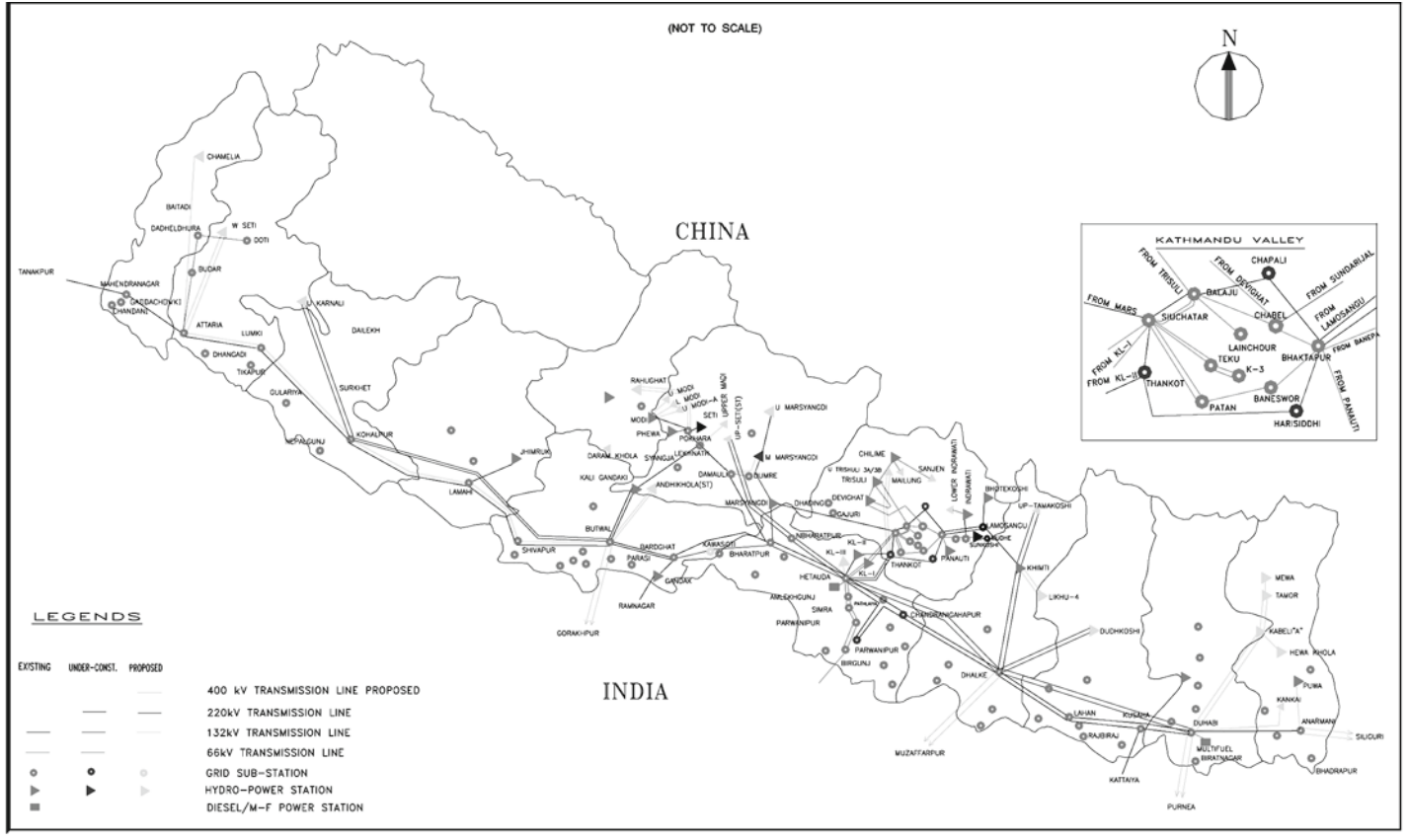
Though the 132 kV transmission line extends over 950 km from Mechi to Mahakali, most of the major power-generating stations are all located in the central region. The Hetauda-Bharatpur corridor is heavily overloaded and efforts are being made to upgrade this sector. In contrast to the lightly loaded western region, the more industrialised eastern region has voltage regulation problems. Eastern Nepal may get some relief when the Kirne/Khimti-Dhalkebar

Existing 132 kV Mechi to Mahakali Transmission Line

From/To	Length Km	Commission date	Total Project Cost MUS$	Donor
Hetuada/Gandak	154	1979	5.34	ADB/First Power Project
Hetauda/Duhbi	283	1986	41.09	ADB/Third Power Project
Dumkibas/Butwal	42	1984	3.50	French Government
Butwal/Nepalgunj	208	1988	19.46	ADB/Fourth Power Project
Nepalgunj/Mahendranagar	190	1992	10.10	French Government
Duhbi/Anarmani	80	1997	25.70	ADB/Fifth Power Project
Mahendranagar/Tanakpur	12	2000	0.70	Nepal/NEA
Duhbi/Kataiya	(27)	1996		World Bank/PSEP
Total Length: 969 km (excluding Duhbi/Kataiya length)				

Note: The ADB/Second Power Project is not mentioned above as it is the 132 kV Bharatpur/Pokhara transmission line. The Project costs indicated above are inclusive of the associated Substations and the Distribution costs, the Third and Fifth Power Projects of ADB in particular had major reinforcement and rural electrification components.
Source: ADB's Project Completion Reports & NEA's Transmission and System Operation

Power Map of Nepal: Major Power Stations, Transmission Lines and Substations (Not to Scale)



Source: Nepal Electricity Authority, Annual Report 2006

220 kV transmission line, initially operated at 132 kV, is commissioned. The present Indo-Nepal power exchange is entirely on the radial mode, connecting the load of the importing system to the exporting system, and is now in an unsynchronised mode. In future, synchronous operation of the Indo-Nepal grids should be considered, for availing the benefits of interconnection and flexibility of operation. While Nepal would prefer to be synchronised with the power-deficit Northern Grid, its present set of generation and high voltage networks are, ironically, oriented towards the power surplus Eastern Regional Grid. HVDC interconnection with India's grid, though more expensive, would also need to be examined thoroughly.

6.2.3 Existing Indo-Nepal High Voltage 132 kV Power Exchange Links

The three existing 132 kV Indo-Nepal links, depicted in the map above, developed over the span of three decades in the following manner:

6.2.3.1 Gandak–Ramnagar 132 kV Link:

Under the Gandak Agreement, the 15 MW Gandak powerhouse in Nepal evacuated its entire generation to the Indian grid through the Gandak-Ramnagar 132 kV links as there were no links within Nepal. In 1979, the ADB completed the 132 kV Gandak-Bharatpur-Hetauda transmission line. This also happened to be Nepal's first 132 kV high voltage transmission line. With the generation system centrally located, this Gandak-Ramnagar link has been Nepal's main flagship in exporting as much as 25 MW of power to India during the surplus period. As this is a radial link, Nepal agreed to India's request in 1997 to synchronise its 15 MW Eastern Gandak power plant on the eastern canal with Nepal's grid. The following are the particulars of the more recent exports to India:

Fiscal Year	Export	Amount in IC Rs	Price per Unit
2005/06	15.64 Million Units	5.15 Crores	IC Rs 3.49
2004/05	25.12 Million Units	7.75 Crores	IC Rs 3.22
2003/04	54.53 Million Units	15.10 Crores	IC Rs 2.97
2002/03	76.77 Million Units	20.36 Crores	IC Rs 2.73
2001/02	108.56 Million Units	26.54 Crores	IC Rs 2.52

Source: Nepal Electricity Authority (NEA)

With the IPPs beginning their generation in 2000, Nepal was in a position to export sizable amounts of power from fiscal year 2000/01. When the 144 MW Kali Gandaki was commissioned in 2002, Nepal had very much surplus power. But one

can clearly see from the figures above that India put the brakes on Nepal's import from 2002/03.

6.2.3.2 Duhbi–Kataiya 132 kV Link

This second 132 kV link was a multilateral off-shoot when the World Bank's Power Sector Efficiency Project executed and commissioned the 132 kV Duhbi–Bhantabari transmission line in 1996. Despite the Indian companies Tata Consult and Indian Railways Construction (IRCON) being the project's consultant and contractor, it was an uphill task to have the 3 km Bhantabari–Kataiya 132 kV line constructed in the Indian territory. However, once commissioned, this Duhbi–Kataiya link has been a saviour for Nepal's eastern region, plagued both by heavy load-shedding and poor voltage regulation. India, no doubt, was also a beneficiary of this link, as indicated by the following figures:

Fiscal Year	Import	Amount in IC Rs	Price per Unit
2005/06	171.97 Million Units	58.85 Crores	IC Rs 3.49
2004/05	133.27 Million Units	40.68 Crores	IC Rs 3.22
2003/04	68.20 Million Units	19.11 Crores	IC Rs 2.97
2002/03	96.32 Million Units	24.76 Crores	IC Rs 2.73
2001/02	76.05 Million Units	17.96 Crores	IC Rs 2.52

Source: Nepal Electricity Authority (NEA)

6.2.3.3 Tanakpur–Mahendranagar 132 kV Link

This 132 kV link is the third and most recent acquisition as the result of Article 2, item 2 (b) of the Mahakali Treaty: 'In lieu of the eastern afflux bund to the Tanakpur barrage, at Jimuwa thus constructed, Nepal shall have the right to: a supply of 70 million kWh (unit) of energy on a continuous basis annually, free of cost, from the date of the entry into force of this treaty.' This has been discussed in detail previously. Though the treaty was ratified in 1996, the necessary Tanakpur switchyard and the 4 km link in India and the 12 km in Nepal materialised only in December 1999. One major hitch of this free Tanakpur power for Nepal is that, because of the link's radial mode of operation, Nepal cannot utilise all the 70 million units on a continuous annual basis. Statistics reveal that Nepal has on an average utilised only 56 million units per annum.

6.3 India's Power Sector Scenario

6.3.1 Acts/Reforms

The first Indian Electricity Act 1910 was enacted to regulate the nascent private developers that supplied electricity only to towns and cities. After India's independence, the Electricity (Supply) Act 1948 created State Electricity Boards whose responsibility was to extend the electricity supply from cities to rural areas of the entire State. The 1948 Act literally pushed the private sector to the '*untouchable*' category although larger electric supply companies in Calcutta, Bombay, Ahmedabad and Surat managed to survive with great difficulty till the liberalisation era. Over the years, the financial condition of the much interfered electricity boards deteriorated, as raising the electricity tariff was a sensitive, political issue which no ruling government dared to touch. Thus, to distance the government from tariff determination, the Electricity Regulatory Commissions Act 1998 was enacted, though belatedly. This enabled the creation of Central Electricity Regulatory Commission as well as the State Electricity Regulatory Commissions. Sixteen States have so far created their own Regulatory Commissions and are restructuring their electricity boards through reform Acts. Orissa took the lead by unbundling it into three components: generation, transmission and distribution. Though the results were mixed, due to deteriorating financial conditions, other States like Haryana, Andhra Pradesh, Karnataka, Rajasthan and even Uttar Pradesh pushed ahead with their Reform Acts despite stiff opposition from the board employees. Ultimately, on June 10, 2003 the Electricity Act 2003 replaced the three 1910, 1948 and 1998 acts.

6.3.1.1 India's Installed Capacity Scenario (As of 31.10.2006)

Ownership sector	Hydro MW	Thermal in MW				Nuclear MW	Renewable MW	Grand Total MW
		Coal	Gas	Diesel	Total Thermal			
State	25,622	38,275	3,500	605	42,380	0	2,568	70,569
Private	1,306	4,241	5,663	597	10,501	0	3,623	15,431
Central	6,672	26,683	4,419	0	31,102	3,900	0	41,674
Total	33,600	69,199	13,582	1,202	83,983	3,900	6,191	127,674

Renewable energy sources mean small hydropower (below 25 MW), biomass, industrial waste and wind.

Source: (www.cea.nic.in)

As indicated by the above 2006 data, India's total installed capacity stood at 127,674 MW, with the predominant thermal at 83,983 MW, hydro at 33,600 MW and nuclear at 3,900 MW. The hydro/thermal mix in 2006 is thus 26/74 when the

ideal optimal mix is 40/60. The States continue to hold 55 per cent of India's total installed generation capacity with the Centre holding the next large chunk of 33 per cent. Though the remaining 12 per cent of the installed capacity (15,431 MW) is indicated as private, this comprises mainly such older '*untouchable*' companies like Calcutta Electric, Tata Electric, Ahmedabad Electric Supply, etc. The contribution of the '*true IPPs*' that emerged after liberalisation of the Indian power sector is, so far, only a tiny 4 per cent of the total installed capacity.

The above data gives the megawatt installed capacity, but what ultimately counts is the megawatt-hour generation from those plants. The following all-India sector-wise overview of actual power generation (Ibid) from April 1, 2006 to March 31, 2007 gives the existing state of the Indian power system:

All India Sector	Actual Generation	
	Million Units	Percentage
Central	275,350.55	41.6
State	325,338.27	49.1
Private	27,375.12	4.1
IPPs	31,439.34	4.7
Bhutan Import	3,010.08	0.5
Total	662,513.36	100

Source: (www.cea.nic.in)

Thus, one sees that the government holds on to a whopping 90.7 per cent of generation, with the State, despite having a much larger installed capacity, being far out-performed by the Central undertakings. The private and new IPPs entrants contribute a humble 4.1 per cent and 4.7 per cent respectively. With the 1,020 MW Tala providing an additional generation from July 2006 onwards, and the 336 MW Chukha, Bhutan's contribution to India at 0.5 per cent is not an insignificant amount.

6.3.1.2 India's Power Demand

The following were the power targets and achievements during India's following three 5 Year Plans:

Plan	Year	Target	Achievement
1. Eighth Plan	1992 -1997	30,538 MW	16,432 MW
2. Ninth Plan	1997 – 2002	40,245 MW	19,015 MW
3. Tenth Plan	2002 – 2007	41,110 MW	21,180 MW

Source: www.ilfsindia.com

Only about 50 per cent of the target was achieved during the three five year plans. Shortfalls in generation capacity addition has naturally led to acute shortages both in terms of energy and peak demand as indicated in the following chart for the fiscal

year 2006/'07. Hence, India has set an ambitious target of 78,577 MW in her 11 th Plan (2008 – 2012).

Region	Northern	Western	Southern	Eastern	N/Eastern	All India
Shortfall in Energy (%)	11.0	15.6	2.7	3.0	9.9	9.6
Shortfall in Peak Demand (%)	15.5	24.7	7.0	4.1	21.1	13.8

Source: www.ilfsindia.com

The most severe shortage is in the heavily industrialized Western region. Nepal adjacent Northern region also has a heavy deficit but the other Nepal adjacent Eastern region has a milder shortfall. Though the percentage shortfall of the North Eastern region is heavy, this region's overall capacity is tiny. In 2004/'05, India estimated its peak at 90,221 MW with the Northern region at 27,759 MW, Western region 31,256 MW, Southern region 23,516 MW, Eastern region 9,317 MW and North Eastern region 1,272 MW (Seventeenth Electric Power Survey of India).

Depicted below is India's estimated power requirement for achieving GDP growth rates of 8 per cent and 9 per cent:

Year	GDP – 8%		GDP – 9%	
	Requirement MW	Addition required MW	Requirement MW	Addition required MW
2011/'12	206,000	66,000	215,000	75,000
2016/'17	303,000	97,000	331,000	116,000
2021/'22	445,000	142,000	510,000	179,000
2026/'27	655,000	210,000	785,000	275,000

Source: www.ilfsindia.com

Despite her huge coal reserves, India is desperate to exploit other forms of energy. Nuclear, at present, provides only 3 per cent of her energy and her attempt to increase this is manifested by the ongoing nuclear negotiation with USA. India's hydropower, mostly located in the northern and north-eastern regions, is quite substantial at over 100,000 MW. But due to strong environmental lobbyists and insurgency reasons, she has not been able to accelerate her works to tap this renewable resource. Even if Nepal's presently estimated 43,000 MW of economically exploitable hydropower is fully developed and exported to India, this will be a mere 6 per cent of India's total power requirement in 2026/'27. With hydropower being a very politicized issue in Nepal, India prefers to work in Bhutan.

6.3.1.3 Hydropower Development Status

As far as Nepal is concerned, the following hydropower development status of India, as of October 31, 2006, would be of interest:

Region	Capacity Identified MW	Capacity Developed MW	Capacity to be developed MW	Main States with potential yet to be developed
Northern	53,395	12,054	33,507	J&K:11,000; HP:9,000; Uchal:13,000
Western	8,928	5,255	2,753	---
Southern	16,458	9,029	6,592	---
Eastern	10,949	2,389	7,449	Sikkim: 3,000
North Eastern	58,971	1,095	54,942	Arunachal: 47,000
All India	**1,48,701**	**29,822**	**1,05,243**	

Source : (www.cea.nic.in)

The hydropower potential is concentrated mainly in the Himalayan northern and north eastern regions. In order to develop this 105,000 MW potential, India has launched the 50,000 MW Hydropower Development Initiative. Under this Initiative, pre-feasibility studies of 162 schemes totalling 47,930 MW were concluded. Seventy-seven schemes, with a first year tariff below IC Rs 2.50 per unit totalling 33,955 MW, have been identified for preparation of detailed project reports.

6.3.1.4 India's Public Sector Arms

While the State's public sector arms in the power sector are either restructured or in the process of restructuring, the Centre already had the generation and transmission entities in place: National Thermal (*NTPC*), National Hydroelectric (*NHPC*), Bhakra Beas Management Board (BBMB), Power Grid (*PGCI*), Regional Electricity Boards (*NREB*), Power Trading Corporation (*PTC*), etc. NTPC, with a massive 25,350 MW of thermal plants, is already the sixth largest generating utility in the world. It operates massive super-thermal power plants at coal pitheads: Farakka/West Bengal 1,600 MW, Singrauli and Rihand in UP 2,000 MW each, Korba/Chattisgarh 2,100 MW, Ramagundam/Andhra Pradesh 2,600 MW, Vidyachal/Madhya Pradesh 2,600 MW, Talcher Kaniha/Orissa 3,000 MW, etc. NTPC, created in 1971, is endowed not only with strong financial muscles but also with a sound corporate culture that is lacking so badly in other South Asian utilities. It has performed so well that the government has now mandated the '*thermal*' NTPC to venture into the 'hydro sector' domain as well. On the other hand, NHPC, created in 1975, has not performed as well as its sister, NTPC. NHPC so far has 3,755 MW of hydel plants and ranks itself as being 'among the TOP TEN companies in the country in terms of investment'. It is presently engaged in constructing 13 projects with a total aggregated capacity of 5,712 MW.[14] In short, India envisages that its public sector arms, NTPC, NHPC etc. would continue to play the dominant roles it has so far been playing in the power sector. The IPPs in comparison with the public sector are mere dwarfs.

[14] Bhakra Beas Management Board with 2,704 MW of hydropower, though older than NHPC, has been limited to the Sutlej-Beas river basin. But the 1500 MW Satluj Jal Vidhyut Nigam has been permitted to foray in Nepal and recently bagged the much publicised 402 MW Arun III.

6.3.1.5 UP and Bihar's Installed Capacity and Tariff

Of importance to Nepal are: the northern regional grid at 34,951 MW (thermal 21,031 MW, hydro 12,046 MW and nuclear 1,180 MW) tied up with UP and the eastern regional grid at 16,478 MW (thermal 13,870 MW, hydro 2,497 MW with no nuclear) tied up with Bihar (**see the Northern and Eastern Regional Grid power maps**)

State	**UP***	**Bihar**
Population	166 million	82.9 million
Installed Capacity	8,849 MW	1,629 MW
Peak demand 2004/05	9,907 MW estimated	2,090 MW estimated
Energy requirement 2004/05	61,681MUs estimated	10,983 MUs estimated
T&D loss 2004/05	25.3 per cent estimated	21.5 per cent estimated

Source: Sixteenth Electric Power Survey of India, Central Electricity Authority
* Government of India's National Census of 2001

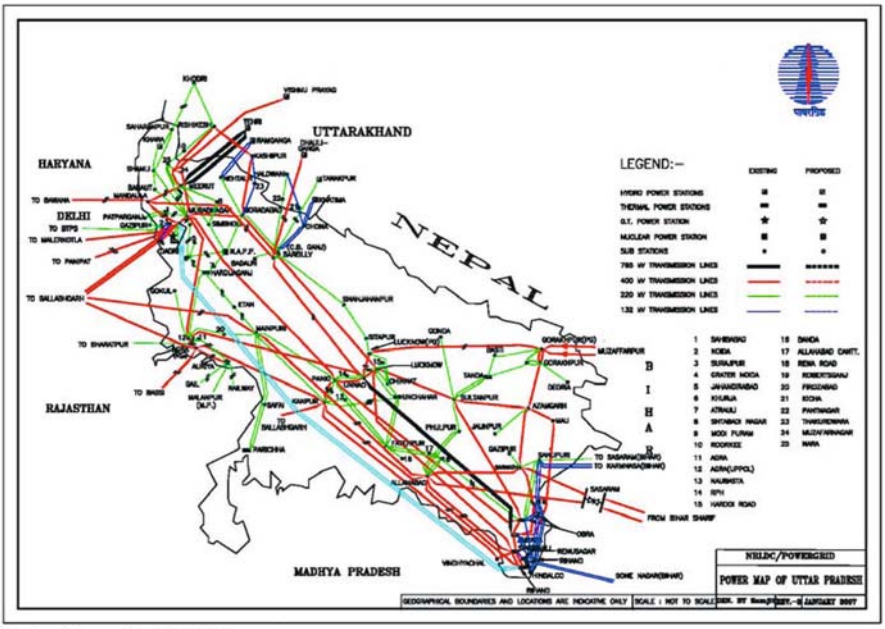
Though the T&D loss figures are estimated, actual losses and particularly those of Bihar are believed to be much higher. But more important to Nepal is the existing electricity tariff prevailing in the two contiguous States of UP and Bihar:

State	Tariff From	Domestic		Commercial 50 kW	Agriculture 2 to 10 HP	Industry		Railway Traction
		100 units	1,000 units			10 kW	10,000 kW	
Bihar	2001	206.70U 63.00 R	743.96U 276.87R	561.80	40.50	703.65	469.44	530.51 25kV 524.51 132kV
UP	2004	282.00U 124.00R	351.30U 110.50R	452.33	224.00U 45.00R	452.33U 408.00R	438.36U 395.42R	472.22>132kV 452.78<132kV
Nepal	2001	456.25	618.75	475.00	218.75	412.50	368.75	268.75 (Trolley Bus)

All Rates of Electricity in IC Paise per Unit (U: urban, R: rural)
Source: Central Electricity Authority and Nepal Electricity Authority

A striking element of UP and Bihar tariff is that the commercial and industrial tariffs are quite high, contrary to the general perception of industrialists in Nepal. In fact, the tariffs in these two categories are slightly higher than those of Nepal, thus giving some optimism to policymakers in Nepal. Undoubtedly, the agricultural tariff at IC paise 40 to 45 per unit is extremely subsidised and India has not been able to make any headway on this politically sensitive issue. In UP, about 32 per cent of total sales are in the irrigation category (CEA 2000), whereas in Bihar it is much less at 16 per cent. The domestic tariff for rural areas is still subsidised, but attempts are being made to upgrade the urban domestic tariff at par with the cost of supply. India's Ministry of Power estimated that in 2002 electricity was being sold at an average tariff of IC Rs2.40 per unit when the average cost of power was actually IC Rs3.50 per unit. This resulted in a massive annual loss of IC Rs33,177 crores.

Northern Regional Grid Power Map



Note: (As on 31.03.2005)
Source: Central Electricity Authority of India: Website.

Eastern Regional Grid Power Map

Note: (As on 31.03.2005)
Source: Central Electricity Authority of India: Website.

A noteworthy feature of the UP/Northern Grid adjacent to Nepal is its high energy requirement during the summer/monsoon period due to the load of pumping water for irrigation of paddy, but during the winter the energy requirement reduces. Such a demand pattern is ideally suitable for Nepalese hydropower plants which can operate as base load stations in the monsoon and in peaking mode in winter. Such a characteristic is not that pronounced on the Bihar/Eastern Grid. Nepal, hence, needs to focus on the Northern and not the Eastern Grid. Nepal needs to build strong north-south transmission links to these centres to get access to the power hungry Northern Grid.

6.4 Nepal's Power Sector Scenario

In comparison to India, Nepal has a tiny power system somewhat similar to that of Bihar and Assam, at 629 and 622 MW respectively, if the central allocations are deducted. As of 2006, Nepal had a total grid connected installed capacity of 605 MW with a predominant 550 MW hydro and a 55 MW thermal system (NEA 2006). Of the 550 MW hydropower, 402 MW is in the public sector, NEA, and 148 MW in the private sector, which is 25 per cent of the total installed capacity. Nepal's peak load forecast for the year 2024/'25 is 2,779 MW which is a mere 6.5 per cent of the economically exploitable potential of 43,000 MW. Nepal's peak load for 2006 was 603 MW and the annual energy requirement was 2,777 GWh. Of this energy requirement, 57 per cent was met by NEA, 33 per cent by the private sector IPPs and a sizable 10 per cent through import from India. However, in monetary terms power purchases in 2006 from IPPs and India totalled a massive Rs.6,575 million, which was 47 per cent of the NEA's total annual revenue of Rs.14,012.6 million. Such outflow of major revenues has been attributed to the NEA's worsening financial condition.

6.4.1 Nepal's High Electricity Tariffs

6.4.1.1 Pre and Post Entry of Multilateral Donors

With the World Bank itself noting *'… in November 1999, tariffs were increased with another 25 percent to about Rs 6.20/kWh or about US cents 9.9/kWh, making it one of the highest in the region'*.(The World Bank 2000), an attempt is being made to outline the genesis behind Nepal's high power tariff. This has been indicated below in two eras: the Nepal Electricity Corporation and the Nepal Electricity Authority. Or to be precise, the **Pre** and **Post entry** eras of the multilateral donors in the Nepalese power sector.

Pre-Entry of Multi-lateral Donors/Corporation Era

Average Revenue per Unit in Nepalese Paisa

Year	1977	1978	1979	1980	1981	1982	1983	1984
N. Paisa/Unit	**38.0**	**38.0**	**39.3**	**43.8**	**52.4**	**52.2**	**55.2**	**80.0**

Source: World Bank's Kulekhani Project Completion Report, July 1, 1985
Exchange rate 1US$: N. Rs: 1975 Rs 10.60; 1978 Rs 12.00; 1980 Rs 14.00; 1984 Rs 15.60; 1986 Rs 19.90

In the mid 1970s, the World Bank and the ADB stepped into Nepal's power sector for the first time with the World Bank implementing the 60 MW Kulekhani Hydroelectric Project and the ADB picking up the 154 km Hetauda/Gandak 132 kV transmission line. There are a number of illuminating comments on the then tariffs in the World Bank's completion report (The World Bank 1985): NEC's tariffs were very low, averaging only US1.9 cents/kWh because NEC did not have any debt to service; NEC's rate of return on historic valued assets was about 3 per cent; an increase to about US3.3 cents/kWh would give NEC the rate of return, based on historic valued assets, of 4 per cent by 1977/78 and 6 per cent by 1980/81; the achievement of these targets required the abolition of the Government imposed royalty tax of 7.5 paisa per kWh sold during FY'76 to FY'79 which amounted to about 25 per cent of operating expenses and equivalent to about 30 per cent of the average revenue/kWh; and that NEC's system losses averaged about 30 per cent. One of the reasons why the World Bank abolished the government-imposed royalty at that time was that it considered electricity a '*social and economic*' service as opposed to the present '*commercial*' stand. The 60 MW Kulekhani project was initially estimated to cost US$68 million, but when ultimately commissioned in May 1982, it ended up double the cost at US$122.6 Million (Ibid). One can thus see that Kulekhani I triggered an increase of 43 per cent tariff hike from 1977 to 1984.

6.4.2 Bundling/Unbundling Game

One of the covenants of the ADB's Fourth Power Project in 1982 stipulated that '*the Nepalese Government was required to decide on the reorganisation of the electricity supply sector and the creation of a new institutional structure acceptable to the Bank*.' ADB's fifth Power Project in 1984 further added that 'the Government proposed that all these bodies (*Note: Electricity Department, Nepal Electricity Corporation and various semi-autonomous development Boards) be merged into a single entity, NEA. After extensive policy dialogue, NEA was finally created in 1985*.' The World Bank's Marsyangdi Implementation Completion Report merely stated, '*Conditions under ADB's fourth and fifth power projects in the country called for establishing NEA by April 1985 along the lines established in the above studies.*

Post-Entry of Multilateral Donors/Authority Era: Average Revenue per Unit in Nepalese Rupees

Year	N Rupees/Unit	Year	N Rupees/Unit
1985	0.84	1986	1.16
1987	1.18	1988	1.29
1989	1.39	1990	1.38
1991	1.45	1992	1.99
1993	2.54	1994	3.38
1995	3.98	1996	4.15
1997	4.96	1998	5.05
1999	5.05	2000	5.70
2001	6.23	2002	6.52
2003	6.60	2004	6.66
2005	6.53	2006	6.50

Source: 1992 to '98 are actual audited figures from World Bank's PSEP Implementation Completion Report, 2000; after 1998 from NEA's Annual Report;Exchange rate of 1US$ to N.Rs.1986 Rs.19.90; 1988 Rs.22.80; 1990 Rs.28.40; 1992 Rs.40.20; 1994 Rs.47.90; 1984 to '94 sourced from Arun Access Road Project, Credit 2029-NEP, Report No. 16037

IDA integrated the same condition in the agreements concerning the Project.' The studies referred to were done by the British consultant, Cooper and Lybrand. Thus, the NEA formally came into existence in August 1985, with the merger of Electricity Department, with about 1,200 staff, including about 200 engineers, and the Nepal Electricity Corporation, with about 4,200 staff, including about 100 engineers.[15] The wisdom of the two multilateral banks with regard to this merger is now being seriously questioned. By 1985, under the very nose of the British consultant, the unbundling of Britain's own Central Electricity Generating Board and its 12 electricity boards was already in the offing and by 1989 was being implemented. The NEA quickly became the employment repository of the then '*powers that be*'. By 1990, NEA's staff strength ballooned to '9,161 persons of whom 4,473 are in regular service, 1,221 in temporary service and 3,467 hired on monthly wage basis' (NEA 1990). Now both the government and the same multil-ateral donors chant an entirely opposite mantra: '*Unbundle NEA*'. Unbundling in itself is not the panacea for Nepal's power shortage. Nepal needs the vision and commitment to create entities like India's NTPC and NHPC, which are capable of competing with any global players.

[15] World Bank's Marsyangdi Implementation Completion Report May 20, 1996 states end-1982 staff strength as Electricity Department: 900 and Nepal Electricity Corporation: 3,200.

6.4.3 Highly Suspect Asset and High Project Cost

'*NEA had started operations with an opening balance sheet including a highly suspect valuation of the asset, it had consultants properly revalue these, which, in FY'90, led to a 300 per cent increase in the valuation of fixed assets and to the installation of a method for their future periodic revaluation*.'(The World Bank 1996). The historically valued assets as agreed in the Kulekhani implementation was first termed 'highly suspect', then it was increased by 300 per cent and coupled with 'periodic revaluation' from 1989 onwards. Many of the electric utilities, even in the developed countries, do not follow this asset revaluation principle. On top of this was the cost of the Marsyangdi project itself which when 'completed in August 1989 at a cost of US$294 million' was by the Bank's own standard 'a very high US$4,260 per kW installed for the plant alone'(Ibid). The Bank's original estimate of US$68 million Kulekhani had ended up with US$122.6 million on completion. The recently commissioned Kali Gandaki at US$384 million, though completed at a cost less than the estimated US$450 million, is still by no means a cheap project. Such high project costs and periodic revaluation all had catastrophic effects on the 6 per cent rate of return (ROR) on revalued fixed assets covenant and hence the power tariff. The other damaging covenant was the self-financing ratio (SFR) that established a minimum contribution of 23 per cent from internal cash generation to the local cost of NEA's investment programme (The Asian Development Bank, 2004).

6.4.4 Tariff Increases in Leaps and Bounds

To fulfil the donors' ROR and SFR covenants (for Marsyangdi, Arun III and Kali Gandaki A), the Nepal tariff thus increased by leaps and bounds: 35 per cent in '85, 22 per cent in '86, 18 per cent in '88 and the biggest single increase of 61 per cent in '92 (The World Bank 1996) raising the tariff to NRs.2.54 to fulfill Arun III's 47 innumerable covenants. Surprisingly, these hefty tariff increases after 1990 were all approved by the Nepali Congress government and when it called for the mid-term election in 1994 it not only sealed its own political fate but that of the Arun III project as well. Many now believe that the continuity of the Nepali Congress as the government in power would have made it difficult for the new World Bank President to make the abrupt U-turn in the bank's decade-old policy of pursuing Arun III. There were further increases of 25 per cent in 1993, 38 per cent in 1994 and another 20 per cent in 1995. Then on August 3, 1995 the World Bank President, James D. Wolfensohn, after a decade-long association with Arun III, finally backtracked with the statement: '*… I have concluded that under today's circumstances and with the information at my disposal, the risks to Nepal were too great to justify proceeding with the project'(The World Bank 1995)*. With this decision, the 144 MW Kali Gandaki A, originally considered an outcast by the World Bank, shot to the front

and ADB firmly took up the reins of Nepal's power sector, hitherto the domain of the World Bank. However, ADB continued the same Arun III covenants, encapsulated in slightly different labels. In 1999, tariffs were increased by another 25 per cent to about NC Rs6.20/kWh or '*…about US cents 9.9/kWh, making it one of the highest in the region' (The World Bank 2000)*. In 2001 there was a slight increase of about 7 per cent, to push the tariff up to NC Rs 6.50/kwh. After this, the tariff has not increased till April 2007 as the Electricity Tariff Fixation Commission, one of the outcomes of Arun III covenant, has been very shy to comply despite the NEA's badly deteriorating finances.

6.4.5 Private Sector Entry

While the donors' ROR and SFR hiked up the Nepal power tariff, the entry of the private sector has not helped to curb the tariff either. The 1992 Hydropower Policy attempted to bring in the private sector into the monopolistic NEA power sector to fill the gap, before the commissioning of Arun III in 2001. The Norwegian-led 60 MW Khimti and the American-led 36 MW Bhotekosi thus materialised through the MOU route and not through the rigorous competitive bidding. In hindsight, Nepal has realised that improvements could have been made on the '*take or pay, dollar denominated, US consumer price index escalated*' power purchase agreements. The near-dead Khimti project was actually resurrected by ADB, acting as the intermediary, with the logic that '*Nepal may send the wrong signal to the private developers*.' Ironically, it is the private sector window of ADB and the World Bank's IFC that have their fingers in the Khimti and Bhotekoshi *'pies'* as the major lenders with high interest rates to these power projects. In fact, Bhotekoshi's local 10 per cent equity holder, Himalayan International Energy, has now bought (The Kathmandu Post March 28th 2006) the American Panda Global Holdings' 75 per cent equity, making it the major 85 per cent owner and raising the debate of dollar denominated tariff to a local Nepalese company after the lapse of 12 year debt repayment. The government, pressed on to demonstrate its hands-off policy, sold off its near entire equity from the 17 MW Butwal Power Company[16] (*that some called 'the family silverware*') for a very paltry sum. Many applaud Ms Shailja Acharya, ex-DPM and Water Resources Minister, for forcing NEA to announce its '*buy-back rates*'[17] for projects under 5 MW. This wet and dry season buy-back rates of NEA have been instrumental in '*kick-starting*' a flurry of small projects that have beneficially leveraged local skills and resources.

[16] The private sector (Shangri-La Energy/Nepal and Interkraft/Norway) bought BPC's 75 per cent equity for NRs.95 crores and distributed 40 and 35 per cent dividends for fiscal years 2003/'04 and 2004/'05.

[17] NEA's buy-back rates for 1998 were NRs.3.00 per unit in the wet season and NRs.4.25 per unit in the dry season with an annual escalation of 6 per cent for 5 years from the base year.

The 1992 policy totally failed to open the export market and thus a more comprehensive 2001 policy was brought out. However, this latest 2001 policy has a quaint definition for '*commercial and non-commercial*' categories. Non-commercial operation, according to that policy, is '*generation of power by a public sector utility owned by a foreign country and the power so generated exported to that same foreign country*'. Project developers up to 1,000 MW built on a '*non-commercial basis*' are, according to this policy, permitted to provide 15 per cent energy in lieu of cash as royalty. Evidently, such non-commercial operation would apply only to India's public sector utilities thus questioning the policy's '*level playing field to all*'. Many argue that it is not Nepal's hydropower policy that would open up the Indian export market. Unless Indian consultants, contractors, manufacturers and financial institutions get their plum share of '*pies*' from Nepal's hydropower export, India would, instead of opening up her market, simply sit and watch as she has been doing in the last decade or so. After 2006 with some semblance of peace in Nepal and the price of oil jumping upwards astronomically, India has come aggressively into Nepal's hydropower sector. Multilateral donors like the World Bank and ADB are similarly watching from the fence.

6.5 'Missed' Indo-Nepal Power Trading Scenarios

6.5.1 Karnali/Chisapani Multi-purpose Project

After the tiny 20 MW Kosi/Kataiya and 15 MW Gandak Indo-Nepal projects, Karnali/Chisapani was the first major multi-purpose project with a huge Indo-Nepal power trading possibility. Nepal, from the early 1960s, lobbied (Mihaly 1965) internationally for the Karnali/Chisapani Multi-purpose Project with the genuine belief that the project would be hugely beneficial for both Nepal and India. The first 1,800 MW feasibility study was conducted by Nippon Koei/Japan in 1966, its review by Snowy Mountains Hydroelectric Authority/Australia in 1968 and the second feasibility study with upgrading to 3,600 MW by Norconsult/Norway and Electrowatt/Switzerland in 1977. India, as the downstream beneficiary of the project and sole purchaser of power, was fully in the picture through such mechanisms like the joint Karnali Coordination Committee and the Committee on Karnali. India's ex-Foreign Secretary, Jagat Mehta (2004) states: 'At one time President Carter, Prime Minister Callaghan and Robert McNamara were prepared to underwrite Karnali'. However, BG Verghese (1990), a well-known journalist on water resources, notes: '*But there was a fear of being too dependent on Nepalese power in some Indian circles….India also exhibited an excessive antagonism towards all international consultants….in the belief that this would necessarily load the dice against it if for no other reason than to favour the smaller country or to foster the sinister designs of the 'foreign hand*'… President Carter, Prime Minister James Callaghan, the World Bank et al. were spurned when they expressed willingness to support Himalayan water resource development.'Undoubtedly, in the cold war era Karnali/Chisapani raised the debate

of whether a large nation should be 'hostaged'[18]by a small nation or a small nation should lose its 'sovereignty' to a large nation. BG Verghese and RR Iyer (1993) opined 'if work on Karnali had been started in the sixties and been completed by seventies …, Karnali might have saved India billions of dollars on oil imports after the hike in oil prices.' The price of oil per barrel a decade ago in 1998 was about US$ 12 as compared to the present (2008) of about US$ 146.

With the UNDP's further assistance, Nepal trained 250 engineers for the Karnali project in the early 1980s at India's own Roorkee University. Nepal went full steam ahead with World Bank assistance to prepare the comprehensive feasibility report of the now 10,800 MW upgraded Karnali Chisapani project in 1989. However, India, with the 24 volume report in her hands, expressed reservations about the report's benefit assessment (*power: 81 per cent, irrigation: 18.9 per cent and flood control: 0.1 per cent*). She argued that only power benefit be taken into account, as according to her, irrigation and flood control benefits were totally negligible. She also questioned the capacity benefit from the project, arguing that it replaced her hydro-generation and not thermal. Thus, India veered towards her more favoured Pancheshwar project on the Mahakali that was successfully clinched in 1996 as Nepal's '*Mahakali package deal*', embracing unwittingly both the Sarada/Banbasa barrage and the embroiled Tanakpur MOU. With Karnali/Chisapani pushed to the backstage, India's Jagat Mehta (2004) was thus constrained to state: 'My greatest unfulfilled ambition was not to have been able to initiate discussion, or at least come to grips on eventual power supply from Karnali…' Mehta now stresses 'India should categorically recognise that hydel projects in Karnali and Pancheshwar should be facilitated at breakneck speed at whatever price–even if it means subsidies and cooperation from acceptable non-Indian international involvement, if Nepal so prefers'. (Ibid)

In the mid-1990s, Enron/USA, the then seventh largest multinational corporation, briefly flirted with Karnali Chisapani. When Nepal informed India at the Ministerial-level meeting in 1996 about Enron's survey licence application for Karnali/Chisapani, India advised[19] that Nepal should not deal with Enron *'in exclusivity'* as their Dahbol/Enron experience was not good. Later, in July 1998, when the Water Resources Deputy Prime Minister, Ms Shailja Acharya, politely requested Enron to have patience on the Karnali project due to uncertainties over '*substantial additional irrigation benefits in India*', there was uproar in the parliament with genuine heartburn among the MPs. Just three years later in 2001, Enron was declared bankrupt and its two top executives, Kenneth Lay and Jeffrey Skilling, indicted for fraud. Nepal expected that the '*downstream benefits precedence*' to be set by the ongoing Pancheshwar negotiation would be replicated on Karnali. But the acrimony over Pancheshwar downstream benefits has bedevilled the project's DPR to this day in

[18] Terell Paul, Bechtel, one of the World Bank Consultants for the Karnali/Chisapani

[19] By India's MOWR minister, Janeshwar Mishra, to Nepal's MOWR minister, Pashupati SJB Rana, at New Delhi November, 1996. In fact, while minister Mishra talked bluntly of the corrupt practices of Enron, a seasoned bureaucrat came to the minister's rescue with the term 'exclusivity'.

2007. In 2004 the Indo-Nepal Secretary-level Joint Committee on Water Resources (Spotlight October 15, 2004) decided to *'reactivate the Karnali Coordination Committee to examine the possibility of implementing the Karnali Chisapani multi-purpose project in Nepal'*. Thus, reactivation of Karnali/Chisapani for implementation is again on the Indo-Nepal table now!

6.5.2 200 MW Power Export from 402 MW Arun III

This 200 MW power export from the 402 MW Arun III hydroelectric project was another opportunity for large Indo-Nepal power trading. As early as 1988, the World Bank-led 402 MW Arun III had envisaged exporting 200 MW of power to India through the Duhbi-Purnea corridor. On the Tanakpur barrage that was unilaterally started in 1984, India by 1990 was very much in an embarrassing position. Having argued all the time that the barrage was very much on her own sovereign territory and Nepal had nothing to object, India belatedly realised that Nepal's cooperation was sorely needed. The stark possibility that Mahakali's monsoon fury[20] of 1992 could easily outflank the newly constructed Tanakpur Barrage through the left bank in the Nepalese territory, leaving India's barrage embarrassingly high and dry, was very real.

Nepal's ruling Nepali Congress government, instead of trading Arun III's 200 MW of power export *'In lieu of the eastern afflux bund of the Tanakpur Barrage, at Jumuwa thus constructed/…'*, was unfortunately coaxed into '*… as a goodwill gesture, the Indian side agreed to provide initially 10 MW of energy annually free of cost to Nepal…'* during Prime Minister GP Koirala's controversial December 1991 MOU at New Delhi. '*The availability of land for construction of bund will be effected in such a way by HMG/N that the work could start by 15th of December 1991*.' Nepal never bothered to read into the strategic significance of this '*by 15th of December 1991*' and thus lost the opportunity of trading 200 MW of power to India and at the same time building the original 402 MW 2,890 GWh Arun III. The beauty of this Arun III project was its high firm energy of 1,513 GWh (The World Bank 1994). As already indicated, the road built for Arun III would have automatically kick-started construction of the other 309 MW 2,276 GWh Lower Arun and 330 MW 2,774 GWh Upper Arun resulting in more power trading. A decade later, in 2006 Nepal opted to float the Arun III tender (The Kathmandu Post December 4, 2006) for export purposes, the project into which Nepal had already sunk over US$30 million.

[20] This is discernable from PM Chandra Shekhar's letter to PM KP Bhattarai (annex 10) where India's primary concern of protecting the barrage from the approaching monsoon was cleverly deflected by stressing instead the benefits accruing to Nepal by tying up the Tanakpur left afflux bund to the high grounds in the Nepalese territory.

6.5.3 6,480 MW Binational Pancheshwar Project

The 6,480 MW Indo-Nepal Pancheshwar project is the main flagship of the 1996 ratified Integrated Mahakali Treaty that *'subsumed'* (Haider 2004), both the Sarada/Banbasa and the Tanakpur barrages. The DPR of the Pancheshwar project that the Treaty envisioned to complete in six months has not surfaced for the last 11 years. In fact, the very Treaty itself stipulated 8 years as the project completion period. There are major differences between India and Nepal on: the return of the Kalapani territory to Nepal, interpretation of equal sharing of the Mahakali waters, protection of India's existing uses 160 km downstream in the Lower Sarada command area, interpretation of power benefit on the basis of saving in costs as compared to the relevant alternatives available, Rupaligad versus Poornagiri reregulating structure site, etc. (ORF 2004). But the real Indo-Nepal bone of contention is the '*benefits accruing*' as the Treaty categorically stipulates that *'The cost of the Project shall be borne by the Parties in proportion to the benefits accruing to them.'* India now demurs that benefit assessment has become '*acrimonious*' and proposes that benefits be assessed on the basis of the two countries' water usage from the storage facility created. Nepal does not agree to this proposal, pointing out that there is no such provision in the Treaty itself.

On the issue of Nepal's share of 3,240 MW of power, the Treaty states: 'A portion of Nepal's share of energy shall be sold to India. The quantum of such energy and its price shall be mutually agreed…' The Treaty's Letter of Exchange states '… net power benefit shall be assessed on the basis of, inter alia, saving in costs to the beneficiaries as compared with the relevant alternatives available.' On the issue of the 'relevant alternatives available', Nepal sanguinely assumed the relevant alternative to be coal-fired thermal power plants (70 per cent of India's present power generation). India, however, cited other alternatives like the gas-fired and other hydroelectric plants (Iyer 2001) as well. India also argues, rightfully in this case, that the 'gain' by Pancheshwar over the alternatives would have to be shared equally by Nepal and India.

There are two schools of thought in India itself on the Mahakali treaty: the so-called '*doves*' stress that the treaty should be made to work as it was signed in good faith by both countries but the other school of '*hawks*' call for scrapping the treaty and leaving it to the market forces (ORF 2004) . In Nepal itself, water pundits vouchsafe that India's primary interest is in the Nepalese waters: both the transit flow and that stored at Pancheshwar, West Seti, Karnali, Naumure/Rapti, Burhi Gandaki, Bagmati, Kamala, Sapta Koshi, Kankai, etc. Electricity, for India, is a mere secondary issue that could be replaced by other forms of energy.

6.5.4 750 MW FDI West Seti Project

This US$1.2 billion storage project on West Seti, a tributary of Karnali, was licensed out to the Australian developer Snowy Mountain Engineering Corporation (SMEC)

about 12 years ago in 1995. By SMEC's own account, they have already spent over Au$14 million (Bonniface, 2001) on investigations. It is reported that SMEC has wrangled valuable concessions from Nepal: debt repayments getting priority over royalty payment and for the 90 cumecs of lean season flow augmentation to Karnali there are no forms of revenue to Nepal, despite submergence of valuable land and displacement of its inhabitants. On the other hand, India has done very well by *'wearing down'* SMEC over the years on the power purchase agreement. SMEC's initial demand of 7.5 US cents/kWh for peaking power tariff is now surprisingly below 5 US cents/kWh (ORF 2004). In comparison, Nepal's pioneer run-of-river IPP projects, 60 MW Khimti and 36 MW Bhotekosi, have '*run away*' with 2006 tariffs at US cents 8.1 per unit that would continue to escalate at US consumer price index until 2012. Incidentally, low-priced power deals by India with the developers exporting power from Nepal mean less royalty to Nepal as royalty is a fixed percentage of the PPA tariff.

With SMEC approaching the private sector window of ADB for debt financing, it is reported (The Kantipur News Daily April 27, 2007) that the Nepalese government has decided to take a US$ 45 million ADB loan, equivalent to 15 per cent equity in the project. This, according to Nepal's Ministry of Finance, is 'necessary to ensure that the project moves forward'. But in the case of domestic use of 309 MW Upper Tamakoshi, the same ministry (The Kantipur News Daily February. 11, 2007) ironically sees no necessity of supporting its own utility NEA, with the argument that 'electricity is a commercial sector and foreign investors will come on Upper Tamakoshi.' It is also reported that ADB's private sector window would also have 20 per cent equity participation. The construction of the project has already been contracted out to a Chinese company. But there is no mention of any participation of Indian companies, which observers believe is '*another necessity*' for the project to move forward.

6.5.5 *Power Trade Agreement*

The Indo-Nepal Electric Power Trade Agreement (PTA) was initialled by the two secretaries of the respective countries on February 17, 1996 in Mumbai just five days after the two Prime Ministers signed the Mahakali Treaty in New Delhi on February 12, 1996. This close linkage, plus no prior vetting in Nepal, has lent an air of suspicion and mistrust in Nepal to the power trade agreement. The salient features of this agreement are: Any party in Nepal or India (governmental, semi-governmental or private enterprises) trading power 'may determine the terms and conditions of such an agreement including the quantum and parameters of supply, the points of delivery and the price of supply of electrical power'(Annex 21) and the parties shall be afforded all necessary assistance by the respective governments in accordance with their respective laws and regulations for conducting surveys, including 'field investigations and for construction, installation, operation and maintenance of facilities required for generation and transmission of power in the territories of both the

countries...' Some in Nepal argue that, like the Mahakali treaty, this PTA also triggers Article 126 of the 1990 Constitution of Nepal and hence requires ratification by two-thirds of the members of both the Houses of Parliament. Others counter that a mere simple majority of the House is all that is required. Like the Pancheshwar project, this Indo-Nepal Power Trade Agreement is also in limbo.

6.6 Looking Ahead

6.6.1 *Short Term: India Import and Small Hydropower Projects*

Due to the ferocity of the Maoist's insurgency during the last five years, Nepal's power sector, like all her other sectors, is in deep trouble. Load-shedding[21] has begun from the dry winter season of 2006. This would intensify each year until a sizable power station is commissioned. The one and only medium-sized power plant under construction, the 70 MW Middle Marsyangdi, may give relief only for a year in 2008. It is, thus, inevitable that power import from India appears to be an immediate solution to mitigate load-shedding.

With the cost of Khimti in 2006 at Rs.5.95 per unit and Bhotekoshi at Rs.5.85, Indian import through the power exchange mode is the most expensive at Rs.6.10 per unit at the 33 Kv level. In December 2006, it has been reported (The Kathmandu Post December 28, 2006) that India has offered Nepal 33 MW (700,000 units per day) of firm power for the five dry months at Rs.6.40 per unit. When Nepal had the power glut in 2002/03, India took the stand that construction of transmission lines on her territory was 'subject to finalisation of the long-term commercial arrangement for sale of power from Nepal to India.' Now that the table has turned, Nepal needs to chew the cud over this offer well.[22] India, during the early period of her power sector liberalisation in the 1990s, chanted the mantra '*expensive power is better than no power'*. With the bitter Dahbol/Enron and Orissa experiences, this mantra then changed to '*no power is better than expensive power*'. Nepal needs to vet and decide which mantra to chant at this hour of need.

Besides import, the other option is the augmentation through construction of small hydropower projects that have shorter gestation periods. For this, both the government and NEA need to reach out to these developers and provide them more than the mere '*helping hands*'. At a time when load growth demands about 60 MW

[21] Load shedding in March 2008 was to the tune of 7 ½ in a day: 4 hours during day and 3 ½ hours at night.

[22] From April 2008 India is to avail Nepal 25 MW in the eastern region at a price of NRs.7.26 per unit i.e. US cents 11.30 (Kantipur March 29, 2008) when NEA's average selling price is NRs. 6.50 per unit. India has also proposed Nepal (Kantipur February 18, 2008) 250 MW power on a long-term basis from her coal fired plant in Bihar at NRs. 4 to 4.80 per unit. Though the price appears attractive, such a substantial chunk of base load power to a foreign entity over a 25/30 year long-term will inhibit Nepal's hydropower development activities.

per year, only 17 MW of eight small power plants are under construction, with another 44 MW of 10 power plants that have concluded power purchase agreements. These developers have a tough time meeting the ever extended commissioning dates. However, with some semblance of peace within the country now, there are chances that more megawatts of small hydropower per year will come in line provided the government apparatus processes them on a '*fast track mode*'.

6.6.2 Medium Term: Doable Medium sized ROR Projects

In the past, the Government of India permitted only her public sector undertakings (*NHPC, WAPCOs*) to work in Nepal's hydropower development. India did not encourage her private sector to delve into Nepal's hydropower. It appears that India has now made a significant shift in her policy. When Nepal put three projects (The Kathmandu Post December. 4, 2006) (*402 MW Arun III, 300 MW Upper Karnali and the 600 MW storage Budhi Gandaki*) for competitive bidding, the response was reportedly good, particularly from well-known Indian private firms (*Reliance Energy, Larsen & Tourbo, Satluj Jal Vidyut Nigam, Jaiprakash Associates, GMR Energy, Jindal Steel & Power, National Hydroelectric Power Corporation etc*). It is also reported (The Kantipur News Daily April 5 and 15, 2007) that, on Upper Karnali GMR has offered Nepal 33 per cent free equity on top of 7.5 per cent free energy. Similarly, on Arun III Jindal Power has offered Nepal 21.9 per cent free energy throughout the generation licence period.[23] Both Upper Karnali and Arun III are run-of-river projects, and the IPPs' offers, which are far above what Nepal's 2001 hydropower policy envisaged, emphasises the attractiveness of these projects. The Power Summit 2006, organised in Kathmandu by the Independent Power Producers' Association of Nepal (IPPAN) and Confederation of Indian Industry (CII) with the American South Asia Regional Initiative/Energy (SARI/E) sponsoring it, had very rightly recommended 'doable projects like ROR or PROR ranging from 100 MW to 500 MW should be started immediately'. Indo-Nepal multi-purpose projects, even of the likes of 600 MW Buddhi Gandaki, evoke sensitive issues. This is because of the lopsided Kosi and Gandak treaties. Hence, in order to create an atmosphere of mutual trust and understanding, doable medium sized ROR projects must be given top priority for Indo-Nepal power trading. But some question the wisdom of offering Upper Karnali and Arun III, two very attractive projects, for export purposes to churn Indian, instead of Nepalese, industries. Also questioned is the floating of the bid for the storage 600 MW Budhi Gandaki without settling the issue of augmented flows to India's Gandak barrage downstream.

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[23] Nepal has now awarded the 300 MW Upper Karnali to India's GMR Energy Limited with 12 percent free energy (up from original 7.5 percent) and 27 percent free equity (down from original 33 percent). Interestingly, Elysee Frontier, a French Developer, had signed a PPA with NEA in October 2001 with the same magical 33 per cent free equity to NEA. The 2001 base year price of NRs. 2.90 per kWh had 4 percent escalation for a total of 11 times. The 402 MW Arun III has also been awarded to Satluj Jal Vidyut Nigam, a Government of India Undertaking that operates

6.6.3 Long Term

6.6.3.1 Nepal's Tenth Five Year Plan

Nepal's Tenth Five Year Plan (2002–2007) has the following target, strategy, policy and work plans for the export of power to India:

- Initiatives will be taken to export 22,000 MW electricity generated from the development of the Pancheshwor, Karnali and Saptagandaki [presumably Sapta Kosi] multi-purpose projects.
- Electricity will be generated through bilateral and regional cooperation, and in keeping with the abundance of production capacity, export of electricity will be encouraged.
- In order to increase electricity exchange between Nepal and India, inter-transmission link will be developed to connect with India's electricity grid.
- Electricity will be imported and exported as per requirement by consolidating the bilateral inter-transmission lines.

The World Bank believes that Nepal's future power trading market prospects in India hinges primarily on the credit worthiness and escrow capacity of the buyer plus the success of the ongoing power sector reforms in India (The World Bank 2001). It is surprising that the Bank has failed to take due cognizance of a very vital issue facing India: the security of freshwater supply in India's densely populated Gangetic belt. The diminishing freshwater supply to India's 440 million people in the Ganges basin[24], for some reason, is not equated at all by the Bank with Nepal's water resources development and hence its hydropower. India's galloping near-double digit GDP growth rate not only requires an insatiable appetite for energy but for freshwater as well. India's Ganga Basin Master Plan has, thus, unfolded as the ambitious IC Rs.5,600 crores River Linking Project (RLP). Nepal has now realised that the storages at Pancheshwar, Karnali, West Seti, Naumure, Budhi Gandaki, Bagmati, Kamala, Sapta Kosi, Kankai or, for that matter, any kind of storage projects in Nepal are all cogs of India's RLP. Though India contends that the RLP is still being examined[25] in India, Bangladesh has strongly opposed it and Nepal has remained silent.

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the 1500 MW Nathpa Jhakri hydropower station, with 21.9 percent free energy (up from original 4 percent) and the payment of 451.4 million Nepalese Rupees as costs that Nepal had already incurred on Arun III (The Kathmandu Post January 25, 2008 and Kantipur March 3, 2008).

[24] India Census 2001: Delhi 14M, UP166 M, Uttaranchal 8.5M, Bihar 82.90M, Jharkhand 26.9M, West Bengal 80.2M – 378M Ganga-fed plus 66M i.e 40% of partly Ganga-fed other States (Himanchal Pradesh 6M, Punjab 24M, Haryana 21M, Rajasthan 56M and Madhya Pradesh 60M – 167M): totalling 444 Million.

[25] Shyam Saran, ex-ambassador of India to Nepal, to the Media, Spotlight/July 16, 2004

6.6.3.2 Water/Power Trade-Off

While India asserts that it has other alternative sources of power supply (*coal, gas, nuclear, etc*.), ex-foreign Secretary, Salman Haider does admit that *'the long-term interest of India in water' (ORF 2004)* far outweighs her interest in power supply. Secretary Haider does agree that power is 'indeed a saleable commodity and not just the outcome of a multi-purpose project to be priced in the traditional way' (Haider 2004). The cost of a barrel of oil in 1998 was about US$12.00 and this has jumped twelve folds to US$146.00, With the economies of China and India trundling along unimpeded at or near double-digit figures, the thirst for energy is huge. Water, on the other hand, has already become a scarce resource in parts of both India and China. The International Water Management Institute, the world's leading body on freshwater management, says that water scarcity was increasing faster than expected. Rising living standards in China and India could lead to increased demand for better food, which, in turn, need more water to produce. Egypt, according to the Institute, imports more than half of its food because it does not have enough water to grow crops domestically.

This aspect of water as a scarce resource has never been factored, either in Indo-Nepal talks or taken seriously by Nepal's own political parties. In fact, the political parties, since the 1990 demise of single party Panchayat system, have made no attempt whatsoever to forge a minimum common consensus on water resources development. In their 1999 election manifestos, while the Nepali Congress wanted private, national and foreign investments in the development of large projects, the other major party, Communist Party of Nepal-United Marxist Leninist (CPN-UML), without opposing large projects as such, was more specific in wanting the more sustainable and quicker small and medium projects. On the other hand, the Communist Party of Nepal-Maoist (CPN-M), that joined the mainstream multiparty democratic process only from 2006, has like its smaller communist party sisters very radical views: terming the Mahakali treaty with India as anti-national and calling for its abrogation. A clearer stance of these three major parties may evolve after the framing of the new Constitution by the Constituent Assembly whose election has just ended on April 28, 2008.

Nepal's nine major and medium rivers contribute 75 per cent of the critical lean season flows of Ganga at Farakka. India's solution to water shortages and floods in the Gangetic belt, therefore, hinges primarily on Nepal. The basic flaw, however, lies in Nepal's obsession with the sale of electricity and India's short-sightedness in pinning its hope of overcoming its looming water scarcity through Nepal's default (Subba 2002). India must concede that stored and regulated water has monetary value. India must stop believing in the concept that as Nepal cannot pump her water up, this will then inevitably flow down to her. This may no longer be the case. Statistics reveal that dry season flows of the small and medium rivers are already deficit for Nepal herself. But so far India has been unwilling to put a price on stored water and flood moderation. Instead, India has preferred to play the waiting game,

waiting for the opportune time in Nepal's political drama[26], to achieve her strategic interests.

While Nepal has been mesmerised by the Indian market for electricity, India has painstakingly avoided spelling out her real interest in Nepal's water. India's quest for freshwater inevitably means large storage projects in Nepal. If India wants such large interventions on Nepalese rivers then she must recognise the value of stored water and this must be factored in the negotiations. As early as 1987, during the Pancheshwar negotiations (Record of Discussion between Nepal and India 1987), Nepal did propose that India pay royalty for stored water in excess of 50 per cent usage as Mahakali is a border river. But India objected *'emphatically'*, arguing that *'acceptance of equal sharing of water formula should not be made a precondition to implement the project'*. Ultimately the Mahakali treaty (Pancheshwar) ended up, incorporating instead the *'prior use right'* formula. Nepal's 2005 National Water Plan stresses that reservoir regulated flows are of 'immense value to the basin people and therefore cannot be ignored for long'.

6.6.3.4 Past Signals

In 2001, the USAID South Asia Regional Initiative/Energy (SARI/E) initiated the Four Border Project in India's eastern region at Siliguri, involving Bangladesh, Bhutan, India and Nepal for power trading. A phased trading, initially with 50 MW at 132 Kv, to be later upgraded to 500 MW at 220 Kv, was found feasible. The project, however, never took off because India was ostensibly sensitive to the selected project area, the 'chicken neck' at Siliguri. Similarly, the ADB-initiated 1,000 MW Arun Valley Development made no headway, as India, the monopoly market, showed no interest. In fact, in August 2004, SARI/E again initiated a two-day Regional Grid Operators' Forum at Kathmandu where Power Grid of Bangladesh, Bhutan Power Corporation, Pakistan's Water and Power Development Authority, Ceylon Electricity Board and Nepal Electricity Authority participated. India's Power Grid Corporation surprisingly backed out of the Forum at the very last moment as it failed to get the customary '*no objection*' clearance from its Ministry of External Affairs. When India, the South Asian regional power, refuses to attend even the regional grid operators' forum, the dream of the SAARC power trading has still a *'long march'* to do!

[26] The two cases: 1950 Treaty of Peace and Friendship with the tottering autocratic Rana regime on development of Nepal's 'natural resources' stipulated that Nepal give 'first preference to Government or the nationals of India' ; India's 1990 Draft Agreement to Nepal's tottering Panchayat regime on Mutual Cooperation that stipulated 'the protection of existing uses' on the 'commonly shared rivers'.

6.6.3.5 Tied Irrevocably to Water and Article 126 of Nepal's 1990 Constitution

Long-term Indo-Nepal power trading is irrevocably and intrinsically tied to Indo-Nepal water sharing. This is apparent from: the 1954 Kosi and 1959 Gandak treaties, the long drawn inconclusive three feasibility studies on Karnali Chisapani, the stand-still quagmire over the 'signed, sealed and done' Mahakali treaty on Pancheshwar multipurpose project and India's policy of blocking all multilateral and bilateral funds for Nepalese projects on rivers without treaty while she herself unilaterally constructs projects like Girijapur/Karnali, Tanakpur/Mahakali and Laxmanpur/Rapti. These were the seeds that ultimately germinated Article 126 on *'the ratification of, accession to, acceptance of or approval of treaties or agreements on natural resources and the distribution of their uses'* in the 1990 Constitution of Nepal. India's ex-Water Resources Secretary, RR Iyer (1999), concurs 'The mistrusts and suspicions led (quite understandably) to the inclusion of a provision in Nepal's new constitution making parliamentary ratification by a two-thirds majority necessary for any treaty or agreement relating to natural resources …' While many Nepalese laud Article 126, now Article 156 in the new 2006 Interim Constitution of Nepal, some (Baral 2000) find this provision 'hamstringing' the government and label it 'as an impediment to any understanding with a possible investor or government'. It may be fair to say that it is not Article 126 or 156 that is an impediment but rather the interpreters of that Article. The author believes that the real impediment is the lack of consensus among Nepal's political parties on natural resources development.

A look at the December 1991 Indo-Nepal MOU (Bhasin 1994) that Prime Minister GP Koirala signed in New Delhi tells the full story of what India has in mind about Nepal's rivers: i) Karnali Multi-purpose Project's project parameters to be completed, ii) Pancheshwar Multi-purpose Project's DPR to be jointly prepared with financing and sharing of costs and benefits to be mutually agreed, iii) Sapta Koshi High Dam Multi-purpose Project's parameters and the method of assessment of benefits to be finalised, iv) Burhi Gandaki Project's DPR 'should be prepared so that construction can start by 1994', v) Kamala and Bagmati Schemes' feasibility reports to be completed by Nepal by 1993 and vi) Tanakpur Barrage Project for which Nepal to avail India 2.9 ha of land to India so that India could start construction of the afflux bund in Nepal '*by 15th of December 1991*'. Long-term power trading would invariably mean the successful implementation of multi-purpose projects like Pancheshwar, Saptakoshi, Karnali, etc. These are India's monsoon storage in Nepal to regulate and feed its River Linking Projects during the critical dry season. Pancheshwar/Mahakali, West Seti/Karnali, Naumure/Rapti, Budhi Gandaki/Gandak and Sapta Kosi/Kosi store valuable freshwater both for flood control and lean season augmentation of the Ganges basin in India. This must be valued in monetary terms and not equated to the Bhutan model where only electricity is valued.

6.6.3.6 Bhutan Model

There is a section of people in Nepal who are ardent proponents of the Bhutan Model. These zealots, crazy over Nepal's '*apar khera gai rakheko pani' (infinite waste of water)*, are mesmerised by India's 60:40 grant/loan with a 10 per cent per annum interest and a cost plus tariff of about US cents 2.80 per kWh. They point out that over 38 per cent of Bhutan's annual revenue accrues from power export to India and with the 2006 commissioning of 1,020 MW Tala, Bhutan's per capita GNP is expected to double to US$1,600. But they overlook the fact that Bhutan, having successfully shoved over one-sixth of her population into Nepal as refugees in 1991, has cleverly foregone her downstream benefits as all her rivers drain into Brahmaputra, a water surplus basin. In contrast, all the rivers of Nepal drain into the densely populated water-deficit Ganga basin. Unlike Bhutan, Nepal cannot afford to forego the downstream benefits that storage in her territory creates. Also, some observers note that Bhutan cannot expect to live in '*splendid isolation with high incomes*' in an area that is increasingly facing the brunt of demographic pressure. Bangladesh, West Bengal and Bihar have some of the highest population density in the world.

6.6.3.7 Laotian Model

Like Nepal, tiny land-locked Laos has a huge hydropower potential that the fast-developing Thailand eyes as one of her energy options. The Laotian model of hydropower development is best exemplified by the US$1.1 billion 1,086 MW Nam Theun II, which is expected to be commissioned in 2008. Based simply on an MOU permitting Laos to export 3,000 MW of hydropower to Thailand, the Nam Theun II project has four equity partners (Louis 2005): Electricity de France (EDF): 35 per cent, Electricity Generating Company (EGCO)/Thailand's utility: 25 per cent, Electricity de Laos (EDL)/Laos' utility: 25 per cent and Italian Thai/Thai company: 15 per cent. This is a well-balanced equity partnership with the smaller Laos, despite having only 25 per cent equity, not minding the larger Thailand's 40 per cent equity as the global player EDF with 35 per cent is also there. This is the kind of model, multi-faceted instead of purely bilateral, that Nepal's 1992 hydropower policy tried to chart but has so far, unfortunately, failed.

6.7 Conclusion

What was started in 1950 as the 'Barahchhetra project' for an Indo-Nepal power exchange has by 2006 emerged as the mega Sapta Kosi High Dam Multi-purpose Project and Sun Kosi Storage-cum-Diversion Scheme. The 1954 Kosi agreement

provided Nepal, only from 1971, about 3.5 MW of the oft-repeated '*Kosi concessional power*', priced in 2006 at IC Rs.2.70 per unit at 33 kV level, whereas India buys Bhutan power at about IC Rs.1.50 per unit. Indian farmers get electricity at IC Rs.0.40 per unit at low voltage level. India has, however, repeatedly requested Nepal that this Kosi concessional power be upgraded at par with the power exchange rate as the generation is 'very low and intermittent'. Similarly, the 1959 Gandak power with the '60 per cent load factor' clause, though handed over to Nepal in 1981, hardly provides 3 MW of continuous power. On the 'goodwill 70 million free units' Tanakpur power, derived through the 1996 Mahakali treaty, Nepal has been able to utilise, on an average, only about 56 million units. Nepal's request to India to avail the balance *'free power'* from other exchange points is merely '*under consideration*'. On the increase in the quantum of Power Exchange from 50 to 150 MW, India has accepted this '*in principle*' only. Of the three additional 132 kV links with India, two of them (Bigunj-Motihari and Dhalkebar-Sitamarhi) are on hold for 'later consideration' and the Butwal-Anandnagar link is 'subject to finalisation of the long-term commercial arrangement for sale of power from Nepal to India'. Now all at once an Indo-Nepal MOU envisions an upgraded 220 kV, again upgraded to 400 kV, transmission line: Dhalkebar-Mujaffarpur, Butwal-Gorakhpur and Silgudhi-Anarmani in the sensitive chicken-neck area.

India's repeated reference to '*Kosi concessional power'* and the '*goodwill 70 million units free Tanakpur power*' is totally oblivious of the huge concessions that Nepal has provided to India. While India bandies its concessions and goodwill gestures in press communiqués and minutes, Nepal strangely fails to utter its own concessions to India. In Kosi, Gandak and Tanakpur, Nepal has mortgaged to India in perpetuity, for all times to come, large tracts of her limited fertile lands. Strangely, India still insists that these projects could have been built in India and India alone; and the only reason for building in Nepal was to give some benefits to Nepal as well! Indo-Nepal water-related projects of the past were devoid of equity and justice.

One is, hence, forced to sadly conclude that the last five decades of Indo-Nepal power trading are also clouded with mistrust and fear of hidden agendas. Recent Indo-Nepal meetings at the highest levels have continued to elude that badly needed trust and transparency. At the October 2000 Secretary-level Nepal-India Joint Committee on Water Resources meeting, India agreed to provide Nepal data related to the 280 MW Dhauliganga hydroelectric project in India. Dhauliganga is a major tributary of Mahakali in India and Article 7 of the 1996 Mahakali treaty stipulates '…each Party undertakes not to use or obstruct or divert the waters of the Mahakali River adversely affecting its natural flow and level except by an agreement between the Parties'. The Dhauliganga project deprives a certain stretch of the Mahakali River the waters of Dhauliganga River. Four years later, in 2004 Nepal again requested India at the Joint Committee on Water Resources meeting for details of the Dhauliganga project and India again agreed (in the minutes) to provide the details '*as soon as possible*'. It transpired that by October 2006 the Dhauliganga project was commissioned and had become operational, having already delivered (www.nhpcindia.com) over 1,229 million units to the Northern Indian Grid. Furthermore, the DPRs of the 200 MW Dhauliganga-Intermediate and 120 MW Goriganga are awaiting the

go-ahead clearance from the Ministry of External Affairs. This is a precise exercise on opaqueness and on how NOT to create the environment for Indo-Nepal power trading.

To conclude, if a sizable quantum of Indo-Nepal power trading is to occur in future then Nepal's major political parties need to get their acts together by forging a common consensus on water resource development. India also must banish her old '*concessional, goodwill gesture, in principle, subject to, etc., etc.*' psyche. It would be morally wrong if India continues to achieve her problems of water scarcity and floods through Nepal's default, as in the past. When Laos and Thailand can conduct commercial power trading business based simply on an MOU, why can't Nepal and India? With the recent entry of a new breed of corporate and global Indian private developers (GMR Energy in particular and not necessarily Satluj Jal Vidyut Nigam) in Nepal's hydropower sector, Indo-Nepal power trading can be a win-win affair for both countries, provided a new era of transparency and mutual trust, equity and fair play, bereft of the hidden grand design prevail. The onus, of course, is on India. As the bigger country, India (Iyer 1999) with her GDP growth galloping towards the magical double digits, must be prepared to go more than halfway, if she is to meet her increasing energy and fresh water needs from Nepal!

Chapter 7
Access to Sea: Kosi Canal Waterway

Ananda Bahadur Thapa

7.1 Context

The 1997 Kosi Study Agreement was signed between the governments of Nepal and India to conduct a detailed study of the 165 km long Kosi Navigation Canal, linking Chatara in Nepal with the seaport, through the Ganges, Bhagirathi and Hooghly. This has paved the way for a new age of cooperation in promoting trade among countries in south Asia in general, and Nepal and India in particular. The proposed Kosi canal waterway could also help to expand the volume of Indian trade with Tibet Autonomous Region of China. At present, the Government of India (GoI) is requesting Nepal to provide transit facilities through Nepal for its trade with Tibet. The detailed study of the Kosi Navigation Canal (KNC) is going be a part of the joint Indo-Nepal feasibility study of the mammoth Sapta-Kosi High Dam Multi-purpose Project and Sun Kosi Storage-cum-Diversion Scheme.

The total length of the proposed KNC would be 165 km, out of which a 120 km long section would be in Indian territory. India has already not only endorsed Nepal's proposal to conduct a detailed study to build the KNC, linking Nepal with the sea through the Ganges, but it has even gone a step further by agreeing to bear the entire cost of the feasibility study of the Kosi Navigation Canal Project.

Nepal's aspiration to get access to the sea through the Kosi canal waterway will not be fulfilled until it is assured that further downstream the conditions of the Ganges and the Hooghly waterways are equally good for navigation. Thus, it has been clearly stated in the 1997 Kosi Study Agreement that the economic study of India's

A.B. Thapa (✉)
Former Executive Secretary, Water and Energy Commission Secretariat, Ministry of Water Resources, Government of Nepal, Former Associate Member Royal Nepal Academy of Science and Technology, Kathmandu, Nepal.
e-mail: abt@mos.com.np

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Waterway No. 1, linking Allahabad with Haldia port, would also form a part of the detailed study of the Kosi canal waterway.

7.2 Why Waterways?

7.2.1 Landlocked and Developing Nepal

All those involved in the economic development of Nepal agree that poverty, backwardness and under-development have resulted, to a great extent, from her being landlocked. However, Nepal is not the only landlocked country in the world. Even some developed countries such as Switzerland and Austria are landlocked. These countries were able to overcome this difficult hurdle. They succeeded in opening inland waterways suited for operation of large river vessels that provided them unhindered access to the sea. These countries have big river harbours to handle incoming and outgoing goods transported by waterways without any worry as to the maximum allowable size of the goods in transit. There are always restrictions on the maximum allowable size when goods are transported by other modes of surface transportation. Water-borne transportation is also the cheapest mode of transportation. It would not be an exaggeration to say that these countries have overcome their geographical constraints. Nowadays, the coastal river carriers (CRC vessels) can directly link these countries to the coastal ports of the rest of Europe.

7.2.2 Nepal could also Overcome its Geographical Constraints

Like Austria and Switzerland, Nepal could also overcome the geographical constraint of being a landlocked country. The groundwork for this highly challenging task has already been laid. Unfortunately, most of the Nepalese, including even intellectuals, are still unaware of this vast potential. There is a great danger that Nepal could lose this great opportunity because of lack of a clear development perspective.

Since 1967, Nepal has been showing a keen interest to develop inland waterways through India, which would provide her with a seaport outlet. On several occasions, she had approached India to allow development of such waterways. But Nepal never got an affirmative nod from India. The year 1997 was, however, a turning point. India accepted Nepal's proposal to develop the Kosi waterway. They endorsed Nepal's proposal to conduct a detailed feasibility study of about 165 km long navigation canal, linking Chatara in Nepal with the Ganges River in India near Kursella in Bihar. The 1997 Indo-Nepal agreement to jointly conduct a detailed feasibility study of the KNC, to be ultimately developed as a part of the Kosi High Dam Project, is indeed a landmark event. The proposed navigation canal could open up new boundless opportunities for rapid expansion of Nepal's trade and industrial development activities.

7.2.3 Competitiveness of Water Transportation

Nepal would continue to experience great difficulties in the transportation of goods to the seaport on account of being landlocked. Free and unhindered access to the sea to facilitate trade and transit has been Nepal's cherished dream. Inland waterway transportation, linking Nepal with the sea, would be ideally suited to relieve her difficulties in handling goods in transit through India. Yet, facilitation of the transit problem alone cannot be Nepal's goal. Waterway transportation cost must be fairly low in comparison to other modes such as roadway or railway transportation, to be attractive for its development. A swift study of the recent trends in the development of inland waterways, particularly in Europe, would show that the Kosi canal navigation would be economically the best mode of transportation to the sea. In any future feasibility study of the Kosi canal waterway, Nepal should always be guided by the vast experience gathered by Europe in the field of planning and operation of artificial waterways for navigation.

7.2.4 Inland Water Transportation is the Cheapest

The coefficient of friction on water is very small. One horsepower can pull 4,000 kg on water while on road and rail it can move only 150 and 500 kg respectively. In the European and American countries, inland water transport has established itself as the cheapest mode of transportation. In the USA, where various modes of transportation freely competing with one another and are equally developed, inland water transport has been found to be five times cheaper than railway transportation and twenty-one times cheaper than road transportation.

The USA had about 25,000 miles of internal commercial navigable channels in 1968, of which 15,000 miles provided operating depths of nine feet or more. The nine-foot draft is considered standard for barge and towing industry operations in the USA. About 490 million tons of freight was carried in 1968 by all kinds of river ships in the USA.

A Unified European Network was agreed to with regard to the whole of Europe wherein category IV waterways should be the standard link between river basins. This category should be able to accommodate 1,350-1,500 ton vessels. The locks should have a minimum depth of 3.5m over the sill.

A comparative study of inland water transport cost for small rivers vis-à-vis road transportation cost on a region-wise basis made in the former USSR shows that road transportation, in comparison with inland water transportation, was almost 10 times more costly in the Kuibshev region. This is about four times more expensive than in the Moscow region. In 1967, some 450 million tons of cargo were carried by all kinds of river ships in the former Soviet Union.

In a report recently published by the Government of Bangladesh, the volume of freight carried by water in Bangladesh stands at approximately 56 million ton/year.

Water transportation charges are said to be less than 10 per cent of the corresponding charges by road or railway.

According to a study conducted on behalf of the German State Railway, to move one ton of goods in Germany per one kilometre, it costs 14 pfenings (now eurocents) by rail and 29 pfenings by road, but just 4 pfenings by inland waterway. It shows that inland water transportation is the cheapest mode of transportation.

7.2.5 Safety and Reliability

Apart from being a very cheap mode of transportation, inland water transportation is the safest and most reliable form of transportation with very little risks of pilferage, loss and damage of goods during carriage. Such a type of transportation is very convenient for moving very big and heavy goods and equipment. There are other inherent advantages of inland water transportation. Some of them are listed below:

(i) Ability to open markets for otherwise non-marketable commodities. It would thus be possible for Nepal to deliver industrial raw materials like coal, ores, crude oil, etc., at low transportation cost from Haldia port and other parts of India. Similarly, it would be possible to export construction materials like sand, gravel, stones, timber, etc., from Nepal. In the USA, river barges carried about 52 million tons of sand and gravel in 1966.
(ii) Stimulates industrial production. Past experiences of other countries show that the development of inland waterway would stimulate industrial production.
(iii) Ability to attract production facilities to water-oriented locations in the interiors and thereby aid in their dispersal from the coastal congested areas. As a result, waterways could help to open up exciting possibilities for the growth of big industries inside Nepal at locations far away from the seaports.
(iv) Ability to fit services into production-line processes for movement of raw materials.

7.3 History of Waterways

7.3.1 Early Canal Era in Europe

In Europe, the canal navigation era started towards the end of the 17th century. France took the lead, integrating its national waterway system further by forging the missing links. In the north, the Saint-Quentin Canal, with a 3.5 mile tunnel, opened in 1810, linking the North Sea and the Schelds and Lys systems with the English Channel via the Somme and with Paris and Le Havre via the Oise and Seine. The Rhine-Rhone

Canal, opened in 1834, provided a direct north-to-south route. The Sambre-Oise Canal linked the French canal system with the Belgian network via the Meuse.

In Germany, in the late 17th and early 18th centuries the three great rivers, the Elb, Oder, and Weser, were linked by canals. The Ludwig Canal, forming part of the Rhine-Main-Danube route, was opened in 1840. A nation-wide Russian canal system connecting the Baltic and Caspian seas via the Neva and Volga rivers became navigable in 1718. In the 19th century, Russia made connections between the heads of navigation of its great rivers, the Volga, Dnepr, Don, Dvina and Ob.

7.3.2 Waterways in Competition with the Railways

With the development of rail transport in the 19th century, canals declined as the dominant carriers of freight in the USA and Britain. In continental Europe, such adverse impact was not evident because the navigation canals in Europe were larger in size. Wherever canals were small, they were enlarged. To meet competition from road transportation with its greater flexibility and higher speeds, water transport has the advantage of larger capacity units and thus there was tremendous rise in the size of vessels. As a result, the 300-ton barges operating economically early in the last century were replaced by crafts as large as 1,350 tons and more. In Europe, push-tows normally operate with fewer than six barges, but on the Mississippi, with its deep channel, a push-tow may aggregate 40,000 tons, an assembly of 40 barges being controlled by one 9,000 horsepower push tug. On the Ohio River the original 600-foot lock chambers were lengthened to 1,200 ft to obviate double lockage. The development of canal waterways continued in Europe and North America in the 19th and 20th centuries.

7.3.3 Modern Waterway Engineering

Despite modern technological advances in air and road transportation, inland waterways continue to fulfil a vital role and, in many areas, to grow substantially. The ongoing construction of the giant Three Gorges project in China is expected to further develop the Yangze river navigation. Recently in 1992, the completion of the construction of the Main-Danube link canal can also be cited as the most recent examples of the continued importance of inland navigation. For many types of commodities, particularly such bulk commodities as grains, coal and ore, inland waterway transport is still far more economical than any other kinds of transport. Although very large capital investment is required to modernise existing inland waterway systems and for carrying out new constructions, water transport has demonstrated competitive strength as a carrier for commodities in the movement of which the time factor is not of prime importance. Thus, it is hardly surprising that

modernised inland waterways, using the latest navigational aids and traction methods and traversing the great landmasses of North America, Europe and Asia, play an important economic role.

7.3.4 Surge in Building Navigation Canals

The primary physical restriction is that vessels cannot travel through water at speeds that are possible for road vehicles or railway wagons. Waterways must provide larger tonnage units than those possible on road or rail, in order to be competitive. Modern waterway engineering, therefore, is directed towards providing channels suitable for larger vessels to travel faster by reducing delays at locks and at other natural hazards. In the last century, existing small canals were upgraded and many new canals much larger in size were built in Europe. In Germany, the 467 km long Mittelland Canal was opened in 1938, which completed the east-west link in a system of about 11,265 km of inland waterways, extending from the Dortmund-Ems Canal east of the Rhine to the Elbe north of Magdeburg. The Nord-Sud Canal (Elbe-Seitenkanal) was completed in 1976. This canal leaves the Elbe about 20 miles above Hamburg, and running south, joins the Mittelland Canal near Wolfsburg, shortening the route between Hamburg and the Ruhr by 134 miles. The Main-Danube canal connecting the Rhine with the Black Sea was completed in 1992.

Many of France's low capacity canals are being raised to the 1,350-ton standard. A major development, planned in the 1970s in cooperation with West Germany, was the construction of the North Sea-Mediterranean waterway to this standard, via the canalised Rhone and Rhine rivers. The Rhine has been navigable between Basel and Rheinfelden since 1934. In the Netherlands, the extensive canal system based on large natural rivers and serving the ports of Rotterdam and Amsterdam has required relatively small improvements. The Juliana Canal was built in 1935 to bypass the Meuse river between Roermond and Maastricht and it was further improved after the Second World War. The Twente Canal opened in 1936.

In the former Soviet Union, navigation played a major role in the country's economy. The Volga-Don Canal, 63 miles in length, was completed in 1952. The Moscow-Volga Canal, built between 1932 and 1937, runs 80 miles from the Volga to the Moskva river in Moscow. Among other important navigation canals are the 127-mile canal connecting different systems, enabling the linking of the Baltic with the Black Sea, the White Sea-Baltic Canal built between 1931 and 1933.

7.3.5 The Most Recently Built Navigation Canal

An example of the most recent navigation canal is the 171 km Main-Danube Canal in Germany, completed in the 1990s. The canal winds through some of the most

challenging, scenic and environmentally-sensitive landscape of Germany. The Altmuhl valley traversed by the canal is one of the most beautiful and environmentally fragile areas in Bavaria. It is this factor that lies behind a long and often passionate opposition to this project. However, Germany did not listen to the environmentalists opposing the canal scheme who regarded the canal as the end of the Altmuhl valley. Stair step locks on the Main River lift barge traffic to Bamburg, the northern entry point to the canal. From there, 11 locks raise ships to the highest point on any commercial waterway in Europe, about 180 m above Bamburg. Five more locks then lower vessels to Kelheim, the southern terminus of the canal. The waterway would accommodate huge Euro-barges carrying up to 2,425 tons of bulk cargo, the equivalent of 78 truck trailers!

7.4 A Lesson to be Learnt

We can draw extremely valuable lessons for Kosi canal navigation planning from the recent and past experiences of the European countries. Unfortunately, in the past, India did not pay attention to the new developments taking place in the field of canal navigation. As a result, the navigation component of the Durgapore barrage project ended in complete failure. This project, taken up for construction as late as the 1950s, was under the Damodar Valley Corporation (DVC), an Indian model of the famous Tennessee Valley Authority (TVA) of the USA. The left bank canal, 120 km in length, was designed to permit navigation of small barges with only 250 ton in capacity. It had been established a long time back that such small barges would have difficulty competing with the railways. Apart from that, the poundage was very small. There are 22 locks in a stretch of just 161 km. Because of these drawbacks, the canal has remained unused for navigation. Fortunately now, it seems India has realised her mistakes. These matters related to the economy have been fully taken care of in the design of the navigation component of the recently built Farakka barrage.

The navigation component of the Farakka barrage has been designed paying full attention to the present global trends with respect to size. The bed width of the 37.5 km long feeder canal is 150 m. The channel depth at full supply level is 6 m. The navigation lock has two chambers, each 25.15 m wide and 180.7 m long. The lock system is adequate for barges up to 1,500 ton capacity. Provision has been made for adding a second lock in the future.

While conducting the feasibility study of the KNC, Nepal should take full advantage of the vast experience Continental Europe has gained in the field of inland navigation. We should not allow the mistakes of the Durgapore navigation canal to be repeated again. The size of the KNC and its related structures, such as the lock system, should be determined in conformity with the size already adopted by India in the design of the Farakka barrage navigation system, which corresponds to the recommended size in Europe.

7.5 Advantages of Kosi Canal Waterway

The use of the Kosi canal for navigation instead of the natural river course would allow Nepal to develop this very important waterway on a par with the waterways that exist in Europe and America. Some of the major advantages of the canal waterway linking Chatara with Kursella where Kosi merges with the Ganges are described below:

Short Distance: The navigation canal would follow the shortest route to the Ganges River. The length of the KNC from the Indo-Nepal border near Birpur to the Ganges is expected to be only about 120 km, whereas the length of the river route to cover the same stretch is about 270 km.
Decrease in Water Losses: Withdrawal of water from the river for irrigation or other purposes would have to be significantly restricted to maintain adequate depths if the natural river channel is to be used for navigation. In case of the navigation canal, the water requirement to maintain adequate depths would be very small. The problem of water losses in the operation of the navigation canal would not arise if such a canal were to be used as a conveyance system to deliver water for irrigation purposes.
Increased Water Depths: The entry point of the KNC into the Ganges is near the extreme tail-end of this river. As a result, the Ganges River channel is sure to be quite deep on this stretch, allowing the operation of relatively large river vessels. Furthermore, there might have already been significant improvements in navigability of the Ganges River right up to the mouth of the KNC into the Ganges due to the increase in water depths after the completion of the Farakka barrage. The Farakka barrage reservoir backwater must have extended further upstream along the Ganges far beyond the mouth of the Kosi River.

7.6 Multi-purpose Project and Kosi Canal Waterway

The KNC will be a component of the Sapta-Kosi High Dam Multi-purpose Project and Sun Kosi Storage-cum-Diversion Scheme. There have been good examples in the past when big multi-purpose projects had helped to develop inland navigation.

The Rhine river is one such example. To improve navigation and to produce hydroelectric energy, France, with the Treaty of Versailles, diverted the Rhine water below Basel into a canal that joins the Rhine at Neu Breisach. This helped to significantly improve the navigational conditions that permitted the plying of barges of 1,500 tons capacity on that stretch of the river.

At present, China has almost finished building the mammoth Three Gorges Project. Inland navigation is one of the major components of that project. The Yangtze river is even now extensively used for water transportation and its waterway constitutes 78 per cent of the volume of China's total inland river transportation. Despite such extensive uses, the navigation condition of its natural course

could not fully meet the growing requirements of China's fast-growing economy. There were bottlenecks from Chongqin in Sichuan province to Yichang in Hubei province. Here, the river flows through an area of high mountains and deep valleys, with considerable turbulence and dangerous shoals, which had limited the development of the Yangtze waterway. Upon completion of the Three Gorges Project, the reservoir backwater would reach Chongqin and the annual transportation capacity for freight would be increased to 50 million tons, with costs lowered by 35-37 per cent. For half of each year when the reservoir water level is high, 10,000 tonne ships would be able to sail right up to the Jiulongpo port of Chongqin. During dry seasons, the navigation conditions of the river downstream of the dam will also be improved due to an increase in the low water flow. Permanent double-line locks would be provided as the main navigation facilities after the project is commissioned. The locks would meet the requirements of a single direction downstream freight volume of 50 million tons, the projected volume for the year 2030, and they would allow passage of fleets of 10,000 ton ships. A vertical ship lift is also provided as an express passage for passenger traffic and also for certain specific types of ships.

7.6.1 Justification for Prioritising Kosi Multipurpose Project

The Kosi river, known as 'the river of sorrow of Bihar', has shifted from east to west over 120 km in the last 200 years. In the past, about 8,000 km^2 of land have been laid waste as a result of sand deposits. In the course of shifting, many towns and villages were wiped out, with heavy loss of property, cattle and human lives. Fortunately, the embankments built a few decades ago temporarily helped to check the lateral shift of the Kosi. But at present, the detention basin upstream of the barrage at Hanuman Nagar is almost full of sediments. Soon, the embankments would be ineffective to control the Kosi floods.

The Kosi river is now on the verge of shifting to the east, far away from its present course. The people of Nepal and India are heading for a natural disaster of an unprecedented scale. It certainly would be very unfortunate if the Kosi swing-to-the-east takes the lives and property of millions of south Asians by surprise, while the governments of Nepal and India become mere silent spectators.

All the past and present studies and the very recent observations indicate that the Kosi is quickly turning into a hanging river and we are heading for an unprecedented flood disaster. Such flood disaster would not be just a one-time event. Like the Yellow river flood disasters in China in the past, the ferocious floods of the Kosi would also be occurring frequently, particularly in north Bihar, wiping out towns and villages, and laying vast tracts of land bare with sand deposits. The eastern and southern boundaries of the flood-affected areas could extend up to the Mahananda River and the Ganges respectively. India's railway and roadway linkages with her north-east states could also be severed. In a similar way, China's Yellow river's latest flooding in 1938 the number of people killed alone was about half a million. After this disaster, big storage dams were built to control the Yellow river floods.

The river is now completely regulated. There are no more flood damage. It is stated in the *China Daily* (October 16, 1998) that as of now the Yellow River dams have helped to save flood damage of about US$50 billions.

Solutions to the problems of the Kosi floods should be quickly found. All the work needed for flood protection should be completed in time. Provision of dams with very big storage volumes in the drainage area is the only lasting solution to the Kosi flood problem. That is the opinion of the renowned experts and scientists involved in the Kosi study in the past. Nepal can also draw lessons from the past experience of China. It can be concluded that for controlling the Kosi floods there are no substitutes for large storage dams. Thus that is the only recourse. The storage dams should be provided in time. The life and property of too many people in Nepal and India would be at great risk if the Kosi dams are not built in time. As a result, in 1997 Nepal and India decided to conduct a detailed study of the Kosi dams, which included the feasibility study of the Kosi canal waterway linking Nepal with the sea.

7.6.2 Advantage of Canal Waterway over Natural Course

Nepal and India have agreed to conduct a detailed study of the feasibility level for developing a navigable waterway extending from Chatara in Nepal to Kursella, the meeting point of the Kosi river with the Ganges. It is stipulated in the agreement that the waterway study would cover two alternatives. A navigation canal to be provided to link Chatara with the Ganges would be one of the alternatives. The use of the natural course would be another alternative. Unfortunately, the topography of the terrain in India traversed by the Kosi river is quite steep. There is an elevation drop of about 40 m between the Indo-Nepal border and the Ganges river on a north-south stretch of just about 120 km. Such a high gradient results in increased flow velocity and small channel depths. Thus, the task of developing a Kosi river channel suitable for navigation of large vessels would be very difficult. These difficulties could easily be overcome if a navigation canal instead of the natural course of the Kosi river for navigation is chosen. It implies that the Kosi canal waterway is in reality the only suitable option. Nonetheless, the study to canalise the natural course of the Kosi has been included as a solution to the flood control problem rather than for navigation. The proposed study to canalise the natural course is necessary for training the Kosi river, to protect the surrounding areas against flood damage.

7.6.3 Southern Terminus of Kosi Navigation Canal (KNC)

The KNC will be linked with National Waterway No. 1 of India. The stretch of the waterway between Allahabad and Haldia has been declared National Waterway No. 1 of India. The total length of this waterway is 1,580 km. It includes the Bhagirathi, Hoogly and the lower and middle reaches of the Ganges. This waterway

can be broadly divided into three sections: the 500 km Haldia-Farakka, 480 km Farakka-Patna and the 600 km Patna-Allahabad sections.

The meeting point of the Kosi waterway with the Ganges, expected to be not far away upstream from the Farakka barrage, would be well within the submersion zone of the Farakka reservoir. As a result, sufficiently big water depths would be ensured in this reach of the Ganges.

7.6.4 Layout of the Kosi Navigation Canal (KNC)

The Kosi Navigation Canal vis-à-vis India's National Waterway No. 1 would provide Nepal with access to the sea. This waterway should be planned on a par with the capacities adopted for the lower reach of the Ganges. The proposed KNC can be divided into two reaches: the 45 km long upper reach between Chatara and Birpur (near the Indo-Nepal border) and the 120 km long lower reach between Birpur and Kursella on the Ganges. The Upper Reach Canal will be entirely in Nepalese territory.

It has been proposed in the Sapta Kosi High Dam Project Report prepared by the GoI that a canal be built from Chatara to the Birpur area to deliver silt-free water from the Kosi storage reservoir for irrigating land in India to the east of the Kosi river. This canal would be 130m wide. There is a drop of about 40 m between Chatara and Birpur. It is proposed that three powerhouses be built along the proposed canal to utilise the topographical gradient for the generation of electricity. The capacity of each such power station is expected to be about 100 MW.

The canal proposed to be built for delivering water from Chatara to Birpur for irrigation and power generation could also be used for navigation purposes. The proposed irrigation canal is sufficiently wide for use as a navigation canal. However, the canal would require significant modifications. A navigation canal requires that adequate water depths be maintained in the canal at all places and at all times. Similarly, it would also be necessary to take into account matters related to free board, as well as the protection of the bank and the bottom of the proposed canal. The canal would need navigation locks for negotiating the fall across the powerhouses. There would be three locks parallel to the powerhouse in the upper reach canal between Chatara and Birpur. The exact size of these locks should be adopted based on a very careful study.

The Lower Reach Kosi canal would be completely in Indian territory. The north-south slope of the land in this reach of the Kosi canal would be less steep compared to the slope of the land in the upper reach. Nonetheless, there is a drop of about 40 m in the north-south, within a distance of 120 km. It might be necessary to provide three to four locks to negotiate this drop. These drops could also be used for power generation. Similarly, the navigation channel running to the Ganges could be used for delivering water for irrigation. For this purpose the outlets from this canal will have to be without cross regulators.

There are several dead channels of the Kosi running almost parallel to the proposed navigation canal. These channels meet the present Kosi river channel just

before the Kosi empties into the Ganges. It would be worth examining the possibility of developing one of these dead channels as a navigation canal if it does not entail serious environmental problems. Such canalisation of the dead channel of the Kosi would require dikes, check structures and navigation locks at several places to improve the hydraulic regime and also to overcome impediments to navigation.

7.6.5 Size of Navigation Canal and Locks

The dimension of various structures of the Kosi navigation canal should be adopted based on the size of the Farakka locks and navigation channel. It would certainly be desirable to adopt the same size. Such dimensions of the navigation structures would be adequate for the operation of barges of 1,500 tonne capacity. The proposed irrigation-cum-power canal between Chatara and Birpur is 130 m wide. The width of the proposed Kosi canal exceeds the size required for its use as a navigation canal. The width of the lower reach Kosi canal could, however, be considerably reduced if it were to serve exclusively for navigation. We might adopt the width of this canal somewhere in the range between 80 and 100 m. It was the minimum width for I and II classes (topmost) navigation channels in the former USSR. The minimum water depth in the Farakka canal is 4 m. The same navigation depth could be adopted for the Kosi navigation canal. Farakka lock has two chambers, each 25.15 m wide and 187.7 m long. This dimension could also be adopted for the Kosi navigation locks. The minimum depth of water at the sill might be taken to be 3.5 m. Such a lock size would permit passage of barges up to 1,500 tons or more in capacity. It would also be necessary to adopt the filling time of the lock chambers that would determine the ultimate capacity of the waterway.

7.6.6 Navigation Canal Design Criteria

Planning of navigation canals will necessitate paying special attention to the following matters:

i. Cross drains
ii. Bridges
iii. Bank and bottom protection of the canal

Cross Drains

The proposed Kosi canal will be running from the north to the south. Other major rivulets and drainage are also heading in the same direction. Thus, the proposed navigation canal might not have appreciable cross-drainage problems.

Bridges

There will be a need to provide bridges across the canal at many places. Such bridges should not tend to cause limitations to navigation. In the design of bridges across the navigation canal, the following dimensions would be very important.

Vertical Clearance: It is the distance between the top of the ship and the underside of the bridge.
Passage Width: It is the narrowest width under the bridge perpendicular to the waterway centre line that can be fully utilised by the ship.

A minimum allowable vertical clearance and the passage width should be adopted for the design of bridges across the proposed KNC. These dimensions should be adopted taking into consideration the future prospect of operating big ships and large trains of barges.

Bank and Bottom Protection

The banks and bottom of navigation canals are affected by ship-induced hydraulic loads. The stability of the banks and bottoms is directly related to the occurring hydraulic loads.

The components of the ship-induced water motion are the screw-race, primary wave and secondary waves. The external loads produce both shear stresses and upward pressures on the protection layer. The dimensions of the bank protection material are, therefore, determined by these external loads.

The regulation of navigation behaviour is also very important for canal navigation. By providing appropriate speed limitations, ship distance to canal bank, etc., the erosion of unprotected canals or the lifting of canal linings can be prevented.

It is proposed that the Narmada project would have an 80 m wide and 3.8 m deep navigation-cum-irrigation canal. The Narmada canal protection system is described below:

- a smooth permeable cover layer (non-reinforced concrete slabs with punched holes, or loose concrete blocks) to reduce uplift pressures and to maintain the smoothness required for irrigation purposes,
- a granular filter layer to prevent the washing out of ballast material underneath, and to act as a drain for the cover layer,
- a ballast material layer to meet the total height for resistance to the uplift pressure; this material might be provided by soil from excavation, if this is suitable. It is essential that the membrane underneath is not pierced by sharp stones during compaction of the ballast material,
- a waterproof membrane (polyethylene or similar material).

As it is impossible to prevent some degree of settlement throughout the alignment, the concrete lining would be made of loose blocks or large panels

(size 10 x 10 sq m) by means of prepared joints or saw cuts in green concrete. As the possibility of settlement increases, the spacing of the cuts will be decreased.

7.6.7 Inland Navigation Ports

The Kosi Navigation Canal (KNC) will require development of an inland navigation port in Nepal. Sunsari could be an appropriate place to locate such an inland port. This port, to be located at a suitable place not far away from the east-west highway, could develop as one of the biggest commercial-cum-industrial centres of Nepal. The site of this port should be selected very carefully. There could be unbelievable expansion in commercial and industrial activities in and around the port area.

7.7 Ganges Waterway

The Ganges is the most important river in the Indian subcontinent. The source of the Ganges is at Gangotri in Uttar Kashi district and is located at an elevation of 7,010 m. The Gangetic headwaters plunging and collecting other mountain torrents, while moving southwards, eventually debouch in one copious flow onto the plains near Hardwar. The total length of the Ganges River from Hardwar to its outfall into the sea (measured along the Hooghly) is 2,135 km. Out of it, 1,170 km is in UP, 445 km in Bihar and 520 km in West Bengal.

The Ganges and her main tributaries were used for navigation by country crafts from time immemorial. During the era of British rule, much of the greater part of the river traffic, as in the old days, continued to be carried on indigenous boats made by the local boat operators. It was estimated in the 18th century that some 30,000 boat operators found employment on Bengal's fleet of country crafts.

Each region of the Ganges River had its own type of country boats to suit the local conditions. The size of the vessels ranges from 5 to 60 tons. The wooden hulls extended from 7.5 to 27 m in length, and had beams of 2.7 to 8.4 m. Some drew draft as little as 55 cm and others as much as 1.5 m.

The first organised effort to introduce modern navigation services on the Ganges River was started in 1844 by a private British company known as the Indian General Steam Navigation Company (IGSNC). The first steamer service commenced between Calcutta (now renamed Kolkatta) and Allahabad. The venture of the IGSNC to operate a steamer service on the Ganges proved to be very successful. By 1860, five other companies had also entered this venture and were competing with each other for the traffic.

In 1937, there were 33 river stations on the Ganges Despatch Service and 26 in all, on the Ganges and Gogra Feeder Services. In 1947, following India's partition, the steamer companies had to divide their fleet between India and East Pakistan (Now Bangladesh).

Prior to the partition, the steamers on the Ganges Despatch Service operated between Patna and Goalundo (in Bangladesh) across a distance of about 715 km. The Bhagirathi was navigable only for about three months a year. As a result, during the rest of the year, steamers destined for Calcutta (Now Kolkatta) had to make long detours around the Sunderban region, which is now in Bangladesh. Soon after the partition, the situation started to worsen. Further continuation of the steamer services became very difficult. Steamer companies decided that the Ganges service had to be closed.

7.7.1 Restoring the Ganges Inland Water Transport

The GoI started to explore the possibilities of finding ways and means of restoring inland water transport to its rightful place since the early 1950s. Consequent to a conference of the States of North-East India, convened in 1951, the Ganga Brahmaputra Water Transport Board (GBWTB) was formed in 1952.

In 1956, the Central Board of Transport in India recommended that the policy to be adopted in the future should allow for the integration of inland water transport in the national transport system. Accordingly, a committee was set up to make recommendations for future development of inland water transport. The Transport Committee submitted the Report of the Inland Water in June 1959.

7.7.2 Transport Committee Report

The Transport Committee Report strongly commends the revival of inland water transport in Europe and America. It points out that the hydrology of the Ganges and the Brahmaputra, which are subject to considerable seasonal fluctuations in discharge, meanders and the instability of channels and banks, differs in many respects from those of European and American rivers. Bringing them under control may be possible only when multi-purpose dams and reservoirs are constructed on the tributaries at an enormous cost, but the return will more than repay the capital outlay in many different ways, as has been proved in the afore-mentioned countries. It is very vital to ensure that the multi-purpose development would not jeopardise navigational potential but would rather aid it. The navigational aspect should be always kept in view while planning development. The Transport Committee has made the following important recommendations:

i. Conservancy and river training works should be done to improve the navigability of the Ganges and the Ghagra (Karnali). Industrialists should be encouraged to locate industries on the banks of the Ganges in suitable areas.
ii. Manufacturing of craft, standard designs of propelling machinery and auxiliaries, including marine diesel engines should be encouraged in India itself.

Manufacturing of dredgers in collaboration with foreign firms that specialise in this field is necessary.

iii. There is an acute shortage of local citizens to staff Inland Water Transportation (IWT) crafts, especially among qualified personnel like masters or Serangs and drivers. Appropriate arrangements should be made for training such staff.

7.7.3 Classification of Waterways

The afore-mentioned transport committee has suggested in its report that a central organisation should classify the navigable rivers and canals of the country following the practice in western countries, but keeping in mind India's own peculiar conditions. The ultimate aim should be to develop a unified network of waterways that can accommodate the most economical type of vessels with maximum draft throughout the year. The committee report proposes to adopt the following classification for rivers.

Class	Navigable Minimum Depth at		Width of Channel (m)
	HW Season (m)	LW Season (m)	
I	2.4	1.8	120
II	1.8	1.2	90
III	1.2	0.9	45

Source: Transport Committee Report, 1959

7.7.4 India's Sixth Plan (1980-85)

Although the GoI started exploratory studies for the development of waterways from the 1950s, and some development works of inland water transport (IWT) commenced from the second plan period, it was only from the Sixth Plan (1980-85) that this sector was given priority. In the Sixth Plan, specific schemes of interstate and national importance for the development of IWT were taken up. The following are the important work undertaken within this plan period:

i. Declaration of National Waterway
   The stretch of the waterway between Allhabad and Haldia has been declared National Waterway No. 1.
ii. The Farakka navigation lock, which is very important for the Ganges navigation, was commissioned immediately after this plan period in 1987.
iii. The conservancy work had been taken up with bandalling in the stretch of the Ganges between Farakka and Patna. The stretch between Patna and Allahabad was also being developed with Dutch assistance.
iv. The work to modernise the dockyard and replace the over-aged vessels has begun.

7.8 Developing the Ganges Waterway

The stretch of the Ganges River between Allahabad and the Farakka is a very important waterway. It is a part of India's National Waterway No. 1.

The Ganges waterway, running along the east-west direction, has great importance to Bihar and UP provinces of India. This waterway would be able to provide services to North Bihar, Nepal and Bhutan if the north-south feeder waterways linked with the Ganges are provided.

The 1,080 km long Ganges waterway, extending from the Farakka to Allahabad, has been divided into two sectors for its development. They are the Farakka-Patna sector and the Patna-Allahabad sector, with lengths of 480 and 600 km, respectively.

7.8.1 Ganges River Training Work

The hydrographic surveys of the sector between Farakka and Patna had been carried out and conservancy work was being done to develop a waterway sufficiently large in width and depth. Bandalling works were also being done to divert the river flow to scour deep channel.

At present, a minimum depth of 2 m and a channel width of 45 m have been adopted for this sector between Patna and Farakka. Once this sector of the Ganges river is developed to the proposed extent, the minimum channel depth in the lower reach of this sector at places like Bhagalpur, Kursella could be well over 3 m. The barrage at Farakka can be expected to impound a reservoir that would extend well beyond Kursella, perhaps even as far as Bhagalpur. Such a favourable hydrographical condition in the lowermost reach of the Ganges in the post-Farakka barrage period presents an excellent opportunity to develop this reach for navigation by big river crafts. A navigation canal to be provided as a component of the Kosi High Dam Multi-purpose Project and outfalling into the Ganges could be planned to operate big river vessels right up to Nepal.

The sector between Patna and Allahabad was, some years ago, being developed with Dutch assistance and know-how. Above Patna, the lean season draft varied between 1.2 and 1.5 m. About 20 shoals had been identified in that sector.

7.8.2 The Channel Improvement Work

The channel improvement work for the development of the waterway can be divided into two groups. They are river training work in conjunction with dredging and the provision of special regulatory structures. Both these types of channel improvement work will be important for developing the upper reaches of India's

National Waterway No. 1, extending from the Farakka to Allahabad, as described below.

The river training work in conjunction with dredging can help to improve the condition of the river channel. The river training work is very effective where the bed material is easily erodable.

The difficulties in developing IWT on the Ganges are the bank erosion, sedimentation, shallow depths, coupled with the shifting of channels. Monsoon rains bring down vast quantity of water into the main Ganges. After each flood, silts are deposited and sand bars form. So, after every flood season, quick surveys should be done to locate the channel course. Those places where the depths are not adequate should be improved. On the Ganges River the application of the bandalling river training technology has been found to be quite effective. A bandal consists of a framework of bamboo driven into the riverbed. Generally, a subsidiary channel takes off from the parent one and attacks the banks. This method has been useful particularly in improving the navigable depth by diverting the flow through an active channel and closing the other subsidiary channels. Where the soil is not easily erodable, dredging would be required as observed in the former USSR and the USA which are given below:

i. *In the Former Soviet Union:* The Volga is the most important navigable river. Out of its total 2,500 km waterway, only half is canalised and the other half is in its natural state. The river course is surveyed continuously by survey parties. The principal method of channel improvement is dredging in conjunction with river training work. Such channel improvement work has helped to double the depth in uncontrolled rivers.
ii. *In USA:* Dredging is very important for waterways in the USA. It is said that, without the modern dredge, the inland waterways system of the USA would neither exist nor function. Dredging is necessary in the initial construction of practically every commercial waterway. It is used in the construction of locks and dams. It is also used to straighten a channel. Normal silting builds up shoals and bars. Vessel movements also shift channel bottoms and contour lines. Floodwater increases silting and causes shoals and bars to form. Dredging is supervised for proper maintenance of the navigable channel. In case of the Mississippi river, in the reach between Cairo and Baton Rouge alone, to maintain a 2.7 m deep channel the quantity of dredging varies from 22 million m^3 to 50 m^3 a year.

The river training work, in conjunction with dredging, would be absolutely essential for the Ganges waterway. Such work would have to be performed continuously for the proper maintenance of the river channel.

Appropriate river training work, coupled with the damming up at the Farakka, barrage would help to develop a fairly deep Ganges River channel extending upstream far beyond the mouth of the proposed KNC. There would be increase in the depth of the Ganges River even up to the Bhagalpur area. For significantly improving the Ganges River channel further upstream, the river training work alone might not be sufficient. It would be necessary to provide special regulatory structures, too.

7.9 Impediments to Bhagirathi Navigation

The major part of Bengal has been formed by mud and sand washed down by the Ganges, Brahmaputra and their tributaries. The south of the Gangetic delta is still a land of swamps, creeks and forests. In the flatland, the rivers meander, swelling in the monsoon, shrinking in the dry season, often changing their courses and debouching into the Bay of Bengal through several channels.

In the past, the Bhagirathi, known as the Hooghly further downstream, was the mainstream of the Ganges River. The Ganges runoff found its way into the sea by flushing out silt and sand, keeping the waterway through the Kolkatta region in good condition. It is said that less than 300 years ago, the Ganges showed a tendency to flow more and more through its eastern channel, the Padma. Ultimately, the Bhagirathi turned into a relegated spill channel receiving water from the Ganges only for three to four months during the flood season. Now, after the completion of the construction of the Farakka barrage, a good proportion of the Ganges flow, as per the Indo-Bangladesh 1996 Agreement on Farakka, is diverted into the Bhagirathi throughout the year. Despite all these efforts, the problem to develop the Bhagirathi into a deep waterway might not be completely resolved without further engineering interventions.

7.10 The Hooghly River

The river Hooghly, on which the port of Kolkatta is situated, takes off from the south bank of the Ganges river, a short distance below the Farakka barrage. The head reach of this river is known as the Bhagirathi. The Hooghly River is formed by the confluence of two rivers, about 130 km upstream of the Port of Kolkatta. These two rivers are the Bhagirathi and the Jalangi. It is reported that they were once very active navigable waterways forming perennial navigation links between the port of Kolkatta and its vast hinterland of Assam and Upper India, but they have now turned into spill channels receiving upland water for only about three to four months a year.

There are a few important tributaries which also join the Bhagirathi/Hooghly. The first one, the Dwarka, rises in the Birbhum hills and joins the Bhagirathi in Murshidabad district. The river has a length of 134 km and a catchment area of 8,850 km^2.

The other Ajoy rises in the Santhal Pragana hills and joins the Bhagirathi near Katwa. Its length is 276 km and has a drainage area of 6,050 km^2.

The biggest tributary is the Damodar, which is 541 km long and has a catchment area of 25,820 km^2. It joins the Hooghly near Fulta point.

The tributaries, Rupnarayan and Haldi, joining the Hooghly, have a catchment area of 8,530 and 10,210 km^2 respectively. The total drainage area of all the tributaries joining the Bhagirathi-Hooghly is 60,000 km^2.

7.11 Bhagirathi can now be Easily Controlled

The upland discharge entering the Bhagirathi/Hooghly should be increased to the extent possible to arrest the process of deterioration of Kolkatta Port. The importance of such flow augmentation would be equally vital for the improvement of the Bhagirathi/Hooghly waterway. The objective to enhance the navigability of the Bhagirathi/Hooghly could also be achieved to a great extent by providing structures to control the flow and water level. The schemes to control the flow and levels could be taken up as a multi-purpose project.

The engineering option to control the flow and levels should not be regarded as a complete substitute for the augmentation of the Bhagirathi/Hooghly flows. Such an option could, however, be far more attractive if the dry season flow of the Bhagirathi/Hooghly could also be increased at the same time. For planning this type of structures to control the flows and levels, past experience gained by countries in Europe and America could be very valuable.

In recent years, the Bhagirathi/Hooghly waterway has been completely cut off from the Ganges and thus it is under total control. As a result it has virtually become a canal. The unpredictable Ganges high flows carrying enormous sediment load is not a threat any more, as in the past, to the Bhagirathi/Hooghly waterway due to the several reasons.

The upland discharge from the Ganges is fully controlled by the Farakka and Jangipur barrages. The total drainage area of all the tributaries of the Bhagirathi/Hooghly is quite small. It is only about 60,000 km^2. Among the tributaries, the biggest with a drainage area of 25,820 km^2 is the Damodar. This river is already fully controlled by four storage dams. Two other tributaries, Rupanarayan and Haldi, with a total drainage area of 18,740 sq km meet the Bhagirathi/Hooghly far away in the south near the sea.

Now the Bhagirathi/Hooghly is not a big river any more; so, it would not be too expensive to adopt various appropriate engineering measures to control the flow and water depths of this waterway.

7.12 Upper Reach Bhagirathi/Hooghly Waterway

The total length of the Bharigathi/Hooghly waterway from the Ganges to Saugor on the Bay of Bengal is about 540 km. Out of it, about 240 km of the upper reach that extends from the Ganges off-take point to Nabadwip is either completely beyond the tidal range or is moderately affected by tides. The total drop in the topographical elevation of the river bed in this stretch could be about 10 m.

A series of low height dams (barrages) could be provided to fully control the water levels to maintain a certain predetermined minimum water depth for year-round navigation. Perhaps two dams with proper side embankments might be adequate to improve the upper reach Bhagirathi/Hooghly waterway to the desired extent without causing serious drainage problems to adjoining areas. However, the

number of such dams might have to be increased to three if serious submersion and drainage problems are expected to be encountered.

Adequate navigation locks should also be provided for the passage of vessels across the dam. The size of the locks should be decided considering the present as well as future needs.

7.12.1 Other Uses of the Bhagirathi Dams

The proposed Bhagirathi/Hooghly dams for raising the water depths for navigation could also be used for the following other purposes:

Power Generation: The water head created by the dams can be used for the generation of power. It could be a peaking station if it is possible to have an adequate storage volume for diurnal regulation. The total installed capacity of all the three power stations to supply power to meet three hours' peak energy demand could be about 300 MW even when the upper reach Bhagirathi discharge is only about 500 cumecs.

As a bridge: The dams to regulate the flow of the Bhagirathi/Hooghly waterway could be used as a bridge for highways and railways.

Several technical characteristics of the Bhagirathi/Hooghly waterway in its upper reach bear close resemblance to characteristics of the Illinois waterway[1] of the USA. These characteristics are the flow pattern, very gentle bed slope of the river, and the need to have very low height dams to raise water levels.

7.13 Kolkatta and Its Port

A port on the Hoogly is believed to have existed from time immemorial. Periplus, Ptolemy and Huen Tsang refer to the ports on the Hooghly. The history of the present town of Kolkatta, however, dates to back to 1690, when it was founded by the East India Company.

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[1] The Illinois waterway extends from the Chicago Harbour at Lake Michigan to Grafton, Illinois and its confluence with the Mississippi river. In the Chicago area, it includes the Calumet-Sag Channel and the Chicago Sanitary and Ship Canal.

Basic Parameters: Waterway length: 527 km; minimum waterway depth: 2.7 m; minimum waterway width: 70 m.

Dams to Raise Water Levels: Seven dams have been built on the Illinois waterway to raise the water level by 48.85 m. Among these dams, the La Grange Dam, raising the water level by 3.05 m, extends the backwater 125 km upstream. Similarly, the Peoria Dam, raising the water level by 3.4 m, extends the backwater 118 km upstream.

Kolkatta is located on the eastern bank of the Hooghly river. In the past, Kolkatta was transformed into India's largest city due to the following reasons:

Calcutta (Kolkatta) became the capital of British India from 1772 till 1912 when it was moved to Delhi. As the British power extended over the subcontinent, the whole of north India became a hinterland for the port of Calcutta. The coming of railways and the inland waterways in the 19th century helped to transform Calcutta into India's biggest industrial and commercial centre.[2]

Even as late as the 1950s, Calcutta port used to handle about 50 per cent of India's total exports. At present, this port has lost its position as India's prominent cargo handler. However, in terms of volume this port still handles one-tenth of India's import cargo and about one-twelfth of its export cargo.

7.13.1 Impediments to Kolkatta's Growth

The 20th century marked the beginning of Kolkatta's distress. In 1912 the capital of British India moved from Calcutta (Kolkatta) to Delhi. The partition of Bengal in 1947 was also a big blow. Calcutta became the capital of only West Bengal, losing the trade of a big part of its former hinterland. There is yet another big obstacle to the development of Calcutta as the biggest industrial and commercial centre of India. It is the deteriorating condition of the Calcutta port and the virtual closure of the inland waterways that connected Calcutta with the hinterland in the east and the west.

Calcutta is an inland port; so, its operation is highly sensitive to changes in the river flows. The river regime is greatly affected by changes in the river flows as a result of the tides and ebbs coming from the seaside, and the upland water provided by the Bhagirathi River.

The progressive reduction in the upland flows entering the Bhagirathi, particularly during fair weather, is said to be the primary cause for the deterioration in the port reach of Calcutta. The continued decrease in depth over the bars has been mainly due to the landward movement of sediment during the dry season. It resulted in the deposition of sediment in the estuary and the upper reaches of the Hooghly river. Such deposition continued to increase because they could not be flushed out due to inadequate supply of water into the Bhagirathi River.

The Hooghly River is becoming shallower each year. Before 1948, ships with drafts of 7.8 m could come up to Calcutta -almost throughout the year. In the 1960s, the permissible drafts for ships entering or leaving the port had considerably declined. The mean permissible drafts vary from 6.3 to 6.9 m, while the minimum draft in the dry months dropped to only 5.4 m. Shipping greatly suffered because

[2] Even now, Kolkatta is the world's largest processor of jute. Engineering constitutes the city's other major industry. In addition, city factories produce and distribute a variety of consumer goods, notably foodstuffs, beverages, tobacco, textiles, other light manufacturers and chemicals.

the decrease in each foot of draft results in a loss of about 600 tonnes of cargo-carrying capacity.

Apart from the adverse effect on shipping, the gradual choking of the Bhagirathi channel made the water more saline. The water at the Fulta, where the pumping station for supplying water to the city of Calcutta is located, is undrinkable and unfit for industrial use. The proportion of salinity in unfiltered water had increased to over six times between 1936 and 1960s.

7.13.2 Resolving the Aggravating Physical Conditions

Apart from the decrease in the depth of the head reach due to a reduction of the upland flows, the following other physical conditions are considered to be causing the deterioration of the Bhagirathi-Hooghly waterway.

Landward movement of the sediment in the estuary and the upper reaches during the dry season, as they could not be flushed out.

The occurrence of strong tides combined with shallow depth gives rise to 'bore tide'. With the reduction of upland discharge, the flood current of tides pushes the bed materials of the river upstream.

Cyclonic surges are also an adverse physical phenomenon for unhindered operation of waterways. Such surges do not occur regularly like the tides, but they cannot be overlooked.

The GoI seemed to have thought of building a barrage across the Ganges river a long time ago to divert the flow into the Bhagirathi for resolving the worsening situation of the Bhagirathi-Hooghly waterway. Sir Arthur Cotton, an eminent engineer, is said to have proposed more than a century ago that if additional water were thrown into the Hoogly river, it might just make the difference of preventing the river from silting up.

7.14 Farakka Barrage

The construction of the Farakka barrage began in the 1960s. The barrage began to operate in 1975. The overall length of the Farakka barrage on the Ganges is 2,240 m. It has 109 bays, each of 18 m clear span. The barrage is designed to pass 73,000 cumecs of the Ganges water. The pond level of the barrage is 22 m. The crest level of the spillway is at 15.6 m and that of the under-sluices and river sluices at 14.3 m. The head regulator is designed for 1,130 cumecs. It has a clear waterway of 11 bays of 12m each. Its full supply level at the head regulator is 21.5 m and the crest level is 18 m.

The feeder canal can divert up to 1,130 cumecs of the Ganges water into the Bhagirathi. The length of the feeder canal is 37.5 km. The bed width of the feeder canal is 150 m. Its depth at full supply level is 6 m.

A barrage has been built on the Bhagirathi at Jangipur to prevent the water fed into the feeder canal at the Farakka from flowing back into the Ganges. The Jangipur barrage is 210 m long and has 15 bays. The span of each bay is 12 m and the crest level is at 12.8 m.

7.14.1 Navigation Locks

The Farakka lock helps to negotiate the difference between the pond level of the Farakka reservoir and the water level of the feeder canal. The lock has two chambers, each 25.15 m wide and 180.7 m long. The lock is adequate for craft or barge train of up to 1,500 tonne capacity. Provision has been made for adding a second lock in the future.

A navigation lock has also been built to provide a navigation link from the Bhagirathi-Hooghly waterway into the Ganges-Padma and Bangladesh.

Chapter 8
River-Linking Concept of India Viewed from the Nepalese Perspective

Hari Man Shrestha

8.1 Introduction

The need for the transfer of water from water surplus basins to water deficit basins has drawn the attention of Indian planners from time to time. After the then Central Water and Power Commission (CWPC) prepared a note for a national water grid linking the Ganges with the Cauvery around 1972, a study was carried out by Dr KL Rao (1972) and the concept of the Garland Canal was developed by Captain Dastur (1977). The suggestion of Dr Rao was not pursued further on the grounds that the costs were grossly underestimated, the proposal required large blocks of power for lifting water and also it did not have flood control measures. Captain Dastur's concept was also found to be technically unsound and economically prohibitive. As such this concept was also given up.

In 1980, a National Perspective Plan revisited the ideas. Although the National Water Development Agency (NWDA) was set up in July 1982, it was only in November 2002 that the Government of India announced that the feasibility studies of six of the peninsular link proposals were ready. This announcement came after the Supreme Court's order of October 2002, suggesting inter-linking of major rivers. The overall proposal of river-linking, in fact, seems to have a total of 30 links divided into two connections—Himalayan Connection with 14 links and Peninsular Connection with 16 links—with a target of total annual water transfer of 174,271 million m^3, comprising 32,983 million m^3 for Himalayan Connection and 141,288 million m^3 for Peninsular Connection (Iyer 2003). So far, the sources from where as much as 174,271 million m^3 per annum of water will be transferred have not been made public. The Indo-Bangladesh Task Force Report of 1990, however, makes it

H. M. Shrestha (✉)
Former Executive Secretary, Water and Energy Commission Secretariat,
Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
e-mail: n252033@hotmail.com and n252033@yahoo.com

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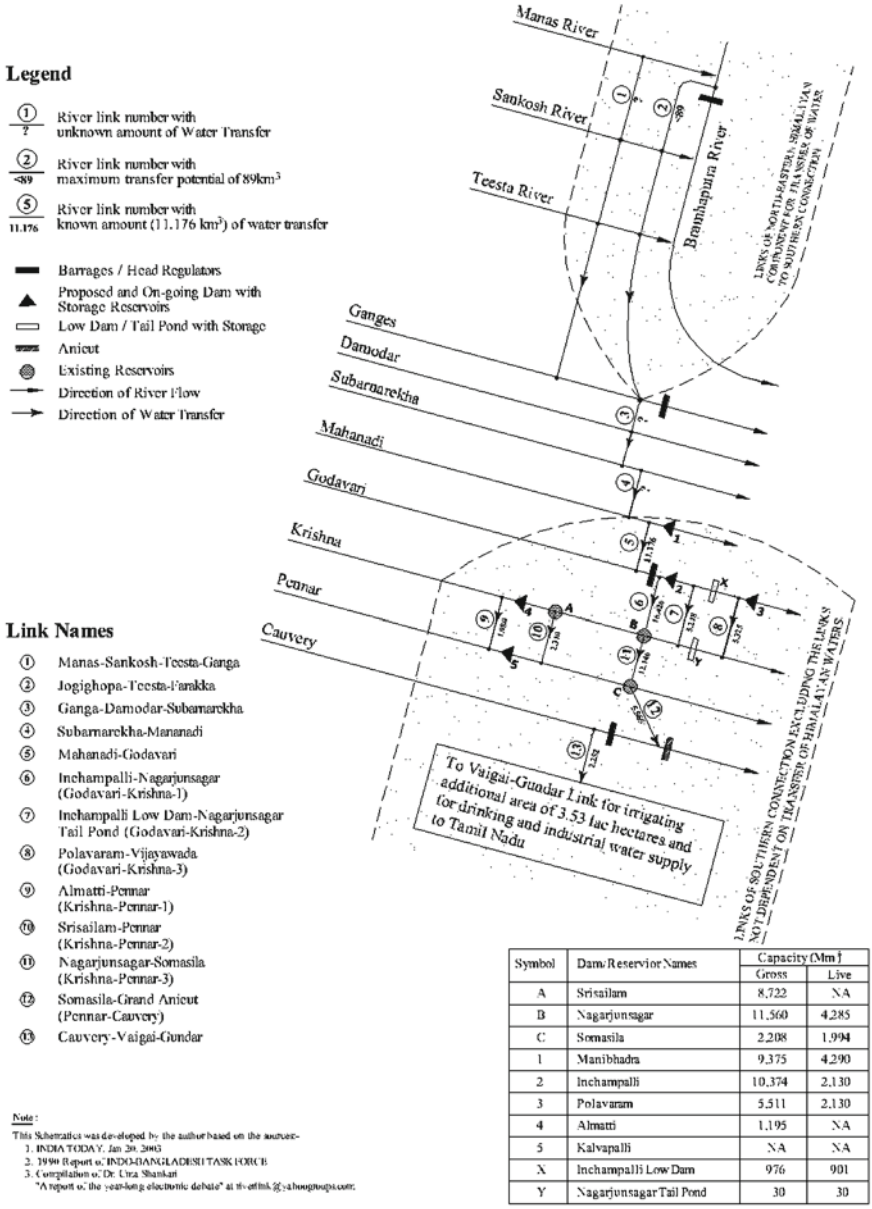


Note:
This Schematics was developed by the author based on the sources-
1. INDIA TODAY, Jan 20, 2003
2. 1999 Report of INDO-BANGLADESH TASK FORCE
3. Compilation of Dr. Uma Shankari
"A report of the year-long electronic debate" at th-efink@yahoogroups.com

Symbol	Dam/Reservior Names	Capacity (Mm³)	
		Gross	Live
A	Srisailam	8,722	NA
B	Nagarjunsagar	11,560	4,285
C	Somasila	2,208	1,994
1	Manibhadra	9,375	4,290
2	Inchampalli	10,374	2,130
3	Polavaram	5,511	2,130
4	Almatti	1,195	NA
5	Kalvapalli	NA	NA
X	Inchampalli Low Dam	976	901
Y	Nagarjunsagar Tail Pond	30	30

Fig. 8.1 Schematics of Transfer of Waters of Himalayan Rivers from North-Eastern Region through linking with Ganges, Damodar, Subarnarekha and Mahanadi

clear that the major target source for most of this water transfer is the Bramhaputra river through the Jogighopa-Farakka link across Bangladesh (Fig. 8.1).

The envisaged design capacity of the canal is 2,832m³/s or equivalent to an annual transfer capacity of up to about 89,000 million m³. Besides this, connect-

ing the right tributaries of Bramhaputra, such as Manas, Sankosh and Teesta with Ganga, has been suggested. These two connections of the East have been planned to be integrated ultimately into the peninsular component through the east-flowing rivers such as Mahanadi and Godavari. The other component of the Himalayan connection has been aimed at the transfer of water to the west.

With the inclusion of the notion on 'Networking of Rivers' in the President of India's Independence Day eve address of August 2003, the idea of river-linking received a further boost.

This paper is based on a study of the limited information available on the Indian proposal on river-linking and makes an effort to highlight the factors on which the success of the major purpose of the proposal depends. The paper also presents some examples of the success and failure of large-scale water transfer projects conceived in other parts of the world and discusses the issues concerning water matters prevailing between Nepal and Bangladesh, vis-à-vis, India.

8.2 River-linking not a New Concept

Water has played a very important role in the development of human civilisation. Humankind, in the process of bringing water from its sources to the locations where it is needed, has been learning, since time immemorial, the methods of transfer of water from one basin to another. River-linking, simple diversion or inter-basin transfer (whatever terminology we use), thus, occurred in the world in the past, is occurring at present, and will undoubtedly occur in the future. Even a small irrigation canal carrying water from a river is generally linked to other rivers or rivulets. Similarly, many hydropower projects constructed have the characteristics of inter-basin water transfer. Take the nearest example of the 60 MW Kulekhani-I hydroelectric project and the 2.4 MW Panauti hydroelectric project, built in Nepal, and the farthest example of many hydroelectric plants in Canada, including the well-known Churchill Falls and James Bay projects (Sewell 1984).

In fact, the Indian subcontinent has a long history of such water works. For 5,000 years, river and canal networks were developed as a single unit, creating one of the biggest hydraulic civilisations in the world, the Indus civilisation, which stretched back three millenniums before Christ (Caponera 1987). Take the example of 'The Grand Anicut', a marvellous piece of hydraulic structure built in the second century AD across the Cauvery river on a sandy bed when science had not developed enough to build safe structures on permeable foundations and which is serving well to this day with a few modifications made in the nature of improvements to the structure (Central Board of Irrigation and Power 1981). Similarly, the Western Yamuna canal and Agra canal have been carrying water from the Himalayas to the distant plains of Punjab and Uttar Pradesh for the past few centuries. The Kurnool-Cuddaph canal and the Periyar-Vaigai canal, executed in the 19th century, all stand as testimony to the inter-basin transfer of water through river-linking (GOI [Background Paper] 2003). As such, the river-linking project, as recently proposed by India, is in no way a new concept.

8.3 Few Examples of River-linking by India in the Recent Past

In the course of the assessment of increased irrigation potential in India, due to the planned Karnali (Chisapani) Multipurpose Project in Nepal, the Himalayan Power Consultants (HPC) identified the existing and committed large irrigation projects in India dependent on the transit flow of four river systems—three flowing from Nepal and one border river, namely West Rapti, Babai (Saryu), Karnali (Ghagra) and Mahakali (Sarada). All these were built unilaterally in Indian territory without consultation with Nepal.

These large irrigation developments are located on both banks of the Karnali (Ghagra) river. The lower Sarada Barrage, completed at the end of June 1974 (HPC 1989), is linked with the Girijapur Barrage, constructed on the Ghagra River to command its west bank (2,000,000 ha) by the Sarada Sahayak Pariyojana, completed in 1978. The Saryu Nahar irrigation development on the east bank, with an ultimate command area of 1,200,000 ha, was at that time still under construction and was supposed to be completed by 1997. The main canals of both projects originate at the Girijapur Barrage across the Ghagra River, located 18 km south of the Nepal-India border, and are linked with the Sarada, Saryu and Rapti barrages and canal system (Ibid). Schematics of these barrages, link canal systems, irrigation areas and water transfer capacities are shown in Fig. 8.2.

8.4 Water Diversion and Transfer by Agreement

There are four agreements on three rivers between Nepal and India. They are:

i) The 1920 letters of exchange for the construction of the Banabasa Barrage on the river Mahakali (Sarada);
ii) The 1954 agreement on the Bhimnagar (Hanumannagar) Barrage Project on the Kosi River;
iii) The 1959 agreement on Bhaisalotan Barrage Project on the Gandak River; and
iv) The 1996 treaty on the Integrated Development of Mahakali (Sarada) River.

Of these four agreements, the first three were aimed mainly at irrigation water supply to India while the last was aimed primarily for power generation at Tanakpur, although at the time of the treaty it took the shape of Integrated Development of Mahakali (Sarada) River, encompassing also the letter of exchange of 1920 and the future Pancheswor Multipurpose Project. From the location of these existing projects and the water withdrawing capacities of the canals of these projects, anybody visiting the project sites with some knowledge of the contents of the agreements will feel that they cannot be based on Nepalese initiatives and are not fulfilling the needs of Nepal.

Under the 1920 Letter of Exchange on the Mahakali (Sarada) River forming the Nepal-India border, the Banabasa Barrage was constructed by locating the entire

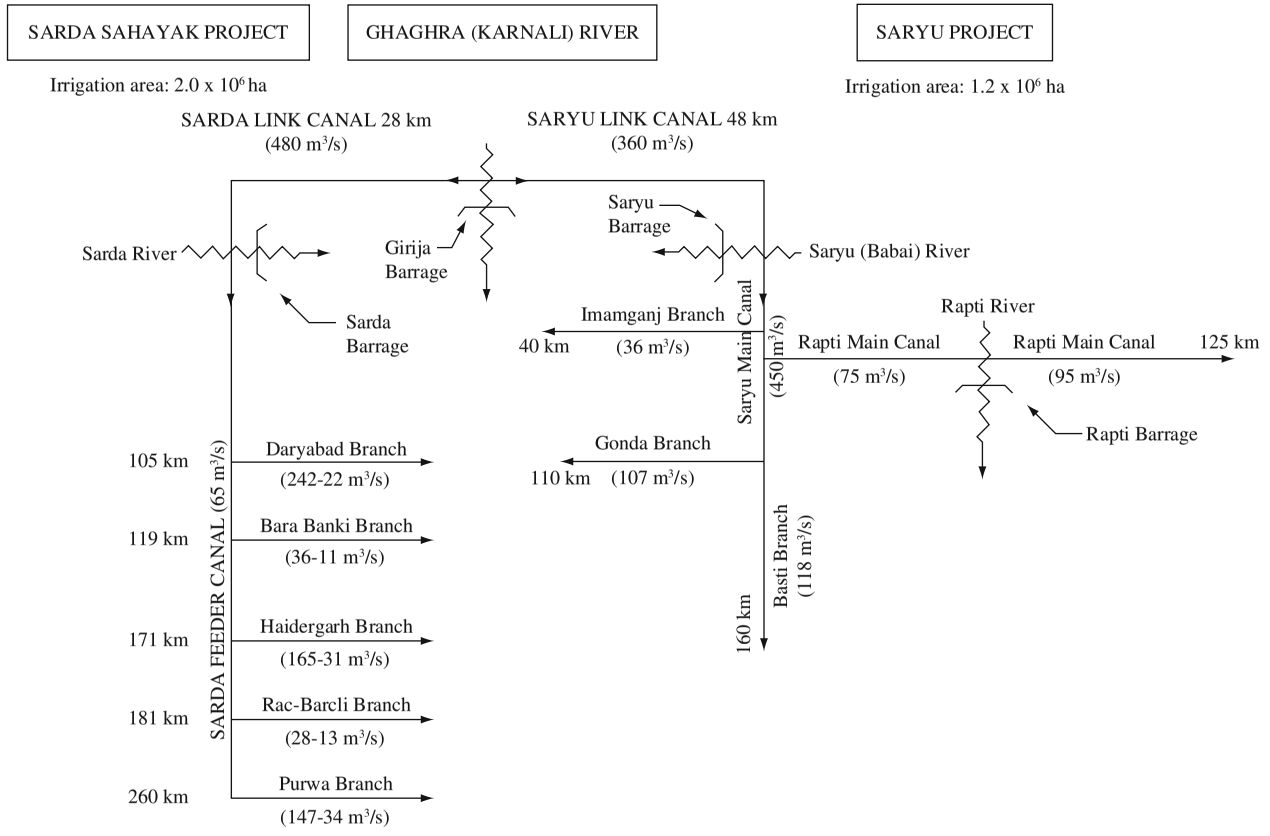


Fig. 8.2 Schematic of linking the Rivers flowing from Nepal to India in the Recent Past

Source: Karnali (Chisapani) Multipurpose Project Report by Himalayan Power Conslultants (HPC), December 1989

barrage site in Indian territory even through an exchange of land. This arrangement gives the right to Nepal only for the supply of 460 cusecs (13m^3/s) of water from May 16 to October 15 (wet season) and 150 cusecs (4.25m^3/s) from October 16 to May 15 (dry season) with the provision of up to 1,000 cusecs (28.3m^3/s), provided a surplus is available, whereas the Sarada canal withdraws up to 14,000 cusecs (396m^3/s) for the Indian Sarada irrigation system (The World Bank 1980).

Under the Kosi project agreement, the Kosi Barrage was constructed on the alluvial plains just on the Nepalese side of the border, leaving aside a very appropriate site at the Chatra gorge, to secure almost all the diverted water for use in India. This created a large submergence in the limited plain lands of Nepal where, with the passage of time, the accumulation of silt in the stretch between the barrage, and Chatra gorge due to the obstruction caused by the barrage, poses the danger of outflanking the Kosi from its eastern bank, even under normal flood conditions.

In the Gandak, had the barrage been constructed near Deoghat, upstream of Chitwan valley in Nepal, some more land in Nepal could have been irrigated with gravity flow. But the barrage was constructed at the Nepal-India border with India withdrawing up to 29,065 cusecs (824m^3/s) of water and leaving Nepal with 845 cusecs (24m^3/s) from two Nepalese canals (Government of Bihar 1960).

In the Kosi agreement, except for some pumping from the western main canal and a separate inundation canal for the Morang-Sunsari irrigation system (66,000 ha), there is no structural provision for taking water for Nepalese use. Thus, the supply to Nepal is quite insignificant when the design capacities of the eastern and western canals for diversion for Indian use are, respectively, 15,000 and 4,500 cusecs (Central Board of Irrigation and Power 1981).

Entitlement by India of a similar disproportionately high quantum of transit flow continued to persist, even in the Mahakali Treaty of 1996, as if Nepal does not require more than a very small amount of water than specified in the treaty, except the future entitlement of half of the surplus flood water in case the flood water currently spilling, could be captured by storage dams.

8.5 People's Sentiment and Government Agreements

The two agreements, Kosi and Gandak, in particular, signed during the '50s, were bitterly criticised in Nepal. During the time of the Panchayat government in Nepal, negotiations were held to revise the agreements; as a result, a few clauses were amended. However, those amendments did not allay the feeling of disenchantment with the projects.

The people living around the project areas are dissatisfied with what is happening on the ground. For example, on the side of the border of a country, where almost all the waters originate and the projects with their inevitable submergence are fully located, there is, apparently, no possibility of water diversion for much-needed irrigation use. As a result, even the limited land available on one side of the border (Nepalese territory) is mostly barren in the non-monsoon period while the other side of the border (Indian territory) utilises these river waters to the maximum possible extent because of the dispro-

portionately advantageous location of the projects for India and the respective design capacities of the water diversion structures. People in Nepal, surviving under a subsistence agricultural economy, are facing in their daily life, the predicament of not having water for use for the enhancement of agricultural productivity of their own land, and are helplessly watching the cornucopia of greenery, resulting from the diversion and use of these very waters flowing under their feet, on the other side of the border. The local farmers, landowners and the people having a national interest blame their own rulers of the time rather than India, for entering into such agreements and are very sensitive to any future deals on water matters. Article 126 of Nepal's constitution of 2047 BS, which requires ratification by a two-thirds majority in the National Assembly, is seen as a measure to safeguard the country from such unfortunate happenings in the future (Shrestha and Singh 1996). However, at the time of the Mahakali Treaty, all the major political parties voted for the treaty, despite people's sentiments against it. Some of the leaders of these parties even advocated high benefits for Nepal from the treaty using false data.

8.6 Quiet Actions of River-Linking along Border Areas Should be of Greater Concern to Nepal

Over and above the river diversion works undertaken by India on three rivers in the Nepal-India border areas with formal agreements, as briefly explained in Section 4, the increasing inundation problems during the monsoon season in the southern lowlands of Nepal bordering India are in effect due to a sort of river-linking actions quietly and unilaterally constantly taken on the Indian side of the border.

Past actions of this nature include:

i) Creation of Sagars (reservoirs), like Mahali, Siswa and Bijwa in Kapilvastu district of Nepal, through the construction of barrages and affluxes on the Indian side of the border;
ii) Submergence in the Paklihawa area of Nepal by blocking the outlet of the river Danda by construction of similar barrages and affluxes;
iii) Construction of a ring-bund very close to the no-man's land in the Sitamadhi district of the Indian territory, blocking smaller natural drainage and creating submergence in the depression of the Gaur Bazaar area in Rautahat district of Nepal;
iv) Construction and heightening of earthen embankments in an almost east-west direction close to the Nepal-India border were affected, thereby, slowing down water flows during the monsoon season from the north-south sloping Nepalese agricultural land of the Nepal Terai.

Such present actions include:

i) The linking of the rivers Saryu (Babai in Nepal) and West Rapti through the creation of the Saryu and Laxmipur barrages and respective link canals;

ii) Construction of Khurdalotan causing the effect of submergence in the Lumbini area (Buddha's birthplace);
iii) Enlarging the Mahali Sagar barrage calling this work renovation.

Even, if actions of the above nature, that directly affect, in an adverse manner, the immediate neighbour, could go on unilaterally without any reluctance on the part of India, why will the parts of such river-linking projects/actions that lie solely within its own territory not continue as long as there are benefits to India from such projects/actions?

Nepal, in particular, should be more concerned about the hardships already created by India through its silent/non-publicised actions undertaken in the border areas than the highly publicised present proposals of river-linking, which seem to be only at the conceptual stage or at the pre-feasibility level study and highly dependent on future actions to be taken in Bangladesh and/or Nepal (See Sections 7 and 9 below).

The planned southern connection and the two proposed links, Jogighopa-Farakka and Manas-Sankosh-Teesta-Ganga, between the Bramhaputra and Ganges or any other storage projects either in the Bramhaputra or in the Barak river system are, in fact, to be considered in the light of the Indian and Bangladesh, relationship to simplify the institutional arrangements that exclude Nepal. The involvement of Nepal in the linking of Bramhaputra would have merit only when a proposal of the diversion of this river to connect it with Arun or Trisuli or Kali-Gandaki in Nepal directly from Tibet is conceived.

8.7 Unless Large Storage Reservoirs are Created The Benefits of River-Linking will be Minimal

The estimated annual flow of the rivers in India is about 1,870 km^3 (see Table 8.1), of which about 224 km^3 enters from Nepalese territory (see Fig. 8.3) and 45.6 km^3 from Bhutanese territory (Bangladesh-Bhutan Joint Team of Experts on Flood Control and Mitigation 1989). For some of the measured data of Bhutanese River's see Table 8.2 compiled from the 'Inventory of Glaciers, Glacial Lake Outburst Floods of Bhutan' (Mool and et al 2001).

The run-off contributions from the Tibetan region of Chinese territory to the Bramhaputra and Indus are not known. However, the data presented for the Dihang dam site (Indo Bangladesh Task force Report 1990), located on the Bramhaputra River, not very far from the Tibet-India border, show that the annual run-off rate at this site is 179 km^3. These data indicate that the annual surface flow generated in the Indian territory will be a little less than 1,421 km^3.

These run-offs are very unevenly distributed season-wise. Ninety per cent of the flow of the peninsular rivers and over 80 per cent of the flow of the Himalayan rivers occur during the four monsoon months of June to September (Government of India Central Water Commission's Pamphlet 1990). In other words, a huge quantity of

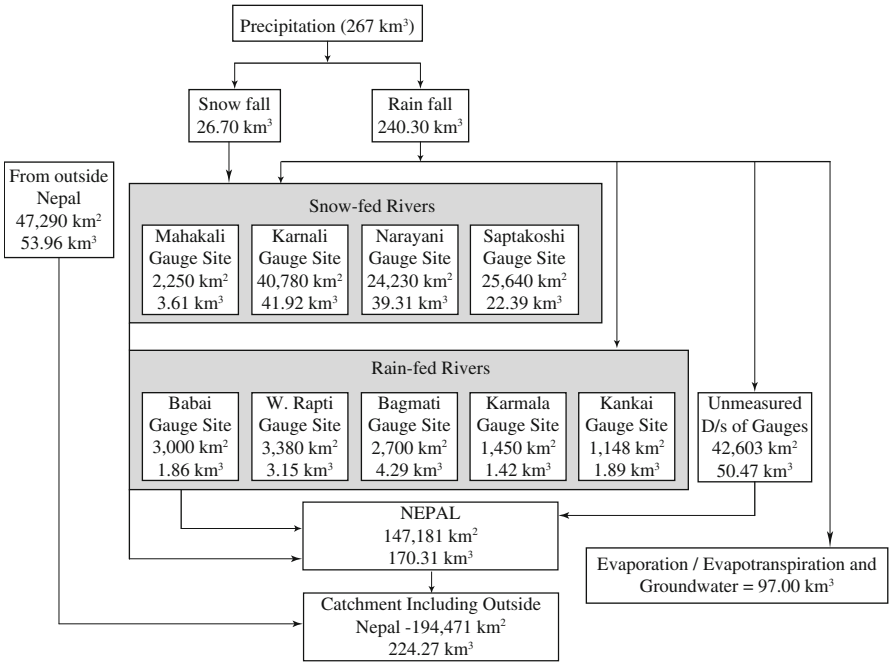
Table 8.1 Annual Flows of the Rivers of India

S.N.	River Name	Catchment Area* (km^3)	Annual Run-off Million m^3
1	Indus	321,289	73,305
2	Ganges	861,404	525,023
3	Bramhaputra	194,413	537,240
4	Barak and others of the North-Eastern region	78,150	59,800
5	Subarnarekha	29,196	10,794
6	Brahmani-Baitarani	51,822	36,227
7	Mahanadi	141,589	66,879
8	Godavari	312,812	118,982
9	Krishna	258,948	67,790
10	East flowing rivers between Mahanadi and Kanyakumari	174,493	34,673
11	Pennar	55,213	6,858
12	Cauvery	87,900	22,358
13	Tapi	65,145	18,389
14	Narmada	98,796	41,273
15	Mahi	34,842	11,829
16	Sabarmati	21,674	4,079
17	West-flowing rivers between Tapi and Kanyakumari	112,117	198,854
18	West-flowing rivers of Kutch and Saurastra	321,851	5,098
19	Minor rivers draining to Bangladesh and Burma		31,000
	Total	3,221,654	1,870,451

* Includes only the catchment area lying within Indian territory.
Source: Government of India's Ministry of Water Resources, Central Water Commission RK Puram New Delhi: Water for the Future, Pamphlet No. 18/90, November 1990

water flows as flood water during the monsoon season. As long as this floodwater cannot be captured in storage reservoirs, flow augmentation will not be possible during the non-monsoon months with the consequences of non-availability of useable surpluses during those lean months for transfer from one basin to another.

Several attractive sites in India suitable for the creation of reservoirs for capturing the monsoon flow have already been developed. India has at least 2,730 large and small reservoirs and nearly 200,000 small water surface structures (village tanks). Of them, 145 existing selected dams included in the publications of the Government of India (Indian National Committee on Large Dams 1979 and Caponera 1987), have a gross storage capacity of 181 km^3.The total volume available for storage in India, including that already created, under construction and under consideration, is indicated to be 304 km^3 (Government of India Central Water Commission's



Source: Shrestha et al. (1996); Yogarcharya (1998) in 'State of the Environment : Nepal'. A publication of ICIMOD, UNEP, NORAD, SACEP and MOPE IMG, 2001

Fig. 8.3 Schematic water balance of Nepal in billion cubic metres $(km)^3$

Pamphlet 1990). It means that only about 123 km^3 storage volume is still available for development, which seems to be grossly inadequate for seasonal regulation of the surplus flow available during the monsoon. Out of this, 76.9 km^3, or 63 per cent, is concentrated in the three reservoirs (Indo Bangladesh Task Force Report

Table 8.2 The Mean Annual Flows of Major Rivers of Bhutan

S.N.	River Name	Location	Catchment Area (km^3)	Mean Annual Discharge (m^3/s)
1	Gongri Chu	Uzorang	8,569	256.0
2	Kuri Chu	Kurizampa	8,600	293.0
3	Chamkar Chu	Kurijey	1,350	53.7
4	Mangde Chu	Tingtibi	3,200	150.0
5	Mo Chu	Yebsa	2,320	116.0
6	Ha Chu	Damachuzam	336	10.6
7	Wang Chu	Tamchhu	2,520	65.7

Source: PK Mool and Dorji Wangdav and others: Inventory of Glaciers, Glacial Lake Outburst Floods of Bhutan, Kathmandu, ICIMOD, August 2001.

1990) located within the Bramhaputra and Barak rivers far away in the north-eastern region of India, indicating that a large proportion of expected transfer of stored water to the south for peninsular connection is to come mainly from the reservoirs in the Bramhaputra River.

Under such a situation of inadequacy of storage volume availability in India, obviously the gross potential for storage of 138.5 km^3 available in 28 potential reservoirs of Nepal (Shrestha, Pradhan and Shankar 1996) will be of vital importance to India in deriving immense downstream benefits from the regulation of monsoon flow generated in Nepalese territory.

It could thus be visualised that behind the scene of the Indian river-linking proposal there is a hidden agenda of acquiring enormously large benefits from the huge transfer of the base flow of the Bramhaputra River from Jogighopa Barrage and the regulated flow from Dihang and Subansiri storage projects in the Bramhaputra River system and huge downstream benefits accruable in Indian territory from flood control in the monsoon season and flow augmentation in the non-monsoon months due to flow regulation achievable by storage reservoirs in Nepal.

Why India does not want to disclose these benefits on a project-by-project basis becomes clear if somebody looks at the minutes of the meetings of the Karnali Technical Committee on the Chisapani multi-purpose project between Nepal and India in which the Indian side has always refused to recognise these downstream benefits with the intention of not sharing these benefits. One should note that these downstream benefits could be obtained only by submerging limited land in Nepal.

8.8 Why Bangladesh is Disturbed

The Bramhaputra-Ganga link (Fig. 8.1), as proposed by India in the June 1990 Report of the Indo-Bangladesh Task Force on Flood Management, envisages the transfer of Bramhaputra water from Jogighopa to Farakka through Bangladeshi territory with a design capacity of 2,832 m^3/s (equivalent to an annual transfer capacity of up to about 89 km^3). The amount of diversion is unprecedented and, therefore, such a canal does not exist even in economically prosperous and technically advanced countries. In addition, the linking of the right tributaries (Manas-Sankosh-Teesta) of Bramhaputra with the Ganga has recently come to public notice (Umashankari 2004).

As can be seen from the Indo-Bangladesh Task Force Report on Flood Management (1990), the Bangladeshi sees the following adverse effects, particularly from the Jogighopa-Farakka link canal:

'The anticipated damages to Bangladesh resulting from the unprecedented diversion of the Bramhaputra waters into the Ganges basin through the link canal include:

i) Loss of 3 million tons of food grains annually in the Bramhaputra dependent areas in Bangladesh during the construction phase of the canal and thereafter;

ii) Highly fertile lands of about 240,000 ha in north-western Bangladesh would remain water-logged for ever;
iii) Destruction of many river ports and severe anticipated damage to the two national sea-ports, clogging of the watery arteries of communication, serious dislocation in transport, commerce and economy leading to gigantic unemployment problems;
iv) Destruction of forest resources and damage to forest-based industries, throwing, in the first instance, some 300,000 workers out of employment in an employment-starved land;
v) Survival and development of fisheries and fish protein supplies;
vi) Adversely affecting water quality and intensifying the rate of pollution and severely disrupting the sources of safe drinking waters especially in the urban centres;
vii) Seriously affecting the ecology and natural environment.

If all these adverse effects are added together and set in the context of the frail economy and delicate social balance prevailing in today's Bangladesh, it becomes clear that disturbing nature, especially its water flow through the mighty rivers, the Bramhaputra and the Ganges, in their separate basins, is something that Bangladesh cannot consciously afford. The length of the proposed link canal passing through Bangladesh territory will be 125 km. The Bangladesh districts affected will be Rangpur and Dinajpur. The extent of land to be acquired on both sides of the canal will be 12,000 ha, of which about 10,000 ha will be in Rangpur and 2,000 ha in Dinajpur district. Assuming that the average district population density data 1981 apply to the respective areas to be affected, homestead occupies 11 per cent of the total land minus forests and water bodies, and total family size is 5.8 persons, the total area to be acquired in Rangpur and Dinajpur districts will be 16,750 ha. To this a vast area of 240,000 ha will have to be added as lost as a result of water-logging after the project is implemented.

In addition to all the human miseries and economic disaster that the massive diversion of Bramhaputra waters through the Indian link canal will bring for Bangladesh, the construction of the link canal will have the effect of virtually trisecting Bangladesh. The country is already divided by mighty river systems into two separate land masses, the north and the east, set apart by the flows of the Ganges and Bramhaputra. The link canal, if allowed to be constructed, will be a man-made river separating the northernmost part of Bangladesh from even the rest of North Bengal.

Despite the proposed construction of six railway bridges and 64 road bridges (i.e. one every 5 km), which would have their own prohibitive costs, the physical separation by a half-mile-wide water body of part of northern Bangladesh from the rest of the country will pose immense psychological and security problems, compounding the problems of social integration. More than a million people that the link canal will displace will pose a significant problem of rehabilitation, which Bangladesh cannot solve. Apart from the pure economic costs, the psycho-social

costs and their implications on social order and peace can never be adequately quantified.'

The average bed level of the Bramhaputra being as low as 21 m above mean sea level at Jogighopa, action on the Jogighopa-Farakka link, of course, may not be possible without action in the Bangladesh territory if the transfer is to be achieved through canal by gravity flow. But the possibility of connecting the left tributaries of the Bramhaputra entering from Bhutan and India with the Ganges through Indian territory (the neck between Nepal and Bangladesh) cannot be denied. Bangladesh seems to be worried by this possibility, although the adverse impact on it from the unilateral implementation of this link by India cannot be as large as in the case of the Jogighopa-Farakka link because even the total average run-off, including flood flows entering from Bhutan, amounts only to a little more than half of the proposed design capacity of the Jogighopa-Farakka link canal. Bangladesh's worries are evidenced by the fact that they have constantly opposed the Indian proposal of the Jogighopa-Farakka link and by the speech delivered by Bangladeshi Water Resources Minister in Kathmandu during his visit on January 21-24, 2004. He explicitly mentioned in his speech the following:

i) The effective regional cooperation has become more crucial in the backdrop of India's recent announcement about her 'Interlinking River Project', which India has designed keeping us in darkness; and
ii) during the last meeting of the Joint Rivers Commission (JRC) in New Delhi, the Bangladeshi side requested the government of India not to go on with the proposed river-linking project without consultation and taking them into confidence (Jalsrot Sanstha 2004).

8.9 The Success of the Proposal Largely Depends on the Ability to Transfer the Bramhaputra Waters to the South and Create Large Storage Reservoirs on the Himalayan Rivers

Waters from the Bramhaputra seem to be little utilised so far. Even the minimum flow available at Bahadurabad is 150,000 cusecs or about 4,270 m^3/s (Siddiqui 1981). With the storage projects conceived at Dihang and Subansiri, an average yield of as much as 232 km^3 available at these sites could at least be partially brought into seasonal flow regulation for use at the time of requirement. Similarly, the potential reservoirs in the left tributaries of the Ganges located in Nepal could smooth out its yield of up to about 4,900 m^3/s equivalent to 155 km^3 of annual flow (Shrestha, Pradhan and Shankar 1996).

These seem to be the major water sources perceived for the river-linking project. Storage and transfer of these river flows require actions in Bangladeshi and Nepalese territories as well.

The waters of the Bramhaputra river system are required for the Tibetan region of China, Bhutan, India and Bangladesh, while the waters of the Ganges system are required for the Tibetan region of China, Nepal, India and Bangladesh. Therefore, the success of the proposal largely depends on:

i) the share of water that India will get from these river systems;
ii) priority needs of storage/water transfer projects to these respective countries in which actions will have to be undertaken;
iii) social, economic and environmental implications that each of the co-basin countries/states will have to face;
iv) recognition of downstream benefits achievable from flow regulation in terms of flood control during monsoon and flow augmentation during non-monsoon months. Similarly, the recognition of the peak power/energy benefits of the storage available; and
v) the international agreements on reasonable utilisation, compensation and sharing of associated costs and benefits.

After all, reaching agreements between these countries, which have bitter experiences in the past in acquiring the lion's share (See Sections 4 and 5) by the stronger party, will not be an easy task (although the governments may still agree on similar deals, resisting the opposition from people will not be easy), consequently, the success of the proposal. India should, first, think about the proposal keeping its geographical position at either Bangladesh or Nepal and not in any way taking the advantage of both as lower and upper riparians by dealing with both the riparians separately on a bilateral basis.

8.10 Environmental, Social and Political Implications of Large-Scale Storage, River-Linking and Water Transfers

There is evidence of adverse consequences of large-scale storage projects. Similarly, many planned large-scale water resources projects, particularly the massive water transfer projects, have not reached the implementation level due to the emergence of the environmental, social, economic as well as political implications associated with them.

The construction of the Moscow canal, linking it with the Volga and Volga-Don navigational canal, has converted the capital of the then USSR into a river port of five seas, playing an important role in inland navigation. However, the large storage projects implemented in the cascade on the Volga-Kama river system changed the hydrologic regime of the Caspian Sea, dropping its level. Adverse effects were experienced in the oil industry, sea transportation and biological productivity and particularly on the fisheries (the Caspian Sea always was the largest producer of sturgeon and other similar fish species, comprising 85 to 90 per cent of the world's catch). In the '60s, a plan was prepared to transfer 40 km^3 of water annually from the Pechora and Vichegdi River systems to the Volga through Kama (Nesteruk 1963)

with a view to increasing the hydropower generation in the Volga-Kama cascade with the reservoir system linking the rivers Pechora and Vichegdi with Kama. This transfer was also felt necessary to stabilise the hydrological regime of the Caspian Sea and its basin. Further studies indicated that any diversion over 20 km^3 per year can result in unpredictable environmental changes and, finally, recommendation was made for the transfer of up to 19 or 20 km^3 per year in three stages. It was also recommended that the environmental changes be evaluated on the basis of the experience gained during the first stage of diversion and special studies, that is, not earlier than 10 or 15 years after the first stage the diversion. Thus, the concept of the project terminated in three-stage diversions comprising 5.8 km^3 annually from the rivers Onega and the upper Sukhona, 3.5 km^3 from lake Onega and lastly 9 to 10 km^3 from the Pechora river (Voropaev and Velikanov 1984).

Sizeable inter-basin water transfers are not a recent phenomenon in the United States of America (USA). Los Angeles, California, began importing municipal water from the Owens valley, more than 400 km far, in 1913. Since then, a number of other transfers have been implemented, chiefly for hydroelectric, municipal and irrigation purposes. Indeed, it is estimated that one out of every five people in the 11 Pacific coastal and Rocky Mountain states is served by a supply from a system that brings water from a distance of more than 160 km.

The keenest interest during the ’50s was in providing water for the south-western USA, especially for central and southern California and the lower Colorado river basin. The source of supply assumed was the Columbia river or its major tributary, the Snake. The Bureau of Reclamation was involved in the study. However, intense political opposition to such transfers on the part of the riparian Pacific north-western states (Washington, Oregon and Idaho) resulted in a Congressional ban on even reconnaissance studies.

The 1960s was the period of most intense interest in large-scale, long-distance water transfers in the USA. This was a time of great faith in engineering solutions to the water shortage problem. At least 16 proposals of basin water transfers ranging from a few to over 300 km^3 were there for the USA. But the rise of environmental and social concerns in the ’60s and ’70s considerably dampened the enthusiasm for them. The important schemes considered were NAWAPA (the Northern American Water and Power Alliance), the Texas Water Plan, California’s State Water Project and High Plains Transfers. Of them, NAWAPA is, without doubt, the grandest (the design transfer of 136 km^3 with an initial transfer of 18km^3 and ultimate potential transfer of over 300 km^3) water manipulation concept ever devised for North America or the World (conceived in 1964 by the Ralpi M. Parsons Company).

NAWAPA, in particular, was opposed by Canada, from where most of the water for diversion was proposed to be taken. Canada would suffer from most of the economic and environmental harms from the scheme, whereas the USA would reap most of the benefits.

California’s State Water Project is the only major inter-basin water transfer project to have been constructed in the USA between 1960 and 1973, demonstrating that diversion from one state to another faces substantial difficulties.

The Texas Water Plan could not move forward on the grounds that it is inordinately expensive and the environmental impact on the Mississippi and its mouth below the point of diversion could be severe. Because of environmental and social complexities involved in large-scale, long-distance water transfers, the present direction of efforts in the USA are on 'Alternative to Water Transfers' like conservation, efficiency improvement and local supply augmentation measures (Micklin 1984).

In Canada, for a long time, inter-basin water transfer has been a widely accepted aspect of water management. At least 60 such diversions have taken place, predominantly for hydropower generation. The total flow involved in inter-basin transfer in Canada is about 4,400 m^3/s (more than 60 per cent of the average annual outflow from Nepal). Canada's past experience suggests that inter-basin water diversions sometimes offer the most attractive solution to a water problem. Take the example of the SunKosi-Kamala diversion for Nepal. There is no substitute to it for supplying irrigation water for the areas of the Nepal Terai lying between the Sapta-Kosi and Hetauda-Birgunj corridor. Similarly, there is no alternative other than the West Rapti diversion for fulfilling the water needs of the Kapilvastu district. These projects, however, are very small in size in terms of the amount of transfer of water for irrigation and the distance involved, due to the limited land available in the Nepal Terai for irrigation and the non-existence of favourable topography for inter-basin transfer; hence, these are not comparable with the projects described in this section and with the Indian proposal.

Some observers believe that interest is declining in large-scale inter-basin water transfers in the wake of rapidly escalating costs and strong opposition by environmental lobbyists. The debate for and against will undoubtedly continue, but for the present it seems that large long-distance inter-basin transfers are unlikely to gain widespread popular support. What is clear is that resistance to large-scale water transfers has stimulated a search for other alternatives, particularly the strategies which foster increased efficiency in water use (Sewell 1985).

As in most countries, in China, too, spatial distribution of water is very uneven. There is more water but little arable land in the south and vice versa in the north. This situation aroused great interest in a number of engineers and scientists for water transfer from the south to the north. Initially, three major schemes, called the West, Middle and East routes, were considered. In the '50s, more than 10 alternative water transfer plans for the West Route were drawn. Since each of the individual canals of the West Route has to cut across mountainous areas, it was found that the engineering works involved would be enormous and, accordingly, the cost would be very high. Earlier consideration of this route, therefore, is unlikely. Similarly, due to the huge investment required for making the Middle Route Project a reality and also due to the reason that this proposal would greatly reduce the electricity generation capacity at Dangjiangkou, a thorough study of the feasibility of this route has been suggested. For the East Route, the Beijing-Hanzhou Grand Canal would be used as the main canal. As such the engineering work will be relatively easy and less costly. The severe drought of 1972 in the northern part of China added impetus for analysis of this route. The first stage work of the Eastern Route Project has been approved. The completion of the East Route project is expected to be favourable to

both the water supply for the Huang-Huai-Hai plains and navigation in the Grand Canal. It was indicated that, on the basis of the experience of both the development of the Grand Canal since the initial excavation started some 2,400 years ago and the construction of water transfer projects in Northern Jiangsu, the First Stage Project of the East Route would be feasible in terms of engineering implementation and consideration of potential environmental aspects (Changming, Dakang and Yuexian 1984). Probably, due to the adoption of the same route of the existing Grand Canal for the first stage of the East Route, the social and environmental disturbances are low. However, the latest developments in this project are not known.

8.11 Alternatives do Exist: They Need to be Studied Before Coming to the Final Decision

Among a number of objectives of the river-linking proposal under discussion, irrigation seems to be of key concern, because in India as much as 80 per cent to 85 per cent (Central Board of Irrigation and Power 1981) of the total water withdrawn is for irrigation, and the present river-linking proposal has the objective of bringing as much as 34 to 35 million ha of additional land under irrigation. The two factors, low use efficiency and the consumptive nature of use in this sector, are mainly responsible for creating a major problem in fresh water supply. The supply requirement for the year 2000 was estimated to be 688 km^3 in this sector. For supply to domestic and industrial uses, due to smaller (68 km^3) water requirements, generally pipe conduits are used and, therefore, environmental as well as social sensitivity is not of the magnitude that is associated with irrigation water supply. Large networks of canals from the largest river link like Jogighopa-Farakka link (for which the planned bed width of the canal is as much as 266 m at its head reach) to field channels will also occupy a large land area, displacing people and creating large water bodies prone to high evaporation losses. These canal networks will also form barriers against the free drainage of monsoon rain/run-off creating flooding and water-logging problems in large areas. Therefore, the search of alternatives, among other things, should primarily focus on the irrigation sector. Water-saving measures such as control of water loss by evaporation (the estimated evaporation loss of soil moisture for India is 600 km^3/yr [Indo-Bangladesh Task Force Report 1990]), improving water use efficiency by utilising improved methods of irrigation such as drip and sprinkler in low rainfall areas, lining of canals, changing in cropping pattern in a way to suit water availability of given locations, renovating existing tanks, creation of more storage for wet season surpluses at local level and/or tapping of flood flows from nearby stream/rivers to fill the existing reservoirs which may have unfilled spaces due to the depletion of water at source, attaching scarcity value in water charge, etc. These measures could be much cheaper and environmentally, as well as socially, more friendly than the long-distance water transfer by way of the proposed river-linking through the creation of storage at greater distances.

8.12 Change in Mind-Set is the Primary Requirement

India's attitude towards its upstream and downstream riparian countries has not yet changed, particularly in respect of the utilisation of water. Nepal works on Indian initiatives with the 'Yes Sir' attitude. Or India takes unilateral actions first, adversely affecting Nepal and legalises them at a later date favourable to it. This was the Nepal-India relation of the past in water matters. There is even evidence that land swap arrangements with changes in international boundaries between Nepal and India were done to completely locate the barrage site in Indian territory for withdrawing almost all the transit flow available in a border river quantifying in significantly small amounts as an entitlement for Nepal (Central Board of Irrigation and Power 1981).

Let us take the example of the Farakka Barrage on the Ganges: it was constructed unilaterally by India, compelling Bangladesh to come to agreements at a later date that politically favoured India. The same applied to the Mahakali Treaty between Nepal and India. India, while taking such actions, does not consider that Nepal (upstream riparian) and Bangladesh (downstream riparian) also require water. When Nepal, for example, approaches international funding agencies for monetary support to implement severely needed water projects well inside Nepal, India requests these institutions to refrain from providing such assistance stating that the project(s) will have an adverse impact on Indian interests. In the meantime, the Indian side starts unilaterally (using her own financial resources) to implement project(s) withdrawing water as fast as possible on the same river by constructing diversion structures/pumping stations or river-linking works, as if by such actions it had acquired entitlement of prior use rights over the transit flow of the rivers. Such an attitude of snatching others' natural rights of withdrawing water originated/generated in their own territories still prevails among Indian decision-makers. That could be the overriding reason why India doesn't feel it necessary to consult its riparian before making the Gigantic River Linking Plan public. It is, otherwise, a surprise why India does not yet make public the conceptual details, particularly of the Himalayan Connection, but takes various decisive steps to push forward the proposal. Even the information compiled by Umashankari (2004) for the southern link does not become complete without incorporation of the large water transfer data dependent on the transfer of the Bramhaputra waters. The total transfer envisaged for the south is very large, amounting to 141,288 million m^3 per year (Iyer 2003), probably not happening so far from a few sources. The single largest source envisioned as per the 1990 Report of the Indo-Bangladesh Task Force is the base flow diversion of the Bramhaputra through the Jogighopa-Ganges link canal having a design water transfer capacity of 2,832 m^3/s or up wards, to an annual transfer volume of about 89 km^3. In addition, there is another proposal of a link canal between the left tributaries (Manas, Sankosh and Teesta) of the Bramhaputra and Ganges for transferring water to the south. The capacity for this link canal has not yet been made public.

Similarly, for the western part of Himalayan Connection, it has been cursorily mentioned in an article "Changing the Course" by Shankar Aiyar published in *India*

Today dated 20 January 2003, that the linking of Ghagra will be done from Chisapani from Nepal, without any other detailing.

From what has been said in Sections 7 and 9 above, without the actions in the territories of Nepal and Bangladesh, the benefits of the so-called river-linking proposal will obviously shrink extensively. In such a situation, if the Indian side publicises in a way that the proposal is under priority and going to be implemented very soon, but does not request the participation/involvement of those riparians where the direct actions seem unavoidable, then what should one speculate from this? India is waiting for one fine morning of a day favourable to her when the government(s) of these co-riparian country(s) say 'Yes Sir' and make paper agreement(s) in the form of a secret pact or even openly, although Bangladesh has, for the time being, started to make official opposition to the proposal (Jalasrot Sanstha 2004).

If China shows an attitude similar to that of India towards Nepal and Bangladesh by diverting Bramhaputra water for use in its Tibetan region or elsewhere, the proposal of river-linking will suffer to an extent beyond its control over the waters of the Bramhaputra river, which amounts to almost 179 km^3 of the annual yield. Similar risks are there, if Bangladesh does not allow the construction of the Jogighopa-Farakka link canal through its territory and Nepal does not feel it worth constructing storage dams, allowing huge submergence of limited but very valuable land located within its river valleys.

If an independent team of experts reviews all the prevalent documents (formal and informal) on water matters between Nepal and India, the team will find that India is tying Nepal's hand legally in a gradual way, but in quite an unreasonable manner. The acceptance by different kinds of international forums the supremacy of human-made agreements, laws and rules over natural laws encourages actions of such a nature leading to what is called the 'might is right principle'. This principle applies not only to India in this region, but also to international institutions like the World Bank. The World Bank was required to inform co-riparian countries even for providing a small quantum – 20 million USD (Project Appraisal Document of World Bank 2002) of Power Development Fund (where no consumptive use of water is involved) to Nepal, but while providing assistance of a magnitude as large as 1.2 billion USD to Uttar Pradesh for completion of the link irrigation systems dependent on the waters of the rivers like Mahakali, Karnali, Babai and West Rapti flowing from Nepal, the Bank did not feel it necessary to inform Nepal (Nepal Water Conservation Foundation 2002).

8.13 Conclusions

Very little technical, economic and socio-environmental details are available on the emerging river-linking project of India, although there seems to be a strong political boost to the project proposal. It is not clear whether the studies are yet still at the conceptual stage or there is intention to keep Bangladesh and Nepal in the dark as

indicated by the Bangladeshi Minister of Water Resources in his speech during his visit to Kathmandu on January 21-24, 2004.

The concept of water transfer through river-linking is in no way a new concept. There are several examples of historical significance, like 'the Indus Civilisation', based on a networking of rivers and canals and the marvellous piece of hydraulic structure, 'the Grand Anicut', built in the second century AD across the Cauvery river in the sandy bed when the science had not developed enough to build safe structures on permeable foundations.

As elsewhere in the world, many ongoing river-linking works must be in hand with India. This is evidenced by the fact that during the course of the assessment of increased irrigation potential in India due to the planned Karnali (Chisapani) Multipurpose Project in Nepal, it was found that large irrigation developments, dependent on the transit flow of four river systems flowing from Nepal, are ongoing with the main canals originating at the Girijapur Barrage across the Ghagra/Karnali Rivers linking with Sarada, Saryu and Rapti barrages and canal system.

The agreements so far conducted on water matters between Nepal and India show that, in terms of project location and water withdrawal capacities, they are most advantageously located for ensuring the withdrawal of almost all the flow available to India while the design capacities of canals for water withdrawal are highly disproportionate, providing India with the lion's share. These agreements, particularly the Banabasa Barrage Project, Gandak and Mahakali Treaty, severely limit the entitlement of Nepal over water in such a way as if Nepal never needed water beyond those severely limited entitlements.

The local farmers, landowners and the people of Nepal, keeping national interests in mind, observing the situation on the ground of not having the right to withdraw waters flowing under their feet, blame their own rulers of the time rather than India for entering into such agreements and are very sensitive to any such future deals on water matters. The insertion of Article 126 (which requires ratification by a two-thirds majority in the National Assembly) in Nepal's Constitution of 2047 BS (1990) is seen as a measure to safeguard the country from such mishaps in the future. But, at the time of the Mahakali Treaty, the expectation of the people could not become a reality.

Inundation problems increase in the southern lowlands of Nepal bordering India during the monsoon season, due to the silent acts of river-linking by the creation of barrages, affluxes and embankments continuously taken in the Indian territories very close to border. They have already adversely affected Nepal and the effects are increasing all the time due to the ever-heightening of those embankments/affluxes and giving them permanence in the form of local roads. These actions should be of immediate concerns to Nepal than those actions that are still at the conceptual level and are highly dependent on the actions to be taken inside Nepali and Bangladeshi territories.

Because of the concentration of 80 per cent to 90 per cent annual run-off during the four monsoon months, the unusable surplus available during this period is very large. This type of climatic pattern prevails throughout India. Hence, during this period, large-scale water transfer does not make any sense except if some gigantic

storage facilities which cannot be filled up by local monsoon flows exist. In any case, the water envisioned by large-scale inter-basin transfers is certainly aimed for use in the water shortage period, i.e. during non-monsoon months, particularly in dry season. Flow augmentation during this period becomes possible only if there is water stored during monsoon months elsewhere in the upper catchments; otherwise the effectiveness of the river-linking proposal for water transfer greatly reduces. In this context, the potential and important role of storage available in Nepal and in the north-eastern region of India does not need further explanation for the success of the proposal. Similarly, the important role of the Jogighopa-Farakka link canal through Bangladesh cannot be undermined if the success of the River Linking Plan is to be achieved. Under such a physical condition India keeps these countries in the dark. At the same time, India overly publicises the proposal at different forums/events and through different media. These actions certainly represent the suspicious political and economic games of India against Nepal and Bangladesh.

Bangladesh is disturbed because of two links in particular, namely, Jogighopa-Farakka and Manas-Sankosh-Teesta-Ganges, if implemented before the creation of the proposed storage reservoirs at Dihang and Subansiri, could result in a huge amount of base flow from the Bramhaputra being diverted, greatly affecting the low flow conditions of the Bramhaputra in Bangladesh. Because of this reason, Bangladesh seems to have registered its objection to the river-linking project at the meeting of the Joint River Commission between Bangladesh and India. However, due to the very low location of the Jogighopa barrage site, the possibility of the Jogighopa-Farakka link is low if Bangladesh does not allow actions in its territory.

The major water sources perceived for the river-linking proposal are obviously base flow of the Bramhaputra and the monsoon flows expected to be captured in the potential reservoirs identified on the left tributaries of the Ganges flowing from Nepal and on the Bramhaputra while flowing in the north-eastern region of India. All these require actions in Nepal and Bangladesh territories. These waters are also required for Nepal, the Tibetan region of China, Bhutan and Bangladesh. Without satisfactory dialogue between these countries, transfer will not be easy. Over and above, Nepal and Bangladesh have had bitter experiences with India on the water matters in the past. The governments may still agree to the deals as in the past, but resisting opposition from the public will not be easy.

Due to the emerging environmental and social concerns, large-scale long-distance water transfer proposals have been either dropped or advanced on a reduced scale in stages to take into account the environmental changes found during the first stages of water diversion. However, inter-basin diversions at a local level still represent the cheapest and most effective strategies available where transfers from a technical standpoint are relatively easy to accomplish.

The key problem of the present river-linking project lies in meeting the irrigation needs, which represent 85 per cent of the total withdrawal. Besides, creation of a large network of canals has a number of adverse impacts, including flooding and water-logging. Water-saving measures exist, such as the control of water loss by evaporation, improvement of water use efficiency, bringing changes in the cropping pattern to suit the water availability of given locations, introduction of pricing

policies that attach a scarcity value to water, etc. Focus should be laid on identifying appropriate alternatives that have potential for reducing water requirements, particularly in irrigation. They need to be studied and compared first with separate links as well as the integrated link of the present proposal, taking into account the technical, economic, environmental and social aspects in light of the cobasin states/countries sharing the same resources.

In water-related matters, in the past there have certainly been bitter experiences, between the coriparian countries of the Ganges, particularly between Nepal and India. The self-centred attitude of India, as in the past, is seen again by its actions on the River-Linking Proposal. Change in the mindset is required for cooperation, but facts tell that stronger parties, including even international organisations, like the World Bank, work on the 'might is right' principle.

Chapter 9
Personal Reflections: Nepal-India Water Relations

Bhubanesh Kumar Pradhan

9.1 Context

Many a time, friends and wellwishers have asked me to write about my experience of working with the Indian side during water-related talks, as I had participated in Nepal-India talks for a long time. However, I had not been able to do so because writing needs a lot of material and memory of events as they take place.

I thought I should write now as it would help the Nepalese side to continue constructive dialogue with India in the matter of water resources in the future.

Before going into that, I will describe how I got involved in the field of water resources.

After passing out from the University of Roorkee, India, in 1959, I joined the Irrigation Department on October 2, 1959. After serving different posts in the Department, I became Director General (DG) of the Department of Irrigation, Hydrology and Meteorology (DIHM) on March 1, 1974. As the name indicates, the Department used to handle hydrology and meteorology apart from irrigation. I served that post for a total of seven years.

As the DG of DIHM, I had opportunities to deal with the Indian side on several occasions, sometimes directly and most of the times assisting the Secretary of the MoWR–several of them, beginning with Karna Dhoj Adhikary, Dirgha Raj Koirala, Murali Prasad Upadhyaya, Narkanta Adhikari, Pashupati Pratap Shah and Madhusudan Dhakal, during my tenure as DG.

After that I became the Executive Secretary of the newly-created Water and Energy Commission Secretariat (WECS) on March 3, 1981. As Executive Secretary of WECS, I was responsible for chance to study and gather knowledge about

B K. Pradhan (✉)
Former Director General, Department of Irrigation; Former Executive Secretary, Water and Energy Commission Secretariat; Former Secretary, Ministry of Water Resources and Former Member-Secretary, National Planning Commission, Government of Nepal, Kathmandu, Nepal.
e-mail: bhubanesh_kumar@yahoo.com

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water resources development in the context of bilateral issues between countries while working with Canadian experts on different subject matters. The Canadian International Development Assistance (CIDA) under the Canadian government, helped Nepal in the development of water resources from 1977 to September 2003. It had fielded a consultant firm, called Canadian International Water and Energy Consultants (CIWEC), to work with the technical people of His Majesty's Government of Nepal in the field of water resources, basically with WECS, Nepal Electricity Authority (NEA) and DIHM. They helped in drafting several papers exposing different issues basically for the Nepalese purpose, drawing their similar experiences gained in dealing with the USA with which Canada had trans-boundary water issues, which were resolved following long and tenuous negotiations.

This involvement also gradually helped to shape Nepal's Water Policy. WECS prepared several policy papers on water resources for the government. The staff at WECS was, therefore, always in the forefront of any talks on water-related issues between Nepal and India. I, along with my colleagues at WECS, therefore, played a key role in water resources negotiations held with India.

We helped the Ministry in drafting key issue papers on water resources. We also helped it in preparing the minutes of official-level talks between Nepal and India, whether held in Kathmandu or New Delhi. We had thus been able to provide indispensable services to the country while at WECS.

I stayed almost seven years there and was able to provide full and able leadership to the institution, which grew from a scratch to a full-fledged vibrant organisation. It was satisfying to see that all the human resources within the organisation were fully committed to the development of water resources.

I became Secretary of MoWR on April 29, 1988. I served that post till June 25, 1991. As Secretary, my responsibilities and participation naturally grew to their height. I led a delegation to New Delhi, India, for secretary-level talks. Similarly, I received an Indian delegation for talks in Kathmandu. I had free and frank discussions with my Indian counterparts and gained an insight into to where India stood vis-à-vis water-related issues with Nepal.

India did not like my being in the MoWR and connived with the then government in power in Nepal led by Girija Prasad Koirala to remove me to the National Planning Commission (NPC) Secretariat. This was clearly visible from an article published in *The Economic Times of India* by columnist Talveen Singh just after my transfer to the NPC Secretariat in 1991. In that article, Singh expressed the glee of the Indian government on being able to remove me from the Ministry.

I served the Ministry for almost three years. Apart from dealing with India over several water-related issues, I had the responsibility of getting commissioned 69 MW Marsyangdi Hydro-electric Project, Babai Irrigation Project, Chapakot Irrigation Project and Marchawar Lift Irrigation Project in very adverse conditions. I was happy that I had been able to render a useful service to the nation.

Coming to Nepal-India talks on water-related issues, I found the Indian side to be always well-equipped in many water-related matters. I found them to be intransigent and using all means, including the size and power of their country, to prevail on others with their stand. I also found that if you were well prepared and had done

your homework before going to talk to the Indian side, you, too, could prevail upon them. I always strived to pay attention to this very important aspect in any future talks with India not only on water-related issues but also on all overall issues vis-à-vis with India.

In any discussion, one tries to see the interest of one's country. I don't see any harm in it. But one should realise that the other side, too, should be able to take this in good humour, which I found lacking. The other side would try all means, right or wrong, to win the issue in question. I am glad that I was able to play a constructive role for Nepal for a long time in my discussions with the Indian side. I had done this in different capacities at different times.

There are still many people in Nepal who think I had rendered a great service to Nepal in putting forth my logic with India on water-related matters boldly and squarely without any fear from any quarter. This has been of great satisfaction to me and I consider this my lifetime's achievement.

9.2 My Involvement

I started actively joining Nepal-India water talks from the days when I was Deputy Director General of the DoI, DIHM, basically to assist Director General Karna Dhoj Adhikary, who was in the forefront of all talks with India over water pertaining to irrigation and other water-related issues. There was always pressure on Nepal from the Indian side on water-related issues to turn the tide in its favour. Water resources became topic number one in any bilateral talks at higher or lower levels.

I had actively taken part in Nepal-India Water talks as Deputy Director General and Director General of the DoI, DIHM, Executive Secretary, WECS, and Secretary, MoWR. I had the privilege of taking part in talks where six Secretaries of MoWR and six Secretaries of Power from the Indian side were involved during my 20-year tenure. This can be cited as the longest involvement for any government servant from the Nepalese side.

While India thinks it has helped Nepal in harnessing water resources, Nepal feels it got a raw deal in all the agreements and the treaty signed between the two countries on the development of water resources.

9.3 Chatara Canal Joke

Water resources could, and should, have been developed for the benefit of both countries. But unfortunately it has been one-sided. Take the case of the Kosi agreement, signed in 1954. The project was basically designed to largely benefit India. Nepal got some benefit after a tenuous development. It took over the canal system known as the Chatara Canal Project, supposed to irrigate 66,000 ha of land in Sunsari and Morang districts, which was neither complete nor functional, as

planned earlier, when it was handed over to Nepal in 1974. It was hardly capable of irrigating even 20,000 ha of land.

It brings to my mind an incident relating to the operation of the canal of the Chatara Canal Project. The Indian Ambassador, HE Maharaj Kumar Rasgotra, who had gone to inspect the canal system on his own made this comment to Dirgha Raj Koirala, Secretary, MoWR, regarding the silt problem in the Chatara Canal. 'Mr Secretary. What do you expect under the canal bed other than silt? You are not supposed to have gold.' This comment he gave probably after he had an argument with the Nepalese engineer in charge at Chatara then, Surya Bhakta Upadhaya, who had to face the silt load carried by the inundation canal. The Secretary called me to communicate what the Indian Ambassador had to say about the Chatara Canal.

I was Director General in 1973 and told our Secretary that silt was a big problem and an annual affair after every rainy season, as the canal did not have a proper diversion structure across the Kosi River. Instead, it was an inundation canal with a side intake. It was but natural that Kosi brought tons of silt to the intake at its head, thus making the canal operation ineffective and virtually impossible until the silt was cleared. I saw for myself the silt load up to the head of the Chatara intake in one of my inspection visits. The Indian side also realised this problem. Member, Engineering, Indian Cooperation Mission (1CM), Mr Babington, once said, though jokingly, had I been the President of India, I would have sanctioned a proper barrage for the canal intake of clean water.

The Indian Ambassador, instead of taking it as an operational affair, went to the point of humour, just belittling the serious point in question. We did approach this silt problem seriously later under a loan assistance of the World Bank. We put up a new intake for the assured supply of water at 1.2 km upstream of the Chatara intake and then dredging the silt in the dredging basin at the head of the Chatara main canal with the help of dredgers before the silt free water was allowed to enter the Chatara main canal. It was with great difficulty that I was able to put across this issue to the Bank in 1989 as Secretary of MoWR. The Bank was quite familiar with the silt problem, having been involved in the project for more than a decade. It was of the view that the cost should be borne by some other donor favourable to the project. It would have taken a long time to look for a new donor, whereas the issue required a quick resolution.

The Kosi Agreement was signed at a time when Nepal was in too weak a position, both technically and politically. This was evident from the fact that the Kosi Agreement, intended to be signed for 99 years, was done for 199 years, with the result that the Officer on Special Duty, Dwarika Das Shrestha, working in the Kosi Project from the Nepalese side, who had been promoted for bringing the Kosi Agreement to a successful conclusion, was fired the next day when the lapse on the Nepalese side upon signing of the agreement for 199 years was seen. Such anomalies in the agreement should still be addressed in a spirit of co-operation and a suitable date inserted therein with mutual agreement as no project is going to be in an operational stage for such a long period and be a burden for the parties in bond.

9.4 Gandak Irrigation Waters for Nepal

Talking of the Gandak Project, it was no better. Under the agreement, Nepal was to get the benefit of irrigation in Bara, Parsa and Rautahat districts from the Eastern Nepal Gandak Canal and in Nawalparasi district from the Western Nepal Gandak Canal. In total, both canal systems were supposed to irrigate about 50,000 ha of land. Both systems were built by India earlier with the deputation of some Nepalese engineers later. The construction of the canal took such a long time that when it was completed, it was already at the rehabilitation stage, indicating the poor quality of construction.

The Gandak Project Agreement between Nepal and India is conspicuous with the agreement being silent on its tenure. A suitable date should be fixed to indicate the agreement period. Such anomalies in the agreement need to be addressed with mutual consent in a spirit of cooperation.

When it was found by the Nepalese side that the Nepal Eastern Gandak Canal at the tail-end of the Don Branch Canal (625 cusecs), built in India, could never cover Rautahat district at the tail-end of the canal, it was with great difficulty, and on the insistence of the Nepalese side, that it was at least put on paper that 850 cusecs of water will be available to the Nepal Eastern Gandak Canal, a myth that was not realised even to this date, with the abandoning of the canal system that was already there in the absence of water.

The Indian side never placed the 850 cusecs of water as per the agreement into the Nepalese canal system with the bulk use of water already in their system in the earlier reach.

His Majesty's Government made a bold effort to give a good shape to the project taken over from India with the loan assistance of the World Bank, which was too keen to help Nepal in its earlier involvement in Nepal. The project served by the Eastern Nepal Gandak Canal System was later developed as the Narayani Zone Irrigation Development Project (NZIDP) under the loan assistance of the World Bank to make up for all the deficiencies of the project and to link it with farming activities. Similarly, the Western Nepal Gandak Canal, with a capacity of 300 cusecs, taking off directly from the Gandak Barrage, was developed with a loan assistance of the Asian Development Bank (ADB).

The Narayani Zone Irrigation Development Project remained ineffective for five years with the discontinuation of the water supply from the Don Branch Canal in India, owing to the collapse of a cross-drainage structure in the Don Branch Canal in 1988. At every secretary-level meeting, the topic of reinstatement of the canal system was raized but to no avail.

His Majesty's Government had to face a hue and cry from all sides over the non-availability of water in the canal. The Indian side showed its helplessness as the onus of repairing the canal structure fell on the State Government of Bihar. In such circumstances, the Union Government could have put necessary pressure on the State Government to undertake repair works under emergency operations. This was not done; as a result, Nepal had to suffer a lot, financially as well as politically.

Nepal took over the projects built for its use by India as and when the other side wanted them to be handed over. But as the projects such as the Chatara Irrigation Project, Western Gandak Irrigation Project and Eastern Gandak Irrigation Project (Narayani Zone Irrigation Development Project) were not at the operational stage to be fully utilised, the World Bank and the ADB stepped in to make up the deficiencies.

One positive aspect of the agreements signed with India is that some irrigation infrastructures were developed with the help and assistance of international institutions, like the World Bank and the ADB, and the human resources that were involved in these projects.

Had there been no agreements between the two countries on the use of the waters of the Kosi and Gandak River, the banks would not have entered. So, the development that took place with Indian assistance was instrumental in building up the irrigation infrastructure in Nepal to the extent of the areas covered by these projects.

After I became Director General of the DIHM in 1974, it was but natural for me to be more active in Nepal-India talks on water-related issues. Secretary-level talks between the two governments used to be held alternately in Kathmandu and Delhi. Secretary of MoWR from both the countries used to lead the respective delegations, though Power Secretary also used to attend such talks on power-related issues from the Indian side. Departmental chiefs used to be members of the delegation from each side, which also included others involved in looking after the water portfolio.

9.5 Indian Hydrologists to be Stationed in Nepal

Apart from such secretary-level talks, the departmental heads had to actively take part in their subject areas when dignitaries from India visited Nepal. It reminds me of an incident that took place in July 1977 when the Honourable Minister of External Affairs of India, Atal Behari Vajpayee, held talks with the Honourable Minister of Water Resources, DP Adhikari, at our Foreign Ministry. During those talks, departmental heads were also invited to attend and brief the visiting Minister on related issues. Mr Vajpayee wanted to know the status of the installation of hydrometeorological stations covering central and eastern Nepal for flood forecasting purposes, with the Indian side fielding their technicians with wireless units for collection of such data for flood forecasting purposes in India.

I was naturally to brief the status to the visiting Minister as our Minister had asked me to do. The Indian proposal for stationing Indian technicians in our territory during the rainy season was not palatable to us and, therefore, we had earlier sent a letter to India telling them that we could send all the data required by ourselves without the involvement of Indian technicians. We had not received any reply for eight months from the Indian side. When I briefed that we had already received the proposal from the Indian side and had put up our views about the Indian proposal and had sent our own proposal to provide the data required for flood forecasting, Mr Vajpayee showed his displeasure and said that we did not cooperate on such

crucial issues. There was numbness for a while in the meeting and many in the meeting thought that the cause for displeasure was my response, whereas in fact I had placed the status of the issues in question as I was asked. It was in fact the Indian side that should have responded to our alternative proposal in time for going ahead with the issue in question.

I also thought I had not said anything that would arouse the displeasure of the visiting dignitary. After the meeting, our Minister DP Adhikari told me that I should not be sad in any way for the displeasure as it was he who had asked me to brief the status and I had done just what I was asked to do. He was satisfied with my reply.

The Indian team came again sometime later following the visit of the External Affairs Minister to hold talks on their proposal of putting hydrological technicians at all the key rivers barring Mahakali and Karnali—mostly rivers flowing in the east in the name of collecting the river data for flood forecasting purposes. This time the talk was held at the level of Director General. The Indian side was still bent upon stationing their technicians at the key rivers for collecting hydrological stations even after we had put an alternative proposal of making them available the pertinent data by the fastest means.

I, as the DG, had to take all the criticism from the Indian side that their proposal was not accepted by our side. We thought, on the other hand, that this was no way of collecting hydrological data from the territory of a friendly neighbour. The proposal thus hung in the balance for the time being.

Our alternative proposal finally materialised after I became Secretary of MoWR in 1988 when the Indian side saw that their proposal would not fly. We had to incur some expenses for putting up physical infrastructure at the sites agreed on by both sides with the Indian side providing the mechanical equipment and related instruments required for flood forecasting. The stations became operational sometime later and India started getting information on river flows for the flood forecasting purpose and they are in operation to this day. However, India never provided the flood data at two points on the rivers whose data Nepal provided even after agreeing to our proposal as reciprocity.

9.6 West Rapti Case

India had put up a hydrological station at Jalkundi at the tail-end of the Deokhuri valley with an eye on harnessing the water resources of the West Rapti river. It had been collecting the hydrological data of the river for several years. Its intention was to use the water initially for generating around 200 MW of electricity across the Nepalese border in its territory and use the water released thereafter for the development of an irrigation system, irrigating millions of hectares of land in the downstream reach of the West Rapti basin in India, several kilometres downstream of Jalkundi.

An irrigation project with a capacity of irrigating 5,000 ha was to be developed for Nepal at Sikta Ghat at the cost of India some kilometres downstream of the

proposed site in lieu of what India received in the launching of the Jalkundi Multipurpose Project with a high dam situated in Nepal, which was solely to be developed for the benefit of India. India would have also provided some electricity as a good gesture for having allowed the construction of such a project in Nepal.

The project, if it was realised as planned by India, would have submerged the beautiful Deokhuri valley and displaced the ethnic Tharu people living in the valley. This would have caused an immense loss to Nepal in terms of environmental degradation and a political crisis.

Realising this, Nepal developed an alternative proposal on its own to utilise the waters of the West Rapti river with the construction of a high dam at a place called Bhalubang at the head-end of the Deokhuri valley for the multiple use of water for both Nepal and India. The proposal would not entail the submergence of the Deokhuri valley and displacement of the local community.

As this proposal ran counter to India's earlier proposal, even though it also benefited it, India did not show keen interest in it. This proposal is still a viable proposition, and Nepal thinks it can be developed for the benefit of both the countries.

9.7 Manusmara Case

The monsoon flood of 1974 breached the embankment of the Manusmara river in Sarlahi district in Central Nepal, giving way for its water to flow in a dry channel, which has been existing without any load of water for many years. During floods, the Bagmati River used to overflow its banks, resulting in flooding in the Manusmara River, which flows parallel but east of it. The river had, therefore, breached its bank at a place called Harkatwa, close to Dumaria village. We, therefore, plugged the breached area, following a detailed survey of the affected area, stopping the flow of water in the dry channel.

At the secretary-level meeting, the Indian side raised the issue of the drying up of the channel by plugging the natural course of water that was flowing from the time immemorial, causing the closure of sugar factories in the absence of sugar cultivation in the vicinity of the dry channel. This issue was blown out of proportion so as to charge me personally of blocking the natural course which was providing irrigation in India. The logic that we had simply carried out the repair work to plug the breached area did not bear well with the Indian side, which insisted that water should be allowed to flow in the dry nullah.

Not satisfied with our presentation, State Irrigation Minister of Bihar came to Nepal to hold talks with Rabindra Nath Sharma, Water Resources Minister of Nepal, on the issue. It was only when we showed the visiting dignitary that the dry channel never carried any water in the past, verified with a one inch to a mile map of the site prepared by India itself, that the issue was peacefully resolved, also following a visit to the site by the Indian technical team.

The Indian side also tried to have a sluice gate above the maximum level of water of the Manusmara river to keep the dry channel running with water. We also told the

Indian side that, after all the water of the Manusmara river flows into the Bagmati, which also flows into India.

There was also propaganda carried out in India that Nepal blocked the natural course of the river to deprive India of a water supply, which was not at all true. It was sad to see an issue being made out of context of a thing that did not even exist.

9.8 Water Diplomacy

During the 1960-l980s, there used to be Indian Aid Mission (lAM), later renamed Indian Cooperation Mission (ICM), working together with the Indian Embassy, looking after the Indian-aided projects.

We were to visit India for a secretary-level meeting headed by Mr PP Shah, who had just become the Secretary of the MoWR. ICM Director, Mr Pritam Singh, invited the Nepalese delegation to his residence and, to the annoyance of many Nepalese members, teased Mr Shah that the Indian side would take off his coat at the airport itself and, to make the matters worse, this time would make many gains in water-related issues. As Mr Shah only made a red face and did not make any comment, I intervened to ask Mr Singh to limit his action at that point and not embarrass the Nepalese delegation. The ICM Director stopped his jokes to continue the usual protocol of guests.

When I took part in the secretary-level talks as Director General, it was always the issue of consumptive use of water that used to take priority over all other issues. The Indian side worked at all times to ensure that Nepal used the least of water, so much so that I had to tell the Indian side that the Department would have to be closed if no water resources were to be developed for irrigation in Nepal. We have always been putting the logic that withdrawal of some quantity of water for irrigation upstream did not at all affect the downstream use in India as we are a land-limited country with enough water resource, both surface and ground.

Gradient being north to south, water always flows south. Again, water generated downstream of the intake flows downwards as there is no chance to tap it due to terrain. Even the water tapped for any project, almost one-third of it as per estimate finds its way south. So, India need not raise objection to Nepal's consumptive use of water. After all, Nepal has a cultivable land of only 2.6 million ha, which amounts to a single project that India builds at one stroke. India has numerous such projects scattered all over the country.

9.9 Karnali Multipurpose Project

Nepal and India should have joined hands to develop those multi-purpose projects which Nepal could not have developed alone. This brings us to the Karnali (Chisapani) Multi-purpose Project. That project was initiated in the early 1960s at

the behest of Nepal under the assistance of the United Nations Development Programme (UNDP) with the full support of the United States of America (USA). It was said that the then President of the World Bank, Eugene Black, was keen to help implement the project once its pre-investment study established its worth. Though the Karnali Project has all the features of a multi-purpose project, India wanted it to be called the Karnali Hydro-electric Project to forego the benefits that would accrue to India from the regulated water once it was built. It was with great difficulty and with discussions on what Karnali is to be called extended over several years that we finally became able to convince India to call the Karnali Project, the Karnali Multipurpose Project.

The UNDP-funded Karnali Multipurpose Project was completed in 1966 with power as the major component with an installed capacity of 1,800 MW and cost estimate of US$300 million. Nippon Koei Co. Pvt Ltd of Japan carried out a study under competitive bidding by UNDP. The results of their work were presented in a report, in four volumes, entitled 'Hydroelectric Development of the Karnali River-Nepal', in February 1966.

This study was independently reviewed by the Snowy Mountain Authority of Australia in February 1968, which recommended that the project be developed as a peaking power plant of 3,600 MW, keeping in with the growing demand for power in India. The project was further refined by Norconsult-Electrowatt in 1977 with the design of a rock-filled dam instead of a concrete arch dam, earlier proposed by Nippon Koei. All this was done to keep India interested in the project. The entire costs of the studies were borne by the UNDP.

The Karnali Multi-purpose Project got a major boost in 1985 when the World Bank came up with a proposal to prepare the terms of reference of the study of the Karnali Multi-purpose Project, acceptable to both Nepal and India, to be studied for Nepal with the World Bank as the executing agency. So, the Indian desire that they be involved in the study right from the beginning of the study was fulfilled. Also, a joint technical team was constituted to supervise and lead the study. A committee on Karnali, led by Secretary of MoWR of each country, representing the governments of Nepal and India, was formed to take stock of the study and make decisions on policy matters for the successful implementation of the project preparation study.

An expatriate Canadian consultant firm, called the Himalayan Power Consultants Pvt Ltd, was jointly selected for the study. The study was carried out in earnest, covering the aspirations of the Indian side. On the conclusion of the study, its outcomes, including the project parameters, were not acceptable to the Indian side, putting great doubt on the implementation of the project itself, which was started with much hope and great aspirations.

From there onwards, the project, with an installed capacity of 10,800 MW, became almost a mirage. Sadly, it could not come through. Nepal had already incurred millions of US dollars in the name of the study to cover the interests of India and help implement this mega-project, which would have helped Nepal to boost its economy by selling energy to India and to develop an industrial base for Nepal with the energy produced by the project. The project would have equally

benefited India to meet the deficit energy so badly needed for its domestic as well as industrial consumption.

It is worth mentioning here some of the best efforts made by our side in the cause of the Karnali Multipurpose Project. They are briefly described below.

As Secretary of Water Resources, I thought it would be better to take the Indian Secretaries coming to talks to the site of the dam of the Karnali Multi-purpose Project to show what shape this mega-project could take if the Indian side took interest in the implementation of the project. This was appreciated by all sides, including the Indians; I also got clearance from our government. Accordingly, I planned and managed to take the Secretary of Water Resources Naresh Chandra and Secretary of Power Raj Gopal to Chisapani in 1989, the site of the dam of the Karnali Multi-purpose Project. After flying from Kathmandu to Nepalgunj, the distinguished guests were taken by car to the Karnali Resort, situated on the left bank of the Karnali River, for a night halt.

The Indian side had all praises for the arrangements and the warm hospitality accorded to them. A boat was also arranged to take the guests upstream of the Karnali to have a better and picturesque view of the gorge and the dam site. Lunch was arranged at the right side of the mighty Karnali River, to be used as the campsite of the consultants, with all infrastructures built those days intact.

We took back the Indian guests full of hope to Nepalgunj. The guests were put up in the best hotel that we could manage for the night as the flight supposed to take us to Kathmandu was cancelled due to bad weather. Next day, we flew back to Kathmandu. Our Indian guests very much enjoyed the trip and they had by now the complete picture of the project itself, as I was told. I was happy again that my long-time wish of taking the distinguished Indian guests to the Karnali Chisapani dam site was fulfilled.

We used to have several meetings in Kathmandu and Delhi, talking about projects, but we had never had the real feel of the project as we had this time. I really felt that we should take more of our Indian friends as frequently as possible to the projects we discuss over the table, stressing the genuineness of purpose so that cooperation in water resources development can take place.

Implementation of the Karnali Multipurpose Project was hot on the agenda. Then came the question of technical human resources required for the project. Nepal did not have enough technical human resources to handle the project. It was thought at that time to recruit fresh engineering graduates produced by the University of Roorkee. It was agreed that UNDP would make available the required financial resources to the University of Roorkee to produce 250 engineers in five batches of 50 engineers. The MoWR was to conduct examinations to select 50 candidates that were to qualify for the undergraduatc course in the University of Roorkee for the engineering study each year. The first batch went to Roorkee for education in 1980, followed by similar batches till 1984 when 250 candidates had been selected. The first batch of engineers started coming in from the year 1984, followed by other batches till 1988.

Unfortunately, the Karnali Multipurpose Project, which was started with much fanfare with the involvement of India right from the start of the study of the project, was nowhere in sight to be implemented. So, the young engineers who should have joined the Karnali Project on being commissioned as engineers, had to loiter in the MoWR, seeking jobs, as under the five-year bond they had signed with the Ministry, they were bound to work there whether the project was implemented or not. For the Ministry, the newcomers became more of a burden than assets, as it had to arrange their placement with no vacancy available.

The anomaly was, however, sorted out after a long time, creating pools for posts to be filled. The first batch was thus amalgamated within the projects under the Ministry. The employment of engineers, however, began to worsen year after year with no placements. When the issue began to harden with the newly recruited engineers becoming impatient, the government brought out a scheme for them where they could get loans from the government for starting some engineering undertaking. This also could not absorb all the engineers in the fray and the situation became tense.

By that time, I had joined the MoWR as Secretary. This was a challenge to be solved. The first thing I did was to release the engineers from the five-year bond of serving the Ministry with the approval of the Cabinet. The second thing was, they could join any Ministry and the third thing was, they could go abroad on their own to pursue further studies. Thus, the vexing problem was solved. From that time on, the Ministry never bothered where the Roorkee-trained engineers had gone other than those that remained under its umbrella organisations.

When the floodgates were thus opened for new engineers, they began working in many other Ministries and some even left the country to pursue their higher studies, feeling quite happy that they had been released from the duty bond. Some, disgruntled with the government, never joined the government service, but stayed in Nepal doing odd jobs, as consultancy services had not flourished then as in the present day. For Nepal, it was a lost cause and the opportunity floundered to the great dismay of the donor organisation that footed the bill for the study.

9.10 Pancheshwor Case

The Pancheshwor Project was also a case of long experience. We often used to hear that India wanted to build the Pancheshwor Project during the 1970s and for that, it needed Nepal's clearance to carry out investigation on the Nepalese side of the territory. Nobody then had a clear idea of what India wanted to do per se and what river was involved. India in fact had been conducting all the studies required for the preparation of a mega-project and had completed most of the studies in India itself, barring some studies in the Nepalese territory. It was even found later that the Indian

side had already done some geological studies in the Nepalese territory on the left bank of the Mahakali River. It was on our visit to the site of the Pancheshwor Project in the early 1980s that many of the things so far unknown became clearer.

The Pancheshwor Project was to be developed on the Mahakali River. The project had been named Pancheshwor as a temple of this name lies on the axis of the dam to be raised for the project on the Indian side of the border. As the Mahakali is a common river, it was but natural for Nepal to take an interest in its development, and we started requesting the Indian government that it should be jointly studied. On our request, the Government of India sent terms of reference for the study, which was one-sided. When we sent the amended terms of reference back to India, it emerged that a study on each side (i.e. India and Nepal) should be carried out by Nepal and India independently to be assembled as a joint report on the completion of the study. The World Bank financed the Nepalese part of the study.

9.11 Tanakpur Case

In the early 1980s, India was undertaking a project, called the Tanakpur Power Project, with an installed capacity of 121 MW, using the gradient available in the Mahakali River within its territory. When Nepal came to know of this construction, it wanted to know its impact on the Nepalese territory. India first kept mum and later, on our insistence, said that the project was being built in the reach of the Mahakali River having the sovereignty of India and it did not in any way affect the Nepalese territory. The project, except for the afflux bund, was started in 1983 and completed in 1988.

After the political changes of 1990, India wanted to tie up the afflux bund of the intake work with the high ground in the Nepalese territory. This would have submerged a portion of Nepalese territory, which would have run counter to the earlier stand of India that the Tanakpur Power Project did not in any way affect Nepal. The ground reality was that the Tanakpur Power Project could not have become operational without tying the afflux bund with the high ground in the Nepalese territory. If the afflux bund was not tied with the high ground in Nepal, the Mahakali River would have outflanked, thus making the Tanakpur Power Project ineffective.

During the visit of the Nepalese Prime Minister, GP Koirala, to New Delhi in December 1991, the Indian wish was complied with and in lieu of that, Nepal got reduced the demand for power to 10 million kWh and also got some irrigation benefit. The same benefits had been substantially increased following the conclusion of a treaty between His Majesty's Government of Nepal and the Government of India in 1996 concerning the integrated development of the Mahakali River, including Sarada Barrage, Tanakpur Barrage and Pancheshwor Project.

9.12 World Bank's Babai Case

Then, there was the case of the Babai Irrigation Project. This project was developed when I was Director General and materialised when I was Secretary, MoWR. The full feasibility of the Babai Irrigation Project was prepared with tender documents for the construction with the loan assistance of the World Bank. The World Bank was to give additional US$60 million for the launching of the project when India stopped the assistance of the World Bank. The World Bank fielded several technical missions to look into the hydrological study of the Babai River. Each mission confirmed that there was no adverse impact from the project as the same quantity said to be diverted was available at the Nepal-India border. The Indian side was not, however, amenable to the reports of such missions.

After a hitch on the issue for a long time, the World Bank wanted, at the behest of India, commitment from Nepal that it would not divert more water from the Babai River other than what was stipulated in the project. This would have severely restrained the future use of the water of the Babai River; as such it was not acceptable to Nepal.

Furthermore, it would have set a precedence on other rivers to the disadvantage of Nepal. With this stumbling block, Nepal did not lose heart. It went ahead with the construction of the Babai Weir-cum-bridge with its own resources and also built the canal system, unmoved by what had happened when I was Secretary, MoWR. This shows that, given determination, Nepal can go along with its plan under adverse conditions, even though the project implementation may take longer time when it has to be built with the country's own limited resources. I, for one, take great satisfaction that I played a key role behind the scenes, sometimes for the realisation of this project.

9.13 Kankai, Kamala, Bagmati Cases

This was not the first time that India had blocked assistance from international institutions. ADB was preparing the Kankai Multi-purpose Project with a medium-size dam for irrigating large chunks of area in Jhapa district and generating electricity for the power-short nation. India objected to it. The project was set aside and a small irrigation project was implemented in its place.

Such actions on the part of India did not help to foster friendly relations between Nepal and India, though time and again it is stressed that Nepal and India, bound by age-old friendly cultural ties, have very close relations.

India used to raise objections whenever Nepal built any irrigation project, big or small. It raised its voice when the 5,000 ha Banganga Irrigation Project was built in Taulihawa, Kapilbastu district. Similarly, it objected when Nepal built the 25,000 ha Kamala Irrigation Project to irrigate land in Dhanusha and Siraha districts and the 37,000 ha Bagmati Irrigation Project to irrigate land in Sarlahi and Rautahat districts.

India unsuccessfully tried to block the Saudi aid for building the infrastructure for the canal in the Bagmati Irrigation Project. Nepal all the time consistently put the logic before India that withdrawal of water from rivers for these projects did not affect India to the extent of harming its interests, as stated earlier, that the withdrawal was small, based on the run-of-the-river flow and there is every likelihood of some water finding its way to India again through various avenues.

9.14 Inundation along the Nepal-India Border

Another issue with India is four 'Sagars' (Mahali Sagar, Marthi Sagar, Sisuwa Sagar and Bajha Sagar, all in Kapilbastu district); pools of water working as reservoirs created in Nepal from the bunds constructed by India just downstream of the no-man's land with the intention of irrigation in India, while the Nepalese land and villages remained under water during the rainy season. This was really a great injustice, which was always raised in Nepal-India talks as the people of the villages affected raised the problem of submergence from the 'Sagars'. People even taunted that the Sagars are in the Nepalese territory while irrigation is effected on the Indian side across the border.

The logic given by India was that such cross-country structures were built with the approval of the then Rana Government. The crux of the problem was to see its resolution rather than what happened in the past. Given goodwill, such grievances on the Nepalese side could still be resolved as one's woe cannot be joy for another.

To make the matter worse, India started building a few more structures without any consultation with Nepal. The ring bund built by India to protect Bairagania in the district of Sitamarhi in the State of Bihar is a glaring example of what a big neighbour can do to a small neighbour. The ring bund built by India closed the waterway of various dry *nullahs*, which became active during the monsoon, submerging offices and villages in Gaur in Rautahat district of Nepal. The sluices built by the Indian side were used as regulators to irrigate the land enclosed by the ring bund. The sluices were of low capacity and took a long time to drain the flooded water. Only after a number of interventions by Nepal did the Indian side take the necessary measures to increase the capacity of the sluices to release the floodwater on the Nepalese side.

Another vexing issue for Nepal is the cross-border embankments spread over the Nepal-India border built by India in the name of protecting various structures across India. These structures badly affect the Nepalese territory either by submergence or by erosion of land. India should have taken precautions not to affect the Nepalese territory while taking up construction work in sensitive areas of the border. Unfortunately, these structures were made without mutual consultation, causing hardships to the other side. Voices were raised at regular meetings and assurances were given to the affected side that the impact of such constructions would be looked into. Even joint teams were constituted to go into the effects of such constructions. No progress seems to have been made in this direction.

The sad thing is that such constructions continue to be made in the face of the concerns raised by Nepal from time to time. It is not that India should not make such constructions across the border, but in doing so, it should be sensitive to the likely harm such constructions can cause in the absence of mutual consultations. There are engineering solutions to each problem, had the Indian side tried to consult the Nepalese side before its construction. Once the construction is done, it is very difficult to do anything but other than raising up one's concern. These issues had been dealt with politically at the highest level. But things have not improved yet.

9.15 Bilateralism

India always tried to raise the issue of water resources development at the bilateral level so much so that it did not like the involvement of international institutions, like the World Bank, let alone any other country. Its contention was that the parties concerned themselves are competent enough to handle the issue at hand. Thus, India always has the upper hand in settling issues in its favour. The fear can clearly be seen in the involvement of the third party. The weaker side of the two involved in negotiation always needed external help to come to some resolution of the disputed issue. This India should realise if pending issues are to be resolved to get along with the implementation of the projects already agreed upon between the two sides. An example can be cited of the implementation of the Mahakali Trcaty, which was signed with great hope, and enthusiasm, which could not move ahead in spite of bilateral discussions, even when there was clear provision in the treaty that the detailed project report (DPR) of the Pancheshwor Multi-purpose Project would be completed within six months of the conclusion of the treaty. Such six-month provisions were made on earlier occasions in other projects, too, at the highest level, but they never materialised. This again is really unfortunate.

9.16 Farakka Augmentation

Bangladesh was trying to convince India that the issue of augmentation of the Ganges water at Farakka could be resolved with the involvement of Nepal in constructing seven high dams in Nepal. They are the Chisapani high dam on the Karnali River, the high dams I and II on the Kali Gandaki River, the high dam on the Trishuli Ganga River, the high dam on the Western Seti River, the high dam on the Sapta-Kosi River and the high dam at Pancheshwor on the Mahakali River. These high dams have a storage capacity amounting to 70,000 million m^3, which, Bangladesh thought, was sufficient to fulfil its requirement of water as well as that of the co-riparian countries, viz Nepal and India.

India and Bangladesh came together in October 1986 to discuss the augmentation issue of the Ganges water at Farakka. India and Bangladesh had made

the common ground, before coming to talks with Nepal in Kathmandu that they would request the Nepalese side to make the data available only formally at the meeting without the involvement of Nepal in subsequent talks about the proposal.

Since Nepal was not going to be involved in the subsequent talks on the use of water, it did not show any interest in making available the data, whereas India and Bangladesh insisted that they would consider the involvement of Nepal only after they had studied the data made available to them by Nepal. Although data per se was not an issue for Nepal, the intention of both not to involve Nepal in subsequent discussions put the whole issue in jeopardy. Nepal was not agreeable to such a joint proposal of India and Bangladesh. It took a consistent stand that it would not make formally available the data sought by both parties where Nepal was not to be involved.

Nepal also argued that the real resolution of the issue could not come without the involvement of Nepal when the issue being raised deeply involved Nepal. Data as such might have been in the possession of both sides from several sources available to either side. Thus, the meet concluded without any tangible result.

The foreign ministers of the three countries, Nepal, Bangladesh and India,also met in Kathmandu later to resolve this issue without any success. This time also they could not agree to the joint communiqué they thought they would issue after the talks.

9.17 Chandra Shekhar's Visit to Nepal and 600 MW Budhi Gandaki

When Krishna Prasad Bhattarai was prime minister of Nepal, Chandra Shekhar, prime minister of India, made a high profile visit to Nepal, a return visit to the one made by Bhattarai earlier to India on becoming the prime minister of Nepal after the political change of 1990. It was a goodwill visit on the part of Chandra Shekhar as both were on very good terms and no particular issue was at stake.

On the official-level talk, I, as Secretary of MoWR, was one of the members of the Nepalese delegation headed by Krishna Prasad Bhattarai. My counterpart in the Indian side, Mr MG Padhye, also took part as a member of the Indian delegation led by Chandra Shekhar. The talks were held in a cordial manner. Both sides agreed during the discussion that Secretaries of MoWR of both the countries would meet separately to probe the areas of cooperation in the field of water resources.

The meeting that took place between my Indian counterpart and me the same day lasted almost three hours with the Indian counterpart presenting several projects for joint survey and investigation. I told my counterpart that the projects he mentioned had already been investigated and as a proof I gave him several reports we had already studied, including the 600 MW Budhi Gandaki Hydro-electricity Project.

My counterpart showed keen interest in that project and suggested that it could be included for possible cooperation in the field of water resources in the joint communiqué to be issued at the end of Chandra Shekhar's visit to Nepal. I thought it was a good gesture on the part of India and that, for the first time, India was agreeing to work on a sizable project, viz the Budhi Gandaki Hydroelectricity Project. Accordingly, this project was mentioned in the joint communiqué issued by both countries at the end of the visit.

9.18 Bhutan Model in Nepal

Before the conclusion of our talks, my Indian counterpart, Mr Padhye, conveyed to me that we should be working on projects on the Bhutan model. I replied that we should work together in any project with the stake of each participating country. The Bhutan model my counterpart was referring to was the project to be entrusted to India for investigation, construction and operation. India had made a few projects on those lines in Bhutan. I told him that it was perfect for him to work in Bhutan that way. However, it would be difficult to sell such a model in Nepal, as people would think projects have been sold out to India. Thus, such projects would have never materialised. It was possible in Bhutan, as the Bhutanese did not feel subservient to such an arrangement as Bhutan depended on India on technical matters and it could not afford to displease India. So, whatever India wanted to do in the field of water resources in Bhutan, it prevailed. Besides, India had some treaty obligations with Bhutan, which both sides had to maintain for mutual interest. I made it plain to Mr. Padhye that we had no objection to what India was doing in Bhutan as it had been doing with the tacit agreement of both sides.

In our case, I stated that India's help was welcome. We should plan and implement together with our full involvement so that there was no grudge on each side on the completion of the project. As an example, I cited the Kosi and Gandak projects where people still think Nepal got a raw deal and thus is a loser. I said this should not happen in future. Both sides should be adequately covered for any project to be handled as a win-win project. Our prime minister, Krishna Prasad Bhattarai, after seeing off his counterpart, congratulated me in front of Nepalese colleagues who had assembled at the airport for aptly handling the Indian side on water resources.

I was very happy that my discussion with my Indian counterpart went very well so much so one significant project was to be jointly implemented by Nepal and India, as brought out in the joint communiqué issued after the visit.

Unfortunately, the project never took the shape we had envisaged. I later realised why my counterpart was mentioning the Bhutan model. Surely, India would have liked to develop the 600 MW Budhi Gandaki Hydroelectric Project independently, had the project been presented to India on a silver platter by Nepal. India should realise by now that such a thing could have never happened. Even if it did take

place, it would not have lasted long as the aggrieved party in the deal would continue to complain.

9.19 Water Resources and MEA, India

Most of the times, the technical-level talks were reasonable. It was only when the Indian embassy intervened on the concluded talks that the trouble started, not only for us but also for the negotiating team from India, with both sides putting up new views with the change of already agreed minutes.

I was Secretary of MoWR when India applied sanctions on Nepal in support of the political parties in March 1989. At that time, the Gandak Western Main Canal, which supplies water to UP and Bihar, collapsed due to heavy rain and poor maintenance, resulting in the closure of the Gandak power house, which was fed water from the same canal. When the canal collapsed there was a hue and cry from the local populace as some of the standing crops in the cultivated land were damaged and they demanded compensation. I had then asked our liaison office that our office and the Gandak Project Office, India, prepare a joint report of the damage caused by the collapse of the canal.

It was done as directed and the damage amounted to about Nrs. 600,000. The Indian side wanted to repair the collapsed canal, but the local inhabitants would not allow this unless they were paid damages. Their demand was reasonable and they would not listen to the local administration. On the other hand, the Indian side could not assure when the local inhabitants would be compensated.

In the meantime, the Indians put out news in a local newspaper that the Nepalese did not cooperate and the chief ministers of the two affected states of Uttar Pradesh and Bihar were to see the External Affairs Minister of India to raise the issue at the state-to-state level to put pressure on Nepal. I thought it was a big injustice. First, India had not approached Nepal for any help from the Nepalese side at the centre. Second, they could not assure the local people that they would be adequately compensated. Third, India was trying to make a big issue out of it.

As soon as I had read the newspaper, I immediately called the Indian Ambassador Aurobindo Kumar Dev and asked him to visit my office to talk about the resolution of the issue. He said he was also worried about it and would come to my office in half an hour's time. When he arrived at my office, I told him that it was unfair for India to make a mountain out of a molehill. I told him it was a local issue, which should have been solved with the payment of damages according to the joint report. They should not make a big fuss about it. When he realized all the things I had put up, he told me that it would take some time to sanction money from the central government. I also told him it would also take some time if we were to pay it, to be reimbursed by India later.

As we were also losing revenue with the closure of the power station, which we had been operating after it was handed over to us, I thought it would be prudent on

our side to get this compensation amount of Nrs.600,000 paid by the Nepal Electricity Authority, to be reimbursed by India at a later date. So, I called the Managing Director of NEA, Mr Harsha Man Shrestha, who agreed to my proposal to successfully resolve this issue. The Indian Ambassador was very happy and the next day with a profusion of thanks to me, said that the canal repair would start. I said 'Thank God'. This could have been worse and India would have put all the blame on us for the part it had not done.

The Indian Ambassador, after calling me on the telephone, sent a cheque within a week in the name of NEA as reimbursement of the amount paid as compensation, thanking me for the resolution of the issue at hand.

This episode would be incomplete without the mention of the key role played by the Indian Embassy in all the secretary-sevel talks held in Kathmandu. In all the government-level talks between the two countries it used to fully participate and guide the Indian side involved in the talks, even at higher level.

This reminds mc of the secretary-level talks held in December 1988, which I was leading. After having concluded the talks with my Indian counterparts, two—in number—Secretary, MoWR, Naresh Chandra, and Secretary, Ministry of Power, Raj Gopal the minutes of discussions were agreed upon. It was agreed that the final minutes were to be printed and signed in our office at 5 pm as their departure flight for New Delhi was scheduled for 7 pm. After this they went to their embassy. At the appointed hour, the two secretaries came back and told me with great discomfort that they needed to make some changes to the agreed minutes. They also expressed their apologies for getting this done at the last moment, as there was little time between the signing of the minutes and their departure time for Delhi. I did not show any displeasure, but said that the Nepalese side would also have to amend the minutes to the extent of the present additions from the Indian side. This was quickly done and the task of completing the minutes was assigned to our computer people.

Our staff were very fast, even when every minute was ticking away and the flight time was approaching. I somehow managed to send some responsible people to the airport to make a time cushion for some 15 minutes, which they were successful in doing. In the meantime, we signed the minutes and all three secretaries of us rushed to the airport in the same car. Inside the car, I was applauded by both the secretaries for accommodating their last-minute changes and still making their flight possible for New Delhi. I could read the uneasiness in their expressions that these changes had to be made.

At the airport, after the departure of the guests, Ambassador Aurobindo Kumar Dev was all happy that the changes were made to the agreed minutes at the last moment and said in a jovial manner to his First Secretary 'Please be mindful of water people. They had been kind to accommodate our demand even at the eleventh hour.' I also replied to him jokingly 'You make water people drink water'. In other words, you often put them in an awkward position. There maybe several other instances but this one is really memorable.

9.20 Way Forward on Indo-Nepal Water Resources Cooperation

Water talks with India will continue at all times, as water is an important resource for both the countries. India will need Nepal's cooperation as Nepal needs Indian goodwill for the implementation of the projects involving the two countries as long as river water flows from north to south.

As Nepal feels handicapped by deficiencies in many areas of water resources development, it is Nepal, and not India, which should be fully prepared to negotiate with India in the coming years. Nepal should utilise all the knowledge available with it for this purpose from all sources. It should pool in knowledge from all quarters. The retired engineers who have gained enough experience while in government service could be one such source. Nepal should also hire the services of foreign expatriate consultants on issues of great importance to assist the Nepalese negotiating team on critical issues where the team may not have adequate knowledge and exposure.

9.21 Building Mutual Trust and Confidence

It is very essential that Nepal and India move towards building mutual trust and confidence and only when such mutual trust and confidence is established can both countries move towards implementing water resources projects of substance. However, this had not happened in the past, even though there were several opportunities, mainly because India wanted to go its own way in the implementation of projects without caring for the susceptibilities of the Nepalese side.

The political situation was not stable in Nepal for one reason or another, and India wanted to take advantage of such instability. Unreasonable demands were being made as a way to the solution to the problems faced by Nepal at that moment. Such an unstable situation will not be there forever. So, both sides should strive hard to have meaningful cooperation with a win-win situation of tangible results.

Water is a substance which is bound to tie Nepal and India under opportunities and threats, opportunities when water-related issues are resolved in a win-win situation and threats when such issues remain unresolved and pending for a long time with bitter and sour relations.

Solutions to the issues lie in opportunities rather than threats. Nepal should be fully prepared before going to talks with India. Exercises should be held within the group of knowledgeable technical hands with possible points the other side may raise with the answers to them in order of priority, thus maintaining sound flexibilities. As most of the talks at the decision level are taken at secretary level, the secretary should be fully briefed by departmental heads on all the points of the agenda beforehand.

The secretary should do his own part of the study and must be fully conversant with them. Only then would Nepal have meaningful dialogue with India. Nepal and India are bound to come to a satisfactory resolution of all issues related to water sooner or later as the demand for regulated water will grow from year to year in India. Regulation can take place only with the construction of storage dams in Nepal. Nature has gifted Nepal with a number of favourable sites for harnessing water. India should also realise that the project should be fully studied to cover all benefits and disadvantages, and it must be prepared to share benefits with Nepal, providing all pertinent data for study. So far, India has been reluctant to make officially available, those data that have already been made public. This brings mistrust and bad faith into play instead of a meaningful relationship.

If the past is any lesson, Nepal should not lag behind to extend the hands of cooperation to India in developing water resources for mutual benefit. If it does not take place, Nepal need not feel sorry about it and need not hanker after it. Nepal should give priority to the development of hydropower for its own use, mobilising external resources and its own internal resources as much as possible. This also applies equally to the development of irrigation for agricultural purposes. Norway and Sweden, with rich potential of hydropower, took 100 years to exploit the total potential. Nepal may take 200 years or more to develop what others developed in the past 100 years.

We should also understand that resources not harnessed today are mined for tomorrow for development by future generations when conditions may become more favourable. When development takes place in the country, avenues for water resources development will also automatically follow. For this, development has to be done by the Nepalese themselves with whatever support is available from outside.

Notably, India had built goodwill at all influential places in Nepal, even in government circles where it matters to it the most, by offering benefits and other facilities. India is a vast country with enough opportunities for such things, but it amounts to corrupt practices for government service holders to enjoy such facilities from a friendly country, which can affect official dealings with India. Such things continued under the very nose of the government. I think the government needs to check these if it wants the negotiations on major issues with India to go smoothly. Taking a stand and begging for facilities do not go together in the conduct of relationship with friendly countries.

The government needs to control its employees from accepting such benefits. The person who took a stand on the issue of negotiations was branded as anti-India and held in disgrace to the great risk of performing his own duties. This should never have happened. Things like these were taken for granted, and people saw no harm in enjoying these facilities as they went on practising such things. These, as we see, are petty things but they greatly influence the conduct of officials in the performance of their official duties.

9.21.1 Way ahead

Some suggestions are made for the development of key sectors in Nepal's water resources in spite of the fact that Nepal faces various problems ranging from its water relations with India to resource constraints on the development of its water resources.

9.21.2 Irrigation

Nepal has an irrigable land of 1.76 million ha over the cultivated area of 2.6 million ha. It should fully develop the irrigation potential over the years as laid out in the National Water Plan, released in 2006. The area involved is around 600,000 ha. Both surface water and groundwater should be tapped for this purpose, utilising as much as possible internal resources for the use of surface water and mobilising external resources for groundwater development. Nepal should always be mindful of developing this sector, notwithstanding what goes on the water resources issues with India. She cannot afford to keep this sector in stagnation, learning from the past.

9.21.3 Power

Nepal should develop hydropower in both the public and private sectors to meet domestic consumption. The external support available from friendly countries should always be tapped and new avenues should be opened for the participation of the private sector already involved in the harnessing of hydroelectric power in Nepal. The local construction company, which is instrumental in realising the Chilime Hydro Project should be encouraged to take up more profitable projects along the lines of the Chilime Hydro-electric Project which has already proved its worth in the private sector. The National Water Plan clearly lays out short-term, medium-term and long-term plans for meeting the domestic power demand and exporting the surplus hydropower generated.

9.21.4 Multi-purpose Projects

Nepal should work together with India in materialising multi-purpose projects beneficial to both countries. Even if one such project could be successfully implemented, it would be a guide for upcoming projects. Multi-purpose storage projects

alone can meet the bulk power demand of India and Nepal's aspiration to export bulk power to India.

The storage projects constructed upstream in Nepal alone have the added advantage to make a firm water supply available for irrigation to the existing projects made by India in the Ghagra (Karnali), Narayani and Kosi rivers by means of regulated flows in these rivers. Both countries have to closely work out measures to implement such projects in a win-win situation, leaving all bitter past experiences behind. All efforts should be made by both the sides to bring to fruition the ongoing study of the Sapta Koshi Multipurpose Project.

No matter what India chooses for its energy development, hydropower development with many other spillover benefits in water resources development would always remains an attractive proposition.

9.21.5 Inundation

Nepal should at all times be conscious about the inundation problems in the areas along the Nepal-India border. She should frequently use the existing institutional arrangements with India such as the Standing Committee on Inundation Problems (SCIP), Sub-Committees on Embankment Construction (SCEC) and High Level Technical Committee (HLTC) for having an overview of the inundation problems and working out the ways and means, if not to totally alleviate the problems, to minimise the effects of the inundation problems.

9.21.6 Treaty Regime

Under the Kosi and Gandak agreements, there are liaison and land acquisition offices in the project areas: one in Biratnagar in the Nepalese territory and another in the Indian territory close to the Gandak Barrage. These offices are merely working as facilitating offices for India without due care of the Nepalese interests within the terms of the agreement. Both offices are on the payroll of the Government of India and the low-ranking officers serving from the side of His Majesty's Government are working as pawns of the project authorities. It is high time Nepal regularises such offices with proper staffing to look after the interests of both countries and takes maximum benefits from the ongoing agreements. Payment to the Nepalese staff should also be made from the Nepalese side so as to keep the Nepalese staff within its control.

9.21.7 Tenure of Project Agreements

Suitable dates should be inserted in both the Kosi and Gandak agreements to indicate the period of agreement to remove the anomalies of the past.

9.21.8 The Current Impasse

The current impasse in the implementation of the Mahakali Treaty has to be resolved with the due care of both countries in the true spirit of friendship and cooperation, as enshrined in the Treaty.

9.21.9 The River-linking Plan

India has a gigantic river-linking plan, which it envisages to complete over a number of years. Though India has not formally approached Nepal about it, Nepal's cooperation will be essential to make it a success. Nepal should be able to utilise this opportunity of cooperation for its maximum benefit while extending its hands of cooperation. For this, Nepal should be working from now onwards on what should be the strategy for such cooperation, keeping in mind the overall national interest.

Chapter 10
Inundation at the Southern Border

Dwarika Nath Dhungel, Santa Bahadur Pun and Basistha Raj Adhikari

10.1 Context

Inundation is the submergence of standing crops, settlements and natural vegetation over a long period of time, which not only affects human activities but also damages property and lives. Inundation occurs adjacent to the flow-paths of natural water bodies for several reasons. The first reason is the high intensity rainfall in the gentle country slope area, where normal sheet flow cannot drain the standing water depth quickly enough. The second reason is the congestion or obstruction of natural flow-path due to human activities.

The natural drainage of all the rivers of Nepal is the Ganges basin. Although ‚the country occupies only 13 per cent of the total drainage area of the Ganges River' (CMS 2004), it contributes as much as 71 per cent in the lean season and 46 per cent of the average annual flow of the Ganges River at Farakka in India (Bandhopadhayaya 1995). In this context, the inundation problems at Nepal's southern borders are discussed from the perspectives of the contentious spot in the Nepal India relationship along with institutional arrangements existing between the two countries to deal with this issue. (Fig. 10.1a, b)

D. N. Dhungel (✉)
Senior Researcher, Former Executive Director, Institute for Integrated Development Studies (IIDS) and Former Secretary, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
e-mail: ddhungel@hotmail.com

S. B. Pun
Former Managing Director, Nepal Electricity Authority and Former Officer on Special Duty, Ministry of Water Resources, Government of Nepal, Kathmandu, Nepal.
e-mail: santapun@ntc.net.np

B. R. Adhikari
Water Resources Engineer, Kathmandu, Nepal.
e-mail: basistha@wlink.com.np

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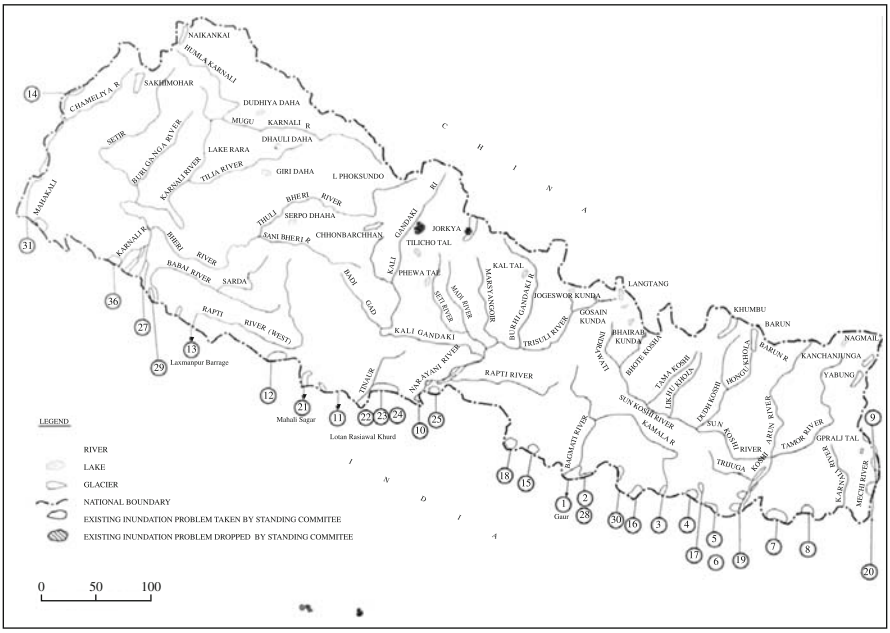


Source: Progress Report (1) for the Study on the National Hydro-Meteorological Management Project (Annex) Ministry of Water Resources, Department of Hydrology and Meteorology, Kathmandu 1991.

Fig. 10.1a Inundation Spots (Sketch)

10.2 Flood, Inundation and Institutional Arrangements

As already discussed in the introduction chapter, Nepal possesses enormous water resources potential flowing through 6,000 big and small rivers, exceeding 45,000 km in length. Thus, the drainage density, 'which expresses spacing channels' is approximately 0.3 km per sq km' (IIDS 2001). Nepalese rivers, on the basis of their origin, are classified into three grades: the first grade[1], the second grade[2] and the third grade[3]. The average annual runoff from all these rivers is estimated to be about 200 billion m^3. All the rivers pass through a boulder stage before descending into the Terai plains and cross the Nepal-India border in alluvial stages.

During the monsoon (June-September), cloudbursts, landslides and flash floods are common in the Himalayas. As water flows down from the mountains to the plains, the rivers cut banks and also shift laterally. Before entering the plains, most of the rivers either have high gradients to enable them to transport their bed loads or flow through narrow gorges without any possibility of bed load retention. But when they

[1] Saptakosi, Narayani, Karnali and Mahakali belong to this group and their sources are the snows and glaciers in the Himalayan regions of Nepal and Tibet (IIDS 2001).

[2] Kankai, Kamala, Bagmati, West Rapti and Babai belong to this group and originate in the midland Mahabharat ranges (Ibid).

[3] Rivers such as Ratuwa, Chisang, Lohandra, Balan, Lalbakaiya, Sirsia, Rohini, Tinau, Banganga, Mohana, Syali etc belong to this group and originate from the southern slopes of Siwalik/Churia and Mahabharat ranges (Ibid).

Village	District	River in Terai	Area No. in Source
(1) Eastern Development Region			
1. Lagadi, Langadiyani	Siraha	Gagan	4
2. Govindpur, Lalpatti	Sapatari	Khando	5
3. Tilathi	Sapatari	Khando	6
4. Sahebganjanj	Sunsari	Burhi and Kaisali	7
5. Majhore	Morang	Lohindra	8
6. Bahundangi, Jamir, Kakarvitta	Jhapa	Mechi	9 & 20
7. Belhi, Tharhi, Balan	Saptari/Siraha	Balan	17
8. Bairawa	Saptari	Drainage congestion by Kosi Canal	19
(2) Central Development Region			
9. Gaur Bazaar, Gaur	Rautahat	Bagmati/Lalbakiya	1
10. Raghunathpur, Balra, Hathiyol	Sarlahi/Mahottari	Marha Manusmara	2
11. Phulbaria, Musharia, Mukhiapatti	Sirah	Kamala	3(a) & 3(b)
12. Inarwa	Parsa	Uriaiya	15
13. Amarpatti	Parsa		18
14. Raghunathpur	Mahottari	Marha	30
(3) Western Development Region			
15. Rangpur, Tulsipur, Bijuwa	Kapilbastu	Siswa, Marthi, Bajaha and Mahali Sagar	11
16. Suata	Nawalparasi	Narayani	10
17. near Surajpur Powerhouse	Nawalparasi	Gandaki Western Main Canal	28
18. Jamuni	Dhanusha	Jamuni	16
19. Karaulia, Heradawa, Semari, Itahawa	Kapilvastu	Banbanga	21
20. Pakhilhawa	Rupandehi	Danda	22
21. Bhiali	Rupandehi	Ghagar	23
22. Parthahewa, Pajarbatti	Rupandehi	Rohini Nadi	24
23. Bhujelhawa, Sankharpur, Kurthawal	Nawalparasi	Jharai	25
(4) Mid-western Development region			
24. Nepalgunj	Banke	West Rapti	13
25. Rajapur, Gulariya	Bardia	Karnali and Saryu	27 & 29
26. Dang Koilabash	Dang	Gurangena	12
(5) Far Western Development Region			
27. Chaugurdi, Dhansingh	Kailali	Karnali	26
28. Darchula	Darchula	Mahakali	14
29. Jogbura	Kanchanpur	Escape Channel of Sarada Canal	31

Note: The area numbers refer to numbers given in No. 10.1a Inundation Spots (Sketch)
Source: Progress Report (1) for the Study on the National Hydro-Metrological Management Project (Annex) Ministry of Water Resources, Department of Hydrology and Meteorology, Kathmandu 1991

Fig. 10.1b Inundation Spots (Names as per numbers)

reach the plains, they spread out and their gradients decrease abruptly. This results in an abrupt decrease in their capacity to transport bed load, which results in a rise in their bed level and thus a change of course and flooding of new areas (Jha 2004). Various other factors such as high flow rates of smaller rivers, bed load deposition and glacial lake outbursts[4] contribute to the inundation of large areas of land.

[4] Outbursts of glacial lakes have recently been recognised as one of the cause of catastrophic floods in Nepal. Glacial Lake outbursts are feared for the potential devastation from a single large event. GLOF can release millions of cubic meter of water in a few hours. Obviously such discharges have enormous power and the potential to do considerable geomorphic work. Some of the examples of flooding caused by GLOF are the destructive flood in the Khumbu Himal of eastern Nepal in August 1985, Indrawati Valley in 1956 etc.

Human factors are also equally responsible for inundations and floods. Several infrastructures like roads and irrigation canals have been constructed adjacent to the border area, which has encouraged in-migration of people from other parts of the country in search of food and employment. With the increase in population, encroachments of river flood plains have also been experienced in several locations, resulting in congestion of drainage flow paths.

Another equally important human-induced factor 'is the encroachment of marginal lands along the river channels. Poor and marginal farmers usually live in such lands in search of food and shelter as these lands are highly productive. Such a practice generally produces congestion in the natural flow of gully and river channels. As a result, during heavy rainfall, the rain water collected in a gully cannot drain out through its channel, leading to inundation of the surrounding area.

Border inundation problems used to be tackled by the two governments on an ad hoc basis through the formation of a joint technical group. But recognising the severity of the problem, an understanding was reached between the late King Birendra of Nepal and the late Prime Minister Rajiv Gandhi of India at the 1985 summit of the South Asian Association for Regional Cooperation (SAARC) in Dhaka to constitute a committee on inundation problems, the Standing Committee on Inundation Problems (SCIP). Its main functions were to deal with the problems of inundation 'that have occurred or are likely to occur in future due to activities in the vicinity of Nepal-India border and suggest both short-term and long-term solutions' (Minutes of the first meeting, 1986, and Annex 22). The committee has met 14 times since its formation and its last meeting was held in August/September 2006 (Annex 23).

Initially, the Director General of the Department of Irrigation (DoI) headed the committee for Nepal, but later, after the formation of the Department of Water Induced Disaster Prevention (DWIDP), its Director General heads the committee. For India, the Chairperson of the Ganga Flood Control Commission (GFCC) heads the Committee (Annex 13). Both countries have agreed that the committee should meet as often as necessary but 'at least twice a year before and after monsoon'.

In addition, there exists a sub committee under this committee to look after the construction of the four embankments on the Bagmati, Lalbakaiya, Kamala and Khando rivers. Also, there is a bi-national committee on flood forecasting, whose main function is to recommend a modality for formulating a Master Plan for basin-wide flood management, including areas of both Nepal and India (Annex 13).

In pursuance of the decision taken by the Prime Ministers of Nepal and India during the visit of Prime Minister of Nepal to India (July 31–August 6, 2000), as already indicated in Chapter 2, a Joint Committee on Water Resources (JCWR) has been formed in the chairperson of the respective water resources secretaries of the two countries to, among other things, review, supervise and give directions to the functions of other committees (Annex 13). There is also a High Level Technical Committee on Inundation Problems (HLTC) to review the issues of inundation, especially of Marchwar area in Rupandehi district (Nepal)/Siddarthanagar district (India) and Laxmanpur area in Banke district (Nepal)/Shravasti district (India). The committee is headed by the Executive Director of the Water and Energy Commission Secretariat (WECS) of Nepal and the Commissioner of the Ministry of Water Resources of India.

As the issues of inundation in Marchwar and Laxmanpur areas became very complicated, the committee was directed by the Prime Ministers of Nepal and India to undertake a joint survey to clarify the facts on the ground and work out agreed proposals and undertake necessary measures so that there would be no adverse effects on the lives and livelihoods of the people on either side of the border. There have been three meetings of the HLTC since its formation in 2002.

Despite the recognition of the need to cooperate and coordinate activities between the two countries in relation to establishment of institutional arrangements to address the inundation issue, serious problems still remain all along the southern areas of Nepal. The southern districts of Nepal bordering India, especially the districts of Jhapa, Saptari, Siraha, Dhanusa, Mahottari, Sarlahi, Rautahat, Parsa, Nawalparasi, Rupandehi, Kapilvastu, Dang, Banke, Bardiya, Kailali and Kanchanpur, are all badly affected districts. They suffer from the problem of flooding and inundation every rainy season. Similarly, India also claims that because of the construction works in Nepal, its districts also suffer from the problem of inundation and flooding during the rainy season.

The coverage by the media of the two countries illustrates the seriousness of the problem. (see the accompanying boxes)

International Relations India-Nepal Ties

Vested interests and a section of the media in Nepal have of late raked up yet another controversy meant to malign India and spoil bilateral relations. This time they are working up passions of the people by spreading a rumour that "an Indian dam under construction close to the border threatens to flood Lumbini, the birthplace of Lord Buddha located inside Nepal". Nothing could be more far-fetched than this unfounded clamouring because what is being constructed on the Indian side in the Siddharthnagar district of Uttar Pradesh is neither a dam nor a barrage. It is an earthen embankment which is essentially a flood control measure. Construction of the 1.8 km embankment has been taken up to safeguard Indian villages in the Kunrha-Ghogi Doab area where floods occurred when a road on the Nepalese side was raised. The road level was raised to four feet between Thumuhan Babu to Bhairahawa, both Nepalese villages, without India's knowledge.

India duly raised the issue with Nepal and twice in the last three years joint official-level meetings were convened. But the Nepalese officials abstained from both the meetings. India thereafter informed Nepal that the Lotan-Rasiaval Khurd earthen embankment being built by it in Siddharthnagar district would never threaten to inundate any area across the border. According to a statement issued by the External Affairs Ministry in New Delhi, at present 1.8 km of embankment, including two of the proposed six regulators, have been built

from Rasiaval Khurd to village Kandhauli. The average height of this embankment is 2.2 metres. In fact, at some places it is only one metre high. Each regulator allows 1,000 cusecs of water to pass, a good discharge capacity. No part of the present construction, nor any part of the proposed embankment, can cause flooding in Nepal. This has been verified by an official representative of the Nepalese Government who visited the site on August 9, 2001. He found that there was absolutely no flooding on either side of the constructed portion of the earthen embankment.

As for the Lumbini linkage, New Delhi has said that any attempt to establish a link between the embankment and the birthplace of Lord Buddha is mischievous. It is at best the figment of imagination of vested interests. Lumbini, in fact, lies 12 km north of this embankment. The ponding effect, if any, could not reach even a fraction of this distance. Lumbini's elevation is at 93.5 metres above mean sea level while Rasiaval Khurd is at an elevation of 90-91 metres above mean sea level. The river Kunhra, called Danav in Nepal, lies in between Lumbini and Rasiaval Khurd. This embankment, as stated earlier, is only 2.2 metres high on an average. It is evident from this that Lumbini cannot be affected in any way by this localised construction. These facts, if understood in proper spirit, should clearly establish that perceptions about inundation risks to Nepal from the Lotan-Rasiaval Khurd embankment are totally misplaced.

Even so, in the best interests of the two friendly neighbours, New Delhi has agreed to the Nepalese Government proposal to stop further work on the earthen embankment where four regulators are yet to be built. This had been done forthwith from July 10, 2001.

Notwithstanding all this, vested interests in Nepal have persisted with their malicious propaganda against India. The External Affairs Minister, Shri Jaswant Singh, utilised the opportunity of his visit to Kathmandu in the third week of August this year, to remove any misapprehensions on this score. He assured the Nepalese authorities that the construction of the bund south of Lumbini does not threaten the historic place, declared as a world heritage site by UNESCO, either with flooding or submergence. After all, he told his interlocutors there, the birthplace of Lord Buddha is as sacred to India as it is to Nepal.

Shri Jaswant Singh's firm assurance and the visit of the Nepalese government official to the Lotan-Rasiaval Khurd embankment being build by the Uttar Pradesh Government to see for himself that there is no inundation threat by it are expected to nip the mischievous propaganda in the bud. The stoppage of work on the embankment until the matter is finally sorted out is proof of India's bonafides.

Source: Dinkar Sukla, Freelance Journalist
Press Information Bureau, Government of India, September 4, 2001
Websites: pib.myiris.com/features/article.php3?fl=010904181833 and
pib.nic.in/feature/feyr2001/fsep2001/f040920011.html

Mahalisagar, Marchawar Embankments Threaten Thousands

KATHMANDU, June 22 - Met officials will not say which part of the country will experience more cloudbursts this monsoon. But thousands of villagers living near Lumbini are worried that two mammoth structures built recently by the southern neighbor, India, could trigger a huge inundation problem in the area.

Across the plains of Rupandehi and Kapilvastu, fears of monsoon disasters - and subsequent water logging in the area stemming from the Rassial-Khurda-Lautan and Mahalisagar embankments - are looming large on the horizon. The embankment in India's Marchabar area, for instance, lies just six kilometers south of Lumbini, the birthplace of Lord Buddha.

'If heavy rain lashes that area, dozens of villages will be submerged there,' says Sheetal Babu Regmi, Director General at the Department of Water Induced Disaster Prevention (DWIDP), a separate entity formed four years ago to look into such problems.

In 2001, India completed the construction of 10-km-long Rassial-Khurda-Lautan embankment and a barrage. In a bid to allay Nepali concerns, one Indian official said, 'The long structure, in fact, is a road'. Meanwhile, Uttar Pradesh-based builders are rushing to complete the two-kilometer-long Mahalisagar embankment and an 'escape' with 15 gates.

In both cases, the structures have been built right across - just a couple of hundred meters south of - the Nepal-India border. In both cases, the structures block the natural flow of the Danav and the Banganga Rivers plus their tributaries notorious for flashfloods, putting tens of settlements and fields in peril.

Thanks to the Rassial-Khurda-Lautan structures, over 200 settlements in 18 VDCs of Rupandehis Marchawar area may be inundated. And thanks to the ongoing Mahalisagar project, seven settlements in two VDCs of Kapilvastu are in grave danger.

But even before the monsoon reaches its peak, poor farmers living near the Mahalisagar structures are beginning to pay the price. 'The Mahalisagar waters have submerged our fields, so there's not going to be any rice plantation this year,' says Abdul Paidami, a farmer of Rangapur village.

Already, the Mahalisagar structures have submerged some 40 hectares of land in the two VDCs. When completed, say officials, the structures could submerge 650 hectares of land in Nepal. That is: three times more than what the structures were originally expected to inundate.

India halted its Rassial-Khurda-Lautan 'road' project after Nepali officials demanded that the structures be demolished to prevent inundation on the Nepali side. But the Mahalisagar structures are currently getting finishing touches, despite the fact that Kathmandu has already sent 18 letters to New Delhi to stop construction works there.

'This is outrageous,' says DWIDP's Regmi. 'We would have no problem as long as India tried to get benefits by submerging its territory. But it is trying to extract benefits by submerging our territory; this is very unfair.'

Before starting off, Indian water resources authorities told their Nepali counterparts that they were going to just repair the 'ancient' structures in and around Mahalisagar, as per an agreement between British-India and Kathmandu in 1901.

But recent developments suggest otherwise. India dismantled the old structure and built a totally new structure. This time, the gated escape is much closer, less than a 100 meters far from the No Man's Land.

'Now that the structures have been built we can do nothing,' jokes one official at the Ministry of Water Resources. 'Well, the government can issue flash flood warnings, if any, and the locals can simply respond to that by evacuating and moving to safer grounds.'

Not everybody agrees to that, however. says Dip Kumar Upadhyay, an influential leader of the ruling Nepali Congress (Democratic) and a former lawmaker of Kapilvastu, 'We have faltered in the past. We can't do it alone. All the parties must come together.'

Source: Surendra Phuyal: With inputs from Manoj Poudel in Kapilvastu (Posted on: June 24, 2004 05:31:33)
www. Ekantipur Com.

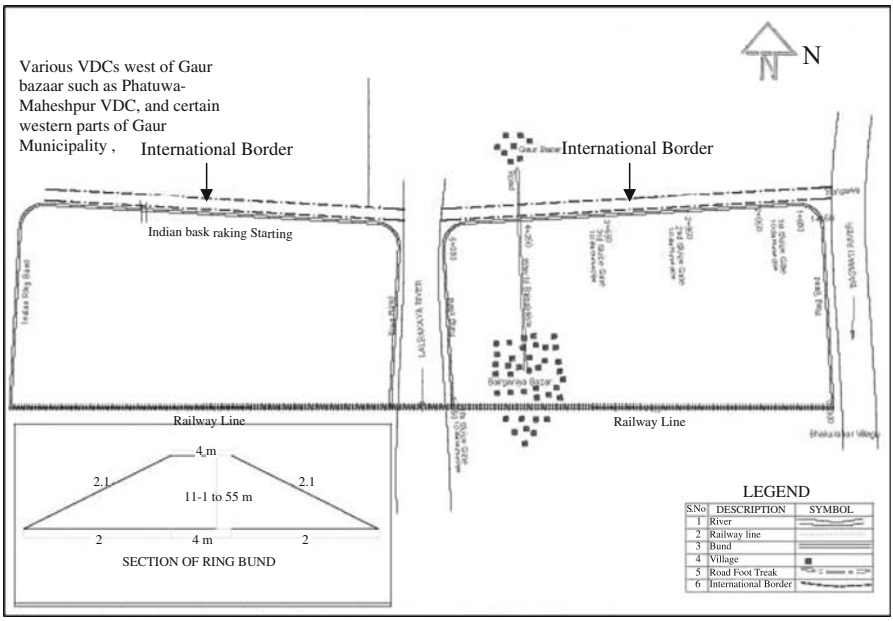
10.3 Contentious Spots

From the above press coverage, it is clear that the inundation problems of the two countries are very serious. The four most contentious spots in Nepal that have caused tensions in the relations between the two countries are discussed as case studies below:

10.3.1 Gaur Bazaar Inundation and Bairgania Ring Bund Construction

Gaur Bazaar is the headquarters of Rautahat district in Nepal's central Tarai. It is located just 1.5 km north of the Nepal-India border between the Bagmati River in the east and the Lalbakaiya River in the west. The Lalbakaiya River joins the Bagmati River after crossing the border.

Gaur Bazaar and the adjacent areas across the border, Bairgania in India, suffered from floods and submergence due to the Lalbakaiya (in the west) and Bagmati (in the east) rivers in the past. To protect her land from flooding, India built Bairgania ring bund unilaterally in the 1960s, which made Gaur Bazaar the centre of the loop between the Bagmati and Lalbakaiya rivers and protected Bairgania town from all sides. In addition, the upper portion of Nepal-India border opposite of Bairgania



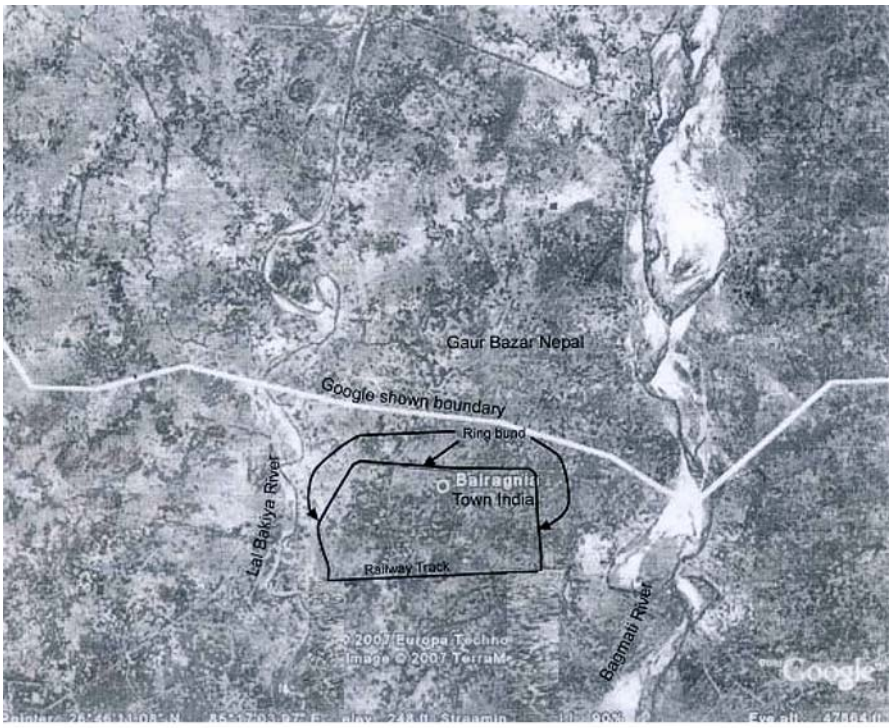
Source: Sketch drawn by Birendra Chaudhari with Lalan Jha of Gaur Bazar

Fig. 10.2 Inundation of Gaur Bazar in Nepal Due to Bairgania Ring Bund

ring bund is usually subject to flood inundation due to not only Bagmati spills but also lack of sufficient openings on the Bairgania ring bund. (Fig. 10.2-10.3)

Nepal had been protesting against the construction of the bund since 1972. It was only after Nepal's repeated requests that India finally constructed three gated drainage openings on the Bairgania ring bund (BRB) to allow the incoming flow safe drainage. In July 1982, the Indo-Nepal Joint Technical Group (JTG) decided that the sluice gates of the bund (Bairgania ring bund) should be kept fully open so that up to 200 cusecs of water from Nepal would flow without obstruction. In fact, the issue of submergence of 'Gaur Bazaar and its surrounding area in between Bagmati and Lal-Bakaiya River' was the priority agenda of the first SCIP meeting held in Kathmandu in July 1986 (Annex 22). Since then, Nepal has been regularly drawing India's attention to keep timely operation of the sluice gates so that the water reaching the Bairgania embankment is drained off to prevent submergence of Gaur Bazaar.

At the 6th SCIP meeting, in January 1991, Nepal pointed out that despite the release of 200 cusecs of flood water from the three sluice gates at Bairgania ring bund the capacity was 'totally insufficient for Gaur Bazaar protection'. India explained that this was caused 'mainly because of spilling from Bagmati and Lal-Bakaiya Rivers', which can be prevented by constructing embankments along these two rivers. Thus, the construction of embankment started on the Bagmati and Lalbakaiya rivers; it was later agreed to construct embankments on the Kamala and Khando rivers as well. India has agreed to construct about an 18 km-long embankment on the left bank and 8 km on the right bank of the Bagmati River along with



Note: The white line denotes the border which is shown by Google but is not necessarily the actual international border
Source: Google 2007 Europa Technologies image 2007 Terra Metrics.

Fig. 10.3 Bairganiya Ring Bund

an 8 km embankment on the Lalbakaiya River. But due to a delay in meeting the commitments, materialisation of embankment construction is far behind schedule. Though embankments would help to mitigate inundation, experts believe that this is only a short-term solution. Experiences on embankments confirm that other associated problems like bed-level rise, spillages over the embankments and blocking of smaller tributaries result in more water-logging and submergence of the area.

10.3.2 Marchwar Inundation and Lotan-Rasiawal-Khurd Bund

Marchwar is located in the western part of Rupandehi district in western Terai of Nepal (southern plain area) bordering India. The area is accessible through a 15 km gravel road from the Bhairahawa-Lumbini highway. The major drainage channels of this area are the Danda River (Ghoghi in India) in the east, Danav River (Kunda in India) in the middle and Kothi River in the west. All these rivers join the Kunda River in India before meeting the Rapti River near Gorakhpur in the state of Uttar Pradesh (UP), India. The longitudinal slopes of these river systems are compara-

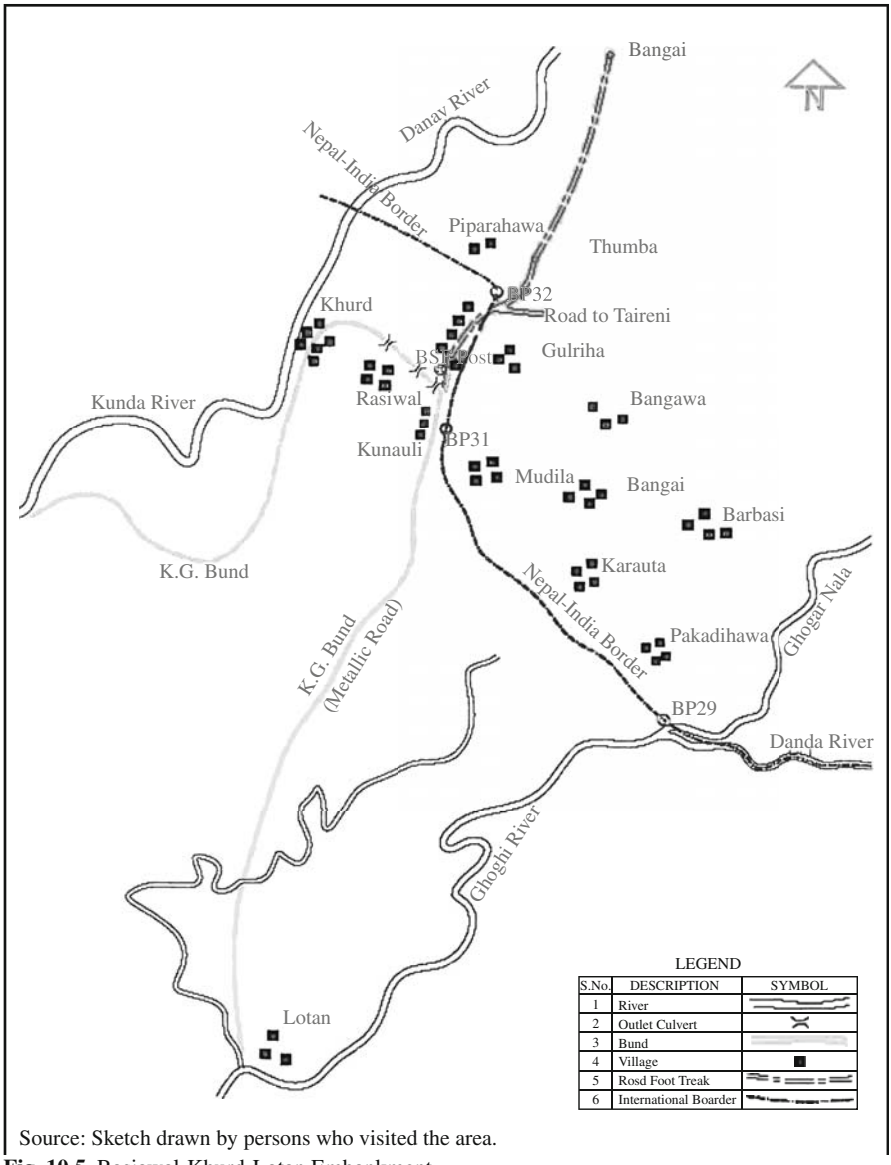
Source: MoWR (2001) Report on Inundation Impact of Lotan Rasiawal Khurd Dam on Nepalese Territory (Called as Arjun Pd. Shrestha, MS Paudel, SB Regmi and SK Sharma Committee) Ministry of Water Resources, Government of Nepal, Kathmandu, Bhadra 2058 (2001).

Fig. 10.4 Flooded Area Due to Khurda Lotan on the Nepal-India Border [Note Border Pillar on left side]

tively flat and, during intensive monsoon rain, these rivers cannot safely drain all the incoming flood flows, resulting in inundation in and around Marchwar area. (Fig. 10.4-10.5)

In the early 1980s, India started to construct a road-cum-embankment near the Nepal-India border on the right bank of the Danda River. The length of the embankment was about 10 km from Lotan to Kunauli and passed 100 to 500 m parallel to the Nepal-India border. India later built this embankment as a permanent road with asphalt top. About 3.5 km from the last western end of this embankment, India had earlier built another embankment on the left bank of the Danav River (Letter of the Secretary, MoWR, July 6, 2001, and Annex 24). This 3.5 km stretch was open untill 1999. But then India started to close this portion by installing three outlet culverts—two with three spans and one with a single span (Field report of DoI, July 6, 2001).

This embankment obstructed the natural sheet flow of drainage water and during the 1999 monsoon, 21 villages (mentioned below) in Nepal were submerged and inundated under flood water. Thus, this issue was again taken up as an agenda at the 10th meeting of SCIP, in October 1999, and it was agreed that the 'contact officers should examine the problem and submit a joint report to the respective member secretaries at the earliest possible' (Item no. 15 of the minute). The 11th meeting of SCIP, held on January 7-12, 2001, decided that the 'contact officers



Source: Sketch drawn by persons who visited the area.

Fig. 10.5 Rasiawal-Khurd-Lotan Embankment

should examine the problem and submit a joint report to the respective member secretaries by March 2001 (Annex II, Item no. 15 of the minute). India unilaterally started construction of the remaining link bund with the provision of only three outlets for natural drainage, which Nepal believes would be insufficient. The natural outlet of waters flowing from Nepal would, thus, be obstructed and inundate 18 villages in Marchawar area. The 18 villages are: Piparhawa, Piparhawa Tole, Bhadauli, Thughawa, Bhurhawa, Taraini, Gulariya, Bangawa, Mudila, Majigawa, Bangai, Barbasi, Pipari, Karauta, Bansidiha, Harwarhawa, Pakadihawa and Ganeshpur

(Shrestha et al. 2001 and Annex 24). In this regard, the Secretary of the Ministry of Water Resources (MoWR), Government of Nepal, wrote a letter to his counterpart in the Ministry of Foreign Affairs, Nepal, for drawing the attention of India (Annex 24), who acting on that letter wrote to the Government of India. In response to Nepal's letter of July 2001, India replied in August 2001 that the 'proposed Lotan-Rasiawal-Khurd Embankment is part of the 47.5 km long Kura-Ghoghi embankment built in the 1950s. The proposed 12.5 km long new construction with a height of 2.2 meters is to fill the gap in and complete the old Kura-Ghoghi embankment' (Annex 24.1). India also stated that 'all construction activities at this site have been stopped on July 10, 2001' (Ibid).

It may be recalled that India in that very area had constructed 'Temporary bund across the Ghagar River in Rupandehi, Lumbini' (Item no. 23 of the first SCIP meeting, 1986, and Annex 22) and 'Area between Border Pillar Nos. 22 and 23 near Barthahawa and Pajarbatti village in Rupandehi, Lumbini' (Item no. 24 of the first SCIP meeting, 1986, [Annex 22].). India had then assured that 'no bund will be constructed in the future which might create submergence in Nepal' and this issue was decided to be dropped in the 2nd 1987 SCIP meeting.

Considering the seriousness of the matter, the Prime Minister of Nepal, during his visit to India in March 2002, raised this issue and the two countries agreed to constitute a Nepal-India High-Level Technical Committee (HLTC) to look into the issue of both Marchwar and Laxmanpur inundation. The first meeting of the HLTC was held in May 2002, which decided to carry out a joint survey of the area, including installation of water-level gauges at appropriate locations of the inundated area (Annex 25). A joint survey was carried out and survey maps were prepared by both sides and presented at the third HLTC meeting, held on September 27-28, 2004. HLTC examined the survey maps in detail and agreed that some of the maps required reconciliation and validation with level data. The meeting also constituted a joint team for this purpose (Annex 25.1). It was also agreed by the HLTC 2004 meeting 'that a joint visit to the site should be undertaken by team as required'. The team visited the site and verified the survey field books and found a discrepancy in the water-gauge level plotted by the two sides. The matter is yet to be resolved. Thus, despite several meetings of the HLTC, and the inconclusiveness of the joint team efforts, India[5], through her Ambassador in Kathmandu, in July 2004, enunciated (*Spotlight* July 16, 2004), in no uncertain terms, her position on the Lotan-Rasiawal-Khurd (LRK) bund in the following manner:

'The decision to construct Rasiawal Khurd Lotan embankment was taken by the Uttar Pradesh Government due to increased flooding in over 80 villages in Siddharthanagar district in India because the HMGN had raised the height of the Bangain-Thumba road close to the border in Nepal. However, based on concerns expressed by HMGN, the construction of the embankment was stopped after less than 20 per cent of the planned stretch had been completed. A joint survey by the Government of India and HMGN in 2002 established that the road is, on an average,

[5] Shyam Saran, India's then Ambassador to Nepal, talking to the Nepalese media on July 9, 2004 just before his departure for New Delhi to take up his responsibilities as the Secretary of the Ministry of External Affairs – as reported by the weekly magazine, Spotlight on July 16, 2004.

1.4 meters above the surrounding ground level and does not possess sufficient culverts or cross-draining structures, and further, that the level of the constructed portion of the Rasiawal Khurd Lotan embankment was much lower than the Marchawar area. For these reasons, the incomplete Rasiawal Khurd Lotan embankment cannot cause any flooding in the Marchawar region in Nepal. On the contrary, Indian villages continue to suffer from inundation caused by the raising of the Bangain-Thumba road'.

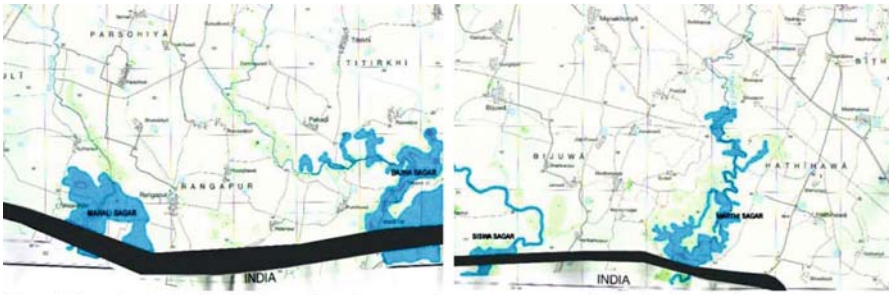
So, with that pronouncement by the Ambassador of India to Nepal and India's next-designated Foreign Secretary, the Lotan-Rasiawal-Khurd bund has only degenerated into more HLTC meetings. The 14th SCIP meeting of September 1, 2006, held at Patna, capital of Bihar state in India merely noted that the inundation problem in and around the Marchwar area of Rupandehi district due to the construction of Lotan-Rasiawal-Khurd bund on the Indian side 'is being addressed by High Level Technical Committee.' But the HLTC has resulted merely in the formation of teams and committees and joint field verification. The problems, however, remain unresolved.

10.3.3 Inundation in Kapilavastu due to Repair of Mahali Sagar Gates

Sagars are artificial lakes constructed to store water for human and agricultural uses. There are four *Sagars:* Marthi, Siswa, Bajah/Jamuwar and Mahali (from east to west in that order) in Kapilvastu district, one of the Western Tarai districts adjacent to the Nepal-India border. Although these four *Sagars* straddle the Indo-Nepal border, they only feed the irrigation canals of India. The surface area of Siswa Sagar at 128 ha (42 ha in Nepal and 86 ha in India) is the smallest Sagar with the submergence more in India than in Nepal. Bajah/Jamuwar *Sagar* at 601 ha (300 ha in Nepal and 301 ha in India), is the largest and equally submerges land in the two countries. The two intermediate ones— Mahali Sagar, at 191 ha *(180 ha in Nepal and 11 ha in India)* and Marthi Sagar at 171 ha (*137 ha in Nepal and 34 ha in India*)—have respectively over 94 per cent and 80 per cent submergence in Nepal.

Of these four, the 1898 Indo-Nepal correspondences regarding the dispute over the sill levels of the three *Sagars* (*Bajah, Marthi, Siswa*), which the Gorakhpur Commissioner Dr. W Racy termed 'Boundary Dispute between Nepal and British Territory', indicate that Nepal and British India had concluded an agreement on these three *Sagars* in 1874 (Annex 2). In fact, Dr. Racy conceded that the Nepal Government had rectified the error in the sill level of the Sagar as provided by the British-India Government.

Mahali Sagar attracted much attention when India went ahead to 'repair' the two escape regulators (one gated and another ungated) 'keeping the crest levels same as was in the old structure before damage'. India went into 'repair mode' because she realised that Mahali Sagar had become a good perennial source of water. (Fig. 10.6) Site inspection by Nepal's Department of Irrigation (DoI) on August



Note: Since the Indo-Nepal boundary demarcation was not complete, the Survey Department of Nepal has shown the border as a black strip.
Source: Department of Survey, Government of Nepal.

Fig. 10.6 Mahali Sagar Bund (Sketch)

7, 2001 indicated that the crest level of the escape masonry was 2 ft above the agreed level from the Joint Survey Contour Map, the length of the flank escape was reduced by 20 feet and the earthen embankment had top width varying from 2.5 m to 5m. Nepal thus concluded that the 'repair' of the regulators by India would result in additional submergence of 25 ha of agricultural land in Nepal. This issue was raised by Nepalese team at the 12th (reconvened) SCIP meeting, in October 2002. India clarified that 'there has been no alteration on the height of the embankment as well as crest level of the regulator' and assured that 'no alteration of the embankment or other level shall be made'.

It appears that, on December 4, 2002, Nepal's officer in charge of District Irrigation Office, kapilvastu in Western Terai that India consistently calls the 'competent Nepalese authority', signed the drawings. Without getting the final approval of the SCIP, India immediately started to 'repair' the previous five gated structures with a massive 15-gated structure. During this period, the DWIDP was formed and DoI no longer handled inundation-related issues. This was intimated to India on January 4, 2003 and the consent given by Nepal's district-level Irrigation Office made 'null and void' through a letter of January 13, 2003, to which India concurred. Furthermore, Nepal, through another letter of January 22, 2003, asked India to stop all foundation excavation work on the escape regulators. India requested that construction work up to ground level be allowed, but Nepal refused to give her concurrence. However, on February 5, 2003, India wrote: 'Construction up to GL is being done as agreed in aforesaid meeting' (12th SCIP meeting and Letter to the editor: *The Kathmandu Post* March 28 2003). Clearly, there was no agreement in the 'a foresaid meeting' and India persisted with the statements that were not factual.

In reply to a letter of Nepal's Ministry of Foreign Affairs, dated March 10, 2003, the Embassy of India in Kathmandu gave the following reply, on March 14, 2003 (Annex 26 and 26.1):

- Mahali Sagar was constructed in 1901.
- Sagar has two escape regulators, one un-gated at FRL 92.6 m and the other gated with crest level at 91.6 m. [However, Indian Embassy's media statement on Mahali Sagar of March 15, 2004 states the agreed overall parameters as FRL - 92.76 m and NOT 92.6 m above msl and crest level or level of the bottom of the regulator - 91.60 m above msl]
- The gated regulator was damaged about 12 years ago. The Contact Officers of India and Nepal decided, on September 4, 2000, to construct a gated escape regulator, keeping the same crest level as in the old structure before damage.
- Designs approved by DIO, Kapilavastu, on December 4, 2002. With the change of Contact Officer on the Nepalese side, it appears that the Indian side was requested to stop construction.
- India drew Nepal's attention that the gate repairs were being done as per the level existing before the damage and, therefore, the repair work could not possibly inundate any new areas. India requested for reasons for the stoppage of work.

In addition, on July 9, 2004, India's ambassador to Nepal, Shyam Saran, told the media:

No embankment has been constructed on the century-old Mahali Sagar reservoir. A new gated-escape is being constructed to replace a damaged gated escape on the Indian side after seeking the approval of competent Nepalese authorities in December 2002. The new gated escape will not change the height or the extent of the reservoir. In fact, the design of the new gated escape incorporates the request of the Nepalese side for an enhanced discharge of 102 cumecs of water. Because of enhanced discharge and no change in reservoir level, the new gated escape would not cause any increased pondage in Nepal. Currently, there is no construction activity at Mahali Sagar. Decks have not been placed on all the bays and gates have not been installed in the escape. There is, therefore, no question of any inundation being caused by the new gated escape. (*Spotlight* July 16, 2004)

Despite the Indian Ambassador's media statement that the decks and the gates had not been placed, at the 14th SCIP meeting of August/September 2006, Nepal brought to the notice of India that 'rehabilitation works including replacement of wooden gates with steel ones in some of the structures without prior information' is being done on Mahali Sagar. India clarified that 'there were no changes in the crest level which could result in additional submergence'. Thus, the saga of 'various areas near Siswa Sagar, Bajha Sagar, Marthi Sagar and Mahali Sagar', raised in the 1980s like all other inundation issues, has been quibbled over for more than two decades. The 15-gated structure on Mahali Sagar, despite Nepal's weak protests, is a fait accompli. India's argument now is not about the illegal construction of the structure but about 'no change in crest level and no additional submergence".

10.3.4 Inundation in Nepal's Banke District and India's Laxmanpur Barrage on Rapti River

The Rapti River is a medium sized river that originates in the Mahabharat hills of mid-western Nepal. It descends onto the Terai plains in Banke district in Western Tarai and enters India at Laxmanpur to meet the Ghagra (Karnali) River. Major intervention on the Rapti River was first contemplated in the 1980s by constructing a level-crossing barrage at Laxmanpur. (Fig. 10.7-10.8)

In 1981, India unilaterally started constructing the Laxmanpur barrage on the Rapti River, downstream of Nepal's Banke district, in UP's Bahraich district and completed it in 1985. The 284 m long barrage consists of 14 bays, each of 18 m clear span, separated by piers of 2.5 m width each. The pond level of the barrage is 127.7 m above msl and the designed high flood level is 130.4 m above msl (Report of the Subcommittee for the Foreign Affairs and Human Rights 2001).

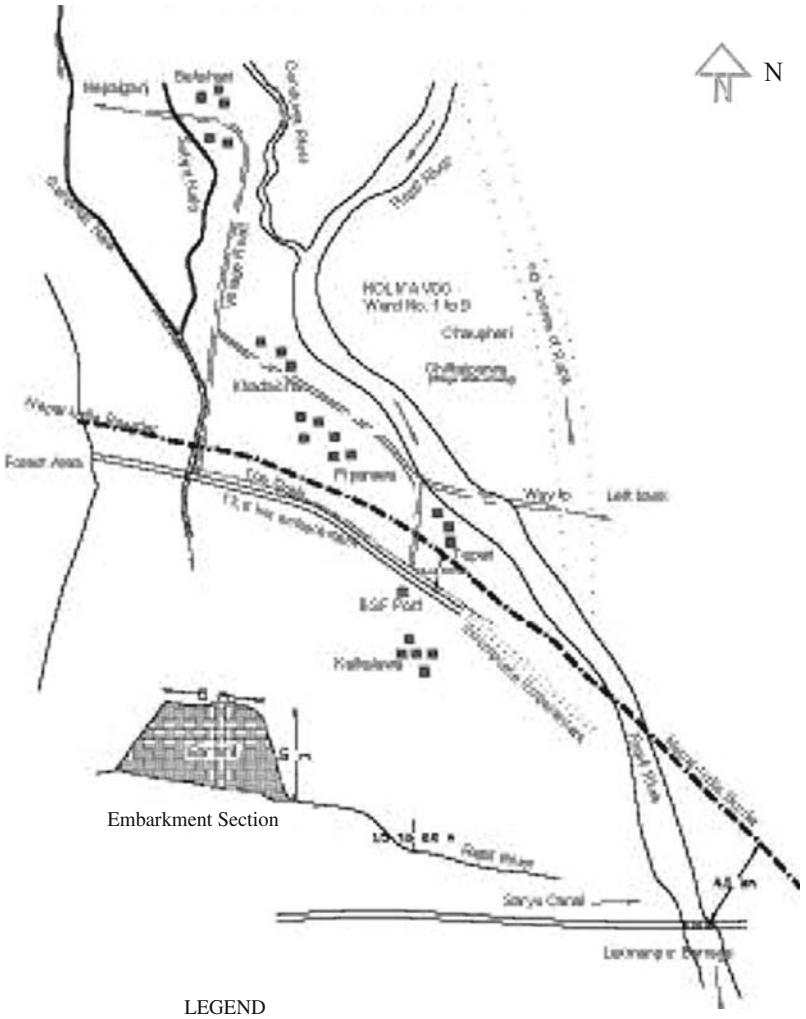
In fact, Laxmanpur barrage is a part of the Sarada Sahayak Pariyojana (project) in Bahraich district of India. This project has a diversion barrage at Girijapur on the Karnali River (Ghaghra in India) with two large main canals on either side of the river. The western main canal augments flow into the Lower Sarada main canal, while the eastern main canal aims to provide irrigation up to the areas of Deuriya district, crossing the Rapti River at Laxmanpur. The headworks of the western main canal was completed in 1975, but the eastern main canal is still not operational.

In addition, in 1999, India started to construct an embankment bund at Laxmanpur barrage. This bund connects the upstream right guide bund of the barrage with the villages of Kalkalawa and Holiya, which is 13.6 km long and parallel to the Nepal-India border.

With the construction of this embankment bund, the issue of Laxmanpur barrage became a grave matter of concern in the Nepal-India water relations. The newly constructed bund not only congested the sheet flow of the upstream catchment areas but also obstructed the flow of natural small drains. The embankment is 300 m away from border pillar no. 19 and 650 m from pillar no. 21.

These new structures submerged 3,900 ha of land in Holiya, Fattehpur, Matehiya, Gangapur and Betahani villages and 2,579 houses with a population of 15,174 people in Banke district in Nepal during monsoon. In addition, 13 schools, 75 temples/monasteries, two health posts, Piparahawa customs office and some dirt roads and culverts were also affected. Furthermore, when Laxmanpur barrage becomes operational, more villages in Nepal like Narainapur, Katkuiana, Kalaphanta, Laxmanpur, etc., would also become submerged (Report of the Subcommittee for the Foreign Affairs and Human Rights 2001).

At the first SCIP meeting, held in 1986, when Nepal raised the issue of submergence in Banke district due to the Laxmanpur barrage, India asserted that the barrage designs are such that no Nepalese land would be submerged. At the fourth SCIP meeting, in 1988, Nepal asserted that some villages in Nepal would become submerged due to the construction of the barrage and its adjoining afflux bunds. India, however, continued to take the stance that the inundation 'problem is not connected



LEGEND

S. No.	DESCRIPTION	SYMBOL
1	River	
2	Embarkment	
3	Village	
4	Road/Foot Treak	
5	International Border	

Source: Sketch drawn by persons who visited the area.

Fig. 10.7 Laxmanpur Barrage and Allied Structure (Sketch) 26. Laxmanpur Barrage and Allied Structure (Sketch)

Note: The short white line on the right corner denotes the border as shown by Google but is not necessarily the actual international border.
Source: Google-Imagery, Map data and NFGIS, Europa Technologies, 2007.

Fig. 10.8 Laxmanpur Barrage in India with completed Western Canal and incomplete Eastern Canal 27. Laxmanpur Barrage in India with completed Western Canal and incomplete Eastern Canal

with the Rapti [Laxmanpur] barrage' and as such the Rapti barrage be 'de-linked' and submergence in Nepal 'be considered as a separate problem'. At the eighth SCIP meeting, in 1992, India provided Nepal with details of the plane table survey plan of the barrage area and its pond level with high flood level from the year 1980 to 1991. Nepal wanted to verify the data and as such wanted India's cooperation to conduct that survey. At the ninth SCIP meeting, in 1994, the two sides merely recorded a minute to conduct more studies to 'specify the cause of problem.'

When Nepal's media started to raise the inundation issue due to Laxmanpur barrage during the monsoon of 2000, the Indian Embassy at Kathmandu issued a press release on Laxmanpur barrage in July 25, 2000 (Annex 27), the gist of which is given below:

- Several reports suggest that large-scale inundation in Banke is due to India's Laxmanpur barrage and the barrage constructed in violation of international norms. The facts are different.
- Laxmanpur barrage is a part of UP's Saryu Canal Project and 'This barrage has not resulted in, and is not likely to result in, any inundation or submergence of villages on the Nepalese side.'
- 'The Laxmanpur Barrage is located 8 kilometers downstream of the India-Nepal border; the submergence is well within Indian territory.' [Authors' note: The barrage may be 8 km 'downstream of the India-Nepal border' along the river, but Nepal insists that the barrage is just '4.25 km away from the Indo-Nepal border'–straight as the crow flies]
- The barrage is a structure for diverting non-monsoon flows, not a storage reservoir, '… the pond level of the Barrage is RL 127.60 meters while the general ground level of the Nepalese side is of the order of RL 131 meters.' Thus, there is 'no question of increase in the water level or of consequent inundation during such periods.'
- 'The main Barrage structure and its right afflux bund, also located well within Indian territory, have been constructed as per internationally recognised technical

norms; … there will not be any adverse impact on the river due to construction of the afflux bund and no inundation will be caused due to the structure.' [Authors' note: The bund may be well within Indian territory, but this 5 m high bund is located as close as 300 m from the Indo-Nepal border. Besides, the 13.6 km bund varying in height from 2 m to 5 m has no outlets at all and blocks even the two natural outlets, Gandheli and Sotiya. Thus while 'no inundation will be caused' to Indian territories downstream, Nepal undoubtedly will suffer because of the absence of outlets.]

- 'However, the Government of India has taken serious note of the apprehension expressed by the Nepalese side that the newly constructed flood protection embankment may obstruct the natural flow of a local "nullah" (drain) at Santaliya… A toe drain, which will ensure that the drainage of the "Nullah" at Santaliya is not blocked, is well under construction.… The Government of India takes the Nepalese concerns of inundation seriously and is ready to address them.'

A dramatic shift in Nepal's position could be discerned from the minutes of the 11th SCIP meeting in January 2001: 'The Nepalese side handed over to the Indian delegates the proposal for the construction of embankment in the Rapti River… The Committee agreed on the alignment of the proposed right embankment with minor modifications. The Committee also agreed on the alignment of the left embankment as proposed by the Nepalese side up to the Bhais Budhawa Nala from downstream.' Thus, setting aside her previous 15 years' argument was that Nepal's Banke inundation was connected with India's Laxmanpur barrage, Nepal at that meeting, agreed to construct embankments on both sides of the Rapti River up to a higher level at upstream locations. This was exactly what India had wanted all along. At the same meeting, Nepal stressed that status quo be maintained in respect of the two existing watercourses, viz. Gandheli and Sotiya Nalas India, however, proposed a drainage along the embankment.

This issue was taken up by the Foreign Affairs and Human Rights Committee of the then House of Representatives of Nepalese Parliament, which constituted a subcommittee. In July 2001, the subcommittee, after site visits and in-depth studies, submitted a very strong and damning report on the Laxmanpur barrage.

- India unilaterally built Laxmanpur barrage on the Rapti River just 4.25 km away from Nepal's border with the 13.60 km embankment going westwards through Kalkalwa in India to Holiya village in Nepal.
- This embankment is only 300 m away from border pillar no. 19 and 650 m from border pillar no. 21. The height of the embankment at India's Kalkalwa is 2 m, but it increases to 5 m when it reaches Nepal's border. The bottom width of the embankment varies from 20 to 25 m while the top width is 5.50 m.
- This 13.60 km embankment (Kalkalawa-Holiya) does not have a single outlet and instead totally blocks the Gandheli and Sotiya Nalas, the natural outlets from Nepal.

Furthermore, the subcommittee castigated India for 'fooling' Nepal through talks for the mere sake of talks at the SCIP, while she continued to finish her unilaterally constructed structures. Nepal's SCIP team was also severely castigated for not doing its homework properly and for not presenting Nepal's position in a strong manner. To solve the present imbroglio, the Subcommittee was of the opinion that a high-level joint committee be formed. The Subcommittee was categorical that the Laxmanpur barrage and its adjoining embankments had dangerous and adverse social, economic and environmental impacts on Nepal, infringing on her very sovereignty. The Subcommittee, therefore, in no uncertain terms, concluded that the only available alternative is the demolition of the barrage and the adjoining embankments.

The uproar in the Nepalese Parliament and the media forced the Prime Ministers of Nepal and India, after their meeting in March 2002, to form a Nepal-India High-Level Technical Committee (HLTC) to tackle the Laxmanpur barrage issue. India's ambassador to Nepal, Shyam Saran, before taking up his post as India's Foreign Secretary on July 9, 2004 told the media on: 'India has offered to construct embankments on Rapti River in Nepal. The Nepalese side is yet to provide Government of India with technical details on alignments for the construction of the embankments.' (Spotlight July 16, 2004)

During the third meeting of the HLTC, it was agreed that appropriate unregulated opening be provided to allow of the Gandheli and Sotiya Nalas in the Kalkalawa embankment natural passage. Despite Parliament's damning report to have the Laxmanpur barrage demolished, and despite the fact that the barrage and the associated embankments are all within 8 km (Report of the Parliamentary Subcommittee 2001) of the international boundary, skeptics note that they are yet another fait accompli like the Tanakpur barrage on the Mahakali River, only to be legalised in the manner that an unwary Prime Minister Girija Prasad Koirala did through the Memorandum of Understanding of December 1991. (Annex 7.1)

10.4 Perspectives and Way Forward on Inundation

10.4.1 Perspectives

i) **On sovereignty:** As early as 1898, even the colonial British perceived the disputes over the sill level of the three Sagars (Marthi, Siswa and Jamuwar/Bajah) as 'Border Disputes between Nepal and British Territory'. That is, Britain did concur that inundation/submergence of Nepalese territory due to structures constructed near the Indo-Nepal border amounted to infringement of Nepal's sovereignty. However, at present the Nepal Government continues to use the term 'inundation' and not 'encroachment' of Nepalese territory. Though India has so far ignored the international norms and the Nepal Government is mired in political instability, there are already voices in the political and professional circles that call for Nepal to go to the International Court if India persists with

its unilateral activities of constructing permanent structures near the international border.

ii) **On India's strategy:** From the above discussion on the 'contentious spots', India appears to follow more than one strategy in relation to water resources with Nepal. One is the tapping and utilisation of waters emerging from Nepal into her territory to the maximum extent possible, like in the case of the four Sagars of Kapilavastu district and Laxmanpur barrage on the Rapti River by maintaining that these '…traditional and established irrigation facilities… cannot now be withdrawn and status quo has to be maintained.' More categorically, India wants Nepal to ultimately concede the 'prior use right'. The other is the protection of her villages and farmlands to the maximum possible extent by constructing unilaterally extensive bunds and embankments (Bairgania ring bund, Lotan Rasiawal Khurd Bund and Kalkalawa-Holiya bund) as close to the border as possible irrespective of international norms. India's strategy is also to construct structures first and then negotiate, hoping to have these illegal structures ultimately agreed to by a 'fatigued' Nepal. This was in total contradiction of what the colonial British India did, that is the Three Sagars Agreement of 1874 and the Sarada Agreement of 1920 (Annexes 2)

iii) **On delayed remedies:** To minimise the effects of submergence on Gaur Bazaar, it was agreed to construct embankments on the Lalbakaiya and Bagmati Rivers. However, due to a delay in cooperation from the Indian side, the embankment construction work was also delayed. This delay has not only created additional emergent work due to a change in river morphology but also caused loss of faith among the flood-affected populace. Banke submergence due to Laxmanpur barrage is now being explained away with 'India has offered to construct embankments on Rapti River in Nepal' and it is Nepal that is not providing 'India with alignment details of the embankments'. In addition, India is delaying opening the drainage path of the Kalkalawa embankment as agreed at the HLTC meetings.

iv) **On legalizing the unilaterally built structures:** The issue of illegal unilateral construction of structures near the international border has no longer become the main Indo-Nepal focus. India insists the unilaterally constructed structures are 'located well within Indian territory' and 'is not likely to result in any inundation or submergence of villages on the Nepalese side'. Unfortunately, due to a lack of seriousness on the part of Nepal or proper homework by Nepal, India has always, through political and media management, skillfully kept the ball in Nepal's court. It may be merely a question of time before a 'fatigued' Nepal agrees to legalise the 'to be demolished' Laxmanpur barrage, the 'repaired' 15-gated Mahali Sagar structure and the 47.5 km long Lotan-Rasiawal-Khurd embankments.

Contemporary international principles enunciate that the state can manage the international cross-border waters without causing appreciable harm to other riparian states (Madrid Declaration 1911 and UN Convention on the Use of Non-navigational Water 1997). However, India has been disregarding these principles with respect to Nepal. Bairgania ring bund, Mahali Sagar structures,

Laxmanpur barrage and Lotan-Rasiawal-Khurd bund are examples of violation of international norms and principles by India. Such violations have created irreparable mistrusts and suspicions in Nepal, making Nepal-India water resources development all the more difficult.

v) **On Terai riddled with east-west structures:** The Terai, with the east-west length of about 900 km and an average width of about 30 km, is the most fertile part of Nepal, her breadbasket, and has dense flora and fauna. The east-west Mahendra highway cuts across this breadbasket and plans are afoot in Nepal to build the old East-West *Hulaki* road (postal runner road) with India's assistance. This *Hulaki* road is just south of the Mahendra Highway and embraces the Nepal-India border. India has recently announced its intention to build an east-west highway (national highway no. 57) on her territory close to the Nepal border. These east-west structures would act as embankments across the slope of the Terai area and obstruct free drainage of the area on the north. On top of these three sets of east-west highway, India's proposed River Linking Project (RLP) intends to interlink the Kosi, Gandak, Karnali and Mahakali rivers to transfer water from the surplus east to the deficit west. This could result in massive inundation and water-logging and Nepal's Terai would no longer be her proverbial breadbasket.

10.4.2 Way Forward/Suggestions

i) **Banish old mindsets:** India, already a regional power and aspiring to be a global one, must banish its old mindsets of the eras of Kosi, Gandak and even the Mahakali agreements. India-locked Nepal has bitter memories of the Babai and Sikta irrigation projects in western Terai, where India was responsible for blocking the foreign funds coming to these projects (discussed in Chapter 2). [If Nepal and India fail to agree on the sill levels of Mahali Sagar or Tankapur Barrage then how can the two countries go ahead to execute the huge Pancheshwar or Sapta Kosi high dam projects?]

ii) **Follow international norms:** India's stand on Laxmanpur barrage 'located 8 kilometers downstream of the NepaI-India border' is a mere play of words. The barrage may be 8 km along the river downstream as it happens to flow eastward at this portion. But, the barrage is only 4.5 km from the Indo-Nepal border. It was only from the 10th SCIP meeting of November 1999 that India herself started to mention this 8 km provision in her own Annex II items on inundation issues: Item no. 15 Construction of Lotan-Rasiawal Khurd bund located within eight kilometer of Indo-Nepal border in Maharajganj-Siddhartha Nagar district of UP to check inundation of 85 villages in India; Item No. 17 Channelisation of Mahwa Nala in Indian territory within 8 km of the Indo-Nepal bor-

der for solution to the inundation problem in Maharajgunj district in UP due to spilling of the Ghoghi and Danda rivers into Mahwa Nala. Thus, India has implicitly agreed to the international norms of not building any structures unilaterally within 8 km of the Nepal border. This must be respected through actions.

iii) **Transparency:** As the regional power, India must be transparent. So far, Nepal has found her to be very reclusive with her Ganga-related hydrological data or projects. The much publicised RLP of India, where Nepal is supposed to have five vital links, has still not been communicated officially to Nepal. Similarly, the Ganga Flood Control Commission is believed to have already prepared a Ganga flood control master plan. But apparently, like the RLP, this is also under wraps.

iv) **Equity, fairness and social justice:** Equity, fairness and social justice must be the hallmarks of all future Nepal-India water related activities, be it the issue of Nepal's Gaur Bazaar or Banke's submergence. Nepal-India relations, starting from the issue of submergence along the border, must be based on mutual trust and faith. If India continues to insist on 'no submergence in Nepal' due to her bunds or dams, then there is also the danger of a *quid pro quo* reaction from Nepal. This would harm both the countries.

v) **Close contacts with neighbouring states in India:** Although one may criticise the suggestion of direct dealing and/or roping New Delhi through contacts with the neighbouring capitals, Kolkatta, Patna, Lucknow and Dehradun, there is need for more and regular contacts between Kathmandu and the capitals of the bordering states. In this regard, the visit to Patna by the then Minister of Water Resources, Dipak Gyawali, and holding the 14th meeting of SCIP there, could be considered an appropriate measure as the flood-affected states would be more appreciative of areas of cooperation than New Delhi-based mandarins and politicians.

vi) **Afforestation:** Similarly, another area where both countries can help each other is to get involved in afforestation programmes, preferably through the community forestry programme, which in the last two decades of its beginning in Nepal, has not only stopped deforestation, but already there are signs of regeneration of forest. In this context, even the Indian press has suggested that:

'The government must also recognise that the problem of recurrent floods in eastern India cannot be tackled without the cooperation of Nepal, Bhutan and Bangladesh, upper and lower riparian nations. For example, Nepal can initiate afforestation in its upper catchment area to impede excess water flow into eastern UP and north Bihar; while India helps it exploit much more than the present measly 8 per cent of its 43,000 MW hydel potential.

'New Delhi should also consider other avenues of ecological collaboration like soil conservation, agro-forestry and grassland and watershed management with Nepal. New Delhi would, in fact, do well to take

the lead to evolve a consensus to put in place a holistic flood control programme for the entire south Asian region' (India should rope in the Neighbours 10 August, 2007, IST, TNN).

vii) **Monitoring office:** There are no technical monitoring offices at the Nepal-ndia border, which has created difficulties in assessing the actual situation of these inundation sites. One should rely to some extent on public opinion, which may or may not be justified technically. The monitoring and evaluation of post-inundation scenario is difficult and hard to believe due to a lack of proper data management and monitoring system. Hence, it is advisable to establish an inundation monitoring office at each critical location of the Nepal-India border.

viii) **Honour treaties, understandings and decisions:** Several committees have been formed between Nepal and India to manage water-related issues and concerns. Neither the meetings of the committees are regular nor the decisions taken in these long-awaited meetings implemented. Since the flood-plain management of the Indo-Gangetic region needs an integrated approach through mutual trust and respect, the treaties, agreements, understandings and decisions between two countries must be honoured and implemented in true spirit by both Nepal and India in order to enhance bilateral cooperation.

10.5 Conclusion

To conclude, the geophysical condition of Nepal is such that her river flows down to India and during the rainy season, the rivers cause havoc in both countries. Unilateral action of one country may mitigate the problem of that country, but it could aggravate the problem of the other country. This is not good neighbourliness. Therefore, Nepal and India must cooperate with each other to deal with flood havocs. But, despite its existence since 1986, SCIP has remained ineffective due to the mindset of bureaucrats. The 1986 inundation issues of Gaur Bazaar, Mahali Sagar, Laxmanpur and Lotan-Rasiawal-Khurd made no headway even till 2007. So, what is required is a radical change in the mindsets that espouse equity, fairness and social justice in dealing with the issue of inundation. If, the two countries cannot think alike on inundation, then how can they be expected to think alike on the larger and far more complicated multi-purpose projects?

Chapter 11
Epilogue
(Re-imagining Nepal's Water: Institutional Blind Spots, Developmental Blind Alleys and the Lessons of the Century Past)

Dipak Gyawali

It is indeed ironical that this epilogue – to a book whose contributors are all senior figures of Nepal's water and energy establishment – is being composed by hand because of power cuts. A country that has long boasted being one of the richest in the world in hydroelectric power potential is reeling under eight hours of daily load shedding in the month of March 2008. Such officially announced and enforced blackouts are, however, not new: they have, like the yearly seasons, regularly followed the commissioning of new hydroelectric plants. A few years of excess capacity have inevitably been followed by several years of shortages in the national grid since the 1970s. The story of scarcity amidst the plenty so frequently propagandised in the media repeats itself in other subsectors of domestic water supply and irrigation as well. Is there a rational explanation, a method to this madness?

This book helps answer that question: it provides much of the raw data, historical information as well as accounts of political and institutional shenanigans that underpin Nepal's hydro travails. The writers are all now-retired senior civil servants whose collective experiences in Nepal's hydrocracy spans the last half century. There is hardly an irrigation, power or flood control scheme in the country that one or the other of them has not been in during their aggregate careers. Some of them have written their chapters in the first person singular, providing a personal testimony of crucial events, difficult negotiations, and crises in riparian relations that will be of immense value to those studying transboundary water issues and, more generally, water management problems in a country that is a latecomer to development.

Nepal's encounter with capitalism and the modernity it entails has been mediated through the praxis of development; and it has been of the reactive rather than

D. Gyawali (✉)
Former Water Resources Minister, Academician, Nepal Academy of Science and Technology and presently Chairman, Interdisciplinary Analyst, Kathmandu, Nepal.
e-mail: ida@wlink.com.np

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the pro-active kind. First, the reaction was through a century of self-imposed isolation with Nepal being a 'forbidden kingdom' similar to the Japanese Tokugawa shogunate where all contacts with things foreign or modern were shunned. Following the Second World War, southern neighbor India's independence and the overthrow of the Rana shogunate in Nepal that drew political sustenance from its good relations with the British Raj, the pendulum has swung towards the other extreme: Nepali skepticism has been replaced with over-hyped expectations of what cornucopian largesse hydropower development may bequest Nepal's economy and everyday living. Hard-headed economic realism has, in this phase of euphoria, always taken a backseat to effusive dream-mongering by the policy class. 'Nepal is the second richest country in the world in hydropower after Brazil", goes a very popular saying without anyone asking if Brazil has ever said it is number one. 'Nepal's will become, if not an Asian tiger, at least an Asian leopard economy if high dams are built and power exported to India' is another ingrained belief.

The chapters of this book lay bare the labour pains of giving birth to a modern Nepal experienced by the midwives of the water sector. While that experience base is its great strength, it is also its inherent weakness: bureaucrats, like others, too have their own blind spots and institutional blinkers. The sociology and politics of knowledge tell us that each social solidarity comes with its own unique set of filters that readily lets in one type of data – that which enhances its own position – and filters out the rest. It is only when another social solidarity, for instance the environmental greens or an aggressive market, comes forward with counterfactual contentions that the filtered-out information is reluctantly re-examined by the mandarins of the water establishment. Such has also been the case in Nepal, especially after the restoration of multi-party democracy in 1990. Indeed, the decade of the 1990s has been the decade of water controversies, with the Tanakpur afflux bund, the Mahakali Treaty and the Arun-3 hydroelectric project being seared into public memory.

I have been actively involved in these controversies as an activist academic, and have jousted with many of the authors of this volume, who were then government officials on the other side of the fence. This kind of fundamental difference on issues is all the more interesting because Nepal's professional class is small and moves in tight-knit circles. My own professional life and its trajectory have intertwined with those of many of the contributors to this volume. Santa Bahadur Pun, one of the editors of this volume and the writer of Chapter 6 was five years my senior and Damodar Bhattarai (Ch 3) was a year behind me in the same American Jesuit-run school, St. Xavier's Godavari. Dr Hari Man Shrestha (Ch 8) was finishing his PhD thesis on Nepal's hydropower potential at Moscow Energy Institute when I was finishing high school. As fate would have it, I too ended up in the same institute in Moscow several years later and studied under the same teacher, Prof. Dzhaffar Omarovitch Seifulla. Upon returning to Nepal, I joined the Department of Electricity under the Ministry of Water Resources, where I lasted only seven years (two of those for study leave under a Fulbright fellowship at UC Berkeley); but it enabled me to interact and work with many of the authors, including the then 'baron' of the irrigation sector and first executive secretary of the Water and Energy Commission,

Bhubanesh Kumar Pradhan (Ch 9). Incidentally, his brother-in-law, a respected power system control engineer, was a very close hostel mate of mine in Moscow!

I resigned from government service a year after my return from Berkeley because of the sheer frustration of being unable to effect any change in thinking within a moribund hierarchic structure. The water ministry was dominated by construction-oriented 'project mindset', where there was little patience for either sound economics or strategic thinking about this vital resource and its regional implications. My last assignments in government service that were memorable were writing the minutes of the only tripartite Nepal-India-Bangladesh meeting which took place in 1986, and in serving as a member of the 'Pokharel Commission' (chaired by former chief engineer and member of the then legislature, the Rastriya Panchayat, Birendra Keshari Pokharel) formed to investigate the problems in the World Bank-funded urban water supply projects. From then on, I have been an 'independent, interdisciplinary analyst', a critic of conventional approaches not only of water resources but also other sector developments, whether foreign-aided or unaided.

It is this public role as a civic voice for alternatives that propelled me to being Nepal's minister of water resources during a very difficult time in the country's history; and personally, short though my tenure was, I have been quite pleased with the policy changes I have been able to achieve or at least introduce into the hierarchic structure. My attempts were born of a different paradigm and sets of global and local concerns than what Nepal's hydrocracy had been weaned on ever since the modernization period (and what I have called 'the Age of Aid') that followed the end of the Second World War (Sharma et al. 2004). What is therefore of interest in this epilogue is that my ministership came at the end of the careers of most of the contributors to this volume and, in a sense, is also an epilogue to an entire chapter in Nepal's water resources development. Of the new chapter that will be written in the future, even the outline is still very vague.

What follows, therefore, will be a look at the issues that the various chapters have raised, but from the perspectives of a different social solidarity, that of the civic egalitarian critic, as well as that of a minister running against the tide of conventional thinking. It has been said that a witty Scottish parson, observing two women shouting at each other from windows across the street, remarked, 'They will never agree: they are arguing from different premises!' As an example of premise differences, I would disagree with most of the writers in describing the impasse behind the Mahakali Treaty as a Nepal-India problem. Both Kathmandu and Delhi hydrocrats *agreed* on the Treaty's primary aim of building possibly the world's highest rock-filled dam on this border river. On the other hand, the social and environmental activists of both Uttaranchal in India and in Nepal's Far West (including some of us in Kathmandu) think nature and society are both being bilked by the 'run amok' technology of high dams: such an approach is too risky and not really addressing the current developmental problems in both the countries. Mahakali is thus, to the socio-environmental critics, not a transboundary problem among nation-states but fundamentally a deep-seated rift in perception between upholders of different development paradigms irrespective of the countries concerned.

And Nepali activists also hold the position that an excessive obsession of Nepal's hydrocracy these last decades with 'exporting power to India' or cajoling lower riparians with the hype of regulated waters providing massive flood and irrigation benefits to the lower Ganga plains has not helped the Nepali domestic and industrial consumers of electricity nor the Nepali farmers either. Their position is that bargaining with others will be only as effective as one is strong internally, that Nepal should consider exports only after her internal needs are met. They are not at all convinced by the 'Bhutan model' (Gyawali, 2001).

With these egalitarians Green beliefs, my approach (and that of my other activist colleagues in Nepal) towards Indo-Nepal water issues is diametrically different, in terms of concept, approach and programmes. The problems that have been described as Indo-Nepal issues by long-serving bureaucrats in this volume are, to many of us, inevitable consequences of moving along a wrong path. Even well-meaning efforts to iron them out will only find us digging ourselves deeper into a hole. The solution, therefore, is to dump the old paradigm and move along a new one—an agenda of democratic development as opposed to an export-led one—where the old problems will simply not arise. Hopefully, the reader will find this epilogue's shift in refractive index from that of the previous chapters both thought-provoking and elucidative: Indo-Nepal water relations need to move away from the hype of the past and address the more pathetic reality that exists at the grassroots, such an approach may benefit India too, as the situation in Bihar and Uttar Pradesh (UP) is not much better (Gyawali 1999).

Flood-Drought Syndrome

The 'flood-drought' syndrome I have described earlier refers to the few years of power and energy glut in the Nepali power system upon the completion of a major hydel project followed by years of load shedding. Cultural Theory, or as it is also called 'the theory of plural rationalities' of which I am a strong proponent (see Thompson *et al.* 1990 and Gyawali, 2003), would argue that this state of affairs suits the bureaucratic solidarity fine. Hierarchism is, after all, primarily concerned with control and its proclivity is towards the choice of such technologies as would allow it to better control the overall process and thus consolidate its expertise-based structure. Large hydropower projects, often times larger than the entire power system, become the natural choice for the hydrocrats rather than a mix of small and medium projects built by the private sector or local communities. The latter option would 'follow the load curve', matching supply with demand, while the former 'single large project' path would be genetically encoded to assure alternate cycles of electricity glut and scarcity. This is true not only in Nepal but also in India with its dirigisme of bureaucratic control over water and power; and the net result has been that state structures in both countries have maintained and managed scarcity while the tedious commission agent politics of development merchants and donor agencies holds local market-led innovation hostage till the next big project is bagged by the right constellation of vested interests.

Nowhere is the perceptual rift regarding the proper manner of developing Nepal's water resources as wide between the hydrocrats and the activists as it is in the power sector. The controversy over the Arun-3 was, for the activists, all about bad economics and not really about the environment or resettlement (it was after all not a storage dam and it was located in a remote, practically uninhabited area). The 201 MW project on the eponymous river was slated for construction at an estimated cost of $5,300 per kW, which, together with the conditionalities associated with the project, was considered outrageously unfair by activists. They cobbled up an international coalition of protest and were successful enough to force the World Bank and its bevy of bi- and multilateral donors to back out of it in August 1995 *on economic grounds*.

Today the activists have been vindicated by the fact that Nepali private entrepreneurs have succeeded in building the Piluwa Khola hydel project in the same Arun valley, still with no road, at only $1,400/kW even after Maoist bombings; and the Nepali integrated power system has subsequently gained a slew of alternative projects, the bulk of them utilizing the funding committed for Arun-3, that are providing the national grid a third more electricity than Arun-3 would have, and at half the cost and half the time (Gyawali, 2003)! Neither PMS Pradhan (Ch 5) nor Pun (Ch 6) adequately explains this anomaly between the cost-effective path propounded by Nepali activism (and successfully implemented in the latter half of the 1990s since the collapse of Arun-3) and the expensive route pursued by bureaucratic hierarchism over the last decades. Nor was Arun-3 purely a Nepali matter : its earlier version of 402 MW could not move forward—and was scaled down to the 201 MW 'baby' version—after it became apparent that India would never agree to buy its excess power at such expensive rates.

The institutional mistakes of Arun-3 were many, of which two of the most significant lie in surrendering to an external agency (World Bank) the lead role in its development instead of retaining it with a national institution (including agreeing to the infamous 'conditionalities' requiring the Bank's approval of the national budget in advance of its presentation to the sovereign parliament!), and in the FIDC-type contracts (as opposed to fixed-price contracts). So bad was this surrender by the national bureaucracy that when the issue of Chinese water withdrawals upstream of the Arun-3 in their Pengchoe irrigation project came up (which would reduce the flow of the Arun at the damsite by an estimated 13 to 39 per cent), rather than discussing the matter with the Chinese in a spirit of good neighbourliness, the Nepali authorities asked the World Bank to do so on its behalf. The FIDC arrangements mean that the client (Nepal government) surrenders all project decision-making powers to its consultants and accords them a privileged position. This allows for open-ended contract variations leading to massive cost escalations in projects, which were repeated in the ADB-led 144 MW Kali Gandaki as well as in the German-led 69 MW Middle Marsyangdi, both of which were projects utilizing the funds originally slated for Arun-3. In contrast, the private sector 60 MW Khimti project had fixed-price contracts that saw its completion ahead of schedule and under cost, even after the tunnel had collapsed during excavation.

The errors made in the agreements regarding electricity pricing, fairness in international contracts, equity over water rights and valuation of regulated water have been repeated in the case of the 750 MW West Seti. They have returned to haunt the water establishment some 16 years after the initial decision was made in 1994 to develop West Seti as an exclusively hydro-electricity export project: social and environmental activists have moved the Supreme Court seeking redress on these issues (Raajdhani, August 13, 2007). Indeed, it does seem unfair that Nepal should be asked to develop storage energy for export at a price that is half of what she is paying private power producers within Nepal for run-of-river electricity such as from Khimti and Bhote Kosi. The cost of undelivered power to Nepali industries (i.e. load-shedding) is four times the proposed export price, and Kathmandu's shops are running portable Honda generators at five times that price.

There is a vibrant debate within Nepal among contending views regarding water resources development: will the export of hydropower make the country rich (and is thus in its 'national interest' to follow an export-oriented path), or is hydropower an input to national production which will make national commerce and industry more competitive (thus developing cheap hydropower not for export but for domestic use)? Laos followed the first path, but is now having second thoughts (Gyawali, 2006a): Norway followed the second path and used water resources development for what she termed 'nation building', as did the United States in the immediate years following the Great Depression for a similar national imperative. No consensus has as yet evolved in the Nepali political sphere regarding the virtues and pitfalls of these two divergent paths, and the debate is quite fierce among the different protagonists. The egalitarian activist view, however, is quite emphatic on this point: export of power does not help Nepal's economy either in terms of forward or backward linkages. Using the example of West Seti, the stalled 750 MW export hydro-electric project in West Nepal, Shrestha (2008) has shown that, as it stands, the current agreement on West Seti achieves only 13 marks out of 300 in terms of contribution to Nepal's national development.

Unlike Euro-American NGOs and environmental activists, whose concerns lie more in stopping excess development of water structures, Nepali activists like their other Southern counterparts are more concerned with stopping bad developments but promoting good ones. Indeed, given that much of the population in the Southern countries still do not have access to electricity, clean drinking water, basic flood protection and reliable irrigation, storage and diversion dams have to be built: the debate in the South is really about how good ones can be built and bad ones avoided. This has been expressed as the slogan of 'No Bad Dams!' rather than 'No Dams' of the northern NGOs. To this end, an interesting exercise was begun in Nepal in January 2003. As with the hydrocrats of India and China, Nepali hydrocrats too had rejected the recommendations of the World Commission on Dams. My contention as minister with our senior officers was that big countries like China and India could get away with it, but Nepal was too small a country, very dependent on both foreign aid and foreign investments, to reject the guidelines proposed by this international study.

Since I was opposed to setting up a formal government commission, which to my mind would be a straight highway to complacent impasse, we worked out an interesting 'constructive engagement' arrangement. IUCN Nepal would coordinate a meeting of Nepal's dam builders (private developers), dam managers (officials of the Ministry of Water Resources) and dam critics (activists). The government would send high-level officials to participate in the deliberations aimed at examining all Nepali laws in the light of the WCD's guidelines. Slated to be completed in four months, the engagement between these three contending social solidarities was exciting enough for this diverse group to continue for over a year and come to some startling conclusions (Dixit, 2007): over a quarter of Nepali laws were actually in conformity with, or in some cases much more progressive than, the WCD's guidelines and defining issues, while almost half could easily be made to confirm to WDC guideline standards with some minimal legislative tweaking within five to ten years! Thus there was no reason for Nepal to reject the WCD recommendations with the expectation of the Seventh strategic priority, which was felt by all the three social solidarities as being against upstream riparians. On the contrary, there was every reason to crow about these achievements to international development agencies funding the building of dams.

A major positive outcome of this constructive engagement between the contending social solidarities has been that the old debate of 'large versus small' scale water projects has become a non-issue in public discourse. The focus is now on what are called 'second generation issues' such as those of risk (even small projects can have large risks to small communities), who bears (or should bear) the risks, how are benefits to be shared, what are the legal and institutional remedies to be pursued, and how is equity to be assured across the board. While the global debate remained focused on 'integrated water resources management' (or IWRM), the Nepali example showed that this much sought-after 'integration' could only be assured through a pluralised policy terrain that provides space for democratic contesting between the dam building market, the dam managing government bureaucracy and the dam-critiquing civic movement. It was not going to come about through procedural means of conventional 'tool kits' and 'best practices' (Gyawali, Allan et al. 2006). This happy state of affairs was the result of the water debate of the 1990s, mainly the Arun-III and Mahakali controversies, where civic voices challenged hierarchic bureaucratic diktat, and where the legal system responded ever so reluctantly. Even so, it was a major vindication of Cultural Theory (Gyawali, 2006) and its concept of institutional pluralism. Pakistanis are currently trying to repeat this Nepali experience to sort out their water controversies.

Pluralising the Power Terrain

Institutional pluralism, with contending social solidarities of the state, the market and the civic movements constructively engaged in a contested terrain, is equally needed within the power sector for it to be economically vibrant and free of the fatalist 'flood-drought' syndrome. This means that the vertically integrated national

monopoly utility – the Nepal Electricity Authority (NEA) – needs to be unbundled into generating, transmitting and distributing units. The bundling was done under donor pressure in the 1970s to facilitate large loan volumes to hydro projects sometimes bigger than the entire power system (Gyawali and Dixit, 1999). Most of the contributors do not seem to sympathise with this view; indeed Pradhan (Ch 5) emphatically states that unbundling of the NEA should not even be thought of until 2015!

One of the tasks I did initiate as minister and ex officio chair of the NEA in November 2002 was the 'internal unbundling' of the NEA, internal because – as an interim cabinet formed by the king after the parliament had imploded itself from party in-fighting with the parties therein unable to hold the elections within the constitutionally stipulated six months – we were in no position to change the NEA Act (which could only be done by an elected body or through a royal ordinance which would have a life of only six months and subject to unsure approval by a subsequently elected parliament). Hence, any element of economic or institutional reform had to be within the elastic limits allowed by the law, and unbundling had to be internal to the overall NEA structure envisaged by the Act. There was, however, the flexible precedence that had been set during the process of 'bundling' in 1985: despite the NEA Act's explicit recognition that it was to be the sole authority in matters electrical within the Kingdom, bureaucratic shenanigans had conspired to resurrect in 1994 the erstwhile Electricity Department as a separate entity, first as the Electricity Development Center (EDC) and eventually as a full-fledged Electricity Development Department (DOED), within ten years of the ostensible 'bundling', completely sabotaging the 'authority' concept of the NEA Act.

My experience in pushing this through was instructive in understanding the mindset of Nepal's hydrocracy and the culture of control and procrastination it has been weaned on – in the absence of strong consumer pressure – through decades of debilitating dependence on foreign aid. On initiating the policy of internally separating the functions of generation, transmission and distribution, I was told it was a good idea but would it not be better to wait for the outcome of an Asian Development Bank's to-be-funded technical assistance consultancy on the subject? On further questioning the senior managers, I learnt that it would take at least six months to select the expatriate consultants, and perhaps two more years to complete the study, implying that it would certainly not be done during my tenure. It required some serious arm-twisting to tell them that I wanted it completed for board decision 'next month': we missed the target by a month but the board did approve the unbundling and 18 semi-autonomous urban distribution centers were created with contractual performance indicators based on loss reduction and other factors. Within two months, the reduction in loss through theft was significant; but subsequent years of political uncertainties have meant that the reforms have been rolled back because of pressure from the trade unions of political parties.

I recall an interesting event a year or so after my tenure as minister ended: I ran into a senior ADB staff responsible for the power sector loans in a New Delhi hotel. I had worked together with him in the newly formed WECS in the early 1980s then doing system planning and optimization for the integrated Nepal

power system. He told me that my decision to unbundle the NEA had sent shockwaves in Manila and there were frantic emails flying in from Kathmandu saying that 'they are already unbundling the NEA and we have not even got our technical assistance through yet'. He realised, he said, that I was up to some tricks and sent back a message saying, 'If Nepalis have found the political will for it, try not to stop them!'

If unbundling of the urban distribution system was a challenge of its own kind, the vast rural hinterlands of Nepal, much of it still in darkness, presented a different sort of test. It had always bothered me that within the next eight years, we would be celebrating the centenary of electricity in Nepal: Nepal's first hydroelectric plant, the 500 kW Pharping powerhouse, was commissioned in 1911 during the reign of Rana Shogun Chandra Sumshere. A village opposite the power plant, Danuwar Gaon, had been looking at that electricity for over nine decades but itself lived in the dark, and situations like these across the country would provoke a lot of soul-searching in 2011 with questions asked about the slow pace of electrification. If we as hydropower professionals were called to answer, what would our mea culpa be?

The generation end of the business had already seen structural reform with the entry of private power producers in developing run-of-river plants; and the results had been impressive: almost a doubling of capacity in 10 years since the restoration of multiparty democracy in 1990 compared to the previous 80 years. The new need was to encourage more participation from Nepali private investors for developing up to 50 or so MW range run-of-river plants, while in parallel the public sector NEA (or at least the government-owned generation company that would have to be carved out of it) would focus on building storage projects which entailed issues of water rights and resettlement that were beyond the ken of the private sector. Four medium-sized storage projects suitable for the Nepali system were identified across the country and preliminary studies to further their future implementation were initiated; this effort, however, fell victim to subsequent political changes and has remained stalled.

It was the oft-ignored distribution end of the business, that too *rural* electricity distribution, which concerned me the most and this task was less about hardware than proper institutional software. NEA had been created as a fully-government venture that, by its very mandate, had to be commercially viable. Rural electrification is an infrastructure-building venture and, by definition, infrastructure is something felt to be absolutely necessary by the body politic but cannot be justified commercially. Nepal's experience with community forestry as well as community-operated water supply had already demonstrated that villagers were quite capable of running their own systems, often more responsibly than government bodies mandated to do that task. It was time to bring this concept into rural electrification, a relatively high-tech field compared to forests and water supply. When the Rural Electrification Bylaws 2060 (2003) were finally passed by the NEA board in May 2003, it had taken over two dozen drafts, much haggling between officials, and frequent public consultations with those interested in such an ignored issue.

Initially 18 groups were 'communitised', but today after four years of experience, there are almost 400 groups formed across the country involved with community

managed rural electrification. Of these, 180 groups in 40 districts have some form of agreement with NEA and are involved in managing their systems or expanding the coverage. A national federation – the National Association of Community Electricity Users Nepal – has 127 groups as its members in 21 districts and functions as a policy lobbying as well as a training and safety instruction body. Since they buy electricity from the NEA at a bulk rate and retail by themselves, there is a double accounting' system that comes into effect and forces user groups to crack down heavily on pilferage.

In the junction town of Mugling on the highway between Kathmandu and Pokhara, communitisation of electricity has meant that all NEA backlog dues have been paid, the community itself has raised money for the expansion of the distribution network, it has introduced new technologies such as lift irrigation and electrically driven fodder chaffing, and the town's overall electricity loss has come down to a mere 8 per cent. To put things in perspective, the overall system loss within the NEA is about 25 per cent, constant for the last so many years, and the town of Bhaktapur has recorded close to 60 per cent ! If, through institutional measures such as unbundling and communitisation, NEA's 25 per cent loss could be brought down to that of Mugling, the 600 MW utility would be, in effect, 'generating' almost 102 MW currently wasted or unpaid for! This effective measure does not require expensive hardware: it only calls for the elusive 'political will' to tinker with institutions.

My efforts at reforming the power system as an institution would not be complete without mentioning a failed battle, that of electricity tariff restructuring. It is a truism in economics, but often ignored by the politics of the day that demand and supply have to be matched by the price mechanism. In times of excessive demand (evening and winter peaks) or poor supply (the dry season between December and May) price has to act as the policeman herding consumers towards conservation. In times of excess supply (night time as well as the monsoon season), consumers have to be encouraged to use as much electricity as possible, which would otherwise be water spilled instead of being sent through the turbines. Furthermore, given that the system suffered from seasonal and peak shortages, it was important to give investors the correct price signal that storage and peak electricity would fetch a better price, and hence encourage them to invest in peaking pondage and even storage reservoirs. In the current tariff setup, where peak and off-peak rates are evened out, there is no reason for a rational investor to opt for more expensive storage over simple run-of-river schemes (Dixit et al. 2004).

After four months of intensive exercise, in May 2003 the NEA board approved a differentiated seasonal and daily off-peak structure to allow price to be the policeman, rather than exhortations on TV to 'save electricity'. Estimates showed that the NEA, by reducing the electricity price for off-peak irrigation to mere NRs.1.90 and nighttime charging of batteries of electric vehicles at NRs. 2.10 and thus selling some of its spilled energy, would actually be earning an extra two billion rupees per annum! Unfortunately, the drafters of the 1992 Electricity Act had envisaged an 'independent tariff commission', which was allergic to public hearings (there is no record of it ever holding one) and seemed unanswerable to any official body outside of itself. It never produced annual reports to the parliament or the cabinet, and never

asked the NEA to come up with tariff revisions. So when the NEA came up with a tariff proposal of its own, the tariff commission's reaction was to stall. Reacting beyond its mandate, which was to merely judge whether the proposed tariff was 'fair' to various classes of consumers and approve the proposed version accordingly, it lamely mentioned that the NEA would find implementing a seasonal tariff difficult, when the NEA itself was saying it could. This reform initiative too fell by the wayside with subsequent political uncertainties; and, while inflation has grown, the electricity tariff has not been revised for almost a decade, and the financial health of the utility continues to decline.

I need to close this section by re-iterating what was stated earlier: Indo-Nepal hydro-power issues, whether export of seasonal surplus or dedicated firm power, will find resolution only when Nepal strengthens her own domestic base. And these internal Nepali efforts described above were means towards that end. If Nepal ignores them, she will be on her knees while negotiating with a bigger and more powerful India!

Irrigation's Irritations

One aspect that strikes a reader of egalitarian persuasion about the different authors who write about irrigation (e.g. Bhattarai in Ch 3, Poudel in Ch 4 or Pradhan in Ch 9), is the near absence of their addressing what can be called 'subaltern water', or water as actually used by farmers at the very grassroots (see Baviskar, 2007). The authors present, and rightly as well as meaningfully so, very impressive data and analysis of the national and regional importance of Nepal's water; but the focus is upwards and outwards, not downwards and in-looking where the struggle to grow crops in a fertile but semi-arid land has seen heroic efforts over the centuries by village communities to harness whatever spring sources lie in their vicinity.

As water resource minister, I was always perplexed by official briefings during inspection visits: the presentation by the irrigation officer invariably began with the sentence, 'This is a scheme/project of X million rupees'. And my equally inevitable question would be: 'That aside, how much water did you actually deliver in which season and for what crop?' Their confused looks seemed to ask, 'Crop? Water? What we deal with are cement and earthworks contractors!' And equally perplexing to me has been a simple observation: why is it, not just in Nepal but all over South Asia, that one does not find a civil engineer selling, and a farmer group buying, his modern irrigation skills? Why is it that their services are only bought either by state hydrocracies or foreign development agencies? In my short tenure as water minister, coming with these questions that I had, I was less successful with new policy initiatives in the irrigation sector than with the power utility; but what little I did attempt still has relevance as I will try and argue below.

The history of irrigation in Nepal is paradoxically both very old and completely new. As a student of water management, I have visited farmer-built and managed irrigation schemes in the hills of Nepal that are hundreds of years old and still running, producing a second and even third crop every year. The famed stone water

spouts of Kathmandu Valley are still functioning after centuries, and are dependent for their flow on the transport of water from irrigation canals that originate from spring sources in the surrounding hills. On the other hand, as minister, I was chief guest at a function marking the 50th anniversary of the government's Department of Irrigation. Was there no irrigation to manage then a hundred years ago? Actually, we are talking of two different worlds, that of the farmer pursuing his inherited craft and that of the modern engineer reacting to contemporary events since the overthrow of the family autocracy of the Rana Shoguns in 1951. It is this striking gap that the new Irrigation Policy 2060 (2003) sought to address.

The irrigation policy document was a negotiated text: it was required by the multilateral lending institutions as a precondition for further aid to the irrigation sector, but the agenda that was being pushed was the Washington Consensus of opening up southern markets, privatisation, removal of subsidies to farmers, etc. Strange indeed it was that removing subsidies to Nepali farmers was being pushed by European and North American governments whose own domestic record (i.e. an EU cow receiving more subsidy than the income of marginal Southern farmers) is mind-boggling. This was a topic that had been of mild academic interest to me, but as minister I found myself suddenly facing raw power. An interesting incident occurred when I spoke once at a public meeting about Nepali farmers having to compete against Indian farmers who received free electricity for pumping, heavily subsidised fertiliser and loan write-offs. Almost the next day, I was facing an agitated delegation of donors led by the resident representative of the Asian Development Bank with Canadian and other bilaterals in tow. Their concern, expressed in the finest diplomatese, was that the agenda of removing agricultural (and irrigation) subsidies, followed dutifully by the previous governments led ironically by democratic socialists and communists, should not be tampered with, or else!

In countering this hegemony, the irrigation department officials were not of much help: on the contrary, given that their interests lay more with new constructions that would be enabled by aid flows, than with irrigation and crop productivity management, they were happy to sign along any policy that would keep the donors happy. I had to look for allies elsewhere and they were found in the National Federation of Irrigation Water Users' Association-Nepal (NFIWUAN). This was an association of farmer-managed irrigation users, which was able to raise farmer concerns at the national level better than the construction-oriented irrigation department. NFIWUAN had submitted a list of demands to the elected governments earlier but their concerns had not been entertained. I brought them together with the irrigation officials and hammered out issues point by point[1]; and these were some of the issues that I was able to weave into the new irrigation policy.

The primary point was to make the government's irrigation policy farmer-friendly and to wean it away from the previous primary focus on 'command area development', i.e. new to weanit constructions. The old Rana administration used to classify land in four categories for tax purposes, depending upon its productivity, with *abbal* (mostly

[1] The meeting took place at the Irrigation Department's meeting hall on December 12, 2002; and the signed agreed minutes between the two bodies was published by NFIWUAN in their annual publication Smarika in 2003.

irrigated) land as the highest. This system, instead of being reformed, was allowed to fall into disuse, with the result that land tax amounts to a negligible portion of the government's revenue. The devastating consequence of this neglect for irrigation management in the country was that government-run schemes too delinked themselves from questions of productivity increase. The primary focus of the new irrigation policy therefore was to restore the equilibrium; and the instrument to achieve this was to officially declare irrigated land as such as well as to give irrigation users a role in raising revenue from such lands. Furthermore, government irrigation offices were to produce an annual 'status of irrigation' report under their jurisdiction highlighting the quantity of water supplied per season for particular crops as well as to try and link them to possible indicators of productivity increase. Such reports have not been produced to date due to subsequent political uncertainties, but eventually will have to be in the future if any intelligent policy discussion is to be conducted about irrigation's contribution to Nepal's development.

Nepal's monsoon dominated climate meant that, of the 80 per cent precipitation that falls during the four wet months, half falls as cloudbursts in as little as 15 hours. So, while we may be rich in water resources on the average, we have virtually drought-like conditions for much of the year. All this requires that water be collected where it falls through a scattered network of ponds and tanks, and not just where it concentrates in narrow river gorges through reservoir-impounding high dams. This kind of thinking demands a policy shift towards conserving (or more often reviving) traditional water-harvesting ponds. Unfortunately, no government body, least of all the irrigation department, looked after this aspect of local water storage in a semi-arid clime. It was introduced into the new irrigation policy and will hopefully sometime in the future precipitate some shift in conventional thinking.

Another important change in approach was related to multipurpose projects. While there has been much lip service on this count, it has not really been seriously implemented in any water project by the government establishment; and the reasons have to do more with turf battles between power and irrigation agencies than with any unsoundness in the idea. Projects are planned and developed as either power or irrigation or flood protection schemes, and professionals guard their turfs with zeal against any encroachment from other engineers. This institutional weakness can be discerned immediately in the chapter on multipurpose projects by Bhattarai (Ch 3). It begins by claiming that developing multi-purpose storage dams in Nepal would 'greatly contribute to promoting regional economic development'. What one wants to see first are examples of successful multipurpose projects in Nepal for the benefit of its citizens before one's arguments of regional-level benefits can be taken seriously.

One positive example that struck me was the 5 MW Andhi Khola hydro-electric project constructed by the Norwegian missionary group-inspired Butwal Power Company (BPC)[2]. It has a strong irrigation component as well and is a good exam-

[2] The BPC, 'nationalised' in 1979 by the government was privatised to a consortium of 11 Nepali business houses and one Norwegian partner in 2003 under my tenure as minister. Its 12 MW Jhim-

ple of a multi-purpose project; but this fact is also systematically ignored in all government reports. In sharp institutional contrast, equally striking was the negative example of the 4 MW power house on the canal of the 66,000 ha Sunsari-Morang irrigation project. Instead of managing the powerhouse as an integrated part of the canal operations together with the water users' association, the powerhouse was handed over to the NEA. Because the canal operations, including its gates and dredging, were under the control of the Department of Irrigation, the NEA load dispatcher was never sure when the turbines would come on line. During my inspection visit, neither of the institutions seemed interested in operating it and both put forth flimsy technical excuses.

To me it was a national loss of power and hence of revenue, and was quite excited when the local water management association of Sunsari-Morang farmers came forward asking that it be handed over to them for operation. I initiated the process of that happening, along the same model as the 250 kW Nigure microhydro near Tumlingtar (in the eastern hill district), which had been bombed by the Maoists. Three local campuses of Sankhuwasabha had gotten together under the leadership of their former MP Hari Bairagi Dahal, approached the NEA for a long-term lease, borrowed money from local banks and rehabilitated the plant. Today the three campuses earn significant revenue from the sale of electricity from this rehabilitated powerhouse, and the phenomenon has earned the sobriquet 'hydro-powered education' (Basnet, 2007). It worked for Sankhuwasabha, but not, unfortunately, for Sunsari for subsequent lack of equally committed policy support. Water storage, whether by means of high dams, rain water harvesting ponds, wetlands or as grounds water, depends on a good understanding of South Asia's monsoon meteorology; and this—from an egalitarian perspective—is one fruitful area for Indo-Nepal and regional cooperation but has sadly been downplayed so far. We in Nepal could make a beginning by improving our hydro-meteorological understanding and proposing cooperation in this area to co-riparians of the basin.

Another example of local (or national) multi-purpose development that should have happened, but did not for reasons of inherent bureaucratic blindness, is the 225 MW Sapta Gandaki project. It should have followed the 69 MW Marsyangdi hydroelectric project in the late 1980s, but was scuttled by the politics of Arun-3. When I went on an inspection visit of this site in March 2003, it quickly dawned on me that the very concept behind it was wrong. It had been planned and designed with help from the Japanese aid agency as a hydroelectric project, when it should have been conceptualised as a water supply scheme. Nepal can always generate 225 MW from almost any number of places around the country, but it can only supply water to the plains of Chitwan and Nawalparasi (and the growing industrialisation therein) from this site. Moreover, Nawalparasi groundwater has serious arsenic problems and should be replaced by surface water from Sapta Gandaki. In addition, the exist-

ruk plant had been bombed by the Maoists and would have been turned into scrap had it not been thus privatised, since the government had no money for rehabilitation. To date, it is the largest privatization in Nepal's history, confirming my Cultural Theory credentials of advocating a balance of privitsation (generation), communitization (distribution) and nationalization (national grid).

ing Chitwan Lift Irrigation scheme in the district of Chitwan in central development region, which badly needs some solution to the heavy electricity costs and siltation difficulties associated with the pump, would benefit if surface flows could be had from the upper pondage of the weir at Devghat. And the burgeoning town of Narayanghat – the crossroads junction of all Nepal – desperately needs a second bypass bridge on the east-west highway to ameliorate traffic congestion, which a properly designed Sapta Gandaki project could provide. All these multi-purpose benefits could be provided by the Sapta Gandaki project if planned and designed right. I do not believe that Nepal can ever sort out its benefit sharing woes with India on proposed mega-schemes until it first manages to do so within Nepal among different Nepali beneficiary sectors.

It was to give such a venture a try that I took a ministry team to the dam site at Devghat just after the confluence of the Kali Gandaki and the Trisulganga before the river becomes Narayani or Sapta Gandaki. A serious difficulty in Hindu Nepal is that an ideal dam site at the confluence of two rivers is also an ideal holy site, and so it is with Devghat, as well as Barahakshetra on the Sapta Kosi, Ridi on the Kali Gandaki as well as Chobhar or Gokarna on the Bagmati. One argument developed against Sapta Gandaki during the Arun-3 debates was that it would submerge holy sites at Dev Ghat. Inspection showed that it was not true: the only significant holy spot at the lowest point was what was known as 'Sitaji Ko Gufa', which would be well above the full supply level of the pondage, especially if the project was designed as primarily a water and only secondarily as a power project. Minor deities and recently built *ashrams* could easily be re-located from the revenue stream that would flow from such a project; and there was appropriate precedence at Hardwar in India where the Dalhousie barrage has actually improved the ambience at the Ganga temple site. I was subsequently told by the officials concerned that quick recalculations done with such a paradigm shift showed a viable multi-purpose Sapta Gandaki with reduced but still significant power benefits to the tune of 90 to 135 MW. This effort too fell by the wayside with subsequent political uncertainties, but the good news is that the astute business community of Narayanghat is considering picking it up.

What the new irrigation policy introduces is precisely such a possibility. It requires that the Irrigation Department promotes storage projects on its own for the sake of dry season irrigation, and if there are power generation benefits, they should be treated as secondary and sold to the national grid through appropriate power purchase agreements. The success of such a policy rests on committed professional leadership within and without the Irrigation Department capable of taking up the challenge. Given that the most experienced irrigation engineers had retired or were about to from government service, I used the occasion of the 50th anniversary celebrations to convince some of them to set up an outside-the-government association of irrigation engineers. Electrical, mechanical, civil and water supply engineers already had such professional associations, and irrigation engineers eventually did set up a society of their own with the former Director-General of Irrigation B. K. Pradhan (Ch 9) as its first president. Such a professional civic leadership outside the governmental set-up was additionally needed to provide wholesome

counterbalancing guidance to the often populist policy advocacy of the irrigation farmers' association such as NFIWUAN. Since the government irrigation establishment, rife with partisan political interference, has not lived up to expectations and since markets are a long way from seeing profit in an infrastructure-heavy and water rights-bedevilled sector such as this, hopefully civic voices within the irrigation fraternity, through their professional association, will provide the catalysing leadership this sector so badly needs. It would also be, from a theoretical perspective, Cultural Theory applied towards the creation of a pluralised institutional context within the irrigation sector. It is my considered position that only such a policy terrain will allow Nepal to negotiate effectively with India.

Riparian Rumpus

The prime purpose of dwelling on Nepal's internal water and power travails, despite the fact that most chapters of this compendium address mostly bilateral issues with India or regional development possibilities, is to make the case that Nepal's bargaining position with India will only be as strong as her own developments are internally strong (Gyawali, 2000). Water rights and power trade are never negotiated as elements of charity; and one cannot get a fair price for either if one's domestic market is not strong, one's experts do not have hands-on experience with real development issues, one's lawyers have no corresponding experience with sophisticated contracts and one's financial sector has not mastered the intricacies of project risks. Nepal has focused excessively on the outside and not much on the inside when it comes to planning the harnessing of her myriad rivers.

As seen in the chapter by Dhungel (Ch 2) and also described elsewhere (Gyawali, 1994), the modern Nepali state's involvement in irrigation as a subject of government intervention was provoked in large part by developments across the border in British India. It was the Raj that wanted to develop, in the early part of the 20th century, the Sarda irrigation scheme on the Mahakali river that forms the western border of Nepal with India; and Nepal, after some intense haggling, acquiesced to the proposal after its needs for some cash up front and land swap (mainly for forest but possibly some agriculture) were satisfied. Water resources were not valued by the Nepali state to the extent that they were by the Raj in India. As regards power, it was in 1937 after the first industrial fair, when Rana Shogun Juddha Sumshere proposed that Britain help Nepal industrialise to absorb her excess young population, that the Raj wanted Nepal to develop hydropower for export to India (Gyawali, *ibid*.)

This legacy of action by the lower riparian and reaction (often quite naturally irate, but also equally often effusively optimistic) has repeated itself right down to the present. Dhungel, Pun and Adhikari (Ch 10) describe India's unilateral building of dams and embankments along the Nepal border submerging crops and settlements in Nepal. Shrestha (Ch 8) describes how Indian plans for river linking envisage utilising reservoirs and canals in Nepali territory (as it did in the infa-

mous Tanakpur case in the 1980s). These Indian agendas, which could be mutually beneficial if jointly planned in a transparent manner but which lead to rancor and ill-will if done unilaterally, are not shared with Nepal until all the constructions on the Indian side have become a *fait acompli*. Subba (1994), who was Bhutan's director general of power and negotiated the Chukha deal with India (and subsequently was forced to be a refugee in Nepal for a decade), complains that India plans for projects in Nepal and Bhutan as if they were 'routine additions to her own utilities'.

Despite my conviction that Nepal should first learn to keep its own house in order and not waste precious institutional resources by keeping national agencies too preoccupied with exporting power or developing storage dams for regional benefits, I could not avoid this issue, given the historical baggage of past treaties and agreements. The first order of business therefore was to do what the Supreme Court had ordered during the judgment on Tanakpur: the government should develop the criteria to be followed in implementing Article 126 of the 1990 constitution. The Article stipulates that any water sharing agreement be approved by a two-thirds majority of the parliament if the matter is 'pervasive, serious and of long-term nature'. Otherwise the agreement could be ratified by a simple majority. What the parties in all the three parliaments since 1990 failed to do was to develop such a set of criteria.

The Mahakali Treaty was conjured up as a jack-in-the-box surprise during the Tanakpur imbroglio and was rammed through parliament with over a two-thirds majority without first defining the criteria for calling for a two-thirds majority voting (Gyawali and Dixit, 2000). Even though building perhaps the highest rockfill dam in the world at Pancheshwar and generating over 6,000 MW of power would undoubtedly qualify as a matter of 'pervasive, serious and of long-term nature', failure to first define the criteria was a serious procedural lapse that would plague every development agreement with India, be it a high dam or a small embankment. For healthy cooperation and development of water resources between two riparian neighbours, it is absolutely essential that no ambiguity should be left (especially for hydro-technical efforts that take decades to materialise) which would be prone to any kind of misinterpretation.

At a reception following a Royal Nepal Army presentation to the King and his cabinet on the security situation (November 2002), I found myself in a separate moment with the monarch and mentioned that I was planning to have a criteria set developed to define the use of Article 126, which to my mind was one of the most 'democratic' provision of the 1990 constitution. Incidentally, democratic India does not need such a public approval of its political or bureaucratic decisions. The King was very supportive of the idea, and his words as I still remember them were: 'You understand the intricacies of the problem; if you don't get it done, no one else will; but remember when you do it, on national interests, especially long-term national interests, no giving up even an inch!'

I assembled a tight-knit team of the best minds on the subject, and we worked on the problem of defining the criteria for four months before coming up with a

Sthiti Patra or 'situation paper'[3]. It postulated that not just water but also a damsite such as an appropriate gorge or a storage valley was also a resource. The Article would be attracted if a resource (i.e. regulated water, not natural flowing water) or a product borne out of the use of a natural resource such as a dam site (i.e. electricity) crossed an international boundary. If it did not, if all the products were used within Nepal, the Article would not be attracted, which meant that which country's company developed a dam, where the money came from and in which denomination, etc., were irrelevant questions. The primary question was whether a resource crosses a border, and if it does how and to what extent; and a set of nine criteria were developed, which if applicable, would trigger the application of the two-thirds provision[4].

While working out this framework, it was important to keep in mind the fact that these criteria could change over time as Nepal developed her capacity to handle these issues; and it was equally important to allow some latitude to whatever government of the day there was to move ahead with some cooperative projects. One cannot require that everything be passed by a two-thirds majority, just as one cannot allow governments too much freedom to approve projects that would have large macro-economic or inter-generational impact. This point is important in today's debate where it is argued by some proponents of the export paradigm that electricity is not a resource, or that development of a dam site by a private company and export of electricity is not resource sharing, or even that flowing water, even if it has been regulated by a dam, is not a resource.

Before taking this 'situation paper' for cabinet approval, we decided to have a public hearing of sorts. The paper was circulated to some 74 experts from the academia to political parties and civil society with the signature of the secretary of the water resources ministry. Unfortunately, on the day the large consultative meeting was slated to be held at 3 pm, my prime minister submitted his resignation to the King at 1 pm on the grounds that, despite bringing about a ceasefire with the Maoists, we were not able to get the political parties to go for elections. Since we were still a caretaker government until a new arrangement was made, I was willing to continue discussions on this subject but was advised by senior bureaucrats not to do so. They argued that the matter rests safely in government files and it would not be seemly to be perceived as pushing such an important matter with undue haste under

[3] The 'situation paper', after it was circulated for comments, was published in full by the Nepal Workers' and Peasants' Party (of Comrade Rohit of Bhaktapur) in its party newspaper *Majdoor.*

[4] The nine trigger criteria (which can be found in Dixit (2008) as well as Dixit et al. (2004), were: 1) if a project is greater than 1000 MW capacity, 2) if there is going to be trans-basin transfer of water, 3) if more than 10,000 people were to be potentially displaced, 4) if more than 25 km^2 of agricultural, grazing or forest lands would be submerged, 5) if the ratio of foreign investments to Nepali investments is greater than 80:20, 6) if the investor asks for sovereign guarantee, 7) if there are possibilities of inter-sectoral (water for water) or cross-sectoral (water for something else) benefit sharing, 8) if more than 50 per cent of the electricity produced is to be exported across the border, and 9) if the river on which the reservoir has been built produces regulated water that increases the dry season flow at the point where the river crosses the national boundary by 10 per cent or similarly reduces peak flood flow by 10 per cent .

the circumstances. It has been almost five years since I left, but the King seems to have been right: if I did not do it, no one else would.

This issue of parliamentary ratification of water-sharing treaties refuses to go away, but refuses to get resolved either. After the street agitations of April 2006, the parliament dissolved by political in-fighting was resurrected by the King as per the demands of the alliance of seven parliamentary parties. In one of its first acts of defining a new order, it framed a new set of rules for parliamentary regulations where Article 126 of the constitution was brazenly violated. Rules 230, 232 as well as those from 105 to 136 allow for ratification of water-sharing treaties by as little as 44 per cent of the parliament ('two-thirds of a minimum two-thirds present'). It led to an uproar among cadres of left political parties when this was pointed out (Gyawali, 2006a), and prompted the Maoists as well as the more moderate United Marxists-Leninists to demand that the interim constitution drafting committee include Article 126 without fail. It was included fully as such, only its nomenclature is now Article 156; but the parliamentary rules still remain in the statute books in complete violation of the interim constitution. Meanwhile, the interim government has awarded licences for plum sites ('low hanging fruits') of Arun-III and Upper Karnali to Indian companies for export to India without voting in the interim parliament. The matter is currently *sub judice*, having been challenged in the courts by the activist community as well as Indian companies not awarded the contract.

After the question of Article 126, the next big issue I faced was the matter of previous agreements, on the West Seti and Upper Karnali, which to my mind had then been done improperly, but for proceeding ahead with which strong pressure was being applied by the business companies or India. The license to begin developing the West Seti for export had been given to an Australian developer (in violation of Article 126) in the mid 1990s; but it had not managed to secure a power purchase agreement with India or arrange financing. When its license period was about to lapse, it put in an application for extension, which I was in no mood to approve. Then interesting things started to happen. As with the subsidies issue described above, donor representatives started arguing that it would send a bad signal to investors, and hinting that it may also therefore affect donor support for the government. And my prime minister, who was from the western part of Nepal where the project was located, came under strong pressure not to have this ostensible developer sent packing.

My concern was of a different nature: it was to see if we could get this company to develop this attractive storage project for Nepal instead of export. We badly needed storage electricity for our power system that was getting overwhelmed with excessive run-of-river capacity. However, over the nearly decade-long holding of the license for 750 MW West Seti, it transpired that the company had, through what is known as 'salami slicing tactics', managed to sign MoUs with a succession of unstable governments denying Nepal the originally agreed benefits, i.e. 10 per cent free electricity. The last MoU had Nepal receiving money in lieu of power, and even that was to be given after the company had paid off all its debtors and there was some profit left! To keep my prime minister happy and to achieve what I believed was in the better national interest than export, viz. allowing the company the chance

to develop the project for Nepal, at the ministry we took the following line: the license would be renewed if we received 75 MW of free storage power and there was recognition that the regulated waters of West Seti (which could irrigate up to some 90,000 additional hectares of land in the dry season) would be Nepal's to own and develop in the future. In case the developer could not provide 75 MW at West Seti for whatever technical reason, it would have to develop and provide Nepal with equivalent storage power from some other alternative site.

Our expectation was that, given that we were willing pay a higher price for storage energy than India, the developer would ultimately chose to supply all the power to Nepal eventually. The developer did go to examine the 122 MW Damauli Seti (or as it is mistakenly called 'Upper' Seti), and did sign the MoU as per our terms. The irrigation department was asked to figure out how to use the regulated waters within Nepal and to also figure out the price of per cubic meter of regulated water in case it had to be traded with India. However, as with other innovative ventures, this one too came to nothing: the subsequent governments went back to re-signing another MoU asking for money instead of power under similar unfavourable terms. However, the interim parliament's natural resources committee has directed the government to renegotiate for receiving power instead of money. It is yet to be seen if the political will to uphold the national interest can manifest itself.

On Upper Karnali, the challenge was of a different nature. When the King had made his first visit to India after the completion of the mourning period following the Royal Massacre, it was agreed that Nepali and Indian businesses would cooperate in establishing in Nepal primarily for Nepal's benefit, a 200 to 300 MW run-of-river project (which would only have one product, i.e. electricity, and would not be encumbered with other difficult-to-handle products such as regulated water with water rights issues, etc.). I took this up as a primary challenge and put my full support behind the Federation of Nepalese Chamber of Commerce and Industry (FNCCI) which began serious cooperation with India's CCI. Unfortunately, there was no cooperation from the Indian embassy and when confronted, the ambassador admitted that the policy in New Delhi was not to allow even the Indian private sector to enter Nepal until the Government of India-owned National Hydro Power Corporation (NHPC) was given the license for Upper Karnali[5]! It proved the fears of many who have been following water related conflict issues between the two riparians that Delhi is less interested in the development of, and more interested in control over, Nepal's water resources.

Taken aback, I had to quickly think on my feet and responded by saying: 'I understand, as a country weaned on Nehruvian socialism, you love your public sector corporations. Please allow us the right to love ours: NHPC can come to apply for a license if it comes in partnership with our NEA.' As with West Seti,

[5] Some of these events have been described by an investigative reporter from interviews with FNCCI. See (Aryal, 2005). When I mentioned this incident to India's former water resources secretary Mr Ramaswamy Iyer, his surprised reaction was: 'This is not the stated policy of the Government of India!'

this was also to be developed primarily for Nepal's needs, with export only if there was surplus and only through the Nepali national grid. I also remember telling the ambassador that, if hauled before an elected parliament in the future, as any decision-maker like me would probably be, this was the only arrangement that I could defend. We could develop this as a public sector to public sector collaboration, while at the same time developing another site, possibly Arun-3, as a private sector to private sector collaboration. The ambassador seemed satisfied, but I later learned that junior functionaries of the Indian embassy would come to the NEA and argue that there could be no joint venture, that NHPC should be the sole licensee.

I immediately informed the prime minister and the Royal Palace of what had transpired, and received the message from the King's secretary that His Majesty thought it was a good counter proposal. However, my fear was that, though I did propose a joint venture, NHPC might reject the idea. I ordered the managing director of the NEA to quickly dash off to Delhi without informing anyone and find out what the NHPC chairman thought of it. The managing director returned the next day, beaming. He told me that the NHPC chairman was more than delighted to collaborate in a joint venture with the NEA ('How can I work in Nepal without a strong Nepali partner?' is what he had said), but was perplexed why the Indian Embassy in Kathmandu and the External Affairs Ministry in New Delhi kept telling him to go it alone.

In the complex web of people-to-people relations between Nepal and India, the best plans of what Karl Witfogel would call 'hydraulic despotism' can go awry. Thapa (Ch 7) describes the tremendous benefits of water transport over land-based haulage not just for Nepal but also India, especially in the Age of Climate Change. Access to the sea has been a national dream for land-locked Nepal, but it has been for long thwarted by the Indian (irrigation) establishment's arguments that it is impossible. The story of how they have come around to at least agreeing to it being studied is also a tale of people-to-people relations.

It was in May 1992 soon after the 1990 peoples' movement that saw the demise of the Panchayat system and the restoration of multiparty parliamentary democracy that academic colleagues in Patna had organised an Indo-Nepal 'Himalaya-Ganga' water conference that has since been recognised as the Patna Initiative. I was there with my colleagues from the Nepal Water Conservation Foundation (NWCF) and the Indian participants' list was full of stellar figures. When the Nepali delegates mentioned the importance of navigation and access to the sea, senior figures from the water establishment in New Delhi immediately rejected the idea as impractical. Before we could counter with our views, our Bihari colleagues took the stage and chided Delhi bureaucrats for being so myopic. They argued that Bihar was as land-locked as Nepal and, if navigational access to the sea were developed, she would benefit even before Nepal! It took another five years for that to find itself in the Kosi memorandum that Thapa signed with his Indian counterparts. This goes to prove the egalitarian activist arguments made at the outset of this epilogue that water problems are

easier to define as a clash of paradigms among differently constituted contending social solidarities than as international Nepal versus India issues.

Beyond the Age of Aid

It is clear that water resources development in Nepal and between Nepal and India are at a cusp or a turning point in history. The past has not worked, but the future has not revealed its features with any clarity. What might that future look like can only be speculated upon at this stage, but speculated with some reason and some hope. Conca (2006) argues that international regime formation, which takes the nation state as the only socio-institutional unit of concern, is but one institutional vehicle currently on the global scene, and even then not the most successful one, where the future of water governance is being forged. The others vehicles are transnational water marketisation initiatives led by multi-national companies and supported by multi-lateral aid agencies; the very effective transnational egalitarian protests against large dams, globalisation, Third World debt, etc; and finally international networks of water professionals with a presence in all these sites but coming together on their own to develop a consensus about good water management through such programs as IWRM (Integrated Water Resources Management).

While the presence of the Nepali state agencies in the regime formation site (e.g. the United Nation's Convention on the Law of the Non-Navigable Uses of International Water Courses, 1997) has been weak, it is almost non-existent in the other three non-conventional ones described above, where many of the non-state actors play an increasingly assertive role. In the case of Nepal and her water resources development, these actors are the investors and financiers of water technology as well as the international brotherhood of protestors and critics. The international bankers control the capital and hence the technology linked to it: without their willing cooperation, the larger grandiose water schemes that are constantly dreamed of cannot be contemplated based only on accumulated Nepali capital.

The critics cannot be ignored either because no international banker will lend money for a dam project, already an endangered enterprise, if there are ground to believe that it is plagued with social and environmental problems. In the past, activists have successfully led effectively painful boycott of products as well as disinvestments from companies and banks engaged in ungreen or anti-social business; and, despite the talks of bravado by Third World hydrocrats, corporate boardrooms in the financial capitals around the world are extremely sensitive to this new form of moral pressure.

Within such a plural terrain, what does water resources development in Nepal and between Nepal and India mean? Let us reflect on the three sound reasons for investing in Nepal's hydropower sector (one can think of similar reasons for irrigation too): almost two-thirds of the population does not have access to reliable, grid-supplied electricity; national energy security demands that the country move fast towards a non-petroleum based economy; and global concerns with climate change require that we reduce our carbon footprints. With all these valid reasons, why are investments not happening to the extent possible and the degree required?

One reason is that we have spent much of the last half a century chasing a mirage, that of earning hydrodollars by exporting hydro-electricity the way countries of the Middle East have earned petrodollars. At the national scale – at least in political speechifying – there is also the feeling that, when 'our colossal potential' is developed, hydropower will replace fuelwood and 'every Nepali will cook his or her *daal-bhaat* (rice and lentils) with electricity'. Fortunately, there are other far more productive end-uses for high quality energy such as hydro-electricity, and both community forestry schemes as well as biogas programs have provided much cheaper cooking alternatives on a sustainable basis. These delusions are the wrong reason for developing Nepal's hydropower, and are ghosts that have to be put to rest if we intend to break the shackles of the past.

Hydro-electricity cannot give hydrodollars the way petroleum gives petrodollars for a slew of reasons. The three most important of them are that consumers of Nepali hydro-electricity will pay only in rupees; that the economics of hydropower projects, given their capital intensity as well as hydrometeorology, does not allow for surplus storage (like oil in bunkers) that can be sold in the global market; and that hydropower has to be harvested on a sustained basis unlike oil can be extracted from the ground. The economics of harvesting requires sustained socio-economic involvement as well as mass consent, while oil extraction does not have to contend with the messiness of having to deal with society and social issues. If we examine the history of countries with predominantly hydro-based systems, we find that they have used this natural resource endowment to develop upstream-downstream linkages in their economies rather than exporting electricity as primary raw material input for production.

Tied with this myth is another that too needs to be laid to rest: the idea that India can be a supplier of electricity in Nepal's hour of need (as during the present crisis) or that it is a market with 'potentially infinite demand' for Nepal's hydro-electricity. Let us first examine this idea of importing power from India. It needs to be safely excluded because India is a heavily power deficit country: it has no significant surplus electricity capacity for its own internal need, let alone to share or export to neighbours.

Furthermore, since water and electricity are state subjects and not union matters as per the Indian constitution, even if Delhi agrees to supply electricity to Nepal, the heavily power deficit states of UP and Bihar and their state electricity boards are not likely to oblige beyond diplomatic tokenism, nor will the quality of electricity, if received from Bihar and UP, be guaranteed to maintain the minimum standards. One only has to look at how members of the Bihar Legislative Assembly have approached Nepal to supply their border areas with Nepali electricity – 'Yes, you may have load shedding, but at least it is regular and announced: in the rural areas of Bihar and small towns, if electri-city is interrupted, one does not know if it will come back in four hours or fourteen days!' – to realise this basic fact of life.[6]

The third persuasive reason arises from current global concerns regarding greenhouse gas- induced climate change. Investing in Nepali hydropower development means moving away from burning fossil fuel to powering one's economy with renewable energy. This is a path that now has, internationally, the same moral imperative

[6] Request made to the author when visiting Bihar in India as Nepal's Minister of Water Resources in 2003.

as poverty alleviation and ridding the world of hunger. It has also demonstrated tremendous success: electrically driven ropeways hauling goods in the mountains between two points are three times cheaper to build than an equivalent unmetalled motorable road, eight times quicker to install, and twice as energy efficient (Gyawali *et al.* 2004). The milk carrying Bhattedanda ropeway (in southern Kathamandu valley), funded by the EU, used to require Rs. 34,000 per month of diesel cost to operate. Once it was able to hook on to community electricity, it shifted to Nepali hydro-electricity that costs only Rs. 7,000 per month! There is a different future, and it works.

However, to access funds for hydropower projects based on this moral (and also economic) logic, Nepal has to play a much more pro-active role in the various forums and sub-committees within the climate change community. If Nepal's Biogas Support Program can access funds through the Clean Development Mechanism (CDM), there is no reason, except procedural, why Nepal's hydropower should not qualify. Unfortunately, our social mindset seems to be so stuck in the old paradigm of foreign-aided development that we have not even noticed that the Age of Aid has ended. If we wish to develop Nepali hydropower (or irrigation), we have to pursue new financing instruments, nationally and globally, as well as new institutional modalities for doing business in the sector.

It is also detrimental to Nepal's water resources development to remain stuck— as we have for the last half-century—with the export led paradigm. It has led to developmental impasse at best and political rancour at worst. Until Nepal's hydrocracy is weaned away from export-oriented development to a Nepal-centric one, impasse and rancour may well bedevil this sector much longer into the future. Indo-Nepal cooperation in water resources will have to be re-imagined with these egalitarian concerns in mind.

References

A. Books and Articles in Books

1. Abbas BM (1982) The Ganges water dispute. The University Press, Dhaka.
2. Agrawal NK (1995) Agriculture and irrigation. In: Thapa BB and Pradhan BB (Study Directors) Water resources development: Nepalese perspectives. Konark Publishers Pvt. Ltd., Delhi.
3. Ahmad QK, Thapa BB and Verghese BG (1994) Converting water into wealth: Regional cooperation in harnessing the eastern Himalayan rivers. Institute for Integrated Development Studies, Kathmandu.
4. Ahmad QK, Biswas AK, Rangachari R, Sainju MM (eds.) (2001) Ganges-Brahmaputra-Meghna region: A framework for sustainable development. The University Press, Dhaka.
5. Baral LR (2000) Clash of values, Governance, Political Elite and Democracy in Nepal. In Kumar D (ed.) Domestic Conflict and Crisis of Governability in Nepal: Centre for Nepal and Asian Studies (CNAS), Tribhuvan University Kathmandu:
6. Baviskar A (ed.) (2007) Waterscapes: The Cultural Politics of a Natural Resource: Permanent Black, Ranikhet, Uttaranchal and distributed by Orient Longman Pvt. Ltd., India.
7. Bernstein HT (1960) Steam boats on the Ganges. Orient Longman, Bombay.
8. Bhasin AS (1994) Nepal's relations with India and China: Documents 1947-92. Siba Exim. Pvt. Ltd., Delhi.
9. Caponera DA (1987) International water resources law in the Indus basin. Ali M et al. (eds.) In: Water resources policy for Asia. Balkema, Boston.
10. Changming L, Dakang Z and Yuexian X (1984) Water transfer in China: The east route project. International Journal of Water Resources Development, Vol. 2, issue 2/3.
11. Conca K (2006) Governing Water: Contentious Transnational Politics and Global Institution Building. The MIT Press, Cambridge, Massachusetts
12. Dixit A (2008) Dui Chhimeki Ko Jal Yatra (Water Journey of Two Neighbours), Nepal Water Conservation Foundation and Action Aid Nepal, Kathmandu.
13. Dixit A (2007) Continuing Reasoned Public Debate on Dams and Development: A Summary of National Dialogue on Dams and Development, Nepal Water Conservation Foundation and IUCN Nepal, Kathmandu.
14. Dixit A, P Adhikari and S Bisangkhe (2004) Baandh Ra Bikas: Rachanatmak Sambaad (Constructive Dialogue on Dams and Development), Nepal Water Conservation Foundation and IUCN Nepal, Kathmandu.
15. Dhungel DN (2003) Purba prasashak-ka samjhanaka goretaharu [Reminiscences of former administrators] (in Nepali). Institute for Integrated Development Studies, Kathmandu.
16. Dhungel DN (2004) Nepal India water resources relationship: Looking ahead. In: ORF (2004) India-Nepal relations: The challenge ahead. Rupa & Co., in association with Observer Research Foundation, New Delhi.

17. Gyawali D (2006) Hype and Hydro (and, at Last) Some Hope in the Himalaya. In Verweij M and M Thompson (eds.) Clumsy Solutions for a Complex World. Palgrave/Macmillan Press, Basingstoke
18. Gyawali D (2003) Rivers, Technology and Society. Zed Books, London (Nepali edition as Water in Nepal published in 2001 by Himal Books and Panos South Asia, Kathmandu).
19. Gyawali D (2001) Water beyond the State: Resolving Conflicts with Institutional Pluralism. In P. Shahadevan of JNU (ed) Conflict and Peace Making in South Asia, Lancer's Books, New Delhi.
20. Gyawali D (2001) Water Nepal. Himal Books and Panos South Asia, with Nepal Water Conservation Foundation, Kathmandu.
21. Gyawali D (2000) Nepal-India Water Resource Relations. In William IZ and the late Jeffrey ZR (eds.) Power and Negotiation, International Institute of Applied Systems Analysis (IIASA), Vienna and University of Michigan Press, Ann Arbor, Michigan.
22. Gyawali D, JA Allan et al. (2006) EU-INCO water research from FP4 to FP6 (1994-2006): A Critical Review. Office for Official Publications of the European Communities, Luxembourg.
23. Gyawali D, Dixit A and Upadhya M (2004) Ropeways in Nepal: Context, Constraints and Coevolution; Kathmandu Electric Vehicle Alliance and Nepal Water Conservation Foundation, Kathmandu.
24. Gyawali D and Dixit A (2000) Mahakali Impasse: A Futile Paradigm's Bequested Travails. In D. Kumar (ed.) Domestic Conflicts and Crisis of Governability in Nepal. Center for Nepal and Asian Studies (CNAS), Tribhuban University, Kathmandu (Earlier version published as Mahakali Impasse and Indo-Nepal Water Conflict in February 27-March 5, 1999 issue of Economic and Political Weekly (EPW), XXXIV, 9, Bombay. The EPW article with a 2004 postscript published in 2005 by Sage Publications India in Samir Kumar Das (ed.) Peace Processes and Peace Accords.)
25. Gyawali D and Dixit A (1999) Fractured Institutions and Physical Interdependence: Challenges to Local Water Management in the Tinau River Basin, Nepal. In Moench M, Caspari E and Dixit A (eds.) Rethinking the Mosaic: Investigations into Local Water Management, published by Nepal Water Conservation Foundation, Kathmandu and Institute for Social and Environmental Transition, Boulder, Colorado.
26. Haider S (2004) Negotiating the Mahakali treaty. In: ORF (2004) India-Nepal relations: The challenge ahead. Rupa & Co., in association with Observer Research Foundation, New Delhi.
27. IIDS (2000) Flood forecasting and warning and disaster management. Institute for Integrated Development Studies, Kathmandu.
28. IIDS (2000) Water-based integrated development of GBM region. Institute for Integrated Development Studies, Kathmandu.
29. IIDS (2000) Augmenting the Lean Season flow of the Ganges at Farakka. Institute for Integrated Development Studies, Kathmandu.
30. IIDS (2001) Quality of water in the GBM region. Institute for Integrated Development Studies, Kathmandu.
31. IIDS (2000) Regional energy grid in the GBM region. Institute for Integrated Development Studies, Kathmandu.
32. IWMI (2004) Pro-poor intervention strategies in irrigated agriculture in Asia. Country reports: India and Bangladesh. International Water Management Institute, Colombo.
33. Karki MD (1995) Inland water transport. In: Thapa BB and Pradhan BB (Study Directors) Water resources development: Nepalese perspectives. Konark Publishers Pvt. Ltd., Delhi.
34. Koirala BP (2055BS, 1998/99) Atmabritanta [Biography] (in Nepali). Jagdamba Prakashan, Kathmandu.
35. Lam WF (1998) Governing Irrigation System in Nepal: Institutions, infrastructure, and collective action. International Centre for Self Governance, Institute for Contemporary Studies, Oakland, California.
36. Lumsali R (1996) Mahakali nadi-baata praapt uplabdhi-haru-ko rakshhya gardai thap uplabdhiko lagi sangharsh garaun [Struggle for additional gains by preserving the gains from the Mahakali river] (in Nepali). Kanchanpur, Nepal.

37. Malla SK (1995) Case study of Kosi and Gandak projects. In: Thapa BB and Pradhan BB (Study Directors) Water resources development: Nepalese perspectives. Konark Publishers Pvt. Ltd., Delhi.
38. Mehta JS (2004) India-Nepal relations: A victim of politics. In: ORF (2004) India-Nepal relations: The challenge ahead. Rupa & Co., in association with Observer Research Foundation, New Delhi.
39. Micklin PP (1984) Inter-basin water transfers in the United States. International Journal of Water Resources Development, Vol. 2, issues 2/3.
40. Mihaly EB (1965) Foreign aid and politics in Nepal: a case study. Oxford University Press, London.
41. Mishra DK (1990) Badh se Trasht – Sinchai se Pasht [Fear from flood and want for irrigation] (in Hindi). Samta Publication, Patna.
42. Mool PK, Wangdav D and others (August 2001) Inventory of glaciers, glacial lake outburst floods of Bhutan. International Centre for Integrated Mountain Development, Kathmandu.
43. Nesteruk FY (1963) Development of hydropower in the USSR. na
44. ORF (2004). Discussions III. In India-Nepal relations: The challenge ahead. Rupa & Co., in association with Observer Research Foundation, New Delhi.
45. ORF (2004) India-Nepal relations: The challenge ahead. Rupa & Co., in association with Observer Research Foundation, New Delhi.
46. Pande BB (1982) Tes Bakhat ko Nepal [Nepal of those days] (in Nepali). Centre for Nepal and Asian Studies/Tribhuban University, Kathmandu.
47. Pant SD (2001) Comparative constitutions of Nepal. SIRUD, Kathmandu.
48. Poudel SN (2003) Nepalma sinchai: jalajanaya sambhabyta ra sansthagat vikas [irrigation in Nepal: Prospects in water and institutional development] (in Nepali). Water Resources Development Centre, Kathmandu.
49. Postal S (1994) Pillar of sand: Can the irrigation miracle last? W/W/ Norton & Company, New York.
50. Poudel SN (1986) Irrigation development in Nepal. Manaslu Press, Kathmandu.
51. Poudel SN (1992) Irrigation profile of Nepal. Department of Irrigation, Kathmandu.
52. Pradhan P and Gautam U (eds.) (2002) Farmer managed irrigation systems in the changed context: Proceedings of the second international seminar, 18-19 April 2002, Kathmandu, Nepal. Organized by Farmer Managed Irrigation Systems Promotion Trust, Kathmandu.
53. Pun SB (2004) Overview: Conflicts over the Ganga. In: Subba B and Pradhan K (eds.) Dispute over the Ganga: A look at potential water- related conflicts in South Asia. Panos Institute, South Asia. Kathmandu.
54. Pun SB (2006) Water resources. In: Dhungel DN and Shrestha AM (eds.) IIDS (2006) Nepal: Conflict resolution and sustainable development: Foreign policy and development issues, Vol. II. Institute for Integrated Development Studies, Kathmandu.
55. Pyakuryal B, Dahal MK and Adhikari D (2005) Partnership in economic development: An enquiry into the Indian aid policy to Nepal. BP Koirala India Nepal Foundation, Embassy of India, Kathmandu.
56. Rajendra Pradhan et al. (eds.) (2000) Water, land and law: Changing rights to land and water in Nepal. Proceedings of a workshop, Kathmandu, 18-20 March 1998, Freedeal/Wageningen Agricultural University/Erasmus University, Rotterdam.
57. Rana PSJB and Dhungel DN (eds.) (1998) Contemporary Nepal. Vikas Publishing House, Delhi.
58. Rao KL (1972) India's water wealth. Orient Longman, Calcutta.
59. Rimal L (2003) In: Dhungel DN (2003) Purba prasashak ka samjhanaka goretaharu [Reminiscences of former administrators] (In Nepali). Institute for Integrated Development Studies, Kathmandu.
60. Rose LE (1971) Nepal strategy for survival. Oxford University Press, Bombay.
61. Sewell DWR (1984) Inter-basin water diversions: Canadian experiences and perspectives. In: International Journal of Water Resources Development, Vol. 2, issue 2/3

62. Shah SG et al. (2001) Irrigation development in Nepal: Investment efficiency and institution. Winrock International, Kathmandu.
63. Shaha PP (2003) In: Dhungel DN (2003) Purba prasashak ka samjhanaka goretaharu. [Reminiscences of former administrators] (In Nepali). Institute for Integrated Development Studies, Kathmandu.
64. Shaha R (1996) Modern Nepal: A political history 1769-1855 (Volume I). Manohar Publications, New Delhi.
65. Sharma CK (1997) A treatise on water resources of Nepal. MASS Printing Press, Kathmandu.
66. Shrestha HM and Singh LM (1996) The Ganges-Bramhaputra systems: A Nepalese perspective in the context of regional cooperation. In: Biswas A and Hasimoto T (eds.) Asian international waters: from Ganges-Brahmaputra to Mekong. Oxford University Press, New Delhi.
67. Shrestha HM, Pradhan BK and Shanker K (April 1996) Augmenting the lean season flow of the Ganges at Farakka. Institute for Integrated Development Studies, Kathmandu.
68. Shrestha RS (2008) Hydropower Development – Irrelevant Debate of Small vs Big. In Pokhrel G, Shakya A and Dahal B (eds.) Water Resource Management of Nepal: A Strong Means for Sustainable National Development. Institute of Foreign Affairs, Kathmandu.
69. Siddiqui MFA (1981) Management of river systems in the Ganges and Bramhaputra basins for development of water resources. In: Proceedings of the National Symposium on River Basin Development, Dhaka, December 4, 1981.
70. Subba B (2001) Himalayan waters: Promise and potential, problems and politics. Panos South Asia, Lalitpur, Nepal.
71. Subba B (2002) Water, Nepal and India. In: Dixit KM and Ramchandran S (eds.) State of Nepal. Himal Books, Kathmandu.
72. Subba B (1994) Tapping Himalayan Water Resources: Problems, Opportunities and Prospects from a Bhutanese Perspective. Water Nepal, Vol. 4:1, Kathmandu.
73. Thakur TN (2004) India-Nepal power trade, India-Nepal relations. In: ORF (2004) India-Nepal relations: The challenge ahead. Rupa & Co., in association with Observer Research Foundation, New Delhi.
74. Thapa BB and Pradhan BB (eds.) (1995) Water resources development: Nepalese perspectives. Institute for Integrated Development Studies, Kathmandu, and Konark Publishers Pvt. Ltd., Delhi.
75. Thompson M, Ellis R, and Wildavsky A (1990) Cultural Theory. Westview, Boulder, Colorado.
76. Upreti BC (1993) Politics of Himalayan river waters. Nirala Publications, Jaipur and New Delhi.
77. Verghese BG and Iyer RR (eds.) (1993) Harnessing the Eastern Himalayan Rivers: Regional Cooperation in South Asia. Konark Publishers Pvt. Ltd. under the auspices of Centre For Policy Research , Delhi.
78. Verghese BG (1999) Waters of hope: From vision to reality in Himalaya-Ganga development cooperation. Oxford and IBH Publishing House, New Delhi.
79. Verghese BG (2004) Harnessing of water resources: India-Nepal relations. In: ORF (2004) India-Nepal relations: The challenge ahead. Rupa & Co., in association with Observer Research Foundation, New Delhi.
80. Voropaev GV and Velikanov AL (1984) Partial southward diversion of northern and Siberian rivers. International Journal of Water Resources Development, Vol. 2, issue 2/3.

B. Articles in Journals

1. Adhikary KD (2003) Amendments in the original Kosi project and the Gandak project agreement. In: DoI: Golden Jubilee Celebration Commemoration 2003. Department of Irrigation, Kathmandu.

2. Adhikary KD (2003) Nepalko Jalsrot Vikas Ko Prayasharu: Kehi Samjhanaharu [Nepal's initiatives in water resource development: A few reminiscences] (In Nepali). In: DoI: Golden Jubilee Celebration Commemoration 2003. Department of Irrigation, Kathmandu.
3. Bandhopadhaya J (1995) Water management in the Ganges-Brahmaputra basin: Ensuring challenges for the 21st century. In: Waters Resources, Vol. II, December 4, 1995.
4. Bhusal JK (1999) Renewable surface waters of Nepal: Uses and constraints to 21st century. A paper presented at the Third National Conference on Science and Technology. March 8-11, 1999. Organised by Royal Academy of Science and Technology, Kathmandu.
5. Gole CV and Chitale SV (1966) Inland delta building activity of Kosi river. In: Journal of Hydraulic Engineering Division of American Society of Civil Engineers, 92 (2).
6. Gywali D (1999) Institutional Forces Behind Water Conflict in the Ganga Plains, Jeo Journal , Vol. 47.9, Kluwer Academic Publishers, Amsterdam
7. Gyawali D and Dixit A (2000) How not to do a South Asian Treaty, Himal South Asian, Kathmandu, April 2001
8. Iyer RR (1999) Conflict-Resolution: Three River Treaties Economic and Political Weekly, June 12-18 1999
9. Shrestha HM (1995) Meeting the irrigation water needs: Regional cooperation for flow regulation-need of the time. In: WECS Bulletin, Vol. 7, No. 1, December 1995.
10. Thapa AB (1997) International water right issues and Nepal's position. In: WECS Bulletin, Vol. 8, No. 2, June 1997.

C. Government Documents

1. Agreement between His Majesty's Government of Nepal and the Government of India for the construction of Chatra Canal, November 1964.
2. Agreement between His Majesty's Government of Nepal and Government of India concerning the Electric Power Trade, 1996.
3. Agreement between Nepal and India for the renovation and extension of the Chandra canal system, construction of a pumped and distribution system of the Western Kosi Canal in Nepal, April 7, 1978.
4. CBIoP (1981) Design and construction features of selected barrages in India, January 1981. Central Board of Irrigation and Power, New Delhi.
5. CEA (2000) 16th Electric Power Survey of India. Central Electricity Authority, New Delhi.
6. CEA (2007) 17th Eelectric Power Survey of India. Central Electricity Authority, New Delhi.
7. CWC (1990) Water for future. Central Water Commission, Government of India, Pamphlet No. 18/90, New Delhi.
8. DoI (1990) Master plan for irrigation development in Nepal. Main report and annexes, Vol. 1-4. Department of Irrigation, Kathmandu.
9. DoI (1994) Reassessment of the groundwater development strategy of irrigation in the Terai, Vol. 1-6. Department of Irrigation, Kathmandu.
10. DoI (1999) Bhairawa Lumbini groundwater irrigation project stage III: Project completion report. Department of Irrigation, Kathmandu.
11. DoI (2002) Irrigation policy (second amendment). Department of Irrigation, Kathmandu.
12. DoP (nd) Nepal, Department of Publicity, His Majesty's Government of Nepal, Kathmandu.
13. GOB (1960) The Gandak project, River Valley Projects Department, Government of Bihar, Patna.
14. GoI (1980) Report on sharing of the Ganges water. Government of India, New Delhi.
15. GoI (2001) National Census of 2001, New Delhi, Government of India.
16. GoI (2003) Background on river linking (RL) for presidential celebration on water management, December 9-10, 2003, Ministry of Water Resources, Government of India, New Delhi.
17. GoI (nd) Study report on Kosi high dam. Government of India, New Delhi.

18. GoI (1961) A proposal to save Calcutta: Preservation of the port of Calcutta. Ministry of External Affairs, Government of India, New Delhi.
19. GoI (1959) Report of the inland water transport. Ministry of Transport and Communications, Government of India, New Delhi.
20. GoN (1954) Agreement between the Government of the Kingdom of Nepal and the Government of India on the Kosi Project, 1954.
21. GoN (2001) Field Report on Lotan Rasiawalkhurd Bund, District Irrigation Office, Rupendhi district, July 6, 2001.
22. GoUP (1980) Note on Tanakpur. Department of Irrigation, Government of Uttar Pradesh, Lucknow.
23. HMG Nepal (1959) Agreement between His Majesty's Government of Nepal and the Government of India on the Gandak irrigation and power project, 1959.
24. HMG Nepal (1964) Amended agreement between His Majesty's Government of Nepal and the Government of India on the Gandak irrigation and power project. Ministry of Water and Power, His Majesty's Government of Nepal, Kathmandu.
25. HMGN (1966) Revised agreement between His Majesty's Government of Nepal and the Government of India on the Kosi project. Ministry of Water and Power, His Majesty's Government of Nepal, Kathmandu.
26. HMGN (2002) Water resources strategy. Water and Energy Commission Secretariat, Kathmandu.
27. HMGN (2003) Department of Irrigation: Golden Jubilee Celebration Commemoration 2003. Kathmandu.
28. HMGN. The Constitution of the Kingdom of Nepal 1990. His Majesty's Government of Nepal, Kathmandu.
29. HMGN and UNDP (1990) Master plan for irrigation development in Nepal, Cycle 2, Main report. Department of Irrigation, Ministry of Water Resources, Kathmandu.
30. HPC (1989). The Lower Sarada Barrage. Hydro Power Corporation of India, New Delhi
31. INCoLD (1979) Major dams in India. Indian National Committee on Large Dams. New Delhi.
32. INCoLD (1979) Design and construction features of selected dams in India. Indian Committee of Large Dams, New Delhi.
33. Indo-Bangladesh Task Force Report on Flood Management, 1990. New Delhi and Dhaka.
34. Letter of British Resident J. Manners Smith to Prime Minister Chandra Shumshere JBRana below on Sarada Barrage, 1916.
35. Letter of Prime Minister of Nepal Chandra Shumshere to Colonel Kennion, British Resident in Kathmandu, 1920.
36. Letter of Government of Public Works, Uttar Pradesh, India, on Return of Land to Nepal in Connexion with Sarada Kitcha Project, 1946.
37. Letter of Ministry of Foreign Affairs, His Majesty's Government of Nepal, to Embassy of India, Kathmandu, on the stricture of Nepalese parliament on Mahakali Treaty, November 22, 1996.
38. Letter of the Secretary, Ministry of water resources, to his counterpart at the Ministry of Foreign Affairs, Government of Nepal, July 6, 2001.
39. Minutes and summary record of discussions of official-level talks:
    - Record of discussion between the Nepalese delegation led by Shri Madhusoodan Dhakal, Secretary, MOWR, HMGN, and the Indian delegation led by Shri Naresh Chandra, Secretary/MOWR, GOI, held at Kathmandu, December 20–22, 1987.
    - Minutes of the first meeting of the 'Standing Committee between Nepal and India on Inundation Problems', held from July 15 to 17, 1986, in Kathmandu.
    - Summary record of discussions of the second meeting of the Indo-Nepal Sub-Commission on Water Resources, held in New Delhi, from April 15 to 18, 1991.
    - Action plan to expedite the various activities agreed between His Majesty's Government of Nepal and Government of India during the visits of Prime Ministers of Nepal and India, 1993.

- Action plan agreed between Dr MS Reddy, Secretary, Ministry of Water Resources, and Dwarika N Dhungel, Secretary, Ministry of Water Resources, His Majesty Government of Nepal, New Delhi, February 1996.
- Minutes of meeting between Indian and Nepalese delegations headed by Secretaries (Water Resources) of both countries on Indo-Nepal joint water resources development projects on November 18, 1996, in Ministry of Water Resources, New Delhi.
- Joint press release of talk between Kumar Prasad Gyawali, Foreign Secretary, Nepal, and Foreign Secretary of India, Krishnan Raghunath, held on August 19-21, 1997, in New Delhi.
- Minutes of the 1st meeting of the Nepal-India Joint Committee on Water Resources, October 1-3, 2000.
- Minutes of the high-level Nepal-India Technical Committee on Inundation Problems in Rupandehi (Nepal), Siddharth Nagar (India), and Banke (Nepal)/Shravasti district (India) (May 3-6, 2002, Kathmandu).
- Minutes of the 2nd meeting of India-Nepal Joint Committee on Water Resources, held on October 7-8, 2004.
- Minutes of the 3rd meeting of High-Level Nepal-India Technical Committee (HLTC) on Inundation Problems in Rupandehi (Nepal)/Siddhartha Nagar (India) and Banke (Nepal)/ Shravasti (India) districts (September 27-28, 2004, Kathmandu).
- Minutes of 1st meeting of the standing committee on inundation problems between Nepal and India 1986
- Minutes of the 14th meeting of the standing committee on inundation problems between Nepal and India, held at Patna, August 30-September 1, 2006.
- Minutes of the 3rd meeting of the committee on Kosi and Gandak projects (2006), Kathmandu.

40. MOF (2004) Working paper for Nepal Development Forum 2004 on Water Resources Development Sector (Hydropower). Ministry of Finance, His Majesty's Government of Nepal, Kathmandu.
41. MoWR (1989) Karnali (Chisapani) multipurpose project. Feasibility Study (Executive Summary). Himalayan Power Consultants, Ministry of Water Resources, Kathmandu.
42. MoWR (1991) Pancheshwar multipurpose project; Final report, Vol. 1-3, Ministry of Water Resources, Kathmandu.
43. MoWR (1996) Treaty on the integrated development of the Mahakali river, including Sarada barrage, Tanakpur barrage and Pancheshwar project, 1996. Ministry of Water Resources, Government of Nepal.
44. MoWR and JICA (1985) Master plan study on the Kosi river basin for water resources development. Main report and annexes. Ministry of Water Resources and Japanese International Agency for Cooperation, Kathmandu.
45. MoWR and JICA (1993) Master plan study for water resources development of the Upper Karnali river and Mahakali river basins. Main report and annexes. Ministry of Water Resources and Japanese International Agency for Cooperation, Kathmandu.
46. MoWR (October/November 1998[Kartik, 2055BS]) Shri. Panchako Sarkar, Nepal thatha Bharat Sarkar Bichha Sampanna, sarada dam Thatha Panchawor Pariyojana Samat Mehakali Nadiko Ekikrit bikash Garna Sambandi Sandi tatha Annya pattarharu [Treaty between Nepal and India on Sarda, Pancheswor project, etc.] (In Nepali). Ministry of Water Resource, Government of Nepal.
47. MoWR (2001) Report on Inundation Impact of Lotan Rasiaval Khurd Dam on Nepalese Territory (Called as Arjun Pd. Shrestha, MS Paudel, SB Regmi and SK Sharma Committee) Ministry of Water Resources, Government of Nepal, Kathmandu, Bhadra 2058.
48. NEA (2006) Nepal Electricity Authority: A year in review (progress report). Nepal Electricity Authority, Kathmandu.
49. NEA (1990) Profile of Progress (1985-1990). Nepal Electricity Authority, Kathmandu.
50. NEA (2006) Nepal Electricity Authority: Generation. Nepal Electricity Authority, Kathmandu.

51. NEA (2005) Corporate development plan for FYs 2005/06 to 2009/10 (Summary). Nepal Electricity Authority, Kathmandu.
52. NEA (2005) Fiscal Years 1999/2000 to 2005-2006: A year in review. Nepal Electricity Authority, Kathmandu.
53. NEA (2006) NEA White Paper. Nepal Electricity Authority, Kathmandu.
54. Nepal Gazette Vol. 41 No. 36, December 29, 1991, Kathmandu.
55. NPC (1987) Irrigation management in Nepal. National Planning Commission, His Majesty's Government of Nepal, Kathmandu.
56. NPC (1995) Nepal Agriculture Perspective Plan. National Planning Commission, Kathmandu.
57. NPC (2003) The Tenth Plan. National Planning Commission, His Majesty's Government of Nepal, Kathmandu.
58. Parliament Secretariat (2000). Report of the Sub Committee of the Foreign Affairs and Human Right of the then House of Representatives on Laxmanpur Barrage and Allied Structures, Kathmandu, July 24, 2000 (Srawan 9, 2057 BS) .
59. Report of Bangladesh-Bhutan Joint Team of Experts on Flood Control and Mitigation, 1989, Dhaka and Thimpu.
60. Speech of Maharaja and Prime Minister Chandra Sumshere JBRana on the occasion of Pharping Hydroelectric Power Station, Gorakhapatra, weekly, Jestha 23, 1968 BS (June 1911).
61. WECS (1989) Bangladesh-Nepal Joint Study Team: Report on flood mitigation measures and multipurpose use of water resources. Water and Energy Commission Secretariat, Kathmandu 1989
62. WECS (1993) Report on the possible technical and financial implications of Tanakpur barrage (Baral Committee), Water and Energy Commission Secretariat, Kathmandu.
63. WECS/GIF (1996) Proceedings of a workshop on Harnessing Eastern Himalayan Waters, Kathmandu, April 7-9, 1996. Water and Energy Commission Secretariat, Kathmandu, and Global Infrastructure Foundation, Japan.
64. WECS (2001) Water resources strategy: Hydropower (Vol. V). Water and Energy Commission Secretariat, Kathmandu.
65. WECS (2002) Water resources strategy in Nepal. Water and Energy Commission Secretariat, Kathmandu.
66. WECS (2003) Water resources strategy formulation (WRSF) project III, National Water Plan, hydropower sub-sector (second draft). Water and Energy Commission Secretariat, Kathmandu.
67. WECS (2005) National Water Plan Nepal 2005. Water and Energy Commission Secretariat, Kathmandu.
68. Various minutes of the power exchange committees.

D. Study Reports

1. ADB (2004) Kali Gandaki: A hydroelectric project completion report. Asian Development Bank, Manila, April 2004.
2. ARMS (July 2003) Compilation and analysis of South Asian treaties and agreements on water resources. Report submitted to International Centre for Integrated Mountain Development. Association for Research and Management Services Pvt. Ltd., Kathmandu.
3. AWOINC (1966) Big Load Afloat: US Water Transportation Resources. American Waterways Operators Inc. Washington, D.C. Library of Congress Catalog No. 65-5774.
4. Basnyat DB (2003) River basin planning (final report) for national water plan. Water and Energy Commission Secretariat (WECS), Kathmandu.
5. CMS (2004) Study of river system in Tarai from Jhapa to Siraha. Consolidated Management Services Nepal, Kathmandu.

6. ERMC and Full Bright Consultancy (2005) Final report: GIS-based river systems from Dhanusha to Rautahat districts. Environment and Resource Management Consultant and Full Bright Consultancy, Kathmandu.
7. Full Bright Consultancy and PESR (2007) GIS based study of the river systems in Tarai from Banke and Bardiya. Full Bright Consultancy and Project Engineering Consultancy and Research, Kathmandu.
8. Louis F (2005) A paper from EDF submitted at the Sixth International Conference on Development of Hydropower, Kathmandu, June 7–9, 2005.
9. Gulati A, Maingem-DR and Raju KV (1999) National workshop: From top-down to bottom-up: Institutional reforms in Indian canal irrigation. Delhi (Proceedings Report).
10. Hall WS (1967) Report on feasibility study of developing waterborne transportation on the rivers of Nepal leading to a seaport outlet for the Government of Nepal. Ministry of Transport and Communications, Kathmandu.
11. IRG (2003) Nepal saleable power: Export marketing negotiation strategy report. International Resources Group Ltd., Kathmandu.
12. Jalasrot Sanstha (2004) Bangladesh-Nepal dialogue: Cooperation in water: A report on visit of Bangladesh Minister for Water Resources to Nepal, January 21-24, 2004, Kathmandu.
13. Lama MP, Sainju MM and Ahmad QK (2000) Economic reforms and power sector in South Asia: Scope and challenges for cross border trade. Rajiv Gandhi Foundation and Centre for South Asian Studies, Jawahar Lal Nehru University, New Delhi, Institute for Integrated Development Studies, Kathmandu, and Bangladesh Unanayan Parishad, Dhaka.
14. NWCF (2002) Nepal's riparian concerns on transboundary waterways: Notes from 11th Pani Satsang. Nepal Water Conservation Foundation, Kathmandu.
15. NCAER (1964) Traffic survey of Gandak River. National Council of Applied Economic Research, New Delhi.
16. Norconsult (1998) Power system master plan for Nepal: Generation expansion plan. Norconsult report to Asian Development Bank, Manila, and Nepal Electricity Authority, Kathmandu.
17. Poudel SN (2000) Investment in irrigation in Nepal: Outlook for future. Draft report submitted to Winrock International, Kathmandu.
18. Poudel SN and Sharma CK (1994) Irrigation and water control, APP technical papers (research paper). Agricultural Projects Services Centre, Kathmandu.
19. RAAS and MEC (2005) GIS based study of river system in Tarai from Nawalparasi to Rupendehi districts. RAAS Engineering Consultancy and Manish Engineering Consultants, Kathmandu.
20. RAAS and MEC (2005). GIS based Study of River System in Tarai from Kapilvastu to Dang districts. RAAS Engineering Consultancy and Manish Engineering Consultants, Kathmandu.
21. Sain K (1970) Plan for flood control in the Kosi River. Synopsis report about water resource development in Nepal, done for National Planning Commission, HMG/Nepal. Kathmandu.
22. Thapa AB (1967) Inland waterways for Nepal. Water and Energy Commission Secretariat, His Majesty's Government of Nepal, Kathmandu.
23. Thapa AB (1992) Kosi waterway. Water and Energy Commission Secretariat, His Majesty's Government of Nepal, Kathmandu.
24. Umashankari (2004) Interlinking rivers: Contradictions and confirmations. A report of the year-long electronic debate at riverlink@yahoogroups.com undertaking South Asian Dialogues on Ecology and Democracy and Centre for the Study of Developing Societies. Worldwide Fund for Nature (WWF) and ActionAid, New Delhi.
25. Upadhyay SN (1991) Nepal's Transboundary Water Resources, New Perspectives on Cooperation, Transboundary Resources Report, International Transboundary Resources Centre, USA.
26. USAID (1989) Irrigation support project for Asia and the Near East. East Water Study. Arlington, Virginia.
27. USAID, SARI/Energy Program (2001) The four borders project: Reliability improvement and power transfer in South Asia: A pre-feasibility study. Kathmandu.
28. World Bank (1972-1990) Staff appraisal reports of various irrigation projects in Nepal. The World Bank, Washington, DC

29. World Bank (June 1980) Staff appraisal report on Mahakali irrigation project (Stage I). The World Bank, Washington, DC
30. World Bank (1985) Kulekhani hydroelectric project completion report. The World Bank, Washington, DC
31. World Bank (1990) Nepal agricultural sector review. The World Bank, Washington, DC
32. World Bank (1991) Nepal: Poverty and income. The World Bank, Washington, DC
33. World Bank (1994) World Bank staff appraisal report of Arun III hydroelectric project. The World Bank, Washington, DC
34. World Bank (1995) World Bank's press release on Arun III cancellation. The World Bank, Washington, DC
35. World Bank (1996) Marsyangdi implementation completion report. The World Bank, Washington, DC
36. World Bank and GoI (1998) India: water resource management sector; Review, main and subsector reports. The World Bank and Government of India, New Delhi.
37. World Bank (2000) World Bank's Implementation Completion Report on Power Sector Efficiency Project. The World Bank, Washington, DC
38. World Bank (2001) Nepal: Proposed Power Sector Development Strategy (Report No. 21912-NEP). The World Bank, Washington, DC
39. World Bank (2002). Project Appraisal Document on Power Development Fund, The World Bank, Washington DC.

E. Country Report

1. Gyawali D (2003) A country report presented at the Third World Water Forum on Sustainable Use of Water for Energy. Organised by the World Water Council, March 16, 2003.

F. Articles

1. Dhungel DN (2000) Implementation status of the treaty on integrated development of the Mahakali river, including Sarada barrage, Tanakapur barrage and Pancheswar project. A paper presented at the Track Two Exercise on Nepal and India Water Resources Relationship. Organised by Institute for Integrated Development Studies, Kathmandu, December 2000.
2. Pun SB (2005) Nepal's hydropower export in the context of India's river-linking project. A paper presented at the 6th International Conference on Development of Hydropower: A major source of renewable energy, June 7-9, 2005.

G. Articles in Newspapers and Interviews

1. Aryal P. Bharat ko Tirkha (India's Thirst). Nepal National Weekly Jestha 8, 2062 (May 21, 2005), Kantipur Publications, Kathmandu.
2. Basnet S. Hydropowered Education. Nepali Times No. 377, December 7, 2007, Kathmandu.
3. Gyawali D. Mekong River Commission, Resurrected Parliament and Section 31 (in Nepali). Samakaleen Weekly July11, 2006, Kathmandu.
4. Gyawali D. A Fate Other Than Marginality, Himal South Asia, May-June, 1994, Kathmandu.
5. Interview of Minister Gyanendra Bahadur Karki. In: Boss, March 15-April 14, 2007.

6. Iyer RR (2003) Changing the course. In: India Today, January 20, 2003.
7. Iyer RR (2001) Delay and drift on the Mahakali. In: Himal South Asian, Kathmandu.
8. Pun SB (2007) Whither Indo-Nepal water resources?: Issues and episodes to reflect on. Spotlight, January 19-25, 2007.
9. RS Mahat, Finance Minister, Kantipur, February 11, 2007 (Magh 28, 2063).
10. Paschim Seti Ma Sarbochha Dwara Karan Dekhau Aadesh (Supreme Court orders show cause in West Seti). Kathmandu: Raajdhani Daily, August, 13 2007.
11. Saran S (2004) Interview. Spotlight. Kathmandu, July 16, 2004.
12. Phuyal S (2004). Mahalisagar, Marchabar embankments threaten thousands. www.ekantipur.com, June 24, 2004.
13. Sukla D (2001) International relations India-Nepal ties. Press Information Bureau, Government of India, September 4, 2001 (www.pib.myiris.com).

H. Letters and Press Releases of Embassy of India, Kathmandu

1. EoI (2000) Press release on Laxmanpur. No. KAT/23/2000, Embassy of India, Kathmandu. July 25, 2000.
2. Letter of Embassy of India, Kathmandu, to the Ministry of Foreign Affairs Government of Nepal on the Lotan-Rasiawalkhurd Embankment. No. Kat/ECW/3/2001.
3. EoI (2003) Letter of Embassy of India on Mahali Sagar (No. KAT/DCM/2003) to Ministry of Foreign Affairs Government of Nepal, Kathmandu. March 14, 2003.
4. EoI (2004) Media statement on Mahali Sagar. No. Kat/14/2004, Embassy of India. March 15, 2004.

I. Newspapers and magazines (All Nepalese)

1. Halkhabar, June 21, 1959.
2. IST/TNN. August 10, 2007.
3. Kantipur. June 2004; January 15, 2007; April 5, 2007; April 15, 2007; and April 27, 2007.
4. The Kathmandu Post: March 28 2003, March 28, 2006; December 4, 2006; December 28, 2006; January 6, 2007, February 18, March 6 and 29, 2008.
5. Spotlight: October 16, 2004
6. Samacharpatra, April 1, 2007.
7. boss. March 15-14 April 2007.

J. Websites

1. www.cea.nic.in.
2. www.nhpcindia.com.
3. www.wrmin.nic.in.
4. www.pib.myiris.com

K. Miscellaneous

1. FAO (2001) Year Book of Production. Food and Agriculture Organisation, Rome.
2. Jack Bonniface, CEO/SMEC, Radio Talk Programme 2001.
3. ILI (1911) Madrid Declaration on the International Regulation regarding the Use of International Watercourses for Purposes other than Navigation, International Law Institute, Madrid
4. Jha U (2004) Inundation in Nepal, unpublished paper
5. Pokhrel JC (1991) Environmental resource negotiation between asymmetrically powerful nations: Power of the weaker nations (PhD dissertation). Massachusetts Institute of Technology (MIT), Cambridge/Massachusetts, USA.
6. Unofficial notes of the Nepal-India Secretarial Meeting [Dhulikhel meeting] on Progress Review of the Mahakali Treaty, January 1998.
7. UN (1997). UN Convention on Law of the Non Navigational Use of International Watercourses, (adopted by the *UN General Assembly May 1997)*
8. Verghese BG (2003) Nepal's paradox: Nature's promise unredeemed, Track II meeting on Nepal-India water resources cooperation. IIDS-CPR, September 3-4, 2003, Kathmandu.

Annexes

Annex 1

Estimated Runoffs from the Rivers of Nepal

S. No.	Station No.	Rivers	Upto Gauge Sites for S. Nos. 1 to 9: Drainage Area sq km	Streamflow m^3/sec	Streamflow 10^9 m^3	Specific Flow lps/sq km	Nepal Territory Up to Gauging Sites: Drainage Area sq km	Estimated Flow m^3/sec	Estimated Flow 10^9 m^3
1	*	Mahakali	12 100	615.00	19.39	50.83	2 250	114.36	3.61
2	280	Karnali	42 890	1 398.00	44.09	32.60	40 780	1329.22	41.92
3	290	Babai	3 000	59.00	1.86	19.67	3 000	59.00	1.86
4	350	W. Rapti	3 380	100.00	3.15	29.59	3 380	100.00	3.15
5	450	Narayani	31 100	1 600.00	50.46	51.45	24 230	1246.56	39.31
6	589	Bagmati	2 700	136.00	4.29	50.37	2 700	136.00	4.29
7	**	Kamala	1 450	45.00	1.42	31.03	1 450	45.00	1.42
8	695	Sapta Koshi	54 100	1 498.00	47.24	27.69	25 640	709.96	22.39
9	795	Kankai	1 148	60.00	1.89	52.26	1 148	60.00	1.89
10	Others up to the border:-								
		(a) Snowfed Rivers:							
		Mahakali	3 160			50.83	3 160	160.61	5.07
		Karnali	1 110			32.60	1 110	36.18	1.14
		Narayani	3 860			51.45	3 860	198.59	6.26
		Sapta Koshi	6 300			27.69	6 300	174.44	5.50
		Total	**14 430**	**569.82**	**17.97**		**14 430**	**569.82**	**17.97**
	***	*(b) Southern Rivers:*							
			28 173	1 030.69	32.50	36.58	28 173	1030.69	32.50
		Total=(a+b):	**42 603**	**1 600.51**	**50.47**		**42 603**	**1 600.51**	**50.47**
		Grand Total	**194 471**	**7 111.51**	**224.27**		**147 181**	**5 400.62**	**170.31**

\# Average Specific Flow for Southern Rivers (S.Nos. 3,4,6,7 & 9) is 36.58
* Data from Pancheshwar Multipurpose Project, Detailed Project Report, November 1995
** Master Plan Study on the Koshi River, JICA, March 1985
*** Based on the average specific flow for southern rivers

Summary Information

	B Cm	mm	
Catchments within Nepal Territory up to Gauge Sites:			
Measured flows from Snowfed Rivers:	107	729	
Southern Rivers:	13	86	
Unmeasured flows d/s of Gauge Sites:	50	343	up to the border
Thus, the Total Annual Flow from Nepal Territory:	170	1 157	
Considering all catchments within and outside Nepal:			
Total Annual Runoff.	224	1 524	
Hence, Flow from outside Nepal:	54	367	[=224.27-170.31]
Within Nepal Territory:			
Average Annual Precipitation in Nepal:	267	1 814	
Therefore, Loss = Precipitation - Runoff:	97	657	[=266.99-170.31]
Runoff Corfficient:		63.78%	[-1157/1814]

Source: Water-based Integrated Development of the GBM Region, Institute for Integrated Development Studies (IIDS) 2000 Kathmandu.

Source: Water-based Integrated Development of the GBM Region, Institute for Integrated Development Studies (IIDS) 2000 Kathmandu.

Annex 1.1

Some of the Features of Major Rivers

unit billion m^3

S.N .	Name of river	Type	Source	Snow+ monsoon	Monsoon only	Annual Total	Measuring point
1.	Saptakosi	A	Tibet	+		53.4	Barahanchetra
2.	Narayani	A	Tibet	+		53.2	Tribeni
3.	Karnali	A	Tibet	+		42.3	Katarniaghat
4	Mahakali	A	Tibet	+		20.7	Banbansa
5.	Bagmati	S	Midland	-	+	5.1	Karmhiya
6.	West Rapti	C	Midland	-	+	3.7	Jalkundi
7.	Babai	C	Siwalik	-	+	2.4	Bargada
8.	Kankai	S	Siwalik	-	+	1.6	Mainachuli
9.	Kamala	S	Siwalik	-	+	1.4	Chisapani
10.	Other smaller rivers of Terai	S	Siwalik	-	+	16.2	
	Total					**200.00**	

A= Antecedent, S=Subsequent, C= Consequent

Source: C.K. Sharma: *A Treatise on Water Resources of Nepal,* MASS Printing Press, Kathmandu 1997.

Annex 2

Letter of Dr. W Racy, Commissioner of Gorakhpur to British Resident in Nepal, May14, 1898

Department XII
From:

Dr. W. Racy, I.C.S.,
Off. Commissioner,
Gorakhpur Division.

To:

Resident in Nepal.
Dated 14 May 1898 No. 5171/XII – 24 of 1898.
File No. 24. Serial No. 67.

File Heading:- Boundary dispute between Nepal and British Territory (Mr. Peppee's Estate)

Subject:

Sir,

1. I have the honour to acknowledge the receipt of your letter No. 375/143-34 dated the 5th instant and to point out that the basis of the decision arrived at in June 1897, was the maintenance of the existing levels which were admitted to be those of 1874 when the former decision was arrived at between the two Government as to those reservoirs.
2. I enclose a comparative table showing that the levels were recorded to be in 1874, side by side you will find the levels entered in the urdu agreement signed by the District Engineer Mr. Kuelles and Subah Mohan Lal dated the 1st November 1897. A copy of the rubkar of agreement of that date was sent to the Durbar but was returned with corrections in red ink, and these corrections were found by me to be in accordance with the levels recorded in 1874. I therefore issued a revised copy giving the levels as entered in column 4 of the comparative table because I had with the Darbar and with your predecessor as the red ink notes of the copy returned to me showed, that the errors as to the top of the Siswa and Marthi gates were real.
3. I agree with the Darbar in holding that the entries of levels in the agreement should be accurate as representing actual facts, and I also hold that an entry should be made as to the existing levels of the sill of the Jamuwar eastern gate and also of the top of that gate. For this reason I have entered these points also in the comparative table so that they may not escape notice.
4. You will see that I have provided a column (5) for the entry of the levels of each point as it shall now be verified by joint representative before the rains set in; and I have the honour to refer you to my letter No. 5038/XII – 24 of the 9th instant to your address and to ask you to move the Darbar to add the duty of verification of these levels generally to the particular matter referred to in para 5 of that letter.

5. I have forwarded a copy of this table and letter to the District Engineer who will meet the Officer deputed by the Nepal Government. I propose that the comparative table be signed in column 6 opposite each item by the District Engineer and the Officer deputed by the Nepal Government, so that the verified levels may be entered in a (similar … illegible) rubcar prepared last year in which there should be no correction invited.

Sd.,Illegible,

Enclosure
The Comparative table.

COMPARATIVE TABLE

Points for determination	Level recorded in 1874	Level entered in agreement 1897 (urdu copy sent to Darbar)	Level as corrected in copy by Commr when (Ilegible) In 1898	Level verified by (illegible) l 1898	Signatures of officers verifying levels
1	2	3	4	5	6
(1) Sill of Jamuwar	301.64	301.64	301.64		
Western Gates	305.14	305.14	305.14		
Top of gates					
(2) Sill of Siswa Gates	302.45	302.45	302.45		
Tops of gates	307.45	307.47	307.45		
(3) Sill of Marthi gates	301.70	301.70	301.70		
Top of gates	306.70	306.00	306.70		
Now added,					
(4) Sill of Jamwar	omitted	omitted	omitted		
Estern	do	do	do		
gate Top of gate					

Source: Ministry of Water Resources, Government of Nepal.

Annex 3

Letter of British Resident J. Manners Smith to Lt. Gen. His Excellency Maharaja Sir Chandra Shumshere Jung Bahadur Rana [JB Rana] on Sarada Barrage, May 3, 1916

No. 923
The Residency, Nepal
3rd May 1916

My dear Maharaja:
The Government of India has for sometime past had under consideration the question of the utilization of the waters of the Sarada river [Mahakali river in Nepal] for the irrigation of land in the United Provinces [Uttar Pradesh] and now desire to recommend to the Secretary of State for sanction the scheme known as the Sarda Kichha Feeder Project.

Your Excellency will remember that in 1910 the Nepal Government granted permission for the survey of the Sarda river channel in connection with the Sarda-Ganges-Jamna Feeder Project from Baramdeo Mandi to a point one mile below Banbasa ferry.

In the original project of 1911 the proposed Headworks were situated entirely in British Territory at Solani Goth. In the years during which the project was in course of preparation practically the whole cold weather supply of water came down the western channel, only a very small amount passing down the main river.

Since the project was prepared, however, the state of the river has altered a great deal. After the big flood of 1910 the river showed signs of swinging over towards the Nepal bank below Tanakpur and in the last four years the cold weather stream has completely changed its course, until the whole winter supply is now in the Nepal side, and the Solani Goth channel is completely shoaled up. In consequence, to enable the project to be carried out, a change in the site of the Headworks has been necessitated. It is now proposed to locate the weir across the eastern channel of the Sarda river at Banbasa ferry about a mile below Solani Goth. This site has been selected because it is here that the river is narrowest. At this point, however, practically the whole river bed is in Nepal territory, the two channels under the high western bank being comparatively insignificant.

Even at this point it will be necessary to locate the left or eastern flank of the weir in the river bed tying it to the higher ground in Nepal territory by means of afflux bunds both up and down stream.

In order to ensure proper control over the river the Government of India are advised that it will be necessary to acquire a strip of land on the east side of the river which is now Nepal territory. As the area in question is understood to be waste and jungle the Government of India hope that the Nepal Government will kindly consent to its occupation for the above purpose.

I enclose for Your Excellency's information (1) a survey plan of the proposed Headworks (to be kindly returned when done with), and (2) a map of the Sarda

Canal project 1915 showing the extent of Nepal territory which it is desired to acquire in connection therewith.

When Your Excellency has been able to consider the proposal I shall be glad to speak to Your Excellency about it and communicate your views regarding it to the Government of India.

With kind regards,
Yours very sincerely,
(Signed) J. Manners Smith

To
Lt. Gen. His Excellency Maharaja Sir Chandra Shumshere Jung Bahadur Rana
G.C.B., G.C.I., G.C. S. I., G.C.M.G., G.C.V.O., D.C.I.
Prime Minister and Field Marshal of Nepal

Source: Ministry of Water Resources, Government of Nepal

Annex 3.1

Letter of Prime Minister of Nepal Maharaja Sir Chandra Shumshere Jang Bahadur Rana[JB Rana] to Colonel Kennion, August 23, 1920

Nepal
23rd August 1920

My dear Colonel Kennion,
With reference to your letter No. 3351/4550-73 dated the 29th July 1920 enclosing copy of a letter from the Chief Secretary to the United Provinces Government for sanction to the survey party to finally demarcate the land required for the Sarda canal work and the irrigation branch staff entering on it to start necessary work of construction, order has been issued to the Bada Hakim of Kailali-Kanchanpur Goswara, to permit the said parties to enter Nepalese territory for the purpose mentioned. Please arrange that an intimation a fortnight in advance of their coming be sent to the said Bada Hakia at Billouri specifying the dates when and on the points where they would enter Nepalese territory so that he may appoint a Nepalese officer to meet the parties and be with them during the demarcation work. In order that the intimation may reach the Bada Hakim without fail it is requested that it be sent by post as well as by messenger, as the delivery from the post office, which is Puranpur (about 28 miles) during the dry season and Palia Kalan (about 36 miles) during the dry season and rains is not very certain.

In connection with this Sarda canal Project, the construction of the head works and exchange of land relating there to it is understood that it is agreed that:

1. The Nepal Government will have a right for a supply of 460 cusecs of water and, provided the surplus is available, for a supply of upto 1000 cusecs when cultivation grows at any future time from the Sarda canal head work during the

Kharif i.e. from 15th May to 15th October, and of 150 cusecs during Rabi i.e. from the 15th October to 15th May, the canal head being in the latter period alternately closed and opened for 10 days at a time running 300 cusecs whenever the canal is open.

2. That is order to give those supplies all necessary works [things] such as the canal head with regulating gates, quarters for the canal staff ie on the left bank of the river and also under-sluices for the purpose of maintaining an open channel from the river to the canal head will be done by the Government of India at their own expense on the understanding that they shall retain full and entire control of the work with this undertaking that they shall supply to Nepal the quantity of water agreed to free of any charge.
3. That the Nepal Government would transfer necessary land for the construction and maintenance of canal works which is provisionally estimated at 4000 acres and would receive land equal in area from the British Government. The land to be taken from Nepalese territory will, after demarcation be measured and then land equal in area to it will be given to Nepal by the said Government.

I would ask to be kindly informed whether the Government of India has to make any proposal with regard to the disposal of timber obtained from trees felled in the course of demarcation and when the land so demarcated to be taken will be taken and land to be given in lieu thereof will be measured and given also whether they wish that valuable trees standing on the lands to be exchanged are to be given and taken along with those lands.

I am, with kind regards,

Yours very sincerely,
Sd/ Chandra

Source: Ministry of Water Resources, Government of Nepal

Annex 3.1.1

Letter of British Resident to Nepal to General His Excellency Maharaja Sir Chandra Shumshere Jung Bahadur Rana [JB Rana] Prime Minister and Field Marshal of Nepal, October 21, 1920

The British Legation, Nepal
21st October 1920

No. 4723/4550-18 of 20

My dear Maharaja,

With reference to your letter dated the 23rd August 1920, I write to inform Your Excellency that I communicated the contents thereof to the United Provinces Government and enclose herewith a copy of their reply for Your Excellency's information.

With kind regards,

Yours very sincerely,
Sd

Enclosed copy of 12th October 1920

To
General His Excellency
Maharaja Sir Chandra Shumshere Jung Bahadur Rana
G.C.B., G.C.I., G.C. S. I., G.C.M.G., G.C.V.O., D.C.I.
Prime Minister and Field Marshal of Nepal

Source: Ministry of Water Resources, Government of Nepal

Copy of a letter No. 2984, dated the 12th October 1920 from the Chief Secretary to the Government of the United provinces, to the British Envoy at the Court of Nepal.

1. With reference to your letter No. 3789, dated the 25th August 1920, I am directed to say that the land to be acquired in Nepal in connection with the Sarda-Kitcha feeder project, is 4093.88 acres. The land this Government is offering the Nepal Government in exchange is noted in the margin.

Division	District	Site	Area in Acres
1. Lucknow	Kheri	Sumerpur	2914.00
2. Fyzabad	Bahraich	Border	569.00
3. Do	Gonda	Near Koela Basa	65.30
4. Do	Bahraich	Border	516.20
5. Do	Do	Do	29.38
Total			**4093.88**

   Orders have been issued to the British authorities concerned for the demarcation, on site, of this land and arrangements for the exchange will be made as soon as the land in Nepal and British territory has been demarcated.
2. The summary of the terms regarding the supply of water from the canal to the Nepal Government as given in His Excellency the Prime Minister of Nepal's letter is correct.
3. As regards the ownership of the trees filled in demarcating the land in Nepal, I am to say that as it will be necessary to cut up and remove these trees so as to clear the line, this Government would suggest that to avoid delay, the trees should be regarded as belonging to the Irrigation Branch of this province, who could then arrange to the Irrigation Branch of this province, dispose of them immediately. Similarly the trees felled in demarcating the land in British India for transfer to Nepal, may be regarded as belonging to the Durbar if it will arrange to clear them away without delay. This arrangement seems to be simple and equitable as it is probable that the trees felled in demarcating the land in Nepal will balance the number of trees felled in demarcating the land in British territory.

I am to add that the remaining trees on the land will be exchanged along with the land. The Nepal Durbar is not likely to lose by the exchange as the land which this Government is offering in exchange comprises valuable forest and grazing ground.

True Copy

2nd Clerk

Source: Ministry of Water Resources, Government of Nepal

Annex 4

Agreement between His Majesty's Government of Nepal and the Government of India concerning the Kosi Project Kathmandu, April 25, 1954

THIS Agreement made this twentyfifth day of April 1954, between the [**Government of the Kingdom of Nepal**] (hereinafter referred to as the **Government**) and the **Government of India** (hereinafter referred to as the '**Union**').

1. Subject Matter

Whereas the Union is desirous of constructing a barrage, head-works and other appurtenant work[s] about 3 miles upstream of (Hanuman Nagar) town on the (Kosi River) with afflux and flood banks, and canals and protective works, on land lying within the territories of Nepal, for the purpose of flood control, irrigation, generation of hydroelectric power and prevention of erosion of Nepal areas on the right side of the river, upstream of the barrage (hereinafter referred to as the 'Project');

And Whereas the Government has agreed to the construction of the said barrage, head-works and other connected works by and at the cost of the Union, in consideration of the benefits hereinafter appearing; Now the parties agree as follows:

(i) The barrage will be located about 8 miles upstream of Hanuman Nagar town.
(ii) Details of the Project—The general layout of the barrage, the areas within affiux bank, flood embankments and the lines of communication are shown in the plan annexed to this agreement as Annexure A. [Not attached]
(iii) For the purpose of clauses 3 and 8 of the agreement, the land under the ponded areas and boundaries as indicated by the plan specified in sub-clause (ii) above, shall be deemed to be submerged.

2. Preliminary Investigations and Surveys

(i) The Government shall authorise and give necessary facilities to the canal and other officers of the Union or other persons acting under the general or special orders of such officers to enter upon such lands as necessary with such men, animals, vehicles, equipment, plant, machinery and instruments as necessary and undertake such surveys and investigations required in connection with the said Project before, during and after the construction, as may be found necessary from time to time by the Chief Engineer, Public Works Department (Kosi Project) in the Irrigation Branch of the Bihar Government. These surveys and investigations will comprise aerial and ground surveys, hydraulic, hydrometric, hydrological and geological surveys including construction of drillholes for surface and sub-surface explorations; investigations for communication and for materials of construction; and all other surveys and investigations necessary for the proper design, construction and maintenance of the barrage and all its connected works mentioned under the Project.

(ii) The Government will also authorise and give necessary facilities for investigations of storage or detention dams on the Kosi or its tributaries, soil conservation measures such as check dams, afforestation, etc., required for a complete solution of the Kosi problem in the future.

3. Authority for Execution of Works and Occupation of Land and other Property

(i) The Government will authorise the Union to proceed with the execution of the said Project as and when the Project or a part of the Project receives sanction of the said Union and notice has been given by the Union to the Government of its intention to commence work on the Project and shall permit access by the engineer(s) and all other officers; servants and nominees of the Union with such men, animals, vehicles, plants, machinery, equipment and instruments as may be necessary for the direction and execution of the project to all such lands and places and shall permit the occupation, for such period as may be necessary of all such lands and places as may be required for the proper execution of the Project.

(ii) The land required for the purposes mentioned in clause 3 (i) above shall be acquired by the Government and compensation therefore shall be paid by the Union in accordance with provisions of clause 8 hereof.

(iii) The Government will authorise officers of the Union to enter on land outside the limits or boundaries of the barrage and its connected works in case of any accident happening or being apprehended to any of the said works and to execute all works which may be necessary for the purpose of repairing or preventing such accident: compensation, in every case, shall be tendered by the Union to the proprietors or the occupiers of the said land for all damages done to the same through the Government in order that compensation may be awarded in accordance with clause 8 hereof.

(iv) The Government will permit the Union to quarry the Construction materials required for the Project from the various deposits as Chatra, Dharan Bazar or other places in Nepal.

4. Use of Water and Power

(i) Without prejudice to the right of Government to withdraw for irrigation or any other purpose in Nepal such supplies of water, as may be required from time to time, the Union will have the right to regulate all the supplies in the Kosi River at the Barrage site and to generate power at the same site for the purpose of the Project.

(ii) The Government shall be entitled to use up to 50 percent of the hydro-electric power generated at the Barrage site Power House on payment of such tariff rates as may be fixed for the sale of power by the Union in consultation with the Government.

5. Sovereignty and Jurisdiction

The Union shall be the owner of all lands acquired by the Government Under the provisions of clause 3 hereof which shall be transferred by them to the Union and of all water rights secured to it under clause 4 (i)

Provided that the sovereignty rights and territorial jurisdiction of the Government in respect of such lands shall continue unimpaired by such transfer.

6. Royalties

(i) The Government will receive royalty in respect of power generated and utilised in the Indian Union at rates to be settled by agreement hereafter.

Provided that no royalty will be paid on the power sold to Nepal.

(ii) The Government shall be entitled to receive payment of royalties from the Union in respect of stone, gravel and ballast obtained from the Nepal territory and used in the construction and future maintenance of the barrage and other connected works at rates to be settled by agreement hereafter.

(iii) The Union shall be at liberty to use and remove clay, sand and soil without let or hindrance from lands acquired by the Government and transferred to the Union.

(iv) Use the timber from Nepal forests, required for the construction shall be permitted on payment of compensation. Provided no compensation will be payable to the Government for such quantities of timber as may be decided upon by the Government and the Union to be necessary for use on the spurs or other training works required for the prevention of caving and erosion of the right bank in Nepal.

Provided likewise that no compensation will be payable by the Union for any timber obtained from the forest land acquired by the Government and transferred to the Union.

7. Customs Duties

The Government shall charge no customs duty or duty of any kind, during construction and subsequent maintenance, or any articles or materials required for the purpose of the project and the work connected therewith or for the bona fide use of the Union,

8. Compensation for Land and Property

(i) For assessing the compensation to be awarded by the Union to the Government in cash (a) lands required for the execution of the various works as mentioned in clause 3 (ii) and (b) submerged lands, will be divided into the following classes:

1. Cultivated lands.
2. Forest lands
3. Village lands and houses and other immovable property standing on them
4. Waste lands.

All lands recorded in the register of lands in the territory of Nepal as actually cultivated shall be deemed to be cultivated lands for the purposes of this clause.

(ii) The Union shall pay compensation (a) to the Government for the loss of land revenue as at the time of acquisition in respect of the area acquired and (b) to whomsoever it may be due for the project and transferred to the Union.

The assessment of such compensation and the manner of payment shall be determined hereafter by mutual agreement between the Government and the Union.

(iii) All lands required for the purposes of the Project shall be jointly measured by the duly authorised officers of the Government and the Union respectively.

9. Communications

(i) The Government agrees that the Union may construct and maintain roads, tramways, ropeways etc. required for the Project in Nepal and shall provide land for these purposes on payment of compensation as provided in clause 8.

(ii) Subject to the territorial jurisdiction of the Government the ownership and the control of the metalled roads, tramways, and railway shall vest in the Union. The roads will be essentially departmental roads of the Irrigation Department of the Union and any concession in regard to their use by commercial and non-commercial vehicles of Nepal shall not be deemed to conder any right of way.

(iii) The Government agrees to permit, on the same terms as for other users, the use of all roads, waterways and other avenues of transport and communications in Nepal for bona fide purposes of the construction and maintenance of the barrage and other connected works.

(iv) The bridge over Hanuman Nagar Barrage will be open to public taffic but the Union shall have the rigth to close the traffic over the bridge for repairs, etc.

(v) The Government agrees to permit the use of telephone and telegraph in the project area to authorised servants of the Government for business in emergencies provided such use does not in any way interfere with the construction and operation of Projects.

10. Use of River Craft

All navigation rights in the Kosi River in Nepal will rest with the Government. The use of any water craft like boat launched and timber rafts within two miles of the Barrage and headworks shall not be allowed except by special licence, under special permits to be issued by the Executive Engineers, Barrage. Any unauthorised watercraft found within this limit be liable to prosecution.

11. Fishing Rights

All the fishing rights in the Kosi River in Nepal except within two miles of the Barrage shall vest in the Government of Nepal. No fishing will be permitted within two miles of the Barrage and Headworks.

12. Use of Nepal Labour

The Union shall give preference to Nepali labour, personnel and contactors to the extent available and in its opinion suitable for the construction of the Project but shall be at liberty to import labour of all classes to the extent necessary.

13. *Administration of the Project Areas in Nepal*
The union shall carry out inside the project areas in the territory of Nepal functions such as the establishment and administration of schools, hospitals, provision of water-supply, and electricity, drainage, tramway lines and other civic amenities.

14. The Government shall be responsible for the maintenance of law and order in the Project areas within the territory of Nepal. The Government and Union shall, from time to time, consider and make suitable arrangements calculated to achieve the above object.

15. If so desired by the Union, the Government agrees to establish special court or courts in the Project area to ensure expeditious disposal of cases arising within the Project area. The Union shall bear the cost involved in the establishment of such courts, if the Government so desires.

16. *Future Kosi Control Works*
If further investigations indicate the necessity of storage or detention dams and other soil conservation measures on the Kosi and its tributaries, the Government agree to grant their consent to them on conditions similar to those mentioned herein.

17. *Arbitration*
If any question, differences or objections whatever shall arise in any way, connected with or arising out of this agreement or the meaning or operation of any part thereof or the rights, duties or liabilities of either party, except as to decisions of any such matter as therein before otherwise provided for, every such matter shall be referred for arbitration to two persons—one to be appointed by the Government and the other by the Union—whose decision shall be final and binding, provided that in the event of disagreement between the two arbitrators, they shall refer the matter under dispute for decision to an umpire to be jointly appointed by the two arbitrators before entering on the reference.

18. This agreement shall be deemed to come into force with effect from the date of signatures of the authorised representatives of the Government and the Union. respectively.

IN WITNESS WHEREOF the undersigned being duly authorised thereto by their respective Governments have signed the present agreement. DONE at Kathmandu, in duplicate, this twenty fifth day of April, *1954*.

Sd	Sd
GUJLZARI LAL NANDA	MAHABIR SHUMSHER
For the Government of India.	For the Government of Nepal.

Source: AS Bhasin, (1994), Nepal's Relation with India and China: Documents 1947-92, Siba Exim. Pvt. Ltd. Delhi.

Annex 5

Agreement between His Majesty's Government of Nepal and the Government of India on the Gandak Irrigation and Power Project, December 4, 1959

PREAMBLE:

WHEREAS His Majesty's Government of Nepal and the Government of India consider that it is in the common interests of both Nepal and India to construct a barrage, canal head regulators and other appurtenant works about 1,000 feet below the existing Tribeni canal head regulator and of taking out canal systems for purposes of irrigation and development of power for Nepal and India (hereinafter referred to as "the Project").

AND WHEREAS in view of the common benefits, His Majesty's Government have agreed to the construction of the said barrage, canal head regulators and other connected works as shown in the Plan annexed to this Agreement to the extent that they lie within the territory of Nepal, by and at the cost of the Government of India.

Now the parties agree as follows:

1. *Investigation and Surveys:*
   His Majesty's Government authorise the Project Officers and other persons acting under the general or special orders of such officers to move in the area indicated in the said Plan with men, material and equipment as may be required for the surveys and investigations in connection with the Project, before, during and after construction, as may be found necessary from time to time. These surveys include ground, aerial, hydraulic, hydrometric, hydrological and geological surveys; investigations for communication and for the alignment of canals and for materials required for the construction and maintenance of the Project.

2. *Authority for the execution of works and their maintenance:*
   (i) His Majesty's Government authorise the Government of India to proceed with the execution of the Project and for this purpose His Majesty's Government shall acquire all such lands as the Government of India may require and will permit the access to the movement within and the residence in the area indicated in the Plan of officers and field staff with labour force, draught animals, vehicles, plans, machinery, equipment and instruments as may be necessary for the execution of the Project and for its operation and maintenance after its completion.
   (ii) In case of any apprehended danger or accident to any of the structures, the officers of the Government of India will execute all works which may be necessary for repairing the existing works or preventing such accidents and/or danger in the areas indicated in the Plan. If any of such works have

to be constructed on lands which do not belong to the government of India, His Majesty's Government will authorise these works to be executed and acquire such additional lands as may be necessary for the purpose. In all such cases the Government of India shall pay reasonable compensation for the lands so acquired as well as for damage, if any, arising out of the execution of these works.

3. *Land Acqusition:*
   (i) His Majesty's Government will acquire or requisition, as the case may be, all such lands are required by the Government of India for the Project, i.e., for the purpose of investigation, construction and maintenance of the Project and the Government of India shall pay reasonable compensation for such lands acquired or requisitioned.
   (ii) His Majesty's Government shall transfer to the Government of India such lands belonging to His Majesty's Government as are required for the purpose of the Project on payment of reasonable compensation by the Government of India.
   (iii) Lands requisitioned under paragraph (i) shall be held by the Government of India for the duration of the requisition and lands acquired under sub-clause (i) or transferred under sub-clause (ii) shall vest in the Government of India as proprietor and subject to payment of land revenue (Malpot) at the rates at which it is leviable on agricultural lands in the neighbourhood.
   (iv) When such land vesting in the Government of India or any part thereof ceases to be required by the Government of India for the purposes of the Project, the Government of India will reconvey the same to His Majesty's Government free of charge.

4. *Quarrying:*
   His Majesty's Government shall permit the Government of India on payment of reasonable royalty to quarry materials, such as block stones, boulders, shingles and sand required for the construction and maintenance of the Project from the areas indicated in the said Plan.

5. *Communications:*
   (i) His Majesty's Government shall allow the Government of India to construct and maintain such portion of the Main Western Canal which falls in the Nepal territory and to construct and maintain communications for the construction and maintenance of the Project. The roads will be essentially departmental roads of the Project and their use by commercial and non-commercial vehicles of Nepal will be regulated as mutually agreed upon between His Majesty's Government and the Government of India.
   (ii) The bridge over the Gandak Barrage will be open to public traffic, but the Government of India shall have the right to close the traffic over the bridge for repair, etc.
   (iii) The Government of India agree to provide locking arrangements for facility of riverine traffic across the barrage free from payment of any tolls

whatever, provided that this traffic will be regulated by the Project staff in accordance with the rules mutually agreed upon between His Majesty's Government and the Government of India.

(iv) His Majesty's Government agree to permit installation of telegraph, telephone; and radio communications as approximately indicated in the Plan for the bona fide purpose of the construction, maintenance and operation of the Project.

(v) The Government of India shall permit the use of internal telegraph, telephone and radio communications as indicated in the Plan to the authorised servants of His Majesty's Government in emergencies, provided such use does not interfere with the construction, maintenance and operation of the Project.

6. *Ownership, Operation and Maintenance of Works:*
Subject to the provisions of sub-clause (v) of clause 7, all works connected with the Project in the territory of Nepal will remain the property of and be operated and maintained by the Government of India.

7. *Irrigation for Nepal:*

(i) The Government of India shall construct at their own cost the Western Nepal Canal including the distributary system thereof down to a minimum discharge of 20 cusecs for providing at their own cost flow irrigation in the gross commanded area estimated to be about 40,000 acres.

(ii) The Government of India shall construct the Eastern Nepal Canal from the tail-end of the Don Branch Canal up to river Bagmati including the distributary system down to a minimum discharge of 20 cusecs at their own cost for providing flow irrigation in Nepal for the gross commanded area estimated to be 1,03,500 acres.

(iii) His Majesty's Government shall be responsible for the construction of channels below 20 cusecs capacity for irrigation in Nepal but the Government of India shall contribute such sum of money as they may consider reasonable to meet the cost of construction.

(iv) The Nepal Eastern Canal and the Nepal Western Canal shall be completed, as far as possible, within one year of the completion of the barrage.

(v) The canal systems including the service roads situated in Nepal territory except the Main Western Canal shall be handed over to His Majesty's Government for operation and maintenance at their cost.

8. *Power Development and Rreservation for Nepal:*

(i) The Government of India agree to construct one Power House with an installed capacity of 15,000 KW in the Nepal territory on the Main Western Canal.

(ii) The Government of India also agree to construct a transmission line from the Power House in Nepal to the Bihar border near Bhaisalotan and from Sugauli to Raxaul in Bihar in order to facilitate supply of power on any point in the Bihar Grid up to and including Raxual.

(iii) The Government of India shall supply power to His Majesty's Government at the Power House and/or at any point in the Grid up to and including Raxaul to an aggregate maximum of 10,000 KW up to 60 per cent load factor at power factor not below 0.85. The charges for supply at the Power House shall be the actual cost of production, and on any point on the Grid up to Raxaul it shall be the cost of production plus the cost of transmission on such terms and conditions as may be mutually agreed upon.

(iv) His Majesty's Government will be responsible for the construction at their own cost of the transmission and distribution system for supply of power within Nepal from the Power House or from any point on the Grid up to and including Raxaul.

(v) The ownership and management of the Power House shall be transferred to His Majesty's Government on one year's notice in writing given by them to the Government of India after the full load of 10,000 KW at 60 percent load factor has been developed in Nepal from this Power House.

(vi) The ownership of the transmission system constructed by the Government of India at its cost shall remain vested in the Government of India, but, on transfer of the Power House, the Government of India shall continue the arrangements for transmission of power, if so desired by His Majesty's Government, on payment of the cost of transmission. Provided that His Majesty's Government shall have the right to purchase the transmission system from the Power House to Bhaisalotan situated in the Nepal territory on payment of the original cost minus depreciation.

(vii) The Government of India shall be free to regulate the flow into or close the Main Western Canal Head Regulator temporarily, if such works are found to be necessary in the interest of the efficient maintenance and operation of the Canal or the Power House, provided that in such situations the Government of India agree to supply the minimum essential power from the Bihar Grid to the extent possible on such terms and conditions as may be mutually agreed upon.

9. *Protection of Nepal's Riparian Rights:*
His Majesty's Government will continue to have the right to withdraw for irrigation or any other purpose from the river or its tributaries in Nepal such supplies of water as may be required by them from time to time and His Majesty's Government agree that they shall not exercise this right in such manner as is likely in the opinion of the parties hereto prejudicially to affect the water requirements of the Project as set out in the schedule annexed hereto.

10. *Pro Rata Reduction of Supplies during period of Shortage:*
Whenever the supply of water available for irrigation falls short of the requirements of the total areas under the Project for which irrigation has to be provided, the shortage shall be shared on Pro rata basis between the Government of India and His Majesty's Government.

11. *Sovereignty and Jurisdiction:*
Nothing in this Agreement shall be deemed to derogate from the sovereignty and territorial jurisdiction of His Majesty's Government in respect of lands acquired by His Majesty's Government and made available to the Government of India for investigation, execution and maintenance of the Project.

12. *Arbitration:*
(i) Any dispute or difference arising out of or in any way touching or concerning the construction, effect or meaning of this Agreement or of any matter contained herein or the respective rights and liabilities of the parties hereunder, if not settled by discussion, shall be determined in accordance with the provisions of this clause.
(ii) Any of the parties may by notice in writing inform the other party of its intention to refer to arbitration any such dispute or difference mentioned in sub-clause (i) and within 90 days of the delivery of such notice, each of the two parties shall nominate an arbitrator for jointly determining such dispute or difference and the award of the arbitrators shall be binding on the parties.
(iii) In case the arbitrators are unable to agree, the parties hereto may consult each other and appoint and Umpire whose award shall be final and binding on them.

13. This Agreement will come into force with effect from the date of signatures of the authorised representatives of His Majesty's Government and the Government of India respectively.

IN WITNESS WHEREOF the undersigned being duly authorised thereof by their respective Governments, have signed the present AGREEMENT in Nepali, Hindi and English in duplicate, all three texts being equally authentic, at Kathmandu this 19th day of Marg Sambat 2016 corresponding to December 4, 1959. For purposes of interpretation the English text shall be used.

For the Government of India
For and on behalf of the
Sd.
PRESIDENT OF INDIA
BHAGWAN SAHAY
Ambassador of India

On behalf of
His Majesty's Government of Nepal
Sd.
SUBARNA SHAMSHERE,
Deputy Prime Minister

EMBASSY OF INDIA, NEPAL
KATHMANDU
Dated 4th December 1959

My Dear,

There are a few matters pertaining to the Gandak Irrigation and Power Project Agreement in respect of which certain understandings are necessary. They are detailed below:

(a) Sub-clauses (i) and (ii) of clause 3 lay down that the Government of India shall pay reasonable compensation for acquisition or requisition of any lands which may be required for the Project. It is agreed that for purposes of fixation of rated of compensation His Majesty's Government would appoint an Expert Committee with which Revenue Officers of the Gandak Project would also be associated. The Committee will visit the area of the Project and fix the principles for assessment of compensation payable for such lands. The total compensation payable for the lands acquired or requisitioned will be calculated on the basis of the agreed rates fixed by the Committee. The Government of India shall deposit the agreed amount of compensation to the credit of His Majesty's Government in the Rashtra Bank. Thereupon His Majesty's Government will make the required arrangements for payment of compensation to those persons to whom it may be due.

(b) Clause 4 provides that His Majesty's Government will grant permission to the Government of India for the quarrying of materials required for the construction and the maintenance of the Project in the areas shown in the Plan annexed to the Agreement. It is our understanding that if suitable materials are not available from these areas in sufficient quantities His Majesty's Government will permit on the request of the Government of India quarrying in such other areas as may be mutually agreed upon.

(c) Sub-clause (ii) of clause 7 of the Agreement States that under'the Eastern Nepal Canal the gross commanded area will be 1,03,500.acres. It may be explained that this gross commanded area will be possible only on the execution of the training works on the river Bagmati for which certain proposals have already been under discussion with His Majesty's Government. The river has been taking a westward course and certain training works are required to be set up in order to divert it back into its old eastern channel to flow under the Bagmati Railway Bridge. Without th. river training scheme the gross commanded area will not exceed 93,000 acres.

(d) Sub-clause (iii) of clause 7 of the Agreement refers to a contribution by the Government of India of a sum which they consider reasonable towards the cost of construction of channels below 20 cusecs capacity for irrigation in Nepal. It is our understanding that such contribution would not cover any. cost of land acquisition for the channels but would be related only to the actual expenditure on works. As regards the latter it is estimated that a sum of rupees fifteen lakhs will be sufficient and accordingly the Government of India will make this sum available to His Majesty's Government in suitable instalments according to the progress of construction.

(e) Sub-clause (v) of clause 8 provides that the ownership and management of the power house shall be transferred to His Majesty's Government on one year's notice by them after the full load of 10,000 KW at 60 per cent load factor has been developed in Nepal from this power house It as our understanding that for a period of fifteen years after obtaining the ownership and management of the power house His Majesty's Government would be generating secondary

power to the full extent possible and supplying it to the Government of India on payment of its actual cost of production.

(f) The schedule annexed to clause 9 gives the minimum quantities of water required for the Project after making the allowance for the withdrawal of water from the upper reaches of the Gandak river and its tributaries sufficient for the irrigation of two lakh acres which is the maximum area estimated to be available for the purpose. It is our understanding that if at anytime, due to natural causes, the supplies in the river are insufficient for all the purposes His Majesty's Government will be entitled to continue to withdraw water sufficient for the irrigation of such area.

(g) His Majesty's Government and the government of India also agree to set up as early as possible a Co-ordination Committee consisting of three representatives of each Government with a Minister of His Majesty's Government as its Chairman and the Chief Administrator of the Project as its Secretary. The Committee will meet from time to time to consider such matters of common interest concerning the Project as may be referred to it by either Government with a view to expedite decisions for the early completion of the Project. The Government of India will bear all expenditure in connection with the working of the committee, such as salaries of special staff, if any, travelling allowance of members, etc.

2. I shall be grateful if you will kindly confirm the understandings explained above.

Your[s] Sincerely,
Sd/-
Bhagwan Sahay,
Ambassador of India.

His Excellency Sri Subarna Shamshere,
Deputy Prime Minister,
His Majesty's Government of Nepal

SINGHA DURBAR, NEPAL

KATHMANDU
Dated 4th December, 1959

My Dear,

I acknowledge the receipt of your letter of the 4th December 1959, regarding the Gandak Irrigation and Power Project which is as follows :

"There are a few matters pertaining to the Gandak Irrigation and Power Project Agreement in respect of which certain understandings are necessary. They are detailed below:

(*a*) Sub-clauses (i) and (ii) of clause 3 lay down that the Government of India shall pay reasonable compensation for acquisition or requisition of any lands which may be required for the Project. It is agreed that for purposes of fixation of rates of compensation His Majesty's Government would appoint an Expert Committee with which Revenue Officers of the Gandak Project would also be associated. The Committee will visit the area of the Project and fix the principles for assessment of compensation payable for such lands. The total compensation payable for the lands acquired. or requisitioned will be calculated on the basis of the agreed rates fixed by the Committee. The Government of India shall deposit the agreed amount of compensation to the credit of His Majesty's Government in the Rashtra Bank. Thereupon His Majesty's Government will make the required arrangements for payment of compensation to those persons to whom it may be due.

(*b*) Clause 4 provides that His Majesty's Government will grant permission to the Government of India for the quarrying of materials required for the construction and the maintenance of the Project in the areas show in the Plan annexed to the Agreement. It is our understanding that if suitable materials are not available from these areas in sufficient quantities His Majesty's Government will permit on the request of the Government of India quarrying in such other areas as may be mutually agreed upon.

(*c*) Sub-clause (ii) of clause 7 of the Agreement states that under the Eastern Nepal Canal the gross commanded area will be 1,03,500 acres. It may be explained that this gross commanded area will be possible only on the execution of the training works on the river Bagmati for which certain proposals have already been under discussion with His Majesty's Government. The river has been taking a westward course and certain training works are required to be set up in order to divert it back into its old eastern channel to flow under the Bagmati Railway Bridge. Without the river training scheme the gross commanded area will not exceed 93,000 acres.

(*d*•) Sub-clause (iii) of clause 7 of the Agreement refers to a contribution by the Government of India of a sum which they consider reasonable towards the cost of construction of channels below 20 cusecs capacity for irrigation in Nepal. It is our understanding that such contribution would not cover any cost of land acquisition for the channels but would be related only to the actual expenditure on works. As regards the latter, it is estimated that a sum of Rs. 52.85 lakhs (Rupees fifty two point eighty-five Iakhs) will be sufficient for the construction

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• This has been amended on the 29th November 1973. The original clause reads. as follows — Sub-clause (iii) of clause 7 of the Agreement refers to a contribution by the Government of India of a sum which they consider reasonable towards the cost of construction of channels below 20 cusecs capacity for irrigation in Nepal. It is our under-standing that such contribution would not cover any cost of land acquisition for the channels but would be related only to the actual expenditure on works. As regards the latter it is estimated that a sum of rupees fifteen lakhs will be sufficient and accordingly the Government of India will make this sum available to His Majesty's Government in suitable instalments according to the progress of construction.

of channels below 20 cusecs capacity of the Nepal Eastern Canal and accordingly the Government of India will make this sum available to His Majesty's Government in suitable instalments according to the progress of construction.

(e) Sub-clause (v) of clause 8 provides that the ownership and management of the power house shall be transferred to His Majesty's Government on one year's notice by them after the full load of 10,000 kW. at 60 per cent load factor has been developed in Nepal from this power house. It is our understanding that for a period of fifteen years after obtaining the ownership and management of the power house his Majesty's Government would be generating secondary power to the full extent possible and supplying it to the Government of India on payment of its actual cost of production.

(f) The schedule annexed to clause 9 gives the minimum quantities of water required for the Project after making the allowance for the withdrawal of water from the upper reaches of the Gandak river and its tributaries sufficient for the irrigation of two lakh acres which is the maximum area estimated to be available for the purpose. It is our understanding that if at any time, due to natural causes, the supplies in the river are insufficient for all the purposes His Majesty's Government will be entitled to continue to withdraw water sufficient for the irrigation of such area.

(g) His Majesty's Government and the Government of India also agree to set up as early as possible a Coordination Committee consisting of three representative of each Government with a Minister of His Majesty's Government as its Chairman and the Chief Administrator of the Project as its Secretary. The Committee will meet from time to time to consider such matters of common interest concerning the Project as may be referred to it by either Government with a view to expedite decisions for the early completion of the Project. The Government of India will bear all expenditure in connection with the working of the Committee, such as salaries of special staff, if any traveling allowance of members, etc

I shall be grateful if you will kindly confirm the understanding explained above."

2. We confirm the understandings as indicated in your letter.

Yours sincerely
Sd
Subarna Shamshere

His Excellency Shri Bhagwan Sahay,
Ambassador of India, Kathmandu.

Appendix II

Schedule of Water Requirements of the Gandak Project in Cusecs (Vide clause 9 of the original Agreement) signed on December 4, 1959

Months	Western Canal System and Power House in Nepal	Eastern Canal and Power House in India	Total
January	6,960	4,540	11,500
February	6,100	3,900	10,000
March	5,960	3,690	9,650
April	5,760	4,340	10,100
May	8,270	7,980	16,250
June	11,190	14,000	25,190
July	15,240	13,980	29,220
August	14,980	14,000	28,980
September	14,980	14,000	28,980
October	16,060	14,110	30,170
November	11,070	13,240	24,310
December	10,410	9,290	19,700

Source: AS Bhasin, (1994), Nepal's Relation with India and China: Documents 1947-92, Siba Exim. Pvt. Ltd. Delhi.

Annex 6

Agreement between His Majesty's Government of Nepal and the Government of India on the Gandak Irrigation and Power Project (Amended), April 30, 1964

PREAMBLE: Whereas His Majesty's Government of Nepal and the Government of India consider that it is in the common interests of both Nepal and India to construct a barrage, canal head regulators and other appurtenant works about 1,000 feet below the existing Tribeni canal head regulator and of taking out canal systems for purposes of irrigation and development of power for Nepal and India (hereinafter referred to as 'the Project').

AND WHEREAS in view of the common benefits, His Majesty's Government have agreed to the construction of the said barrage, canal head regulators and other connected works as shown in the Plan annexed to this Agreement to the extent that they lie within the territory of Nepal, by and at the cost of the Government of India.

NOW THE PARTIES AGREE AS FOLLOWS:

1. *Investigations and Surveys:*
   His Majesty's Government authorise the Project Officers and other persons acting under the general or special orders of such officers to move in the area indicated in the said Plan with men, material and equipment as may be required for the surveys and investigations in connection with the Project, before, during and after construction, as may be found necessary from time to time. These surveys include ground, aerial, hydraulic, hydrometric, hydrological and geological surveys; investigations for communication and for the alignment of canals and for materials required for the construction and maintenance of the Project.

2. *Authority for the execution of works and their maintenance:*
   (i) His Majesty's Government authorise the Government of India to proceed with the execution of the Project and for this purpose His Majesty's Government shall acquire all such lands as the Government of India may require and will permit the access to the movement within and the residence in the area indicated in the Plan of officers and field staff with labour force, draught animals, vehicles, plans, machinery, equipment and instruments as may be necessary for the execution of the Project and for its operation and maintenance after its completion.
   (ii) In case of any apprehended danger or accident to any of the structures, the officers of the Government of India will execute all works which may be necessary for repairing the existing works or preventing such accidents and/or danger in the areas indicated in the Plan. If any of such works have to be constructed on lands which do not belong the government of India,

His Majesty's Government will authorise these works to be executed and acquire such additional lands as may be necessary for the purpose. In all such cases the Government of India shall pay reasonable compensation for the lands so acquired as well as for damage, if any, arising out of the execution of these works.

3. *Land acquisition:*
   (i) His Majesty's Government will acquire or requisition, as the case may be, all such lands as are required by the Government of India for the Project, i.e., for the purpose of investigation, construction and maintenance of the Project and the Government of India shall pay reasonable compensation for such lands acquired or requisitioned.
   (ii) His Majesty's Government shall transfer to the Government of India such lands belonging to His Majesty's Government as are required for the purpose of the Project on payment of reasonable compensation by the Government of India.
   (iii) Lands requisitioned under paragraph (i) shall be held by the Government of India for the duration of the requisition and lands acquired under sub-clause (i) or transferred under sub-clause (ii) shall vest in the Government of India as proprietor and subject to payment of land revenue (Malpot) at the rates at which it is leviable on agricultural lands in the neighbourhood.
   (iv) When such land vesting in the Government of India or any part thereof ceases to be required by the Government of India for the purposes of the Project, the Government of India will reconvey the same to His Majesty's Government free of charge.

4. *Quarrying:*
   His Majesty's Government shall permit the Government of India on payment of reasonable royalty to quarry materials, such as block stones, boulders, shingles and sand required for the construction and maintenance of the Project from the areas indicated in the said Plan.

5. *Communication:*
   (i) His Majesty's Government shall allow the Government of India to construct and maintain such portion of the Main Western Canal which falls in the Nepal territory and to construct and maintain communications for the construction and maintenance of the Project. The roads will be essentially departmental roads of the Project and their use by commercial and non-commercial vehicles of Nepal will be regulated as mutually agreed upon between His Majesty's Government and the Government of India.
   (ii) The bridge over the Gandak Barrage will be open to public traffic, but the Government of India shall have the right to close the traffic over the bridge for repair, etc.
   (iii) The Government of India agree to provide locking arrangements for facility of riverine traffic across the barrage free from payment of any tolls whatever, provided that this traffic will be regulated by the Project staff in

accordance with the rules mutually agreed upon between His Majesty's Government and the Government of India.

(iv) His Majesty's Government agree to permit installation of telegraph, telephone and radio communications as approximately indicated in the Plan for the bona fide purpose of the construction, maintenance and operation of the Project.

(v) The Government of India shall permit the use of internal telegraph, telephone and radio communications as indicated in the Plan to the authorised servants of His Majesty's Government in emergencies, provided such use does not interfere with the construction, maintenance and operation of the Project.

6. *Ownership, operation and maintenance of works:*
Subject to the provisions of sub-clause (v) of clause 7, all works connected with the Project in the territory of Nepal will remain the property of and be operated and maintained by the Government of India.

7. *Irrigation for Nepal:*

(i) The Government of India shall construct at their own cost the Western Nepal Canal including the distributary system thereof down to a minimum discharge of 20 cusecs for providing flow irrigation in the gross commanded area estimated to be about 40,000 acres.

(ii) The Government of India shall construct the Eastern Nepal Canal from the tail-end of the Don Branch Canal up to river Bagmati including the distributary system down to a minimum discharge of 20 cusecs at their own cost for providing flow irrigation in Nepal for the gross commanded area estimated to be 1,03,500 acres.

(iii) His Majesty's Government shall be responsible for the construction of channels below 20 cusecs capacity for irrigation in Nepal but the Government of India shall contribute such sum of money as they may consider reasonable to meet the cost of construction.

(iv) The Nepal Eastern Canal and the Nepal Western Canal shall be completed, as far as possible, within one year of the completion of the barrage.

(v) The canal systems including the service roads situated in Nepal territory except the Main Western Canal shall be handed over to His Majesty's Government for operation and maintenance at their cost.

Also, the head regulator of the Don Branch Canal shall be operated by His Majesty's Government keeping in view the irrigation requirements of area irrigated by this branch canal in India and Nepal

8 *Power development and reservation for Nepal:*

(i) The Government of India agree to construct one Power House with an installed capacity of 15,000 KW in the Nepal territory on the Main Western Canal.

(ii) The Government of India also agree to construct a transmission line from the Power House in Nepal to the Bihar border near Bhaisalotan and from

Sugauli to Raxaul in Bihar in order to facilitate supply of power on any point in the Bihar Grid up to and including Raxual.

(iii) The Government of India shall supply power to His Majesty's Government at the Power House and/or at any point in the Grid up to and including Raxaul to an aggregate maximum of 10,000 KW up to 60 per cent load factor at power factor not below 0.85. The charges for supply at the Power House shall be the actual cost of production, and on any point on the Grid up to Raxaul it shall be the cost of production plus the cost of transmission on such terms and conditions as may be mutually agreed upon.

(iv) His Majesty's Government will be responsible for the construction at their own cost of the transmission and distribution system for supply of power within Nepal from the Power House or from any point on the Grid up to and including Raxaul.

(v) The ownership and management of the Power House shall be transferred to His Majesty's Government on one year's notice in writing given by them to the Government of India after the full load of 10,000 KW at 60 percent load factor has been developed in Nepal from this Power House.

(vi) The ownership of the transmission system constructed by the Government of India at its cost shall remain vested in the Government of India, but, on transfer of the Power House, the Government of India shall continue the arrangements for transmission of power, if so desired by His Majesty's Government, on payment of the cost of transmission. Provided that His Majesty's Government shall have the right to purchase the transmission system from the Power House to Bhaisalotan situated in the Nepal territory on payment of the original cost minus depreciation.

(vii) The Government of India shall be free to regulate the flow into or close the Main Western Canal Head Regulator temporarily, if such works are found to be necessary in the interest of the efficient maintenance and operation of the Canal or the Power House, provided that in such situations the Government of India agree to supply the minimum essential power from the Bihar Grid to the extent possible on such terms and conditions as may be mutually agreed upon.

9. *Protection of Nepal's Riparian rights:*
His Majesty's Government will continue to have the right to withdraw for irrigation or any other purpose from the river or its tributaries in Nepal such supplies of water as may be required by them from time to time in the Valley
For the trans–Valley uses of Gandak waters, separate agreements between His Majesty's Government and Government of India will be entered into for the uses of water in the months of February to April only.

10. *Pro Rata Reduction of Supplies during period of Shortage:*

11. *Sovereignty and Jurisdiction:*
Nothing in this Agreement shall be deemed to derogate from the sovereignty and territorial jurisdiction of His Majesty's Government in respect of lands

acquired by His Majesty's Government and made available to the Government of India for investigation, execution and maintenance of the Project.

12. *Arbitration:*
    (i) Any dispute or difference arising out of or in any way touching or concerning the construction, effect or meaning of this Agreement or of any matter contained herein or the respective rights and liabilities of the parties hereunder, if not settled by discussion, shall be determined in accordance with the provisions of this clause.
    (ii) Any of the parties may by notice in writing inform the other party of its intention to refer to arbitration any such dispute or difference mentioned in subclause (i) and within 90 days of the delivery of such notice, each of the two parties shall nominate an arbitrator for jointly determining such dispute or difference and the award of the arbitrators shall be binding on the parties.
    (iii) In case the arbitrators are unable to agree, the parties hereto may consult each other and appoint and Umpire whose award shall be final and binding on them.

13. *This Agreement will come into force with effect from the date of signatures of the authorised representatives of His Majesty's Government and the Government of India respectively.*

IN WITNESS WHEREOF the undersigned being duly authorised thereof by their respective Governments have signed the present AGREEMENT in Nepali, Hindi and English in duplicate, all three texts being equally authentic, at Kathmandu this 19th day of Marg Sambat 2016 corresponding to December 4, 1959.* For purposes of interpretation the English text shall be used.

For the Government of India	**On behalf of**
For and on behalf of the	**HIS MAJESTY'S GOVERNMENT OF**
PRESIDENT OF INDIA	**NEPAL**
Sd.	Sd.
BHAGWAN SAHAY	SUBARNA SHAMSHERE
Ambassador of India	Deputy Prime Minister

* **Amanded date April 30, 1964 (The amended portions have been highlighted)**

KATHMANDU,
April 30, 1964

EXCELLENCY,

In the course of recent discussions it has been decided by our two Governments that certain clauses of the Gandak Project Agreement require amendment. The terms of this decision are as follows:-

(i) It is agreed between His Majesty's Government of Nepal and the Government of India that Clause 10 of the Gandak Irrigation and Power Project Agreement entered into on December 4, 1959, shall be deleted and Clause 9, shall be modified and shall hereafter read as under:-

Clause 9 Protection of Nepal's Riparian Rights:-

"His Majesty's Government will continue to have the right to withdraw for irrigation or any other purpose from the river or its tributaries in Nepal such supplies of water as may be required by them from time to time in the Valley.

For the trans-Valley uses of Gandak waters, separate agreements between His Majesty's Government and the Government of India will be entered into for the used of water in the months of February to April only."

(ii) The following shall be added under clause 7 (v):—

"Also, the head regulator of the Don branch canal shall be operated by His Majesty's Government keeping in view the irrigation requirements of areas irrigated by this branch canal in India and Nepal."

I shall be grateful to have your confirmation that the amendments agreed upon which will take effect immediately, are correctly set out above.

Accept, Excellency, the assurances of my highest consideration.

Sd.
HARISHWAR DAYAL,
Ambassador of India at the Court of Nepal

His Excellency
Major-General Padma Bahadur Khatri,
Foreign Secretary,
His Majesty's Government of Nepal,
Kathmandu.

KATHMANDU,
April 30, 1964

Excellency,

I have the honour to acknowledge receipt of your letter dated April 30, 1964 reading as follows:

"In the course of recent discussions it has been decided by our two Governments that certain clauses of the Gandak Project Agreement require amendment. The terms of this decision are as follows:

(i) It is agreed between His Majesty's Government of Nepal and the Government of India that Clause 10 of the Gandak Irrigation and Power Project Agreement entered into on December 4, 1959 shall be deleted and Clause 9, shall be deleted and shall hereafter read as under:

Clause 9: Protection of Nepal's Riparian Rights:
His Majesty's Government will continue to have the right to withdraw for irrigation or any other purpose from the river or its tributaries in Nepal such supplies of water as may be required by them from time to time in the Valley.
For the trans-Valley uses of Gandak waters, separate agreements between His Majesty's Government and the Government of India will be entered into for the use of water in the months of February to April only.
(ii) The following shall be added under clause 7 (v):

"Also, the head regulator of the Don Branch Canal shall be operated by His Majesty's Government keeping in view the irrigation requirements of areas irrigated by this branch canal in India and Nepal.

I shall be grateful to have your confirmation that the amendments agreed upon which will take effect immediately, are correctly set out above."

I hereby confirm that this correctly sets out the agreed amendments which are to take effect immediately.

Accept, Excellency, the assurances of my highest consideration.

Padma Bahadur Khatri,
Foreign Secretary,
His Majesty's Government of Nepal

His Excellency Shri Harishwar Dayal
Ambassador of India at the Court of Nepal
Kathmandu

Source: Agreement between His Majesty's Government of Nepal and the Government of India on the Gandak Irrigation and Power Project, Ministry of Water and Power, Durbar Marga, Kathmandu, Nepal 1975

Annex 6.1

Revised Agreement between His Majesty's Government of Nepal and the Government of India on the Kosi Project, December 19, 1966

WHEREAS the Union was desirous of constructing a barrage, head-works and other appurtenant works about three miles upstream of Hanuman Nagar town on the Kosi River with afflux and flood banks, and canals and protective works on land lying within the territories of Nepal for the purpose of flood control, irrigation, generation of hydro-electric power and prevention of erosion of Nepal areas on the right side of the river, upstream of the barrage (hereinafter referred to as the 'Project')

AND WHEREAS HMG agreed to the construction of the said barrage, head-works and other connected works by and at the cost of the Union, in consideration of the benefits arising there from and a formal document incorporating the terms of the Agreement was brought into existence on the 25th April, 1954 and was given effect to;

AND WHEREAS in pursuance of the said Agreement various works in respect of the Project have been completed by the Union while others are in various stages of completion for which HMG has agreed to afford necessary facilities;

AND WHEREAS HMG has suggested revision of the said Agreement in order to meet the requirements of the changed circumstances, and the Union, with a view to maintaining friendship and good relation subsisting between Nepal and India, has agreed to the revision of Agreement;

NOW, THEREFORE, THE PARTIES AGREE AS FOLLOWS:-

1. *Details of the Project:*

   (i) The barrage is located about 3 miles upstream of Hanuman Nagar town.

   (ii) The general layout of the barrage, the areas within afflux banks, flood embankments, and other protective works, canals, power house and the lines of communication are shown in the amended plan annexed to this agreement as Amended Annexure - A.

   (iii) Any construction and other undertaking by the Union in connection with this Project shall be planned and carried out in consultation with HMG,

   Provided that such works and undertakings which, pursuant to any provision of this Agreement require the prior approval of HMG shall not be started without such prior approval;

   And further provided that in situation described in Clause 3 (iii) and Clause 3 (iv) intimation to HMG shall be sufficient.

   (i) For the purpose of Clauses 3 and 8 of this Agreement the land under the ponded areas and boundaries as indicated by the plan specified in sub-clause (ii) above, shall be demand to be submerged.

2. *Investigations and Surveys:*

   (i) Whenever the Chief Engineer of Kosi Project, Government of Bihar may consider any survey or investigation to be required in connection with the said project, HMG shall, if and in so far as HMG has approved such survey or investigation, authorise and give necessary facilities to the concerned officers of the Union or other person acting under the general or special orders of such officers to enter upon such land as necessary with such men, animals, vehicles, equipment, plant, machinery and instruments as necessary to undertake such surveys and investigations. Such surveys

and investigations may comprise aerial and ground surveys, hydraulic, hydrometric, hydrological and geological surveys including construction of drill holes for surface and sub-surface exploration, investigations for communications and for materials of construction; and all other surveys and investigations necessary for the proper design, construction and maintenance of the barrage and all its connected works mentioned under the Project. However, investigations and surveys necessary for the general maintenance and operation of the project, inside the project area, may be done by the Union after due intimation to HMG
In this Agreement, the "Project Area" shall mean the area acquired for the project.

(ii) The Provisions of sub-clause (i) of this clause shall also apply to surveys and investigations of storage dams or detention dams on the Kosi, soil conservation measures, such as check dams, afforestation, etc., required for a complete solution of the Kosi problems in the future.

(iii) The surveys and investigations referred to in sub-clauses (i) and (ii) shall be carried out in co-operation with HMG.

(iv) All data, maps specimens, reports and other results of surveys and investigations carried out by or on behalf of the Union in Nepal pursuant to the provisions on this clause, shall be made available to HMG freely and without delay. In turn, HMG shall, upon request by the Union, make available to the Union all data, maps, specimens, reports and other results of surveys and investigations carried out by or on behalf of HMG in Nepal in respect of the Kosi river.

3. *Authority for execution of works and use of land and other property:*

(i) Provided that any major construction work not envisaged in the amended plan (Amended Annexure - A) referred to in clause 1 (ii) shall require the prior approval of HMG, HMG shall authorise the Union to proceed with the execution of the said project as and when the project or a part of the project receives sanction of the said Union and notice has been given by the Union to HMG of its intention to commence work on the project and shall permit access by the Engineer(s) and all other officers, servants, and nominees of the Union, with such men, animals, vehicles, plant, machinery, equipment and instruments as may be necessary for the direction and execution of the project, to all such lands and places, and shall permit the occupation, for such period as may be necessary, of all such lands and places as may be required for the proper execution of the project.

(ii) The land required for the purposes mentioned in clause 3 (i) above shall be acquired by HMG and compensation therefore shall be paid by the Union in accordance with the provisions of clause 8 hereof.

(iii) HMG shall, upon prior notification, authorise officers of the Union to enter on land outside the limits or boundaries of the barrage and its connected works. In case of any accident happening or being apprehended to any of the said works and to execute all work s which may be necessary for the purpose of repairing or preventing such damage. Compensation, in every case, shall be tendered by the Union through HMG to the owners of the said land for all accidents done to the same in order that compensation may be awarded in accordance with clause 8 hereof.

(iv) HMG will permit the Union to quarry the construction materials required for the project from the various deposits at Chatra, Dharan Bazar or other places in Nepal.

4. *Use of water and power:*

(i) HMG shall have every right to withdraw for irrigation and for any other purpose in Nepal water from the Kosi river and from the Sunkosi river or within the Kosi basin from any other tributaries of the Kosi river as may be required from time to time. The Union shall have the right to regulate all the balance of supplies in the Kosi River at the barrage site thus available from time to time and to generate power in the Eastern Canal.

(ii) HMG shall be entitled to obtain for use in Nepal any portion up to 50 percent of the total hydro-electric power generated by any Power House situated within a 10 mile radius from the barrage site and constructed by or on behalf of the Union, as HMG shall from time to time determine and communicate to the Union:

Provided that:

HMG shall communicate to the Union any increase or decrease in the required power supply exceeding 6,800 KW at least three months in advance:

(iii) If any power to be supplied to Nepal pursuant to the provisions of this sub-clause is generated in a power house located in Indian territory, the Union shall construct the necessary transmission line or lines to such points at the Nepal-Indian border as shall be mutually agreed upon.

(iv) The tariff rates for electricity to be supplied to Nepal pursuant to the provisions of this clause shall be fixed by mutual agreement.

5. *Lease of the Project areas:*

(i) All the lands acquired by HMG under the provisions of clause 3 hereof as of the date of signing of these amendments shall be leased by HMG to the Union for a period of 199 years from the date of the signing of these amendments at an annual Nominal Rate.

(ii) The rent and other terms and conditions on which lands for Western Kosi Canal shall be leased by HMG to the Union pursuant to this Agreement shall be similar to those as under sub-clause (i).

(iii) The rent and other terms and conditions of any other land to be leased by HMG to the Union pursuant to this Agreement shall be fixed by mutual agreement.

(iv) At the request of the Union, HMG may grant renewal of the leases referred to in sub-clauses (i), (ii) and (iii) on such terms and conditions as may be mutually agreed upon.

(v) The sovereignty rights and territorial jurisdiction of HMG, including the application and enforcement of the Laws of Nepal on and in respect of the leased land shall continue unimpaired by such lease.

6. *Royalties:*

(i) HMG will receive royalty in respect to power generated and utilised in the Indian Union at rates to be settled by agreement hereafter:
Provided that no royalty will be paid on the power sold to Nepal.

(ii) HMG shall be entitled to receive payment of royalties from the Union in respect of stone, gravel and ballast obtained from Nepal territory and used in the construction and future maintenance of the barrage and other connected works at rates to be settled by agreement hereafter.

(iii) The Union shall be at liberty to use and remove clay, sand and soil without let or hindrance from lands leased by HMG to the Union.

(iv) Use of timber from Nepal forests, required for the construction, shall be permitted on payment of compensation. Provided that no compensation will be payable to HMG for such quantities of timber as may be agreed upon by HMG and the Union to be necessary for the use in the spurs and other river training works required for the prevention of caving and erosion of the right bank in Nepal.
Provided likewise that no compensation will be payable by the Union for any timber obtained from the forestlands leased by HMG to the Union.

7. *Customs Duties:*

HMG shall charge no customs duty or duty of any kind, during construction and subsequent maintenance, on any articles and materials required for the purpose of the Project and the work connected therewith.

8. *Compensation for land and property and for land revenue:*

(i) For assessing the compensation to be awarded by the Union to HMG in cash:
   (a) Lands required for the execution of various works as mentioned in clause 3 (ii) and clause 9 (i); and
   (b) Submerged lands, will be divided into the following classes:
      1. Cultivated lands.
      2. Forest lands.
      3. Village lands and houses and other immovable property standing on them.
      4. Waste lands.

All lands recorded in the register of lands in the territory of Nepal as actually cultivated shall be deemed to be cultivated lands for the purpose of this clause.

(ii) The Union shall pay compensation:
  (a) to HMG for the loss of land revenue as at the time of acquisition in respect of the area acquired, and
  (b) to whomsoever it may be due for the lands, houses and other immovable property acquired for the Project and leased to the Union.

The assessment of such compensation and the manner of payment shall be determined hereafter by mutual agreement between HMG and the Union.

(iii) All lands required for the purposes of the Project shall be jointly measured by the duly authorised officers of HMG and the Union respectively.

9. Communications:

(i) HMG agrees that the Union may construct and maintain roads, tramways, railways, ropeways, etc., required for the project in Nepal and shall provide land for these purposes on payment of compensation as provided in Clause 8. Provided that the construction of any roads, tramways, railways, ropeways, etc., outside the Project area shall require the Prior approval of HMG.

(ii) Any restrictions, required in the interest of construction, maintenance and proper operation of project, regarding the use of the roads, etc., referred to in sub-clause (i) by commercial or private vehicles may be mutually agreed upon. In case of threatened brench or erosion of the structures on account of the river, the officers of the Project may restrict public traffic under intimation to HMG.

(iii) HMG agrees to permit, on the same terms as for other users, the use of all roads, waterways and other avenues of transport and communication in Nepal for bona fide purposes of the construction and maintenance of the barrage and other connected works.

(iv) The bridge over Hanuman Nagar shall be open to public traffic. With prior approval of HMG, the Union shall have the right to close the traffic over the bridge temporarily if and in so far as required for technical or safety reasons. In such cases, the Union shall take all measures required for the most expeditious reopening of the bridge.

(v) HMG agrees to permit installation of telegraph, telephone and radio communications for the bona fide purposes of the construction and maintenance of the Project:

Provided that Union shall agree to the withdrawal of such facilities which HMG may in this respect provide in future.

Further provided that the Union agrees to permit the use of internal telephone and telegraph in the Project area to authorised servants of HMG for business in emergencies provided such use does not in any way interfere with the construction and operation of the project.

10. *Navigation rights:*
All navigation rights in the Kosi River in Nepal shall rest with HMG. Provision shall be made for suitable arrangements at or around the site of the barrage for free and unrestricted navigation in the Kosi River, if technically feasible. However, the use of any water-craft like boats, launches and timber rafts within two miles of the barrage and head-works shall not be allowed on grounds of safety, except by special permits to be issued by the competent authority of HMG in consultation with the Executive Engineer, Barrage. Any unauthorised water-craft found within this limit shall be liable to prosecution.

11. *Fishing rights:*
All the fishing right in the Kosi River in Nepal shall continue to rest with HMG. However, no fishing shall be permitted within two miles of the barrage and head-works except under special permits to be issued by the competent authority of HMG in consultation with the Executive Engineer, Barrage. While issuing the special permits within two miles, HMG shall keep in view the safety of the head-works and the permit-holders.

12. *Use of Nepali Labour:*
The Union shall give preference to Nepali labour, personnel and contractors to the extent available and in its opinion suitable for the construction of the Project but shall be at liberty to import labour of all classes to the extent necessary.

13. *Civic Amenities in the Project Area:*
Subject to the prior approval of HMG, the Union may, in the Project area, establish schools, hospitals, water-supply systems, electric supply systems, drainage and other civic amenities for the duration of the construction of the Project. On completion of construction of the project, any such civic amenities shall, upon request by HMG, be transferred to HMG, and that, in any case, all functions of public administration shall, pursuant to the provisions of clause 5 (v) be exercised by HMG.

14. *Arbitration:*
    (i) Any dispute or difference arising out of or in any way touching or concerning the construction, effect or meaning of this Agreement, or of any matter contained herein or the respective rights and liabilities of the parties hereunder, if not settled by discussion shall be determined in accordance with the provisions of this clause.

    (ii) Any of the parties may by notice in writing inform the other party of its intention to refer to arbitration any such dispute or difference mentioned in sub-clause (i); and within 90 days of the delivery of such notice, each of the two parties shall nominate an arbitrator for jointly determining such

dispute or difference and the award of the arbitrators shall be binding on the parties.

(iii) In case the arbitrators are unable to agree, the parties hereto may consult each other and appoint an Umpire whose award shall be final and binding on them.

15. Establishment of Indo-Nepal Kosi Project Commission:

(i) For the discussion of problems of common interest in connection with the project and for purposes of co-ordination and co-operation between the two Governments with regard to any matter covered in this agreement, the two Government shall at an early date establish a joint "Indo-Nepal Kosi Project Commission". The rules for the composition, jurisdiction, etc., of the said Commission shall be mutually agreed upon.

(ii) Until the said Joint Commission shall be constituted the "Co-ordination Committee for the Kosi Project" shall continue to function as follows:

(a) The committee shall consist of four representatives from each country to be nominated by the respective Governments.

(b) The Chairman of the committee shall be a Minister of HMG, and the Secretary shall be the Administrator of the Kosi Project.

(c) The committee shall consider among others such matters of common interest concerning the Project as land acquisition by HMG for lease to the Union, rehabilitation of displaced population, maintenance of law and order.

(iii) As soon as the said Joint Commission shall be constituted, the Co-ordination Committee for the Kosi Project shall be dissolved.

16. (i) This present Agreement shall come into force from the date of signature of the authorised representatives of HMG and the Union respectively and thereafter, it shall remain valid for a period of 199 years.

(ii) This present Agreement shall supersede the Agreement signed between the Government of Nepal and the Government of India on the 25th April, 1954 on the Kosi Project.

IN WITNESS WHERE of the undersigned being duly authorised thereto by their respective Governments have signed the present Amended Agreement.

Done at Kathmandu, in quadruplicate, this day, the 19th of December, 1966.

For the Government of India	For His Majesty's Government of Nepal
Sd.	Sd.
SHRIMAN NARAYAN,	Y. P. PANT,
Ambassador of India in Nepal.	*Secretary, Ministry of Economic Planning and Finance.*

Ministry of Economic Planning and Finance,
Singh Durbar.

Kathmandu (Nepal)
December 19, 1966

Your Excellency,

With reference to sub-clause (iv) of clause 5 of the Amended Kosi Project Agreement, our two Governments have reached an understanding that the Government of India will be reasonably compensated in case the project properties are taken over by His Majesty's Government at the end of the lease period. The compensation will cover the cost borne to date and such other cost as may be incurred in future by the Government of India with the agreement of His Majesty's Government. In that case the depreciation in the value of the Project materials would, of course, be taken into account.

I shall be grateful if Your Excellency will kindly confirm that the above correctly sets out the understanding reached between our two Governments.

This letter and Your Excellency's, reply confirming the understanding will constitute an agreement between our two Governments and shall form part of the Amended Kosi Project Agreement and shall come into force from the date of your letter in reply.

Please accept, Your Excellency, the assurances of my highest consideration.

Sd.
Y.P. Pant
Secretary to His Majesty's
Government of Nepal

His Excellency Shri Shriman Narayan,
Ambasador Extraordinary and Plenipotentiary
of India to Nepal, Embassy of India,
Kathmandu, Nepal.

EMBASSY OF INDIA, NEPAL
Dated 19th December 1966

My Dear Dr. Pant,

I acknowledge the receipt of your letter of the 19th December 1966 regarding sub-clause (iv) of clause 5 of the Amended Kosi Project Agreement, which is as follows:

"With reference to sub-clause (iv) of clause 5 of the Amended Kosi Project Agreement, our two Governments have reached an understanding that the Government of India will be reasonably compensated in case the Project properties are taken over by His Majesty's Government at the end of the lease period. The compensation will cover the cost borne to date and such other cost as may be incurred in future by the Government of India with the agreement of His Majesty's Government. In that case the depreciation in the value of the Project materials would, of course, be taken into account.

I shall be grateful if you will kindly confirm that the above correctly sets out the understanding reached between our two Governments. -

This letter and your reply confirming the understanding will constitute an agreement between our two Governments and shall form part of the Amended Kosi Project Agreement and shall come into force from the date of your letter in reply."

2. I confirm that the foregoing correctly sets out the understanding reached between us.

Yours sincerely,
Sd.
SHRIMAN NARAYAN

Dr. Y. P. Pant
Secretary, Ministry of Economic Planning and Finance,
His Majesty's Government of Nepal, Kathmandu

Embassy of India, Nepal

Dated' the 19th December 1966

My Dear Dr. Pant,

With reference to sub-clause (ii) (a) of clause 8 of the Amended Kosi Project Agreement, it has been agreed between our two Governments that the Government of India will pay compensation annually at the rate of Rs. 5 NC per Nepali Bigha for all lands that have been acquired so far for the Kosi Project. For lands to be acquired in future, and especially for the Western Kosi Canal, the existing provision under which loss of land revenue is to be determined on the basis of land revenue payable as at the time of acquisition of the land will be applicable.

With reference to sub-clause (ii) of clause I of the Amended Kosi Project Agreement, it has been agreed between our two Governments that the land on which the Nepal Link Bund is situated, as shown in Amended Annexure A referred to in sub-clause (ii) of clause I, will be surrendered by the Government of India to His Majesty's Government who, on their part, will agree to permit the Government of India to maintain and operate the existing waterways in this Bund.

I shall be grateful if you will kindly confirm that the above correctly sets out the understanding reached between our two Governments.

This letter and your reply confirming the understanding will constitute an agreement between our two Governments and shall from part of the Amended Kosi Project Agreement and shall come into force from the date of your letter in reply.

Yours sincerely,
Sd.
SHRIMAN NARAYAN

Dr. Y.P. Pant,
Secretary,
Ministry of Economic Planning and Finance,
His Majesty's Government of Nepal, Kathmandu.

Ministry of Economic and Finance
Singh Durbar Kathmandu (Nepal)
December 19th, 1966

Your Excellency,

I acknowledge the receipt of Your Excellency's letter of December 19th, 1966 regarding certain clauses of the Amended Kosi Agreement, which is as follows:

"With reference to sub-clause (ii) (a) of clause 8 of the Amended Kosi Project Agreement, it has been agreed between our two Governments that the Government of India will pay compensation annually at the rate of Rs.5 NC per Nepali Bigha of all lands that have been acquired so far for the Kosi Project. For lands to be acquired in future, and especially for the Western Kosi Canal, the existing provision under which loss of land revenue is to be determined on the basis of the land revenue payable as at the time of acquisition of the land will be applicable.

With reference to Sub-clause (ii) of clause I of the Amended Kosi Project Agreement, it has been agreed between our two Governments that the land on which the Nepal Link Bund is situated, as shown in Amended Annexure-A referred to in sub-clause (ii) of clause I, will be surrendered by the government of India to His Majesty's Government who, on their part, will agree to permit the Government of India to maintain and operate the existing waterways in this Bund.

I shall be grateful if you will kindly confirm that above correctly sets out the understanding reached between our two Governments

This letter and your reply confirming the understanding will constitute an agreement between our two Governments and shall form part of the Amended Kosi Project Agreement and shall come into force from the date of your letter in reply."

2. We confirm the understandings as indicated in Your Excellency's letters.

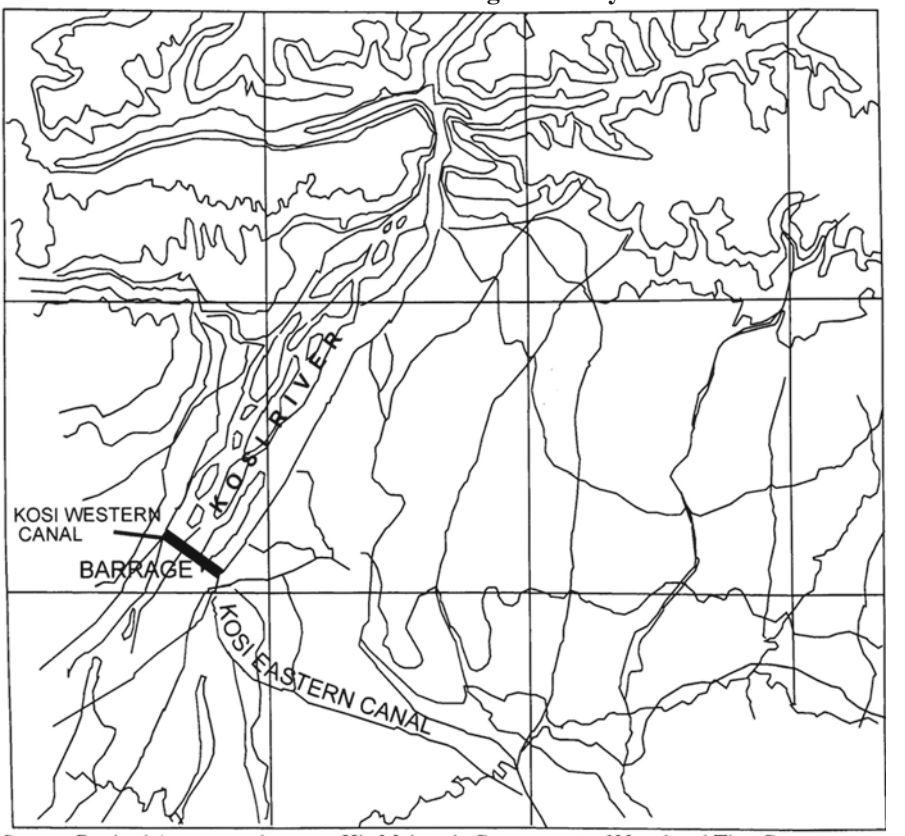
Please accept, Your Excellency, the assurance of my highest consideration.

Y.P Pant
Sd.
Secretary to His Majesty's Government of Nepal.

His Excellency Shri Shriman Narayan,
Ambassador Extraordinatary and Plenipotentiary
of India to Nepal,
Embassy of India, Kathmandu, Nepal

Source: Revised Agreement between His Majesty's Government of Nepal and the Government of India on the Kosi Project, Ministry of Water and Power, Durbar Marga, Kathmandu, Nepal 1975

Annexure A. Kosi Barrage Canal System



Source: Revised Agreement between His Majesty's Government of Nepal and The Government of India on The Kosi Project, Ministry of Water and Power, HMG Durbarmarg, Kathmandu, Nepal 1975.

Annex 7

Water Resources Main Points/Topics Covered in Some of the Joint Press Statements Issued at the End of Official Visits between Nepal and India and in the Treaty of Peace and Friendship, July 31, 1950
Prior to 1990/91

1. **Treaty of Peace and Friendship, July 31, 1950 (Accompanying Letter from the Ambassador of India to the Prime Minister of Nepal):**
   Point No: 4: If the Government of Nepal should decide to seek foreign assistance in regard to the development of the natural resources of, or of any industrial project in Nepal, the Government of Nepal shall give first preference to the Government or the nationals of India, as the case may be, provided that the terms offered by the Government of India or Indian nationals, as the case may be, are not less favourable to Nepal than the terms offered by any other foreign Government or by other foreign nationals.

   Nothing in the foregoing provision shall apply to assistance that the Government of Nepal may seek from the United Nations Organizations or any of its specialised agencies.

Political level Visits

2. **Joint communiqué issued at the end of the visit of Prime Minister Jawaharlal Nehru to Nepal, Kathmandu, June 14, 1959 :**
   The Kosi project is the first such endevour in cooperative development on a big scale. A similar project on the river Gandak is expected to provide irrigation facilities and cheap power to large areas at present under-developed in Nepal and India.

3. **Joint communiqué during the visit of Prime Minister Bishweshwar Prasad Koirala to India, New Delhi, January 29, 1960:**
   The Government of India have also undertaken to construct the East Kosi (Chatra) Canal at a cost of Rs. 3 to 4 crores [30-40 million].

4. **Joint communiqué issued at the end of the visit of Home Minister Lal Bahadur Shastri to Nepal, Kathmandu, March 5, 1963**:
   The Home Minister also paid a visit to the Trishuli Hydroelectric Project. He was glad to see that the work on the construction of the barrage and the powerhouse was in full swing and the pace was expected to be further speeded up.

5. **Joint communiqué issued at the end of the visit of Dy. Prime Minister Kirtinidhi Bista to India, New Delhi, February 7, 1965:**
   His Excellency the Foreign Minister mentioned His Majesty's Government's desires for India's co-operation and assistance, in appropriate ways, to ensure further progress on the Karnali Hydel Project...The Minister of External

Affairs reassured...India's desire and anxiety to extend cooperation and assistance to His Majesty's Government...It was agreed that the manner and extend which the two countries could cooperate in carrying forward the work on the Karnali Project should be discussed between the experts of the two countries at a suitable time. The Minister of External Affairs further suggested that the two Governments should jointly consider ways and means of harnessing, to the maximum advantage of both countries, the natural resources of which they are joint beneficiaries.

6. **Joint communiqué issued at the end of the visit of Prime Minister Lal Bahadur Sastri to Nepal, Kathmandu, April 25, 1965:**
Their Majesty's and the Chairman of the Council of Ministers, accompanied by the Prime minister and Shrimati Shastri, visited the Kosi Barrage, which His Majesty graciously inaugurated on April 24. The Prime Minister laid the foundation of the Western Kosi Canal. These two projects are symbolic of the joint efforts of the two countries to provide in cooperation with each other a better and fuller life for their peoples.

7. **Joint communiqué issued at the end of the visit of Dy. Prime Minister Morarji Desai to Nepal, Kathmandu, October 24, 1967:**
Mr. Morarji Desai...assured the Deputy Prime Minister of Nepal of the Government of India's increasing assistance...in the economic development of Nepal. He also agreed to arrange an early technical appraisal of the Karnali hydro-electric project from the point of view of determining India interest in it. The Deputy Prime Minister, Mr. Kirtinidhi Bista, thanked the Government of India for all their generous help and assistance.

8. **Joint communiqué issued at the end of President Dr Zakir Husain's visit to Nepal, Kathmandu, October 16, 1968 :**
His Majesty indicated to the President Nepal's desire to develop hydro-electric potential of the Karnali River and informed him of the present state of the project. The President expressed India's willingness to help Nepal in this project in the feasible and mutually beneficial manner.

9. **Joint press statement issued at the end of the visit of External Affairs Minister Atal Bihari Vajpayee to Nepal, Kathmandu, July 16, 1977 :**
Both sides reviewed the position on agreed on-going projects relating to the harnessing of water resources and noted that much progress had been achieved in these projects. Following discussion on the Devighat Hydroelectric Project, it was agreed that the Indian side would consider the fresh proposals made by the Nepalese side. Both sides agreed that the envisaged steps relating to the Karnali Project should be taken up. They have agreed to take steps to expedite further joint investigations regarding the Pancheswor Dam Project. They further decided that the joint feasibility studies on the multi-purpose project on the Rapti River would be expedited. It was agreed that the ground surveys of the Dolalghat - Dhankuta Road would be undertaken.

10. Joint communiqué issued at the end of the visit of Prime Minister Morarji Desai to Nepal, Kathmandu, December 11, 1977 :

The two Prime Ministers readily accepted that mutual cooperation can be enlarged and intensified. The Prime Minister of India affirmed India's determination to continue to participate fully in the developmental programmes of Nepal. In the spirit of this understanding the two Prime Ministers agreed on the following decisions in respect of projects which have been under discussion in the past:

a. **Karnali Project:** India affirmed its desire to purchase the surplus power from the project. As a first step, it has already been agreed to establish a committee to examine the preliminary issues with regard to the execution of the project. India has already nominated her representatives for this committee. It was now decided that the terms of reference would be settled and the Committee will meet within a period of three months and submit its recommendations within one year.

b. **Pancheshwar Hydro-Electric Project:** Both sides decided to nominate their representatives within a period of three months to start the joint investigations relating to the Pancheshwar Hydro-Electric Project, to be located on the borders of India and Nepal, on river Mahakali (Sarda). It was also agreed that both the countries will give all facilities and assistance for the early completion of the investigations.

c. **Rapti Project:** It was noted that the feasibility of a multi-purpose project on river Rapti at Bhalubhang in Nepal has been established and in keeping with their desire for the early execution of the project for the benefit of the two countries, it was agreed that experts of the two sides should meet within one month to finalise the arrangements and to prepare detailed project estimates within two years.

d. **Devighat Hydro-Electric Project:** India agreed to execute, on a turn-key basis, the Devighat Hydro-Electric Project utilizing the tailrace waters of the Trisuli Hydro-Electric Project for the exclusive benefit of Nepal. It was agreed that the formal agreement to enable commencement of the work should be signed as soon as possible.

Press releases or notes on official level meetings

11. Joint press note issued at the end of the official discussions on water resources, Kathmandu, April 24, 1983: The three major projects, Karnali (Chisapani), Pancheswor, Rapti (Bhalubang) were discussed. On Karnali, the discussions were a follow-up to the technical meeting held in Kathmandu in Feb 1983 by the two sides with the World Bank team. The Coordination Committee on the Karnali Project was constituted. On Pancheswor, both sides had discussions focusing on the role of the foreign consultants and the sharing of costs and benefits of the Project. On Rapti (Bhalubang), matters relating to location of proposed dam and flood control and irrigation benefits from the project to both sides were discussed.

A review was also made of the problems of smaller rivers flowing from Nepal to India relating to water utilization, creation of additional storage capacity, and flood control.

On Kamala and Bagmati it was noted that eventual construction of storage reservoirs upstream was envisaged. India's downstream requirements would also be taken into account in the preparation of feasibility studies. On Kankai, it was agreed to exchange data on a reciprocal basis.

Specific problems of submergence of the Nepalese territory arising out of construction works on the Indian side were discussed and it was agreed that a joint inspection for the affected areas would be made as far as possible to be resolved at the local level.

The progress report on Chandra Canal, Kosi Pump Canal and Western Kosi Distribution System Project presented by the review group was discussed in the meeting. It was agreed that every effort would be made to complete the entire project by June 1984 and only marginal works would be left over for completion by June 1985.

As regards the Kosi High Dam project at Barahakshetra, the Nepalese side stated that they had an open mind on all possible sites in the basin but that their exact location could be considered only after the master plan for the development of the entire Kosi basin currently being undertaken by His Majesty's Government of Nepal was complete.

As regards the flood forecasting system currently in the process of being set up by Nepal, the Indian sides repeated its offer to provide training facilities to His Majesty's Government of Nepal and requested accelerated implementation.

12. **Report on the official level discussions on water resources, Kathmandu, February 24, 1984:** After the Secretary-level talks, committees began their meetings. The statement said that the committee on Karnali and the joint technical group on Pancheswar also meet. It was apparent that Nepal was quite keen on initiating the Karnali project as soon as possible while India appeared to want to take on the Pancheswor project.

In terms of size, the Karnali with a high dam at Chisapani and power potential of 3600 megawatts is clearly the larger of the two projects as Pancheswor could at best generate only 1,400 megawatts.

The Pancheswor is, however, situated at the Nepalese border with India in the west and thus could prove to be more convenient to them.

There thus appears to be a wide gulf in the priorities of the two countries in not only the projects themselves but also on the question of sharing of benefits. For instance, though nothing is officially stated, it is widely believed that India wanted a 60-40 per cent basis for the sharing of the Pancheswar project benefits , while Nepal appears to be insisting on a 50 -50 share. These differences appear to be irreconcilable and cannot obviously be solved at the official level.

13. **Press note issued at the end of the official level discussions on water resources, Kathmandu, April 22, 1984:** In addition to the Secretary-level

meeting, other meetings held were those of the Karnali Committee, the Karnali Coordination Committee, the Joint Groups of Experts on Pancheswar and the Rapti Joint Technical Committee.

Considerable progress was registered during the talks on the Karnali (Chisapani) Multi-purpose Project. The Karnali Committee finalised the short list of consultants for the Karnali Project as well as approved the terms of reference for the consultants. The Joint Group of Experts on Pancheshwar also registered a forward movement. The Rapti Joint Technical Committee met and discussed matters of mutual interest to both sides.

14. **Joint Press note issued at the end of official level discussion on water resources, New Delhi, September 20, 1984:** The two delegations reviewed the satisfactory progress being made on the Karnali project. It was decided that the Karnali Committee should meet early to approve of the report of the experts group, presently evaluating the bids received from short-listed consultants. In respect of the Pancheshwar multi-purpose project on river Sharda/Mahakali, it was decided to continue the discussions on this project with a view to finalising the project for investigation and feasibility report. The joint technical committee on the West Rapti Bhalubhang project held further discussions for finalizing the terms of reference for the consultants. These discussions would be continued. The delegation also discussed the question of water resources development on other rivers.

15. **Press note issued by the Government of India on the eve of official level talks on water resources, New Delhi, May 29, 1985:** The Indo- Nepal Secretary level talks on water resources development will begin here tomorrow… Discussions will focus on the Karnali and Pancheshwar multi-purpose projects and the setting up of flood -forecasting and warning systems in Nepal. These issues have caused urgent concern in view of the flood problem in north Bihar. Modalities of exchange of rain-fall and fiver flow data in order to give timely notice to flood affected people and district authorities will be discussed.

The two delegations will discuss matters relating to the Kosi Pump Canal, Don Branch Canal, the Western Gandak Canal and Tanakpur Hydro Electric Project. Inundation problems and exchange of electric power will also be discussed.

The other issues that are likely to come up for discussion are the Kosi High Dam on the river Kosi and other reservoir storages on the rivers Kamala, Bagmati, Babai and Kankai.

16. **Report on official level discussions on water resources, Kathmandu, December 22, 1987:** With regard to the Karnali (Chisapani) Multi-purpose Project, both sides, while agreeing on the need for making a forward movement, also realised that it was necessary to have to finalise the Feasibility Report by the Consultants for determining the viable size of the Project. They agreed that the Karnali Coordination Committee should meet more frequently to resolve the relevant issues.

Nepal and India also attached importance to the implementation of the Pancheshwar Multi-purpose Project on the border river, Mahakali.

On the request by Nepal, India has accepted to furnish relevant data and information on investigations carried out on the Indian side so as to ensure that the final project report is prepared in an integrated and coordinated manner.

Nepal and India also agreed to establish an effective flood forecasting and warning system through exchange of data on reciprocal basis and exchange of visits of experts, as and when necessary.

On the construction of the Tanakpur Barrage on the Indian side on the River Mahakali (Sharda) an Agreement on the construction design was reached (which accommodates the interest of the Nepalese side for the agreed supply of water from that river).

17. **Joint press note issued at the end of official level discussions on water resources, New Delhi, June 3 1988:** Discussions were held on Karnali (Chisapani) multi-purpose project. Both sides agreed that Karnali Coordination Committee would meet from 4th to 7th June, 1988 at Kathmandu for further discussion and review of the work of the consultants. Discussions also took place on the investigations to be carried out on Pancheswar multipurpose project.

Both sides agreed to proceed further on setting up of an effective flood forecasting and flood warning system so that rain fall data would be available from few selected stations for this monsoon. Further action in installation of equipments required for flood warning would also be taken up.

The meeting also considered the matters relating to the exchange of power between the two countries.

Both sides agreed to hold the meeting of the Inundation Committee at earliest to suggest appropriate measures for consideration at the next Secretary level meeting.

18. **Report on the meeting of Water Resources Secretaries of India and Nepal following the discussions between the Prime Ministers of the two countries, Kathmandu, February 14, 1991:** During the meeting, the Nepalese side explained to the Indian delegation that Nepal had already completed the surveys of different river basins and had also identified all the potential water resources projects.

In view of the interest shown by India for purchasing Nepalese power, the Nepalese side apprised the Indian authorities of various hydro-electricity projects which had been studied by Nepal.

The Nepalese side also apprised the Indian side of the various issues in regard to the functioning of the Don Canal, the inundation of Nepalese territories, the erosion from the River Koshi, and also other matters.

Various aspects arising from the construction of Tanakpur barrage by India were also discussed in all their depth. (Some doubts were raised in the Nepalese media that the Tanakpur project in India could adversely affect Nepalese interests. A Spokesman of the Nepalese Ministry of Water Resources discounted such reports and said that the construction of power house by India at Tanakpur will not affect the Mahakali Irrigation project in Nepal. The tail race of the Tanakpur Hydel Project will be directly connected to the river Mahakali upstream of the Banbassa barrage, instead of connecting it with Sharada Canal

which will ensure the agreed supply of water to the Nepalese irrigation system on the left bank at Banbassa. Referring to the decision taken at the Secretary level meeting between India and Nepal from December 20-22, 1990 the Spokesman said all requisite measures would be taken by India to stop the submergence of the Nepalese territory due to the construction and operation of the Tanakpur Barrage.)

During the meeting, mega projects like the Pancheswar and the Karnali had also come up for discussion.

It was agreed by both the sides that the existing institutional framework of sub-commission as well as various committees should be further utilised, and that these fora be made active and effective.

As such, the meetings for sub-commission on multiple uses of water resources, the Committee on Karnali, the Karnali Coordinating Committee, and the joint group of experts on Pancheswar and Koshi Coordinating Committees, were scheduled for the coming months.

It was felt by both sides that these forthcoming meetings would enhance the cooperation between the two countries and give a meaningful shape in the form of the execution of Projects for their mutual benefit.

19. **Press note issued by the Government of India on the official level talks on water resources, New Delhi, April 15, 1991:** During the four day discussions, the meeting will discuss development of common water resources including that of taming of Kosi river and other mega projects like Karnali and Pancheswar.

    The progress of setting up flood forecasting and warning system for better flood management will be reviewed. The extension of Indian embankments at the border on common rivers into the Nepalese territory for tying them to high ground onto the embankments on the Nepalese side had already been agreed and modalities for the implementation will be worked out. This will avoid spilling of rivers on the border and save large areas from inundation every year. A programme for survey and investigation for taking up jointly storage projects on Kamala, Bagmati and Babai rivers and hydro electric projects in Nepal is expected to be agreed. Way is also likely to be paved for preparing the soil conservation and watershed management plan in the Kosi basin in Nepal.

20. **Report on the meeting of the Sub-Commission, New Delhi, April 18, 1991:** Various matters like setting up of the Pancheswar Development Authority, the adverse effects on Nepal due to the construction of Tanakpur Barrage, and early forward movement towards the acceptance of the Feasibility Report of the Karnali (Chisapaani) Project after incorporating the recommendations of the Committee on Karnali, and to the possibility of joint approach for procurement of finance from appropriate international funding agencies for implementation of projects were discussed.

    Other important items discussed at the meeting were inundation problems along the Nepal-India border, embankments on the Kamala, the Bagmati, the Lalbakaiya, and the Khando rivers as well as projects on small rivers like the Kankai, the Kamala, the Bagmati, the West Rapti and the Babai.

Source: AS Bhasin, (1994), Nepal's Relation with India and China: Documents 1947-92, Siba Exim. Pvt. Ltd. Delhi.

Annex 7.1

Water Resources Main Points/Topics Covered in Some of the Joint Press Statements Issued at the End of Dignitaries' Visits

A. Prime Minister's/Deputy Prime Minister's Level Visits, Especially After 1990

Date/Dignitary	Points/Topics Covered
1. K.P Bhattari New Delhi visit to 1990	The two leaders declared their solemn intention to usher in a new era of cooperation between the two countries, particularly, in the spheres of industrial and human resources development, for the harnessing of the waters of the common rivers for the benefit of the two peoples and for the protection and mangment of the environment
2. Prime Minister Girija Prasad Koirala (New Delhi, December 6, 1991)	THE following are the agreements arrived at during the visit of the Prime Minister to India from 9 to 14 Mangsir, 2048 (B.S.) (Corresponding to December 1991) between His Majesty's Government and the Government of India relating to water resources, published for the benefit of the public: ***1. Kamali (Chisapani) Multi-purpose Project*** Project parameters based on further study as agreed in the Eighth Karnali Committee Meeting shall be completed expeditiously. Proposals in regard to organisations and other matters relating to the project will be made available expeditiously by the Indian side. ***2. Pancheswar Multi-purpose Project*** Views of Indian Government on the establishment of Pancheswar Development Authority will be sent soon. A detailed project report for Pancheswar Multipurpose Project shall be prepared jointly by October 1992. The financing for the project will be provided by India. The basis for financing and sharing of costs and benefits shall be subject to mutual agreement. ***3. Kosi (Bhimnagar Barrage) Project*** All the protection works in the Nepalese territory including safeguarding of erosion in Hanuman Nagar, Jogania areas and their vicinities would be carried out by the Koshi Project in time, as per the Koshi Project Agreement with the necessary cooperation from HMG/N. ***4. Sapta Koshi High Dam Multi-purpose Project*** Joint studies/investigations as are necessary to finalise the parameters of the Sapta Koshi High Dam Multipurpose Project will be carried out expeditiously. For this purpose, a joint committee of experts shall be constituted to finalise the modalities of the investigations and the method of assessment of benefits. Thereafter, the two sides will start the investigations of the project with a view to preparing a detailed project report at the earliest.

5. ***Burhi Gandaki Project***
A joint team of experts shall conduct field surveys to reach agreement on the parameters of the project as outlined in the pre-feasibility study completed by HMG/N. These field surveys shall be completed by June, 1992. Modalities of financing the project will be worked out jointly pad passu. The detailed project report should be prepared so that construction can start by 1994.

6. ***Kamala and Bagmati Scheme***
Nepal will carry out the needed investigations and prepare the feasibility report by 1993. The possibility of financing of the studies by India will be considered.

7. Flood Forecasting and Warning System
The implementation of this system took sometime. Every effort needed to make the scheme fully operational from the monsoon season of 1992 will be done. Necessary arrangements will be made for continuous and el'fective functioning of the system, enabling improved monitoring of the flood situation on a continuing basis.

8. Flood Protection Embankments
The joint team of experts set up to finalise the schemes for flood protection embankments along the rivers Kamala, Bagmati, Lal Bakaiya and Khando would complete its work expeditiously and recommend cost effective proposals for immediate implementation, starting work in November 1991 with financial assistance from India.

9. Power Exchange
(a) 50 MW of power will be supplied to Nepal under the existing power exchange programme as already agreed to
A Power Exchange Committee will be constituted. Quantum of power exchange will be increased depending upon availability in India or Nepal; and
(c) Necessary transmission inter-connection works would be provided.

10. Tanakpur Barrage Project
(i) The site at Mahendranagar municipal area in the Jimuwa village will be made available for tying up of the Left Afflux Bund, about 577 metres in length (with an area of about 2.9 hectares) to the high ground in the Nepalese side at E1.250. The availability of land for construction of bund will be effected in such a way by HMG/N that the work could start by 15th of December 1991;

(iii) India will construct a head regulator of 1000 cusces capacity near the left undersluice of the Tanakpur Barrage, as also the portion of canal upto Nepal-India border for supply of upto 150 cusces of water to Irrigate between 4000-5000 hectares of land on Nepalese side. The releases from head regulator will be increased as and when substantial upstream storage at Pancheswar, or similar, is developed on the Mahakali Rivet; and

(iii) In response to a request from Nepalese side, as a goodwill gesture, the Indian side agreed to provide initially 10 MW of energy annually free of cost to Nepal in spite of the fact that \this will add to a further loss in the availability of power to ndia from Tanakpur Power Station. It was agreed that investigations of the road connecting the Tanakpur Barrage to the East-West Highway at Mahendranagar would be undertaken by the Government of India.

3. Prime Minister P.V. Narasimha Rao (Kathmandu, October 21, 1992)

i. Water Resources Cooperation: Following up on the understandings reached and the decisions taken during the visit of His Excellency the Prime Minister of Nepal to India in December, 1991 on bilateral cooperation in this sector, both sides have agreed on a time frame for investigations, preparation of project reports etc. on the Karnali, Pancehswar, Sapta Kosi, Budhi-Gandaki, Kamala and Bagmati Projects, as also on the installation of flood forecasting and warning systems, the construction of flood protection embankments and on power exchange. The implementation of this detailed programme would prepare the ground for taking up some or all of these projects and to enter into required agreements. It was further agreed to explore the possibility of private sector participation in setting up of hydel projects. Both the governments agreed to give priority to undertake Pancheshwar and Budhi Gandaki projects. It was agreed to investigate and study the aspects of navigation through river Kosi. It was also agreed that the supply of water to Nepal under the Sharada Barrage Agreemnt will be maintained.

ii. Tanakpur Barrage: With reference to the decision taken at the Second Meeting of the Indo-Nepal Joint Commission in New Delhi on December 4-5, 1991 regarding the Tanakpur Barrage, the following clarifications were agreed upon:

- The site at Mahendranagar municipal area in the Jimuwa village which is made available for tying up of the left afflux bund about 577 metres in length (within an area of about 2.9 hectares) to the high ground in the Nepalese side at el 250 and the Nepalese land lying on the west of the said site/bund upto the Nepal-India border including the natural resources/endowment lying within that area remains under the continued sovereignty and control of Nepal and Nepal is free to exercise all attendant rights thereto.
- As referred to above, the Tanakpur Barrage Project does not make any consumptive use of water. No arrangement concerning the tying up of the afflux bund to the left of the Tanakpur Barrage to the high ground on the Nepalese shall be construed as depriving either country of its share in the storage projects envisaged at Pancehswar or similar other places on the Mahakali river upstream of the Tanakpur Barrage.

	-	The supply of upto 150 cusecs of water from the Tanakpur Barrage to irrigate between 4000-5000 hectares of land on the Nepalese side shall be made on a perennial /round the year basis as would be requested by Nepal. The construction of the portion of the canal upto the Nepal-India border for the supply of water shall be completed at the earliest.
	-	Regarding the supply of power to Nepal from the Tanakpur Power Station, both sides agreed that 20 million units would be supplied annually, free of cost to Nepal. The modalities for the supply of energy shall be worked out. Further, as some pillars on the Nepal-India border in the Tanakpur Barrage area are missing or in dilapidated condition, they would be put in place or renovated by May, 1993 under the auspices of the Joint Technical Level Nepal-India Boundary Committee, in consonance with the governing principles of territorial sovereignty and mutual respect.
	iii.	Power Exchange: Recalling the decisions taken regarding power exchange during the visit of the Prime Minister of Nepal to India in December, 1991, the two sides agreed that the future quantum of exchange shall be considered by the High Level Task Force to be constituted.
4. Dy. Prime Minister Madhav Kumar Nepal (New Delhi, February 7, 1995)	i.	Water Resources: There is a prospect to enter into comprehensive Mahakali River as package, Mahakali is basically a border river. Both the countries have equal right over it. So we can harness this river in the interest of both the countries on equal cost benefits basis.
	ii.	In Kanchanpur and Kailali districts of Nepal 150 thousand hectares of land has to be provided water for irrigation. The area needs 7000 cusecs of water from Mahakali. This need has to be solved.
	iii.	There is also need of 350 cusecs of water from the Sarda canal to irrigate Chadani, Dodhara area of Nepal.
	i.	We can conclude an agreement on the utilization of waters of Mahakali river for Sharada, Tanakpur and Pancheswor Projects.
5. Prime Minister Man Mohan Adhikari (New Delhi, April 10-14, 1995)	i.	Water Resources: The two Prime Ministers also discussed the issue of water resources. It was agreed that the two sides should continue their efforts for the development of the use of the Mahakali river. In this context, the Prime Minister of Nepal presented certain proposals regarding additional benefits to Nepal. The Prime Minister of India agreed that these proposals would be examined taking into account relevant aspects. For this some time would be required to enable consultations. Thereafter, both sides agreed that they would have further discussions and come to a conclusion.

6. Prime Minister Sher Bahadur Deuba (New Delhi, February 11-17, 1996)	i. Cooperation with Water Resources: The two Prime Ministers expressed satisfaction at the conclusion of the Treaty on the Integrated Development of the Mahakali River, the implementation of which would bring significant benefits to both countries. They directed that every effort should be made to ensure progress towards implementation of the Treaty clauses and accompanying exchange of letters. The Treaty has also paved the way for possible investment and financing by private investors and lending agencies in Pancheswar Multi-purpose Project. Nepal and India should jointly make efforts to attract private investors and lending agencies for jointly agreed projects. ii. They discussed other projects under consideration between Nepal and India and directed that meetings at the technical, expert and other levels as necessary, should be convened in regard to the Saptakosi High Dam including Sunkosi Diversion and Karnali Multi-purpose Projects, and the Budhi Gandaki Hydro-electric Project to expedite progress in this regard. iii. The two sides expressed satisfaction at the initialing of the agreement between the two countries on Power Trade which would facilitate increased investment in the power sector in Nepal.
7. Prime Minister Inder Kumar Gujral (Kathmandu, June 5-7, 1997)	i. Water Resources: The two Prime Minister expressed satisfaction over the exchange of Instruments of Ratification of the Treaty on the Integrated Development of the Mahakali River. They noted with satisfaction the steps taken for the implementation of the Treaty provisions, especially discussions at technical level regarding the various aspects related to preparation of the Detailed Project Report of the Pnacheshwar project. The two Prime Ministers agreed that the Pancheshwar project be designed as a peaking power plant, to maximise its net benefits. They directed their officials to continue their discussions and resolve the outstanding issues for the completion of the Pancheshwar Detialed Project Report within six months. ii. The two Prime Ministers directed their officials to take immediate action to finalise modalities for supply of power from Tanakpur to Nepal and for the Sarada Barrages to Nepal. They also directed that construction of the Mahendranagar-Tanakpur Barrage Road be undertaken at the earliest. iii. The Prime Minister of Nepal drew the attention of the Prime Minister of India, to certain issues raised during the Joint Session of the Parliament of Nepal, at the time of Ratification of the Mahakali Treaty. The Prime Minister of India took note of the same. It was agreed that these issues would receive attention while the DPR for the Pancheshwar project is prepared.

iv. *River Navigation:* The Prime Ministers of India and Nepal directed their officials to expedite a joint study of river navigation for promotion of tourism and for facilitating transportation of cargo.

v. *Power Trade Agreement:* The two Prime Ministers noted with satisfaction the signing of the Power Trade Agreement between Nepal and India, which aims at encouraging private sector participation in the development of hydro power projects in Nepal.

8. Prime Minister Girija Prasad Koirala (New Delhi, July 31-August 6, 2000)

i. Water Resources: The two Prime Ministers noted that the huge potential for development of hydropower resources in Nepal and the projected demand for power in India in the coming decades offered rich opportunities for cooperation to bring about rapid, environmentally sustainable economic growth on both sides of the border. However, the process of achieving concrete results had been relatively slow and needed to be accelerated. The Prime Ministers directed that a Joint Committee on Water Resources, headed by the Water Resources Secretaries of the two Governments, be set up to discuss all important issues pertaining to cooperation in the water resources sector including implementation of existing agreements and understandings. The Joint Committee, which would meet at least once in every six months, would also oversee the work of all technical and expert level committees and groups in this field

ii. The Prime Ministers reiterated that the implementation of the Mahakali Treaty would be given high priority. They directed that the remaining investigations and studies be completed as per the schedule agreed upon by the Joint Group of Experts on Pancheshwar and that the work on the preparation of the DPR be completed latest by the end of 2001. Unresolved issues pertaining to the DPR would be addressed by the Joint Committee on Water Resources.

iii. On the Sapta Kosi High Dam and Sun Kosi - Kamala Diversion Projects, the two Prime Ministers agreed that the ongoing process be expedited.

iv. The two Prime Ministers directed that the Joint Task Force on Flood Control and Forecasting be set up immediately to review cooperation in a comprehensive manner and give its recommendations to the two Governments. It was also agreed that there would be close consultations between the concerned authorities of the two Governments regarding flood control structures, which may cause damage to life and property in the adjoining border districts of India and Nepal. Responding to the Nepalese concern of inundation in the Banke District of Nepal, the Indian side assured that measures were being taken to ensure that the flood control embankment constructed in the Indian side would not cause inundation in the adjoining regions of Nepal and that the situation in this regard would be monitored jointly and necessary action taken.

v. *Boundary Demarcation:* The two Prime Ministers reviewed the progress in the work of the Joint Technical Level Boundary Committee and directed the Committee to complete its field work by 2001-2002 and final of strip maps by 2003. The Committee was also directed that in case it was unable to reach mutually acceptable agreement on certain specific segments of the boundary despite its best efforts, detailed reports on those pockets, including a compilation of the available evidence, would be submitted to the two Governments for their consideration. The Prime Ministers also directed the Joint Working Group of the Joint Technical-Level Boundary Committee to expeditiously complete its examination of the facts relating to the alignment of the boundary in the western sector, including the Kalapani area, and in other pockets, where there were differences in perceptions of the two sides.

vi. Water Resources: The two Prime Ministers noted that the huge potential for development of hydropower resources in Nepal and the projected demand for power in India in the coming decades offered rich opportunities for cooperation to bring about rapid, environmentally sustainable economic growth in both sides of the border. However, the process of achieving concrete results had been relatively slow and needed to accelerated. The Prime Ministers directed that a Joint Committee on Water Resources, headed by the Water Resources Secretaries of the two Governments, be set up to discuss all important issues pertaining to cooperation in the water resources sector including implementation of existing agreements and understandings. The Joint Committee, which would meet at least once in every six months, would also oversee the work of all technical and expert level committees and groups in this field.

Sources: Joint Comminque's, Bhasin 1994 and Notification in the Nepal Gazette Vol. 41 No. 36, Kathmandu, December 29, 1991.

B. Speeches of External Affairs Minister Madhav Singh[Singh] Solanki and Minister Maheshwar Prasad Singh at the second meeting of the Indo-Nepal, Joint Commission, New Delhi, December 4, 1991.

'Water Resources Development: I am happy to note that the Sub-commission on Water Resources held its second meeting in April, 1991. I would recommend that this meeting take note of the discussions at the Sub-commission meeting, which were frank and productive and formed one of the inputs for the subsequent deliberations of the High Level Task Force on this key subject.

The recommendations of the HLTF on water resources development are well-chosen and can be adopted straightaway. I am, however, compelled to stress the need for resolving the still pending problem concerning Tankpur in a satisfactory manner. Despite the fact that a balanced and mutually acceptable set of discussions was reached at the meeting between the HMGN secretary for Water Resources and

our Secretaries for Water Resources and Power fully two months ago, which were immediately endorsed in toto by the HLTF, permission has not yet been given for starting work on the left afflux bund. The note verbale from His Majesty's Government of Nepal of December 3 leaves room for future controversy. We should therefore request that this matter be resolved immediately.' (Bhasin 1994)

C. Ministerial level Visits: Joint Communique released after discussion of Minister of Water Resources Pashupati Shumshere JBRana with his counter-part Janeshwar Mishra during Rana's visit to New Delhi in November 1996.

1. 1. It was agreed that the DPR for Pancheswor project should be finalised expeditiously.
   2. It was agreed that the Mahakali River Commission as stipulated in the Mahakali River Treaty will be set up soon.
   3. It was agreed to constitute a Joint Study Team to study the possibility of navigation in the Kosi, Gandak and Karnali rivers flowing from Nepal to India.
   4. India Agreed to consider positively Nepal's request to supply water during the dry season as per article 2.1 (a) of the Treaty from the Sarada barrage till head regulator in the Tanakpur barrage and the canal upto the Nepal-India border is built, both of which India has agreed to build expeditiously.
   5. India agreed to consider positively Nepal's request to take up permanent measures to settle the recurring problem of damage to Dodhara-Chandani area due to release of water through the Nagla escape of Sarad canal.
   6. India agreed to take up the construction of the Lalbakaya embankment early next year with simultaneous action on finalisation of reports on the Kamala, Bagmnati and Khando embankments. It was also agreed to consider for implementation during the Ninth plan with first priority to Kamal embankment after Lalbakaya .

   The two Ministers expressed satisfaction at the conclusion of the delegation level talks which enable the two sides to proceed positively on implementation of the Mahakli Treaty.

D. High-Level Nepal-India Task Force (HLTF)[1] Meeting

Meeting/Date	Points/Topics Covered
First (August 4,1991)	Discussions between two sides covered various subjects of mutual interests, including water resources … and other areas of mutual cooperation.
1. Second (September 2, 1991)	The task force considered issues relating…and various possibilities of bilateral cooperation in the field of waters resources…
2. Third (October 10, 1991)	These include the development of water resources, Mr. Gautam [the head of Nepalese delegation] said…that Nepal wanted to develop this important resource in a way which would be mutually beneficial. … Already separate panels, consisting of the officials and experts from both countries, are regularly discussing the details of the proposed huge projects on Karnali and Pancheswar. These projects require very elaborate works. Both sides to meet and discuss every phase of the programme, Mr. Naresh Chandra [the head of the Indian delegation] said.

[1] Agreement for the formation of this task force was made as a result of the agreement between the two countries during the visit of then Indian Prime Minister Mr. Chandra Shekhar to Nepal in February 1990 (AS Bhasin 1994).

3. Fourth (May 31 - June 1, 1997)	i. Embankments: Both sides agreed to complete the Lal Bakeya embankment in the next two working seasons. Also counter-protective measures in Bihar would be undertaken ahead of the works in Nepal. As requested by HMGN the Indian side agreed to send a formal letter to confirm that the Project would be commenced during 1997-98. The Indian side also agreed to accord priority to the construction of the Kamala embankment during the Indian Ninth Plan period, immediately after the completion of the Lalbakaiya works. Both sides agreed to expedite updating of the estimates for Bagmati embankment and the preparation of a report for the Khando embankment. ii. Implementation of Mahakali Treaty: Both sides reviewed progress on the implementation of the Mahakali Treaty which was signed in February 1996 and noted the following: - The Instruments of Ratification of the Treaty would be exchanged shortly during the forthcoming high level visit from India. - The Ministers of Water Resources of the two countries had met in November 1996 in New Delhi and taken advance action on various aspects of its implementation and there has been good progress on all issues. - The HLTF reviewed the informal discussions taking place between Nepal and India on the various aspects of the Pancheshwar DPR at the technical levels and expressed satisfaction on the progress. It was also agreed in principle that the Project be designed as a peaking power plant, keeping in view the objective of maximizing net benefit. It was also agreed that informal discussions should continue. Outstanding issues, if any, should be resolved at the earliest. Nevertheless if for certain components of the project, the detailed investigations will have to be made, they should be conducted while finalizing and, as required, after the completion of the DPR. - The issue of supplying water from Tanakpur as per the Treaty and also from the Sarada Barrage would be further discussed at the Contact Officers level of the two countries in continuation of a meeting held by them in January 1997 at Tanakpur. - The construction of the link road from Mahendranagar to Tanakpur would be taken up by the Ministry of Surface Transport, GOI. - The meeting of the Power Exchange Committee would be convened soon to finalise the modalities for supply of Power from Tanakpur to Nepal. iii. New Proposal: The Nepalese side sought the Indian assistance for the electrification of about 20 villages in the district of Nuwakot. The Indian side sought the details of the proposal, which the Nepalese side agreed to provide as early as possible.

4. Fifth (6-7 June, 2000)	i. Review of Projects Under Implementation: It was noted that the construction work on the extension of the right embankment on the Lalbakaiya river in Nepal had commenced and that the construction of embankments on Kamala, Bagmati and Khando rivers would be finalised thereafter. ii. It was agreed that the proposed Nepal-India Task Force on Flood Control and Flood Forecasting would be constituted shortly to review cooperation in this area in a holistic manner and recommend short-term and long-term measures. iii. Consideration of New Projects: The HLTF confirmed that the two Governments had agreed in principle to cooperate in jointly setting up a small or medium sized hydropower project in Nepal. It was agreed that an Indian expert team would visit Nepal in the near future to hold discussions on the identification of the project, which could preferably be a run-of-the-river hydropower project with good potential for export of power to India. The feasibility study of the project would be undertaken thereafter. iv. The TLTF also reviewed cooperation in the field of Water Resources, Trade and Transit, and Investment. It was agreed that discussions on these issues should continue through designated channels.

Sources: Personal collections of the Editors and Contributors, Ministry of Foreign Affairs and Ministry of Water Resoruces Government of Nepal.

Annex 8

Note on the Rapti Project (Jalkundi), February 7, 1974

'The river Rapti drains a total catchment area of 9,230 sq.miles. The approximate yield is 3 millions acre feet at Jalkundi. The catchment area at Julkundi is 1,950 sq. miles . Over 700,000 acres in Uttar Pradesh suffer from the floods of Rapti every year. Since 1895, the question of controlling floods in Rapti is engaging the attention of Government of India. A preliminary Project Report was prepared in 1958 and the same was revised in 1973. The revised project envisages construction of dam at Jalkundi, 188 feet high. The estimated cost in 1973 is Rs.80 crores. This is a multi- propose project. A live storage of 1.5 million acre feet, together with a flood cushion of about 23 feet, is proposed. A barrage about 20 miles downstream at Sikta has been proposed to command about 1,50,000 acres (gross area) in Nepal by means of two canals taking off on either bank of the river. Some hydro-power generation may also be feasible. This project is based on preliminary spot investigations and paper study using topo sheets.

'The Jalkundi site involves submergence of about 71,000 acres in Nepal. Sizeable cultivated area and a number of villages come under submergence. With a view to eliminate or considerably reduce submergence of cultivated area at the Jalkundi site, the former Minister of I & P suggested a storage site about 20 miles downstream of Jalkundi with a storage capacity of about 1.5 million acre feet. The site will also enable regulation of Rapti flows for irrigation in Nepal and the canals would be the same as proposed in para 1.1 [above]. However, this was on the basis of a paper study. Further investigations to locate the most suitable site or sites and establish their feasibility for storage are necessary. The Nepal Government may like to investigate such a feasibility with a view to formulate a joint multi-purpose project. India will be glad to render all assistance to Nepal in this connection, if needed. While investigating the scheme of development, maximisation of irrigation and hydro power benefits to Nepal will be the prime consideration. An index map indicating the dam and barrage site is attached.'

Source: Letter from Ministry of Foreign Affairs (No. P.I./1/5811 dated: Feb-7, 1974 (Bikram Sambat [BS]) 2030/10/25) to Secretary Ministry of Water & Electricity, His Majesty Government of Nepal. In this letter it is indicated that Dr. KL Rao, Former Minister of Irrigation & Power, Government of India, had briefed late King Birendra during his visit to India. Also Nepalese ambassador to India had discussed about this project to Mr. RV Subramanyam, Secretary, Irrigation & Power in Government of India too.

Annex 9

Note on Tanakpur-Banbassa Hydel Scheme on River Sarada, Irrigation Department UP, December 1980

December 1980

1.0 PREAMBLE

1.1 The scheme envisage the utilisation of water resources potential of river Sarda near Tanakpur. The instant scheme will utilise the drop of 25 Mtr. (Gross) available between the Barrage site situated on the river near Tanakpur and diverting supplies upto a limit of 20,000 cusecs in the power channel for Hydro-electric power development at the power house located near Banbassa. An Index Map of the scheme (scale 2" =1 Mile) is attached as Exhibit I.

1.2 Sarda River originates in high Himalayan region perpetually covered with snows and forms international boundary between India and Nepal in the hilly region. It emerges into plains at Tanakpur. The river upstream of Tanakpur is called Mahakali and down below as Sarda. An Index map (scale 1" = 8 Mile) is attached as Exhibits which shows the origin of the River, its parineal [perennial] tributaries, International boundary and other important topographical features besides the Hydel and multipurpose scheme (11 Nos) identified so far for Master Plan for water resources development of the Sarda Valley. The storage schemes would increase power generation at proposed Banbassa Power House after these are implemented in feature. This exhibit also indicated that the instant Tanakpur-Banbassa scheme fits in the Master Plan, because the planning has necessary to be from Banbassa towards up stream.

1.3 There is a restraint in the Tanakpur-Banbassa scheme posed by the International boundary between India and Nepal. Prior to the construction of barrage for Sarda Canal at Banbassa (1928) the river Sarda formed the International boundary. By an agreement between the two countries, land measuring 2898 acres on left bank of river Sarda (as shown in Exhibit I) was transferred to India in exchange for 4000 acres of land in Disst Bahraich given to Nepal. The restraint in the scheme is to avoid negotiations with Nepal for obtaining concurrence for…execution. Accordingly the barrage and its protection works be wholly in the India territory and the afflux of the pond created does not exceed the normal flood level in Nepal territory.

Sd.
R. C. Gupta
Ad. Chief Engineer

Source: Lumsali R. Struggle for Additional Benefits from Mahakali River by Protecting Existing Benefits, 1996 (November 10) [2053/7/25], Kathmandu.

Annex 10

Letter of Prime Minister Chandra Shekhar, Government of India to Prime Minister Krishna Prasad Bhattarai, His Majesty's Government of Nepal, May 17, 1991

PRIME MINISTER
New Delhi
May 17, 1991

My dear Kisunji,

I am glad that the series of meetings between India and Nepal were planned in the water resources sector when we met last in February, 1991, have taken place. The meeting of the Sub-Commission on Water Resources was concluded on 18th April, 1991. The discussions were held in a cordial atmosphere and in spirit of mutual cooperation. We hope to move forward in achieving our short and long-term objectives in harnessing the common water resources for mutual benefit.

We had taken up a Hydro-electric Project at Tanakpur near the border on river Sarda upstream of the existing Banbasa Barrage, and construction works for this have been going on for the past few year[s]. We have taken all required measures as were desired by the Nepalese side in 1987 to prevent submergence of Nepalese territory due to the construction work under the Project. We also proposed to connect the left afflux bund of the Project to the high bank in the Nepalese territory to prevent inundation and erosion of territories at the border, and sought concurrence of the Government of Nepal at the Sub-Commission meeting. The Nepalese side requested for the introduction of a head-regulator of 1,000 cusecs capacity on the left side of the Tanakpur Barrage along with a stretch of canal up to its border in lieu of the existing head regulator at the Banbasa Barrage, supply of 25 MW power to the region and connection of the Kohalpur-Banbasa highway to the Barrage. Even though this arrangement would involve additional costs and mean loss in generation of power, we agreed in principle to construct the head regulator after the finalization of its location jointly by an Indo-Nepalese team. It was also agreed that the releases of water for Nepal from this new outlet at Tanakpur would be governed as per the existing Agreement between the two countries. We also agreed to consider other requests from the Nepalese side.

However, during subsequent discussions in the Sub-Commission meeting, Nepalese side made additional demands for supplying this power free of cost and for 50% [per cent] of water from [the] Project. No agreed decisions could be arrived at and it was thus decided to refer the matter to the Joint Commission.

While the unresolved issue could be formally taken up in the Joint Commission meeting, in view of the approaching monsoon, the work of the left afflux bund has to be completed at the earliest. The areas at the border on the left side of the river at Tanakpur are subject to inundation and erosion, and tying the left afflux bund with high banks in the Nepalese territory, as proposed by us, will bring a permanent

solution. A large area of Nepal will also become flood free and usable for irrigation and development.

I count on your cooperation for assisting us in completing the remaining works on the left afflux bund before the monsoons so that the area on the Nepalese side is made safe from recurring damages during the monsoon.

With kind regards,

Your[s] Sincerely,
[Chandra Shekhar]

His Excellency
Mr. Krishna Prasad Bhattarai
Prime Minister of Nepal
Kathmandu

Source: Lumsali R, Struggle for Additional Benefits from Mahakali River by Protecting Existing Benefits, 1996 (Nov 10) [2053/7/25], Kathmandu

Annex 11

Mahakali Package
Draft Agreement between the Kingdom of Nepal and the Republic of India Concerning the Utilisation of the Waters of the Mahakali River, April 4, 1995

WHEREAS the Kingdom of Nepal and the Republic of India, through exchange of letters in 1920, had entered into an arrangement for the construction of Sarada Barrage whereby Nepal is to receive some waters from the said Barrage;

WHEREAS the Sarada Barrage has out-lived its life and in future it may be nonfunctional;

WHEREAS India has constructed a barrage at Tanakpur where a course of Mahakali River passes through and a part of the eastern afflux bund and the adjoining pondage area of the said barrage lies in the Nepalese territory;

WHEREAS the Kingdom of Nepal and the Republic of India made a decision in the Joint Commission dated [5 December, 1991] and the issue was further discussed during the visit of the Prime Minister of India to Nepal on [21 October, 1992], which was reflected in the joint communique issued on that date;

WHEREAS both the above barrages are dependent on the waters of Mahakali River which is basically a border river between the two countries and both the countries are entitled to equitable share in its use;

WHEREAS a joint study is being conducted for a multipurpose project called Pancheshwar on the upper reach of Mahakali River where it forms the border between the two countries;

WHEREAS it is expedient for both the countries to formally enter into a treaty to define the existing obligations of both the countries and their respective rights and duties in regard to the utilization of Mahakali River;

NOW THEREFORE, the Parties being animated by the desire of achieving mutual benefit by utilizing the Mahakali River hereto hereby have agreed as follows:

Article 1
Tanakpur Barrage

1. For the construction of the eastern afflux bund of the Tanakpur Barrage and tying it up to the high ground in the Nepalese territory at EL 250 M, Nepal shall give its consent to use a piece of land of about 577 metres in length (an area of about 2.9 hectares) of the Nepalese territory at the Jimuwa Village in Mahendra Nagar Municipal area and certain portion of the No-Man's Land on the either side of the border. The Nepalese land consented to be so used and the land lying on the west of the said land (about 9 hectares) up to the Nepal-India

border which forms a part of the pondage area, including the natural resources endowment lying within that area remains under the continued sovereignty and control of Nepal and Nepal is free to exercise all attendant rights thereto.

2. In lieu of the Tanakpur Barrage thus constructed under the provision of this Article:
   (a) India shall supply to Nepal ... cusecs of water in dry season and .... cusecs of water in wet season and for this purpose, India shall construct a head regulator of the capacity of 2000 cusecs near the left undersluice of the Tanakpur Barrage, as also the waterway of the same capacity up to Nepal-India border. Additional head regulator and necessary waterway, as required, up to Nepal-India border shall be constructed to supply additional water to Nepal subject to the provision mentioned in Article 3. Such head regulators and waterways up to Nepal-India border shall be operated by Nepal.
   (b) India shall also supply...million kilowatt-hours (units) of energy on a continuous basis annually to Nepal, free of cost, and for this purpose India shall construct a 132 kV transmission line up to Nepal-India border from the Tanakpur Power Station. Nepal shall be entitled to receive this supply of energy from the date of commissioning of the Tanakpur Power Station.

Article 2
Sarada Barrage

1. Nepal shall have the right for a supply of 1000 cusecs of water from the Sarada Barrage during Kharif season i.e. from 15th May to 15th October and 150 cusecs during Rabi season i.e. from 5th, October to 15th May.
2. In cases where Sarada Barrage becomes non-functional due to any cause India shall, by using the head regulator constructed near the left undersluice of the Tanakpur Barrage, supply the water as mentioned in Paragraph 1 of this Article to Nepal. Such a supply of water shall be in addition to the water to be supplied to Nepal pursuant to Paragraph 2 of Article 1.

Article 3
Pancheshwar Multipurpose Project

As both the countries are jointly preparing a Detailed Project Report (DPR) of a multipurpose project at Pancheshwar in Mahakali River and if such a Project is found viable, it shall be implemented jointly on the basis of following principles:

1. Hydro-electricity generating stations of equal capacity shall be constructed on each side of the Mahakali River. These stations shall be operated to generate equal amount of power and energy.
2. While developing the Project, the requirements of water for Nepal shall be given prime consideration. Nepal shall be entitled to a share of…cumecs of water from Mahakali River to fulfil its water requirements. Withdrawal of such water shall be made from Tanakpur Barrage and/or other feasible points.
3. While preparing the DPR, the Project shall be designed so as to produce the maximum total net benefit. In doing so re-regulating structures required downstream shall also be incorporated. All benefits accruing to Nepal and India with the development of the said Project in the forms of power, energy, irrigation, flood control etc. shall be assessed. The costs of the Project shall be borne in proportion to the benefits thus accrued.
4. A portion of the power and energy generated from the generating station located in Nepal shall be sold to India: The quantum of power and energy and its price shall be mutually agreed between the Parties.
5. Additional power and energy generated from Tanakpur Power Station after the development of Pancheswar and other structures upstream of Tanakpur, shall be shared equally between the Parties.

Article 4
Irrigation Facility to Dudhaura-Chandani Area

India shall give its consent to Nepal for the construction of a head regulator and/or diversion structure at an appropriate point on the Sarada main canal and necessary waterway up to Nepalese territory to divert 350 cusecs of water on perennial/round the year basis to irrigate Dudhaura-Chandani area of Nepal territory lying on the west bank of Mahakali River.

Article 5
Maintenance of Flow and Level

In order to maintain the level and flow of the waters of the Mahakali River, each Party undertakes not to use or obstruct or divert the waters of Mahakali River affecting its natural level or flow on the either side of the border except by agreement between the two countries.

Article 6
Works on the Tributaries of Mahakali River

This Agreement shall not preclude planning, survey, development and operation of any project on the tributaries of the Mahakali River, to be carried out independently by each Party in its own territory without adversely affecting the provision of Article 5 of this Agreement.

Article 7
Mahakali River Commission

1. For the execution of the provisions of this Agreement the Mahakali River Commission (hereinafter referred to as "the Commission") shall be established. The Commission shall be composed of equal number of representatives from both the countries.
2. The Commission shall have the right to make inspection of the Sarada Barrage as also the Tanakpur Barrage and make recommendations to both the countries to take steps which shall be necessary to implement the provisions of this Agreement in relation to those barrages.
3. The Commission shall make recommendations to both the countries for the conservation and utilization of Mahakali River and may also submit proposals to both the countries concerning the execution of joint works or works of joint interest as envisaged and provided for in this Agreement and as shall be executed in future.
4. The functions of the Commission shall inter alia include the following:

    a) inspect and supervise periodically the conditions of both banks of Mahakali river and any installation thereto,
    b) prepare measures in matters relating to the conservation and utilization of Mahakali river,
    c) make an expert evaluation of projects and provide recommendations thereto,
    d) coordinate with the plan of actions arising out of the implementation of this Agreement.

Article 8
Working Procedure of the Commission

1. The Commission shall be guided by the principles of mutual benefit, no harm to either Party and the entitlement of both the countries on the waters of Mahakali River as mentioned in this Agreement while making recommendations to both the countries as mentioned in Article 7.
2. The expenses of the Commission shall be borne equally by both the countries.
3. As soon as the Commission has been constituted pursuant to Paragraph 1 of Article 7, it shall draft its rules of procedure which it shall submit for the approval of both the countries.
4. Both the Parties shall reserve their rights to deal directly on the matters which may be in the competence of the Commission.

Article 9
Constitution of Entities

Both the countries can form entities for the development, execution and operation of projects in Mahakali River for their mutual benefit. Such entity shall function under the general guidance of the Commission.

Article 10
Miscellaneous

1. Following the conclusion of this Agreement, the earlier Understandings reached between the two countries concerning the use of the waters of Mahakali River shall be deemed to have been replaced by this Agreement.
2. This Agreement shall remain valid for a period of fifty (50) years from the date of its entry into force. This shall enter into force thirty (30) days after the date of exchange of instruments of ratification.
3. This Agreement shall be reviewed by both the parties at ten (10) years interval and make amendments if deemed necessary.
4. Agreements on details, as required, shall be entered into by the parties to give effect to the provisions of this Agreement.

IN WITNESS WHERE of the respective representatives have signed this Agreement in two originals in English language and have hereunto affixed their seals.

Done at Kathmandu the ….. day of ……. in the year one thousand nine hundred ninety.

Arbitration

1. Differences arising under this Agreement may be referred to arbitration for decision. In so doing either Party may submit the difference to arbitration by giving three months prior notice.
2. Arbitration shall be proceeded by a tribunal composed of three arbitrators. One arbitrator is to be appointed by Nepal, one by India and the third arbitrator shall be appointed jointly, who, as a member of the tribunal, shall also preside over such tribunal. In the event that either Party has failed to appoint its arbitrator or they are unable to agree upon the third arbitrator, either Party may request the President of the International Court of Justice to appoint the arbitrator or arbitrators.
3. The procedures of the arbitration shall be determined by the tribunal and the decision of a majority of the arbitrators shall be the decision of the tribunal. The decision of such a tribunal shall be in writing. Both the Parties shall accept the decision as final, definitive and binding.
4. Provision for the administrative support of arbitration tribunal and for remuneration and expenses of its arbitrators shall be as agreed in an exchange of notes between the Parties. Both the Parties may also agree by such exchange, of notes on alternative procedures for settling differences arising under the Agreement including reference of any difference to the International Court of Justice for decision.

Source: Lumsali R, Struggle for Additional Benefits from Mahakali River by Protecting Existing Benefits, 1996 (Nov 10) [2053/7/25], Kathmandu and other knowledgeable persons.

Annex 12

Treaty between His Majesty's Government of Nepal and the Government of India, Concerning the Integrated Development of the Mahakali River Including Sarada Barrage, Tanakpur Barrage and Pancheshwar Project, February 12, 1996

His Majesty's Government of NEPAL and the Government of INDIA (hereinafter referred to as the "Parties"),

Reaffirming the determination to promote and strengthen their relations of friendship and close neighbourliness for the co-operation in the development of water resources:

Recognizing that the Mahakali River is a boundary river on maor stretches between the two countries;

Realizing the desirability to enter into a treaty on the basis of equal partnership to define their obligations and corresponding rights and duties thereto in regard to the waters of the Mahakali River and its utilization;

Noting the Exchange of Letters of 1920 through which both the Parties had entered into an arrangement for the construction of the Sarada Barrage in the Mahakali River, whereby Nepal is to receive some waters from the said Barrage;

Recalling the decision taken in the Joint Commission dated 4-5 December, 1991 and the Joint Communiqué issued during the visit of the Prime Minister of India to Nepal on 21st October, 1992 regarding the Tanakpur Barrage which India has constructed in a course of the Mahakali River with a part of the eastern afflux bund at Jimuwa and the adjoining pondage area of the said Barrage lying in the Nepalese territory;

Noting that both the parties are jointly preparing a Detailed Project Report of the Pancheshwar Multipurpose Project to be implemented in the Mahakali River;

Now, therefore, the Parties hereto hereby have agreed as follows:

Article 1

1. Nepal shall have the right to a supply of 28.35 m^3/s (1000 cusecs) of water from the Sarada Barrage in the wet season (i.e. from 15th May to 15th October) and 4.25m^3/s (150 cusecs) in the dry season (i.e. from 16th October to 14th May)

2. India shall maintain a flow of not less than 10 m3/s (350 cusecs) downstream of the Sarada Barrage in the Mahakali River to maintain and preserve the river eco-system.
3. In case the Sarada Barrage becomes non-functional due to any cause:

    (a) Nepal shall have the right to a supply of water as mentioned in Paragraph I of this Article, by using the head regulator(s) mentioned in Paragraph 2 of Article 2 herein. Such a supply of water shall be in addition to the water to be supplied to Nepal pursuant to Paragraph 2 of Article 2.
    (b) India shall maintain the river flow pursuant to Paragraph 2 of this Article from the tailrace of the Tanakpur Power Station downstream of the Sarada Barrage.

Article 2

In continuation of the decisions taken in the Joint Commission dated 4-5 December, 1991 and the Joint Communiqué issued during the visit of the Prime Minister of India to Nepal on 21st October, 1992, both the Parties agree as follows:

1. For the construction of the eastern afflux bund of the Tanakpur Barrage, at Jimuwa and tying it up to the high ground in the Nepalese territory at EL 250M, Nepal gives its consent to use a piece of land of about 577 metres in length (an area of about 2.9 hectares) of the Nepalese territory at the Jimuwa Village in Mahendranagar Municipal area and a certain portion of the No Man's Land on either side of the border. The Nepalese land consented to be so used and the land lying on the west of the said land (about 9 hectares) upto the Nepal-India border which forms a part of the pondage area, including the natural resources endowment lying within that area, remains under the continued sovereignty and control of Nepal and Nepal is free to exercise all attendant rights thereto.
2. In lieu of the eastern afflux bund of the Tanakpur Barrage at Jimuwa thus constructed, Nepal shall have the right to:

    (a) A supply of 28.35 m3/s (1000 cusecs) of water in the wet season (i.e. from 15th May to 15th October) and 8.50 m3/s (300 cusecs) in the dry season (i.e. from 16th October to 14th May) from the date of the entry into force of this Treaty. For this purpose and for purpose of Article 1 herein India shall construct the head regulator(s) near the left undersluice of the Tanakpur Barrage and also the waterways of the required capacity upto the Nepal-India border. Such head regulator(s) and waterways shall be operated jointly.
    (b) A supply of 70 millions kilowatt-hour (unit) of energy on a continuous basis annually, free of cost, from the date of the entry into force of this Treaty. For this purpose, India shall construct a 132 kV transmission line upto the Nepal-India border from the Tanakpur Power Station (which has, at present,

an installed capacity of 120,000 kilowatt generating 448.4 millions kilowatt-hour of energy annually on 90 percent dependable year flow).

3. Following arrangements shall be made at the Tanakpur Barrage at the time of development of any storage project(s) including Pancheshwar Multipurpose Project upstream of the Tanakpur Barrage:
   (a) Additional head regulator and the necessary waterways, as required, up to the Nepal-India border shall be constructed to supply additional water to Nepal. Such head regulator and waterways shall be operated jointly.
   (b) Nepal shall have additional energy equal to half of the incremental energy generated from the Tanakpur Power Station, on a continuous basis from the date of augmentation of the flow of the Mahakali River and shall bear half of the additional operation cost and, if required, half of the additional capital cost at the Tanakpur Power Station for the generation of such incremental energy.

Article 3

Pancheshwar Multipurpose Project (hereinafter referred to as the 'Project") is to be constructed on a stretch of the Mahakali River where it forms the boundary between the two countries and hence both the Parties agree that they have equal entitlement in the utilization of the waters of the Mahakali River without prejudice to their respective existing consumptive uses of the waters of the Mahakali River. Therefore, both the Parties agree to implement the Project in the Mahaka1i River in accordance with the Detailed Project Report (DPR) being jointly prepared by them. The Project shall be designed and implemented on the basis of the following principles:

1. The Project shall, as would be agreed between the Parties, be designed to produce the maximum total net benefit. All benefits accruing to both the Parties with the development of the Project in the forms of power, irrigation, flood control etc., shall be assessed.
2. The Project shall be implemented or caused to be implemented as an integrated project including power stations of equal capacity on each side of the Mahakali River. The two power stations shall be operated in an integrated manner and the total energy generated shall be shared equally between the Parties.
3. The cost of the Project shall be borne by the Parties in proportion to the benefits accruing to them. Both the Parties shall jointly endeavour to mobilise the finance required for the implementation of the Project.
4. A portion of Nepal's share of energy shall be sold to India. The quantum of such energy and its price shall be mutually agreed upon between the Parties.

Article 4

India shall supply 10 m3/s (350 cusecs) of water for the irrigation of Dodhara-Chandani area of Nepalese Territory. The technical and other details will be mutually worked out.

Article 5

1. Water requirements of Nepal shall be given prime consideration in the utilization of the waters of the Mahakali River.
2. Both the Parties shall be entitled to draw their share of water of the Mahakali River from the Tanakpur Barrage and/or other mutually agreed points as provided for in this Treaty and any subsequent agreement between the Parties.

Article 6

Any project, other than those mentioned herein, to be developed in the Mahakali River where it is a boundary river, shall be designed and implemented by an agreement between the Parties on the principles established by this Treaty.

Article 7

In order to maintain the flow and 1evel of the waters of the Mahakali River, each Party undertakes not to use or obstruct or divert the waters of the Mahakáli River adversely affecting its natural flow and level except by an agreement between the Parties. Provided, however this shall not preclude the use of the waters of the Mahakali River by the local communities living along both sides of the Mahakali River, not exceeding five (5) percent of the average annual flow at Pancheshwar.

Article 8

This Treaty shall not preclude planning, survey, development and operation of any work on the tributaries of the Mahakali River, to be carried out independently by each Party in its own territory without adversely affecting the provision of Article 7 of this Treaty.

Article 9

1. There shall be a Mahakali River Commission (hereinafter referred to as the "Commission"). The Commission shall be guided by the principles of equality, mutual benefit and no harm to either Party.
2. The Commission shall be composed of equal number of representatives from both the Parties.
3. The functions of the Commission shall, inter alia, include the following:
   (a) To seek information on and, if necessary, inspect all structures included in the Treaty and make recommendations to both the Parties to take steps which shall be necessary to implement the provisions of this Treaty.
   (b) To make recommendations to both the Parties for the conservation and utilization of the Mahakali River as envisaged and provided for in this Treaty.
   (c) To provide expert evaluation of projects ad recommendations thereto.
   (d) To co-ordinate and monitor plans of actions arising out of the implementation of this Treaty, and
   (e) To examine any differences arising between the Parties concerning the interpretation and application of this Treaty.
4. The expenses of the Commission shaft be borne equally by both the Parties.
5. As soon as the Commission has been constituted pursuant to Paragraph 1 and 2 of this Article, it shall draft its rules of procedure which shall be submitted to both the Parties for their concurrence.
6. Both the Parties shall reserve their rights to deal directly with each other on matters which may be in the competence of the Commission.

Article 10

Both the Parties may form project specific joint entity lies for the development, execution and operation of new projects including Pancheshwar Multipurpose Project in the Mahakali River for their mutual benefit.

Article 11

1. If the Commission fails under Article 9 of this Treaty to recommend its opinion after examining the differences of the Parties within three (3) months of such reference to the Commission or either Party disagrees with the recommendation of the Commission then a dispute shall be deemed to have been arisen which shall then be submitted to arbitration for decision. In so doing either Party shall give three (3) months prior notice to the other Party.
2. Arbitration shall be conducted by a tribunal composed of three arbitrators. One arbitrator shall be nominated by Nepal, one by India, with neither country to nominate its own national and the third arbitrator shall be appointed jointly, who, as a member of the tribunal, shall preside over such tribunal. In the event that the Parties are unable to agree upon the third arbitrator within ninety (90) days after receipt of a proposal, either Party may request the Secretary-General of the Permanent Court of Arbitration at the Hague to appoint such arbitrator who shall not be a national of either country.
3. The procedures of the arbitration shall be determined by the arbitration tribunal and the decision of a majority of the arbitrators shall be the decision of the tribunal. The proceedings of the tribunal shall be conducted in English and the decision of such a tribunal shall be in writing. Both the Parties shall accept the decision as final, definitive and binding.
4. Provision for the venue of arbitration, the administrative support of the arbitration tribunal and the remuneration and expenses of its arbitrators shall be as agreed in an exchange of notes between the Parties. Both the Parties may also agree by such exchange of notes on alternative procedures for settling differences arising under this Treaty.

Article 12

1. Following the conclusion of this Treaty, the earlier understandings reached between the Parties concerning the utilization of the waters of the Mahakali River from the Sarada Barrage and the Tanakpur Barrage, which have been incorporated herein, shall be deemed to have been replaced by this Treaty.
2. This Treaty shall be subject to ratification and shall enter into force on the date of exchange of instruments of ratification. It shall remain valid for a period of seventy-five (75) years from the date of its entry into force.
3. This Treaty shall be reviewed by both the Parties at ten (10) years interval or earlier as required by either Party and make amendments thereto, if necessary.
4. Agreements, as required, shall be entered into by the Parties to give effect to the provisions of this Treaty.

IN WITNESS WHEREOF the undersigned being duly authorised thereto by their respective governments have hereto signed this Treaty and affixed thereto their seals in two originals each in Hindi, Nepali and English languages, all the texts being equally authentic. In case of doubt, the English text shall prevail.

Done at New Delhi, India, on the twelfth day of February of the year one thousand nine hundred ninety six.

Sd.	Sd.
(SHER BAHADUR DEUBA)	(P. V. NARASHIMHA RAO)
PRIME MINISTER	PRIME MINISTER OF INDIA
HMG OF NEPAL	

Prime Minister
New Delhi: February 12, 1996

Excellency,
I have the honour to acknowledge the receipt of your letter of today's date which read as follows;

"I have the honour to refer the Treaty concluded between us concerning the Integrated Development of the Mahakali River including Sarada Barrage, the Tanakpur Barrage and Pancheshwar Project (Treaty). At this juncture, may I also recall for your Excellency the decisions taken in the Joint Commission dated 4-5 December, 1991 and the Joint Communiqué issued during your visit to Nepal on 21st October, 1992.

In order to give effect to the desires expressed by our respective Governments, I have the honour to make the following proposals on the basis of the provisions of the said understandings and the said Treaty.

1. The all-weather link road connecting the Tanakpur Barrage to the East-West Highway at Mahendranagar in Nepal shall be completed by India within one (1) year from the date of the entry into force of the Treaty.
2. The supply of 20 millions kilowatt-hour (unit) of energy annually, free of cost, to Nepal from the Tanakpur Power Station as indicated in the said Joint Communiqué from the date of commissioning of the Tanakpur Power Station in July 7, 1992 till the start of the supply of 70 millions kilowatt-hour (unit) of energy annually, free of cost, to Nepal as provided for in the Treaty, shall be reconciled with the energy procured or to be procured by Nepal from India under the existing power exchange arrangement.
3. Regarding Pancheshwar Multipurpose Project (Project), the following principles shall be adopted and arrangements made for finalization of the Detailed Project Report (DPR), completion of negotiation and implementation of the Project:

Note: This Treaty was ratified by Two-Thirds Majority of Nepal's Parliament on Aswin 4, 2053 i.e. 20 September 1996.

(a) The DPR shall be finalised by both the countries within six (6) months from the date of the entry into force of the Treaty. For this purpose, necessary data and reports shall be exchanged expeditiously. While assessing the benefits from the Project during the preparation of the DPR, net power benefit shall be assessed on the basis of, inter alia, saving in costs to the beneficiaries as compared with the relevant alternatives available. Irrigation benefit shall be assessed on the basis of incremental and additional benefits due to augmentation of river flow and flood control benefit shall be assessed on the basis of the value of works saved and damages avoided.

(b) It is understood that Paragraph 3 of Article 3 of the Treaty precludes the claim, in any form, by either Party on the unutilised portion of the shares of the waters of the Mahakali River of that Party without affecting the provision of the withdrawal of the respective shares of the waters of the Mahakali River by each Party under this Treaty.

(c) Agreement for the financing and implementation of the Project, including the proposal for the establishment of the Pancheshwor Development Authority shall be negotiated and finalised by both the countries within one (I) year from the finalization of the DPR.

(d) In order to expedite the implementation of the Project, field investigation and detailed design including tender document preparation shall start immediately after the finalization of the DPR and run parallel to the negotiation on agreement for implementation of the Project. For this purpose, a separate financing arrangement for such activities shall be agreed upon by both the countries.

(e) The Project shall be aimed to be completed within eight (8) years from the date of the agreement for its implementation, subject to the provision of the DPR.

I shall be grateful if Your Excellency will kindly confirm that the above correctly sets out the understanding reached between our two Governments. This letter and Your Excellency's reply confirming the understanding will constitute an agreement between our two Governments which also shall come into force on the date of exchange of instruments of ratification between the Parties as set forth in Paragraph 2 of Article 12 of the Treaty."

I have the honour to confirm that the foregoing correctly sets out the understanding reached between our two Governments.

Please accept, Your Excellency, the assurances of my highest consideration:-

H.E. Mr. Sher Bahadur Deuba
Prime Minister of Nepal
Kathmandu

Sd.
(P. V. Narasimha Rao)

Note: An identical letter of the same date from the Prime Minister of Nepal (which is not reproduced here) together with the above letter constitute an agreement (Exchange of Letters) between Nepal and India.

Source: Ministry of Water Resources, Government of Nepal

Annex 13

Coordinating and Institutional Arrangements on Water Resources between Nepal and India

1. **Joint Committee on Water Resources (JCWR):** Established as per the Agreement of 3 August, 2000 during the visit of Prime Minister GP Koirala of Nepal to India, and headed by the secretaries of the ministries of water resources of both the countries, it is the highest administrative level coordinating and supervisory body on water resource relations between Nepal and India. It has the mandate to discuss all important issues pertaining to cooperation in the water resources sector including implementation of existing agreements and understandings, it is required to oversee all technical and expert level committee and groups in this field and is supposed to meet every six months. Its detailed TOR is as follows:

I. The JCWR shall discuss and take decisions on all the important issues pertaining to cooperation in the water resources sector including implementation of existing agreements and understanding;

II. The JCWR shall report to their respective government to get required endorsement of their decisions or to get approval where ever applicable;

III. The JCWR shall oversee the work of all the technical and expert level committees and groups in the field of water resources and thus shall act as an umbrella committee of these committees and groups. The JCWR shall assess the compliance of the provisions of all the agreements and understanding reached between the two countries in water resources, monitor the progress achieved by different committees and groups and shall approve and/ or recommend the necessary actions needed to be undertaken by the respective governments in order to expedite the progress or to meet the agreed objectives;

IV. The JCWR, whenever needed, shall appoint a group of technical personnel or experts to assist this committee on matters related with water resources development; and

V. The JCWR shall carry on the understanding, decisions, and actions that were taken during the earlier meetings of the secretaries of water resources and Sub Commission on Water resources; and

VI. The meeting of the JCWR shall be held at least once in every six months alternatively in Nepal and in India, at places mutually agreed upon. The JCWR shall adopt an agreed agenda for the meeting and discuss each of the agenda items. At the end, minutes of meeting shall be drawn up and signed by the leaders of the delegations. The office of the secretaries of the respective countries will act as the secretariat for the JCWR. The in-charge of the secretariat will be designated by the respective secretaries and will be communicated to each other. The cost of running such a secretariat shall be borne by the respective governments.

2. Standing Committee on Inundation Problems between Nepal and India (SCIP): This committee was formed in 1985 following an understanding reached during the discussion between His Majesty the King and the then Prime Minister of India during the SAARC Summit in Dhaka, Bangladesh with an objectives of dealing with the problems of inundation that have occurred or are likely to occur in future due to activities in the vicinity of Nepal-India border, and to suggest both short term and long term solutions. The Director General of the Department of Irrigation heads the committee from Nepal while the Chairman of Ganga Flood Control Commission heads it from India. Its other members are the professionals from the concerned agencies of both the countries. Also it has the representatives of the foreign ministries of Nepal and India.

2.1. Sub-Committee on Embankment Construction (SCEC): This is the sub-committee of the SCIP constituted to deal with all the aspects of construction of four embankments, Lalbakiaya, Bagmati, Khando and Kamala, including the approval of designs, recommendation of release of fund, supervision and monitoring of construction of these embankments. The team is co-headed by Deputy Director General of Department of Water Induced Prevention Department (DWIP) of Nepal and Member Ganga Flood Control Commission, Government of India. It has the representatives of Water and Energy Commission Secretariat, Department of Irrigation, Department of Hydrology and Metrology and Ministry of Foreign Affairs in the case of Nepal. From India's side, it has the representatives of Ministry of Water Resources, Central Water Commission, Ministry of Water Resources, Government of Bihar and Ministry of External Affairs. From its present mandate, this sub committee seems to be temporary in nature and would have to wind up once the construction of four embankments is completed. Its mandates are: to finalise criteria for the design of the four embankments; to finalise all technical matters of those embankment constructions such as tenders procedures, construction progress, contract approval; to monitor the execution of schemes and provide appropriate guidance to accelerate the work progress; to monitor utilisation of grant assistance including periodic site inspections and to provide guidance to settle disputes/ claims of contractors, if any.

3. High Level Technical Committee on Rasiawal-Khurd-Lotan and Laxmanpur Barrage: Pursuant to the mandate of the India-Nepal Joint Press Statement issued on March 23, 2002 on the occasion of the visit of the Rt. Hon. Prime of Nepal to India, a High Level Nepal-India Technical Committee on Inunudiation Problems in Rupendehi (Nepal)/Siddhartha Nagar (India) and Banke (Nepal)/ Shravasti (India) district has been formed. The committee is co-chaired by Executive Director, Water and Energy Commission Secretariat, Government of Nepal and Commissioner (Eastrern Rivers) Ministry of Water Resoruces, Government of India. The concerned departments (Department of Water Induced Prevention, Survey Department, Department of Irrigation) and related field offices and Ministry of Forign Affairs are represented in the committee from Nepal. Ganga Flood Control Commission, Ministry of External Affairs, Department of Irrigation, Government of Uttar Pradesh and Central Water Commission are represented from India.

4. Coordination Committee for Kosi and Gandak Projects: This is the committee that deals with all the aspects, and mainly the maintenance of the two barrages, Kosi and Gandak. The committee is co-headed by the Director General, Department of Irrigation of Nepal and Engineer in Chief, Bihar Its other members from Nepal are: Deputy Director General (Planning), DOI; Regional Director, ERID; Regional Director WRID; District Irrigation Chief, Sunsari; District Irrigation Chief, Nawalparasi; and Representative, MOWR. From the Indian side: Chief Engineer (Birpur); Chief Engineer (Motihari); Chief Engineer, U.P. Government; Liaison Officer, Water Resource Department, Bihar Government; and Representative of MEA/Embassy of India, Kathmandu.

5. Committee on Karnali: Established in 1970's as per the understanding between the two governments, it is the commission headed by the secretaries of the respective governments to deal with matters related to the studies and other things about this project, Karnali-Chisapani High Dam. The committee is co headed by the secretaries of water resources of both the countries and has the representation of the concerned agencies (Water and Energy Commission, Department of Irrigation, and Nepal Electricity Authority from Nepal and Central Water Commission, Central Electricity Authority, Irrigation Department of Uttar Pradesh and representative of Ministry of External Affairs from India).

6. Karnali Coordination Committee: It is the technical committee of the Commission on Karnali. It is co-headed by the professionals of both the countries and has the representatives of the agencies concerned of Nepal and India.

7. Joint Group of Experts of Nepal and India on Pancheswar Multi-purpose Project: It was established in 1977 for the joint investigation study, with the objective of undertaking the project related studies and preparing the detailed project report for consideration by the two governments. The team is co-headed by Executive Director (ED) of Water and Enegary Commission Sectariate (WECS) of Nepal and Member Centeral Water Commission (CWC) of India. The other members are representatives of (Department of Electricity Development (DOED), Department of Irrigation) (DOI), Ministry of Water Resources (MOWR), Department of Hydrology and Meterology (DOHM) Ministry of Foreigen Affairs (MOF/MOFA) in the case of Nepal and Ministry of Water Resources (MOWR), Ministry of External Affairs (MEA), Central Electricity Authority (CEA) in the case of India.

8. Joint Team of Experts on Sapta Kosi High Dam Multi-purpose Project: The committee is headed by the Executive Director of Wand Energy Commission Secretariat (WECS) from Nepal and the Chairman of Central Water Commission (CWC) from India and its main functions are to jointly carry out the field investigations and prepare the detailed project report. Its other members are the representatives of the concerned agencies of Nepal and India. The team is co-headed by ED WECS of Nepal and Member CWC of India. The other members are representatives of DOED, DOI, MOWR, DHM, MOF/MOFA in the case of Nepal and MOWR/MEA/CEA in the case of India.

9. Committee on Flood Control and Forecasting: This has been formed to deal with the matters pertaining to this matter. The committee is co-headed by the Director General of the (DHM) and Commissioner Eastern Rivers (ER) MOWR, Government of India. Its other members from Nepal are: Deputy Director General (River Training), DOI; Chief, Flood Forecasting, DHM; Senior Telecom Engineer, DHM; Senior Meteorologist, DHM and Representative of MOFA. From the side of India are: Chief Engineer, CWC, Lucknow; Representatives, UP and Bihar Governments, MEA and Embassy of India.

10. Power Exchange Committee: This committee is responsible for dealing with and recommending matters, including the terms of the exchange of the power/energy between the two countries, to the government. The committee is co-headed by the Managing Director (MD) of the Nepal Electricity Authority (NEA) from Nepal and by the Member (Planning) of Central Electricity Authority (CEA) from India. Its other members in the case of Nepal are Deputy, M.D., NEA; Representatives MOWR; EDC and MOFA. Director Corporate Planning; NEA, Member Secretary. From the Indian side are: SE, UPSEB ; Engineer-in-chief, BSEB; Joint Secretary, Ministry of Power; Under Secretary (Nepal) MEA; and Chief Engineer (IRP) CEA - Member Secretary.

Note: In addition to these committees, there also exists a high level committee at the level of Chief Secretary of Government of Nepal and Principal Secretary to the Prime Minister of India. This committee meets as and when required and also reviews the progress made in the water resources sector.

Source: Ministry of Water Resources, Government of Nepal

Annex 14

Nepal-India Cooperation in the Water Resources Sector

Name	District	Year	Area (ha)
1. Tika Bhirab 1	Lalitpur (Kathmandu)	1957-62	400
2. Mahadev Khola	Bhaktapur (Kathmandu)	1957-60	375
3. Bijayapur	Kaski	1957-60	1,200
4. Gokarna	Kathmandu	1958-63	375
5. Phewa	Kaski	1959-64	320
6. Kotkhu	Lalitpur (Kathmandu)	1962-66	360
7. Bosan	Kathmandu	1962-66	260
8. Janjha	Rautahat	1958-63	2,500
9. Dunduwa	Banke	1959-63	1,400
10. Manusmara	Sarlahi	1960-66	2,700
11. Hrdinath	Danusha	1962-67	2,000
12. Chatara	Sunsari-Morang	1964-74	66,000
13. East Gandak	Bara, Parsa and Rautahat	1965-76	34,000
14. Western Gandak	Nawalparasi	1966-76	12,500
15. Wstern Kosi	Saptari	1980-90	25,000
Total			153,690

Note: According to Som Nath Poudel from whose publication the above table is adapted the projects undertaken in the areas of Nepalgunj, Rajbiraj, Biratnagar, Birgunj and Bhirahawa are not included in the list.

Undertaken in Collaboration with US Government:

1. Sirsiya	Bara	1957-61	1,000
2. Dudhaura	Bara	1957-61	500
3. Tilawe	Parsa	1957-62	2,400

Hydro Power Projects

1. Trisuli	Nuwakot	21 MW
2. Devighat	Nuwakot	14.1. MW

Source: Som Nath Poudel, Nepal Ma Sinchai (Irrigation in Nepal) Water Resources Development Institute Anamnagar, Kathmandu, March-April, 2003

Annex 15

Letter of Ministry of Foreign Affairs, His Majesty's Government of Nepal to Embassy of India, Kathmandu on the Stricture of the Nepalese Parliament on the Mahakali Treaty, November 22, 1996

November 22, 1996

NoSA/63-57/4398

The Ministry of Foreign Affairs, His Majesty's Government of Nepal present its compliments to the Embassy of the Republic of India and has the honour to inform the Embassy that the Treaty signed between His Majesty's Government of Nepal and the Government of India on the Integrated Development of the Mahakali River including Sarada Barrage, Tanakpur Barrage and Pancheswor Project was ratified by the Joint Session of the Nepalese Parliament on September 20, 1996 as per the provision of the Constitution of the Kingdom of Nepal.

The Ministry would like to draw the attention of the Embassy to Article 12 para 2 of the Treaty which stipulates that the Treaty shall come into force after the exchange of instruments of ratification. The Ministry would, therefore, like to request the Embassy to make necessary arrangements as early as possible for the exchange of the above instruments.

The Ministry would like to inform that a Parliamentary Monitoring Joint Committee has been formed under the chairmanship of the Rt. Hon. Speaker of the House of Representatives to give guidance to [the] Nepalese side, during the preparation of the detailed project report, with a view to monitor the process reflecting the resolution and commitment as expressed by the parliament in safeguarding the national interest of Nepal. The Terms of Reference of the Committee are as follows:

1. export of energy and its pricing principle;
2. formation of Mahakali River Commission;
3. equal sharing of waters of the Mahakali River after the Pancheswor project; and
4. status of the Mahakali River

In addition to advising about the formation of the Parliamentary Monitoring Joint Committee to look into the above issues, the Ministry would also like to draw the attention of the Embassy to a number of issues on Nepal-India relations and other matters on the Mahakali Treaty and the utilisation of the waters of Mahakali River, such as;

1. determination of the price of energy to be exported to India on the basis of the principle of avoided cost;
2. determination of the source of the Mahakali River;
3. withdrawal of the Indian military personnel from the Nepalese territory;
4. return by India to Nepal of the excess land (36 acres) in Brahmadev Mandi/ Tanakpur between pillar Nos. 3 and 4;
5. review of the 1950 treaty;

6. alternate transit route to Nepal to and through Bangladesh;
7. developing river navigation for Nepal for trade purposes; and
8. monitoring the Nepal - India border.

In the light of the generally positive spirit shown by the Indian side towards the issues mentioned above, the Ministry hopes that the Nepalese concerns would be taken into account in a friendly and positive manner by the Government of India.

The Ministry of Foreign Affairs, His Majesty's Government of Nepal avails itself of this opportunity to renew to the Embassy of the Republic of India in Kathmandu the assurances of its highest consideration.

The Embassy of the Republic of India
Kathmandu

Source: Ministry of Water Resources, Government of Nepal

Annex 16

Letter of Government of Public Works, UP India on Return of Land to Nepal in Connexion with the Sarada Kitcha Project, July 23, 1946

Letter No 733 W/XXIII/1687-1939 dated 23.7.46
from
K.N. Kathpalia, Esquire, ISE,
Deputy Secretary
Government Public Works Department, UP

to
the Secretary
Government of India, External Affairs Department
New Delhi

and copy to the Minister, Nepal

Subject: Exchange of Land with Nepal in connexion with Sarada Kitcha Project

Sir,
I am directed to refer to your letter No. 857-CA /46 dated February 14, 1946 in which this Government was referred to the letter No 922 dated January 24, 1946 from His Majesty's Government Minister, Nepal and asked for further comments of the Provincial Government.

2. I am to say that the area of the land shown at "B" in the sketch map forwarded with this Government's letter No. 1408W/168W-1937, dated November 23, 1944 which the Nepal Government have accepted for transfer to them, is 36.68 acres. This area was offered by Government for transfer to Nepal to rectify the error of 31.47 acres in the computation of land caused during the survey of 1934 and in exchange for 5.21 acres of Nepal land (shown at "A" on the sketch map in which about 80 feet of the existing right Down stream Guide Bund projects at present. The demolition of this Bund along with the low boulder bund in plot "C" would be most undesirable from the point of view of the protection of the Chaure-pani…against attack by the Sarada river.

3. I am therefore to request that if the Government of India have no objection, the Nepal Government may kindly be moved to receive an Engineer representative of this province to explain this Government difficulties to them with a view to persuade them to reconsider their decision regarding the exchange of 5.21 acres of land in plot "A" and 116.32 acres in plot "C" for an equal area of in plot "B" and "D" as proposed in paragraph 6 of this Government's letter No. 1408/ 163W-1939 dated November 25, 1944.

4. I am to add that, if the Nepal Government are not agreeable to this proposal, they may kindly be requested to let this Government have the area in question on a long term lease on term mutually agreed upon.

Sources: Ministry of Foreign Affairs and Ministry of Water Resources, Government of Nepal.

Annex 17

Record of Discussion between the Indian Delegation led by Shri Naresh Chandra, Secretary, Ministry of Water Resources, Government of India and the Nepalese Delegation led by Shri Madhusoodan Dhakal, Secretary, Ministry of Water Resources, His Majesty's Government of Nepal, December 20-22, 1987, Kathmandu.

1.0 Shri Madhusoodan Dhakal, Secretary, Ministry of Water Resources, His Majesty's Government of Nepal (HMG/Nepal) extended cordial welcome to the visiting Indian delegation and hoped that their stay in Kathmandu would be pleasant. He stated that there has been an agreement on the undisputable common interest of both our countries in the proper development of water resources. He stressed that nothing durable can be achieved on issues to be discussed by both sides but in a spirit or real cooperation and understanding. He hoped that this meeting would be held in a spirit of mutual understanding and cooperation. He expressed further hope that the discussion would try to cover the areas of mutual concern as much as possible and at the same time will specially cover those which need to be addressed in their earnest. The number and magnitude of the problems with which we find confronted, might warrant meeting of our group at more frequent intervals.

2.0 Shri Naresh Chandra, Secretary, Ministry of Water Resources, Government of India (GOI) thanked the Secretary of Ministry of Water Resources of His Majesty's Government of Nepal for the warm welcome accorded to and excellent arrangement made for his and his team members in Kathmandu. He hoped that this meeting would lead to a series of meetings at regular intervals where the ways and means to ensure orderly administration of Water Resources to the mutual benefit of both the countries at a faster pace would be devised. As this meeting is taking place after an interval of three years, the issues to be discussed are many and, therefore, we endorse the need of frequent meeting as suggested by Secretary Mr. Dhakal. At the same time, he expressed satisfaction that useful discussions were held not long back in the Karnali Coordinating Committee, the Committee on Karnali, the Inundation Committee and the Chandra Canal Committee. He pointed out the areas of cooperation as the development of multi-purpose projects for power, irrigation and to the extent possible, flood control as a long-term aim and the immediate necessity to establish/expand flood forecasting and flood warning system on both sides of the border in order to minimise the flood damage. He further added that information on small rivers should be exchanged and long term planning in Kosi River basin should be undertaken. In this connection, he suggested that a detailed study on Kosi High Dam be made. For establishment of the flood forecasting and flood warning network, he pointed out the need for a technical discussion to identify the appropriate sites for installation of stations, and to discuss and agree upon standard format for recording and reporting and to ensure an efficient communication service for transmitting data on real time basis. He invited discussions with open mind and in a sprit of give and take. Concluding his opening remarks, Shri Naresh Chandra

invited the Nepalese delegation to New Delhi to continue the dialogue at the earliest possible time.

Delegations of both the countries were then introduced to each other; the list of the members of the respective delegations is attached as annex.

3.0 After some discussion, the following items were agreed as agenda for discussion:-

I. Review of status of Karnali (Chisapani) Multi-purpose Project.
II. Review of status of Pancheshwar Multipurpose Project.
III. Discussion on:
    a) Kosi Pump Canal (Chandra Canal Complex) and related matters.
    b) Gandak Project:
       Don Branch Canal
       Western Gandak Canal
    c) Tanakpur Hydroelectric Project
    d) Setting up of flood forecasting and warning system.
    e) Specific problems due to inundation arising out of construction work on either side.
    f) Exchange of electric power.

IV. Other matters:

    a) Kosi High Dam and other Projects taken up/proposed to be taken up in the Kosi basin.
    b) Projects in Kamla, Bagmati, Babai, Kankai and exchange of data on existing uses and proposed uses.
    c) Flood protection measures in India and Nepal on rivers Kamala, Bagmati, etc. to give reasonable protection from floods in both countries.
    d) Environment protection for the catchment areas and soil conservation measures in the upper catchment areas.

4.0 Karnali (Chisapani) Multi-purpose Project

Referring to the progress in the Karnali Project Shri Madhusoodan Dhakal, Secretary, Ministry of Water Resources, HMG/Nepal stated that the last Karnali Coordinating Committee which as scheduled to meet earlier could meet only in September 24-26, 1987 which was followed by the Committee on Karnali meeting on 7th and 8th October 1987. Explaining the need for finalising the Inception Report prepared and submitted by the Consultant he stated that the formulation of the project would entirely depend upon the economic value of the benefits accrued from the project to both countries and a viable size of the project could only then be determined. Therefore, he pointed out that the lack of agreement on Inception Report and non-availability of data in time had affected the consultant's work adversely. He requested that Government of India should direct the concerned officials to provide all necessary data and information so that this project could advance for the benefit of both the countries.

Shri. M M Kohli Secretary Power Government of India agreed that the Karnali Coordinating Committee should meet more regularly. He suggested that the

meetings of the Coordination Committee which got delayed due to unavoidable circumstances should now be held on 16th to 18th January and from 16th to 18th February 1988. He hoped that the Committee would address all the pending issues with utmost seriousness. He mentioned that consultants already had a lot of data on which they could continue the work and make a report according to their terms of reference. Mr. JC Gupta Member (Hydroelectric), Central Electricity Authority of India informed that he had brought with him some data and comments on Reports of the consultants, and is being made available to His Majesty's Government of Nepal. The proposed dates for meetings were agreed upon by both sides. It was agreed that a team of engineers from Karnali Multipurpose Project and it's consultants will visit New Delhi before the proposed meetings of Karnali Coordinating Committee to discuss technical matters and relevant data.

5.0 Pancheshwar Multipurpose Project

Secretary, Ministry of Water Resources, His Majesty's Government of Nepal stated that His Majesty's Government attaches equal importance to this project and informed that HMG/Nepal had approached the World Bank for an I.D.A. credit to carry out investigation on the Nepalese side of the project area. Stating that the co-related and meaningful results of the investigation is possible only when the relevant necessary data and information from Indian side of the investigation would be made available, he requested to provide the same from India. He expressed the need for an agreement on a certain number of basic principles and modalities in order to achieve progress on the project. He further stated that while the sharing of power in the ratio of 50:50 basis had already been agreed upon, there was a need to agree on the establishment of a bi-national entity as the project entity and on the equal sharing of the resource including the costs and benefits, and the modalities to be followed in this respect.

Responding to the proposal made by Secretary, Water Resources HMG/Nepal, Secretary, Ministry of Water Resources, GOI stated the view that it was too early to talk about bi-national entity as there was no document or report on which to draft the Charter for the proposed bi-national entity. Instead, he proposed to establish a committee on the same lines as the committee on Karnali. Reacting to the need to agree in principle about the equal share of waters, he stated that the sharing of power was not a problem because it was a commercial matter, but application of the same principle for water would not be appropriate or feasible. He emphatically expressed that payment of royalty for use of water in excess of 50% as proposed by HMG/Nepal could not be accepted and mentioned that acceptance of the equal sharing of water formula should not be made a precondition to implement the project. Instead, he said that India might be prepared to bear even the entire cost of reservoir allocable to irrigation component and suggested sharing of water from the project on equitable basis.

On the questions of carrying out separate investigation in the respective areas by respective country, he expressed his doubt on technical grounds. He informed the meeting that concerned Indian agency had completed the investigation on its side of the Mahakali River to the extent possible from the Indian side. Hence he added that

in order that the data generated on both the sides of the river be compatible, there was a need of a coordinating body. He further said that the existing joint group of experts could only look into the technical matters and could not make policy decisions which have to be resolved in inter-Governmental discussions. Hence, a coordinating committee would be the best approach. After some discussion, he agreed that data and information of investigation on the Indian side of the river could be made available to ensure that the final project report was prepared in an integrated and coordinated manner.

Reacting to the proposals made by secretary, Water Resources, Government of India, Secretary, Water Resources, His Majesty's Government of Nepal, stated that owing to the nature of the project, which was to be located on the border river and having a binational Character, it was not possible to create a coordinating committee on the lines of the Karnali Multipurpose Project. He reiterated the view point of Nepal on the equal sharing of the resource. Secretary, Ministry of Water Resources, Government of India agreed to put these matters to his government for consideration.

Shri Dhakal stated that instruction to the local Nepalese authorities have already been given to provide necessary access and approach facilities to the Indian team for carrying out the survey and investigation on the Indian side.

6.0 Kosi Pump Canal

It is agreed that Kosi Pump Canal scheme which has been damaged by the last flood shall be repaired to function properly as agreed with the mission of the Central Water Commission (CWC) of GOI. The services of WAPCOS, India can be utilized to help completion of the project as per the revised schedule worked out by CWC experts. While undertaking the construction supervision of the remaining works and micro-canalization schemes, WAPCOS would also prepare a report of the training of the Khando and other rivers in the Project Area.

7.0 Don Branch Canal and Western Canal (Gandak)

On Nepal's concern of the condition of the Don branch canal and non-availability of water from this canal to Nepal's eastern canal, the Indian side informed that Don canal is temporarily being repaired to provide required quantity of water for rabi crop irrigation and the water has already been let down at the canal head and is expected to be available soon into Nepal.

The Indian side indicated that the Don canal was extensively damaged during the excessive floods of 1986 and 1987 and the efforts are already on to restore the damaged canal so that the Don canal could supply the discharge of 850 cusecs of water to Nepal Eastern Canal during the next Kharif season in a dependable manner.

The Nepalese side re-iterated that to ensure the supply of water from the coming Kharif season, special measures should be undertaken expeditiously.

Both India and Nepal agreed to make proper examination and study of the ecology, morphology of streams crossing Don Canal and other technical aspects of that canal to facilitate a stable supply of water for irrigation to Nepal. For this, it was agreed that Project Manager, Narayani Irrigation Project from Nepal and Superin-

tending Engineer of Betiya, Bihar would survey and study this aspect together and make specific recommendations for further action. This aspect should be dealt on a priority basis. For this purpose, it was agreed that the said officers will meet soon before the end of January 1988 and take steps for survey and investigation.

As regards the long pending issue of the cost of construction of distribution system from 20 cusces to 2 cusecs of Nepal western canal system, the Nepalese side suggested that the estimate prepared by the Department of irrigation, hydrology and Meteorology and discussed with the team from the Central Water Commission of India, be approved by the Government of India as soon as possible to avoid further escalation of the cost involved. It was decided that the matter should be resolved before the next meeting at the Secretary level.

8.0 Tanakpur Barrage

The Nepalese side referred to the minutes of the Secretary level meetings held in April 1983 and September 1984 and the information supplied in 13 Nov. 1987, and pointed out that if the water from the tailrace channel of Tanakpur Project is not brought back into the Banbasa barrage, the pond level at Banbasa may be reduced and affect irrigation releases on the Nepalese side. The Indian side indicated that there were different alternatives to Tanakpur Hydro-electric Project. After detailed discussions and in order to meet the concern expressed by Nepalese side it was agreed that:-

1) The tailrace of Tanakpur hydro-electric project will be directly connected to Mahakali river upstream of Banbasa barrage instead of connecting it with Sarada Canal, which will ensure the agreed supply of water to Nepalese irriation system on the left bank at banbasa.
2) All requisite measures shall be taken by India to prevent submergence of the Nepalese territory due to the construction and operation of Tanakpur barrage.

At this juncture, Mr. M.S. Dhakal, the Secretary, Ministry of Water Resource, His Majesty's Government of Nepal expressed his further concern that the Mahakali river being a common border river both the countries are entitled equally to the resources of that river. His Majesty's Government wants to make it very clear and record that the construction of Tanakpur Barrage would not in any way entitle India for claim of more than fifty percent of the water by way of its prior use. As per the description received the power channel of Tanakpur Project is 566 cumecs whereas the average flow of river is in the order of 685 cumecs.

The Indian side clarified that the formula of fifty-fifty sharing or any other mode of sharing was not a settled matter; and it had also to be kept in mind that the Tanakpur project was based on non-consumptive use of water.

9.0 Flood forecasting

Both India and Nepal agreed to expedite the implementation of facilities to be provided for an efficient flood forecasting systems. as agreed before, Nepal will implement and maintain the system in its territory. However, at the suggestion of India, Nepal agreed to accept the necessary equipment from India to implement

the scheme expeditiously. It was agreed that Nepal will supply data on the real time for flood forecasting (June-October). India will provide similar data on two points downstream of the border of the same river on reciprocal basis. It was also agreed that standard format for information gathering and standard schedule of information exchange should be agreed upon at the technical level. The experts of both countries should have exchange of visits to the sites of each other's countries frequently.

10. Inundation of the territories on either side of the border

Both the governments appreciated the work so far done by the Inundation Committee. However, they felt that there is a need to identify the measurers to be taken to mitigate the problems on both sides. Hence, it was agreed to ask the Inundation Committee to suggest measures to solve specific problems to be put up at the Secretary level meetings.

11. Power Exchange

Requirements for exchange of power between the two countries were discussed. Nepal presented her needs of power at different new locations including additional power requirements at existing points, as per details attached herewith. Indian side also indicated that India may require additional power at existing or new locations.

After discussions, the following decisions were taken to enable further action with regard to power exchange.

1) India will indicate specific locations where additional power is required and its phasing and time, so that a comprehensive picture of power exchange can be formulated at least upto the year 1990.
2) Estimation of the additional investments required for strengthening the existing system or providing new transmission facilities to meet the power requirements projected by Nepal and India will be worked out for each location, along with implementation schedules.
3) The various issues of exchange of power including tariff will be discussed by a group comprising-

   - One representative form the Ministry of Water Resources HMG/Nepal;
   - three officials from Nepal Electricity Authority
   - two officials from Government of India;
   - one official from the UP State Electricity Board;
   - one official from the Bihar State electricity Board;

This group will meet in New Delhi on 12-13 January, 1988. Both sides may co-opt additional members as may be considered necessary.

4) This group will also look into the technical aspects of improving the quality of power supply, wherever it is necessary.

Requirement of Additional Power by Nepal

Location	Supplier	Existing Supply (MW)	FY 1987-88	FY 1988-89	FY 1989-90	Remarks
Biratnagar	BSEB Kataiya)	8	8	12	18	Under Kosi Agreement
Rajbiraj	BSEB (Kataiya)	4	4	5	6	"Plus Kosi West Pump Canal
Jaleshwar - Janakpur	BSEB (Vittamoda)		2.5	4	8	
Bhairahawa	UPSEB (Sunauli)	2	4	5	8	
Nepalgunj	UPSEB (Nanapara)	2	5	6	8	
Gulariya	UPSEB	-	-	0.5	0.5	New Points
Rajapur	UPSEB	-	-	0.5	0.5	New Points
Tikapur	SUSEB	-	-	0.5	0.5	New Points
Darchula	UPSEB	-	-	0.5	0.5	New Points
			23.5	34.0	50.0	

Note: 1. Peak demand in Nepal generally occurs in Winter (December/January) during which the proposed power are required, however during the late summer or monsoon period Nepal could supply equivalent quantum (upto 50 MW) of power to the Indian side.
2. The above mentioned locations, Biratnagar, Janakpur and Bhairahwa will be considered as immediate priority.

12. Kosi

Referring to high level discussions on environmental issues Shri Naresh Chandra, Secretary, Ministry of Water Resources, Government of India stated that this matter could be discussed in an appropriate body. Still some environmental issues concerning the water resources sector would be discussed here separately. He specifically mentioned the problems of silt in Kosi River. While appreciating the importance of catchment management for control of silt, he suggested that the problem could not be solved without considering appropriate storage. He emphasized the need to continue with the study of the Kosi High dam project, even though implementation of the project may not be in the immediate offing . In this context, he requested HMG/Nepal to give serious consideration to the project report given to HMG/Nepal in 1981.

Responding to the proposal made above, secretary, Ministry of Water Resources, HMG/ Nepal stated that as the government was already carrying out the study of one mega project Karnali Multipurpose Project- and intends to carry out investigation of another mega project-Pancheswor Multipurpose Project, it would be quite impossible to handle at present another mega project with such a big dimension due to the resource and other constraints. Moreover, the high dam construction is not the ultimate solution to the issues to be resolved. However, he expressed the opinion

that watershed management in the basin should get due priority to control the silt in the river and deterioration of the catchment area.

Appreciating the constraints, Secretary, Ministry of Water Resources, Government of India reiterated the earlier view that the above situation should not stop the study of the high dam Project on Kosi which would in any case take quite some time for finalization. At least, some reactions at the technical level could be offered on the Indian proposal in this respect.

13. Small Rivers.

Indian side informed that irrigation is being practiced in UP and Bihar in India for a long time using the waters of these small rivers flowing from Nepal to India and while planning further development on these rivers, existing uses should also be taken into consideration. The Nepalese side informed that in Nepal also farmers are using water of these river for irrigation since a long time. The Indian side suggested that exchange of such information and data on the existing uses and proposed uses will help to plan further development without having adverse effects on either side. Indian side also suggested consideration of the possibility of construction of storage projects on small rivers such as West Rapti, Babai, Kamala and Bagmati for the augmentation of flow of water for irrigation and also for mitigation of flood to the extent possible for mutual benefit. The Nepalese side stated that if a specific request from India is received concerning multipurpose projects on specific rivers, it will be examined to take into account the interest of India to the extent possible.

14. It was decided that the next Secretary level meeting between the two governments shall be held during March, 1988 in New Delhi, India.

The discussions were held in an atmosphere of utmost cordiality and friendship.

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(Madhusoodan Dhakal)	(Naresh Chandra
Secretary	Secretary
Ministry of Water Resources	Ministry of Water Resources
His Majesty's Government of Nepal	His Majesty's Government of India

Kathmandu
22nd December 1987

Source: Personal Collection of the Editors and Contributors.

Annex 17.1

Summary Record of Discussions of the Second Meeting of the Indo-Nepal Sub-Commission on Water Resources, April 15-18, 1991, New Delhi

Agenda Item No 1 (a) Pancheshwar Multipurpose Project
Shri S. Rajgopal, Secretary, Deptt. of Power, GOI referred to the last meeting of the Joint Group of Experts on Pancheshwar held at New Delhi and suggested that the Sub-commission may ratify the decisions and the action plan as was agreed to.

Mr. B.K. Pradhan stated that Nepal was very keen to develop Pancheshwar Multipurpose Project hence they would like to have the response from India on the proposed draft treaty for the Pancheshwar Development Authority very early. He also suggested that both Nepal and India should approach the international funding agencies or friendly countries for financing the project, for which the preparation of a bankable feasibility report would be the prime requirement. Hence, an agreement should be reached for engaging a consulting firm of International repute. Procurement of finance for such a feasibility study seemed possible from the World Bank, if both Nepal and India jointly made the request.

Mr. Pradhan added that the job of synthesis of available data, maps, survey results including identification of additional field works required, could also be entrusted to the international consultants engaged for the feasibility study. While engaging the consultants, although full responsibility of preparation of a bankable feasibility report would have to be given to the consultants, the objectives of maximization of use of Nepalese and Indian professionals needed to be kept in mind. By doing this, the cost on consultants could be minimised. The engagement of international consultants would make the procurement of finance from the international funding agencies for implementation of the project easier.

Dr. M.A. Chitale suggested that we should have a mechanism to make the work proceed expeditiously. We should first finalise the feasibility report and then approach the external agencies, if at all necessary. Pancheshwar is not a project of an unusual size and of technical complexities. Hence it should be within the capacity of the two countries together to finalise the project's features without going in for external consultants. The project could also be a good candidate for investment from Indian side and it might not be necessary to depend upon external sources of funding. If Nepal was agreeable, this could be put up to the Government for consideration on these lines. As far as organisational, financial and technical issues are concerned, these are within our ambit. Secretary (Power), GOI mentioned that views of Indian Government on Pancheshwar Development Authority could be made available within six months so as to arrive at a decision regarding its formation by this year end.

After discussion, it was agreed that all actions as already decided in the last meeting of the Joint Group of Experts should be pursued vigorously.

Agenda Item No. 1 (b) Karnali (Chisapani) Multipurpose Project:

Mr. B.K. Pradhan stated that the study had clearly demonstrated that within a very wide range of FSL 370 m and 430 m the project was feasible and attractive. It had also been established that the project was going to generate substantial benefits for both the countries. Therefore, it was essential that as the first step, the feasibility study should be accepted in principle. The Nepalese side appreciated the technical concerns raised by the Indian side which should be studied as agreed in the last Committee on Karnali meeting. The results of these studies could be annexed to the feasibility report. This annexure together with the feasibility study would serve as the basis for the detailed engineering.

Shri S. Rajgopal, Secretary (Power), GOI referred to the decision of 8th Karnali Coordination Committee meeting regarding additional investigations and studies to firm up the feasibility study of Karnali multipurpose project which was also endorsed by the committee on Karnali in its 8th meeting. Therefore, as agreed to earlier, the acceptance of the feasibility study would be considered in the next meeting of Committee on Karnali after the additional studies are completed by September, 1991. Shri S. Rajgopal, Secretary, Power, further referred to his earlier suggestions that for the execution of the project of the magnitude of Karnali, it was essential that a proper understanding on the nature of management, infrastructure development, execution, operation and maintenance and the financing pattern is reached early. Development of infrastructure could be started in parallel to the various studies being taken up so as not to lose further time.

Mr. B.K. Pradhan stated that the commencement of infrastructural development suggested by the Indian side should be looked into in appropriate depth only after a final view on proceeding further with the project was taken. As soon as the decision was taken on proceeding further with the project, an agreement in principle between both the sides on management and financing of the project alongwith evaluation and sharing of benefits would have to be considered. Thereafter the necessary arrangements for detailed engineering and commencement of infrastructural development would be possible. Towards this end, the proposal(s) to be developed by the Indian side as agreed in the 8th Committee on Karnali meeting on management, infrastructural development, execution, operation and maintenance as well as financing of the project might serve as one of the options for further discussions. Arrangement of funds from international funding agencies was also one of the vital tasks for realization of the project.

It was agreed that views on these matters could be taken up by the Committee on Karnali and subsequently be considered further in the sub-commission meeting.

Agenda Item No. 1 (c) Sapt Kosi Multipurpose Project:

Secretary, HMG Nepal stated that the Sapt Kosi Multipurpose Project was completely a new project and located in the eastern region of Nepal close to Bangladesh and, therefore, the multiple benefits accruable from the regulation of flow extend also to Bangladesh. A number of other water related benefits including the benefit of watershed management for all the three countries could also be derived. An excellent opportunity for mobilization of financial resources from international funding agencies and the friendly countries would also be opened resulting into the quicker development of water resources of this region. Hence, whatever arrangements for planning, survey/investigations and development of this project were made, involvement of Bangladesh would be beneficial to all the participating countries.

Mr. Pradhan added that the Kosi river being, located nearest to the sea, Nepal had a high expectation to open inland navigation linking sea port via Kosi river of through a combination of canals and rivers.

Secretary (WR), GOI said that we have created a joint asset - Kosi Barrage Project. It has outlived it's life and Kosi Multipurpose Project can only protect this asset. Secondly, Kosi has large irrigation potential both in India and Nepal,

which will boost the economy of the region. He further stated that in a river like that of Kosi having pronounced meandering tendency, navigation is very difficult and prohibitively costly. In any case navigational aspect can always be looked into separately and need not be linked up with the high dam project a report for which is already given to Nepal in 1981. The utility of the project for flood control will be mainly confined within Nepal and India and will not extend to Bangladesh. It is therefore not necessary to involve Bangladesh on the consideration of the Kosi Project. What is necessary is to complete detailed field investigations and finalise a joint project report.

No definite line of action could emerge from the discussions. Hence it was agreed to take up further consideration of this item in the next meeting.

Agenda Item No. 2200-600 MW Hydro-electric Project:

It was noted that a team of Indian experts had visited the Burhi Gandaki and Kali Gandaki sites. The additional volumes of the Burhi Gandaki Project report were made available by Secretary HMGN during the meeting. It was agreed that India would look into the work already completed and forward a concrete proposal for additional field investigations, if necessary, and for preparation of a detailed feasibility report for Burhi Gandaki Project to Nepal by the end of June, 1991. India also offered to complete the investigations that may be necessary and finalise the draft project report for further consideration of the two Governments as regards investment planning and implementation mechanism.

Agenda item No. 3 Tanakpur Barrage Hydroelectric Project and related matters.

On this item of agenda an in-depth discussion took place and the views of both the sides were carefully examined. However, since no concrete decisions could be arrived at, both the sides agreed to refer the matter to the Joint Commission for finalization.

Agenda Item No. 4 Works under Gandak Project:

The Indian side informed that water for irrigation from Don Canal will become available in the first week of June, 1991.

The Nepalese side while appreciating the present effort done by India expressed their concern that even the present repair works might not guarantee the stable water supply. To ensure stable supply of 850 cusecs of water to Nepal as per Gandak Agreement, necessary additional works as has been estabilished by high level officials during joint inspection in the past should be taken up without delay. It was clarified by the Indian side that works are in progress. It was agreed that Nodal Officers (General Manger, Narayani from Nepal and Chief Engineer, Motihari from India) should meet after canal starts functioning in June 1991 to review the status of the work and suggest additional measures if any required for running the canal in a fool proof manner.

To ensure reliable water supply to Nepal under the existing agreements on Kosi, Gandak and Mahakali Projects and to mitigate the negative impact which might be caused in these projects, Mr. Pradhan said that there was a need for frequent, imme-

diate and day-to-day communication between the two sides. As such, he suggested to nominate contact persons on each side on project to project basis.

Agenda Item No. 5 Works under Kosi Project:

Mr. Pradhan stressed that implementation of the following decisions of the 17th meeting of the Kosi Coordination Committee should be expedited.

a) Flood control and river training measures for the safety of Hanumannager, Jogania and nearby areas.
b) Training of Khando river and construction of drainage system to solve the problems of inundation on the western side of western Kosi embankment up to Kunauli Border the Tilathi village area so as to complete it before the monsoon under the short term measures.

The Indian side assured to complete the short term measures for the protection works of Hanuman Nagar, Jogania and drainage congestion removal as agreed to in the last Kosi Coordination Committee Meeting, but emphasised the need for permanent solution with construction of a high dam over river Kosi.

The Nepalese side draw the attention of the Indian side to the decisions taken in 17th Kosi Coordination Committee meeting for identifying short and long term measures for mitigating submergence of lands in Tilathi and other nearby villages near Kunauli by Khando and wanted the protection works to be done urgently. The estimate prepared by the Nepalese side for short term measures based on the joint inspection in the past was also handed over to the Indian side. Mr. Dubey, Secretary (Water Resources), Bihar clarified that as per his information the survey and investigation works were under progress and were expected to be completed by 30th April, 1991. He assured that short term measures will be completed by 31st May, 1991.

It was agreed that the Nodal Officers (Director, Eastern Region from Nepal and Chief Engineer, Birpur from India) should work together closely to review the site conditions from time to time and suggest remedial measures well in time.

Agenda Item No. 6 Inundation Problems along the Border:

Mr. Pradhan stated the fact that embankment constructed in the vicinity of the Kunauli, Tilathi and other villages was creating large scale damages in the Nepalese territory. He further stated that instead of implementing the decision of the Kosi Coordination Committee, the strengthening work of the embankment constructed on the Indian side was being done by increasing the height and width of the same. Only after implementation of the long term measures any such additional work should be done in the embankment. Hence he requested that the strengthening works on Kunauli embankment should be stopped immediately.

Regarding closure of gap across the border to continue the embankment on either side, he informed that it has been approved by HMGN in case of the Bagmati, Lalbakaiya and Banganga rivers. He stated that the Inundation Committee should take up necessary measures for the implementation of the same at the earliest.

He further stated that the embankment constructed on the left bank of the Jamuni river, repair works and strengthening of the embankment were still continuing contrary to the earlier decision. The Indian side informed that only routine maintenance like repair of rain cuts etc. was being undertaken and the existing embankment on the left bank of the river Jamuni is not being strengthened or raised. It was agreed that the position at site would be jointly verified immediately and if any strengthening work is proceeding, it will be stopped.

The Sub-Commission took note of the decisions taken during the Standing Committee on Inundation Problems and Kosi Coordination Committee meetings and emphasised their expeditious implementation. It was also noted that the standing committee is scheduled to meet at Kathmandu in May, 1991. It was decided that the various proposals on identified issues should be finalised by the Contact Officers as agreed to in the Standing Committee for further consideration by the Committee in their next meeting.

Agenda Item No. 7 Exchange of Power

Mr. Pradhan referred to the past actions on the exchange of power between the two countries and stated that at the various meetings between the officials of Nepal Electricity Authority and Bihar State Electricity Board an understanding was reached to upgrade/reinforce the existing interconnections to facilitate the effective utilization of present level of 50 MW of power exchange. To this effect Nepal Electricity Authority had reached an understanding with Bihar State Electricity Board in December 1987 and November 1990 to construct a 132 kV Transmission Line from Duhabi (Biratnagar) in Nepal to Kataiya in India to interconnect the two power systems. For early implementation of this interconnection, he requested the Indian side to issue necessary instructions to Bihar State Electricity Board.

Regarding enhancement of quantum of power exchange to 200 MW, Mr. Pradhan Stated that as requested by India in the 1st Sub-Commission Meeting, relevant information had already been made available to them but no further discussion could take place after the Nepalese side's last communication in July, 1990. He requested the Indian side for an expeditious reply.

Mr. Pradhan proposed that additional high voltage interconnections at 132kV and /or 220kV with both Bihar and UP State Electricity Boards be established. For this purpose, he also proposed to establish a management framework for the development of such interconnection facilities to carry out effectively these functions and suggested to create:

a) parallel Policy Committees for Power Exchange with responsibilities of (i) preparing proposals for establishment of additional interconnection facilities, (ii) preparing proposals for establishing transactions, (iii) preparing draft power exchange agreement as required and (iv) monitoring progress and problems on power exchange.

(b) parallel System interconnection Units at utility-to-utility level with responsibilities of (i) design and construction and (ii) operations under the guidance of the Policy Committees.

Mr. Rajgopal, Secretary (Power), GOI stated that India had already expressed its willingness to absorb about 200 MW of power from Nepal subject to agreement on operational aspects and availability of power at an economic tariff. It was also stated that the Indian side would require details of project cost, interest rates, O&M charges etc. to examine the matter further.

On Duhabi-Kataiya 132kV line interconnection to facilitate present level of power exchange of 50 MW, the Indian side agreed to communicate their decision shortly.

After detailed discussions, both the sides agreed to set up a Power Exchange Committee between the two countries at the earliest. The terms of reference of the Committee would be decided through the exchange of letters.

Agenda Item no 8: Embankment on Kamla, Bagmati, Lalbakaiya and Khando Rivers:

The Nepalese side made available the detailed report of their schemes for extension of embankments for Lalbakaiya and Bagmati and indicated that for Kamla they would furnish the same in about four months time. It was agreed that joint teams for these schemes could respectively meet in April and July to finanlise the proposals and draw out an action plan so as to start the execution work by October, 1991.

Agenda Item No. 9 Small Rivers (Kankai, Kamla, Bagmati, West Rapti and Babai:

The Indian side requested for salient features and outline details on Kamla, Bagmati and other projects to carry out studies, surveys and investigations for maximizing the mutual benefits while protecting the existing and committed uses. The Nepalese side stated that the projects are planned as to meet the requirements of Nepal first on priority and surpluses, if any, would be made available for use in India. After discussions, it was agreed to defer the further consideration of this item to the subsequent meeting.

Agenda Item No. 10 Inland Navigation:

Mr. Pradhan explained that at present, Nepal's third country trade is being conducted through the sea port of Calcutta which was linked by road and railway routes from India. For a land-locked country like Nepal, the various possibilities of transboundary river navigation should be explored to facilitate its third country trade. Hence, Nepal was working out a proposal in this regard and some relevant data would be required from the Indian side to develop such a proposal. The Nepalese side expected the cooperation of the Indian side in providing necessary data.

The Indian side agreed to consider the supply of data required by Nepal for any technical study on inland navigation on receipt of a formal proposal. It was mentioned that the Sub-commission was not an appropriate forum to discuss the issue related to the right of access to sea.

Agenda Item No. 11 Flood Forecasting and Warning System:

It was noted that four observation stations and two base stations would be commissioned by middle of May 1991 and other nine stations by the end of monsoon. It was

agreed that the work on other remaining sites and base stations would be expedited so that these get commissioned by next year's monsoon.

Agenda item No. 12 Soil Conservation and Watershed Management:

It was agreed that the views of the Indian side on the response received from Nepal regarding the proposal for constituting a Joint Team for preparation of detailed Watershed Management Plan in the form of a scheme outlining the various priorities would be sent at the earliest.

Agenda Item No. 13 Transfer of Technology:

The areas identified for transfer of technology to Nepal by way of training, site visits, study tours, etc. include the fields of seismic and geotechnical and hydraulic engineering, transmission, distribution, operation and maintenance of hydropower stations, irrigation and flood control works. The Indian side agreed to act on this on receipt of a formal proposal from Nepal. The Indian side noted the request for the satellite imageries required by Nepal for further appropriate action.

The discussions were carried out in a cordial atmosphere with a spirit of mutual cooperation and trust.

Sd.	Sd.
Dr. M.A. Chitale	Mr. B.K. Pradhan
Secretary	Secretary
Ministry of Water Resources	Ministry of Water Resources
Government of India.	His Majesty's Government of Nepal

New Delhi
18th April, 1991

Source: Personal collections of the Editors and Contributors.

Annex 17.2

Action Plan to Expedite the Various Activities Agreed between His Majesty's Government of Nepal and Government of India During the Visits of Rt. Hon'ble Prime Ministers of Nepal and India, December 28, 1993

The Minister for Parliamentary Affairs and Water Resources, Government of India (GOT), Hon'ble Vidyacharan Shukia paid a good will visit to Nepal at the invitation of the Minister for Tourism and Civil Aviation, His Majesty's Government of Nepal (HMG/N), Hon'ble Ram Hari Joshi from 26th to 28th December, 1993.

A Meeting was held between the Nepalese delegation led by Minister of State for Water Resources, Hon'ble Laxman Prasad Ghimire and the Indian Delegation led by

Minister for Parliamentary Affairs and Water Resources, Hon'ble Vidyacharan Shukia in Kathmandu.

During the talks, the two sides reviewed actions taken to follow up implementation of decisions on cooperation in water resources development reached during the visits of Rt. Hon'ble Prime Ministers of Nepal to India in December, 1991 and subsequent visit of Rt. Hon'ble Prime Minister of India to Nepal in October, 1992.

Following the talks between the Hon'ble Minister of State for Water Resources, HMG/N and Hon'ble Minister for Parliamentary Affairs and Water Resources, GOI, the official level discussion was held between the delegates of the two countries led by respective Secretaries of Water Resources of HMG/N and GOI. The names of the members of the Nepalese and Indian delegations are attached hereto as Annex-I. The Action Plan, to expedite the various activities agreed between HMG/N and GOI in December, 1991 during the visit of Rt. Hon'ble Prime Minister of Nepal to India and the subsequent visit of Rt. Hon'ble Prime Minister of India to Nepal in October, 1992, is attached hereto as Annex-II.

While the Action Plan aims at preparing the detailed project report on various projects as mentioned in Annex-Il, following considerations would be given:

i. Water requirements of Nepal shall be given prime consideration.
ii. While preparing the detailed project report of the projects as mentioned in Annex-II, benefits such as irrigation, flood control, power and navigation, where possible, shall be assessed.

It is further agreed that:

Joint endeavour shall be made to mobilise the required finance from bilateral and multilateral funding agencies for the agreed projects with agreed detailed project report. Monitoring of the activities shall be made by the respective Secretaries, Ministries of Water Resources, quarterly and shall be reviewed bi-annually by the respective Ministers of both the Governments.

Separate agreements shall be required between the two Governments if the two Governments agree to execute the projects.

Sd	Sd
S.N. Upadhyay	M.S. Reddy
Secretary	Secretary
His Majesty's Government of Nepal	Government of India

December 28, 1993
Kathmandu, Nepal

Action Plan

Project	Action	Target Date
1. Pancheswar	GOI to furnish comments on PDA draft by HMGN	June 1994
	Joint first draft of DPR for consideration in JGE	June 1994
	Completion of Joint DPR	September 1994
	Formulation of alternative mode for execution of project through private sector	September 1994
2. Burhi Gandaki	Meeting of JTE in New Delhi to finalise action program and modalities for investigation and preparation of DPR (FS)	February 1994
	Establishment of the joint project office	April 1994
3. Sapta Kosi	Finalization of the Inception Report by both the sides	April 1994
	Meeting of JCE in New Delhi to finalise modalities and details of investigation	May 1994
	Establishment of the Joint Project office	June 1994
4. Karnali	Meeting of KCC in Kathmandu to resolve differences and finalise project parameters for submission to CK	May 1994
	Meeting of CK in New Delhi.	October 1994
5. Tanakpur	GOI to finalise alignment of canal on plan	January 1994
	Canal work to start	March 1994
	Canal works to be completed	June 1994
	GOI to complete alignment survey for link-road with the Department of Roads, HMGN	January 1994
	Joint topographic mapping of Tanakpur-Banbasa area	June 1994
	Relocation/Reconstruction of damaged boundary pillars by Joint Technical Committee	March 1994
	HMGN to provide their comments on GOI proposal for free supply of 20 million units of electricity annually from Tanakpur through existing transmission links in U.P.	January 1994
6. Flood Protection Embankment	GOI to provide comments on the detailed proposal of execution procedures provided by HMGN for construction of right embankment along Lalbakaiya	January 1994
	Finalization of alignment of embankment, start of procedures for land acquisition and works to begin on embankment	March 1994
	Completion of Lalbakaiya embankment	July 1995
7. Flood Forecasting and Warning System	Indian team to visit Nepal to resolve logistic problems for commissioning of sites	January 1994
	Commissioning of 22 sites	June 1994
	Commissioning of remaining 23 sites	June 1995
8. Power Exchange	Meeting of PEC in Kathmandu to finalise western Nepal - U.P. transmission link including the cost estimates and modalities for construction	February 1994
9. Kamala and Bagmati	Discussion on the studies provided by HMGN	September 1994

Source: Personal collection of the Editors and Contributors.

Annex 17.3

Action Plan Agreed between Dr. MS Reddy, Secretary Ministry of Water Resources Government of India and Dr. Dwarika N. Dhungel, Secretary, Ministry of Water Resources, His Majesty's Government of Nepal, New Delhi, February 14, 1996

Proposed Action Plan

Project	Action	Target Date
1. Pancheshwar	Joint first draft of DRP for consideration in JGE	June 1996
	Completion of Joint DPR	December 1996
	Agreement for the financing and implementation of the project including decision on PDA	December 1997
2. Burhi Gandaki	Finalization of TOR and cost estimate of DPR in JTE	March 1996
	Agreement on preparation of DPR	July 1996
	Establishment of the joint project office	October 1996
3. Sapta Kosi	Finalization of the Inception Report by both the sides	April 1996
	Meeting of JCE in New Delhi to finalise modalities and details of investigation	May 1996
	Agreement on preparation of DPR	July 1996
	Establishment of the joint project office	October 1996
4. Karnali	Meeting of KCC in Kathmandu to finalise detailed feasibility report for submission to CK	May 1996
	Meeting of CK in New Delhi	September 1996
5. Power Exchange	Meeting of PEC in New Delhi to finalise Western Nepal-UP transmission link including the cost estimates and modalities for construction and to finalise an increase of quantum of power exchange to 150 MW	February 1996
6 Power Trade	GOI to give comments on HMG's proposal on Agree ment for power trade between the two countries.	February 1996
	Signing of Agreement	February 1996
7. Flood Protection Embankments in Lalbakeya, Bagmati, Kamala and Khando rivers	Agreement on the execution modalities for the con struction of embankments in the four Rivers	February 1996
	Review and updating of the design and cost estimates of the four embankments	April 1996
	Finalization of alignments, land acquisition and commencement of works on embankments - Lalbakeya embankment	May 1996
	- Bagmati embankment	October 1996
	- Kamala embankment	January 1997
	- Khando embankment	January 1997
	Completion of construction - Lalbakeya embankment	May 1997

- Bagmati embankment	June 1998
- Kamala embankment	June 1999
- Khando embankment	June 1999

Source: Personal Collection of Dwarika N. Dhungel

Annex 17.4

Minutes of Meeting between Indian and Nepalese Delegations Headed by Water Resources Secretaries of both Countries on Indo-Nepal Joint Water Resources Development Projects November 20, 1996, New Delhi

CONTEXT

The Minister for Water Resources, His Majesty's Government of Nepal (HMG/N) Hon'ble Pashupati Shumshere J.B. Rana paid an official visit to India at the invitation of the Minister for Water Resources, Govt. of India (GOl) Hon'ble Janeshwar Mishra from 18th to 20th Nov., 1996.

A meeting was held between the Nepalese delegation led by Minister for Water Resources Hon'ble Pas[h]upati Shumshere J.B. Rana and the Indian delegation led by Minister for Water Resources Hon'ble Janeshwar Misra.

During the talks the two sides agreed to implement the provisions of the Mahakali Treaty in a realistic timeframe and reviewed the follow up actions of earlier decisions/ agreements reached between the two countries in the field of water resources.

Before the ministerial level discussions on Nov.19, the official level meeting led by the respective Secretaries of the two countries was held. The discussions held at the official level meeting were reviewed at the delegation level meeting held between the Ministers.

Discussions and Understandings

Discussion Notes and Understanding reached at the Secretary Level Meeting were as follows:

At the beginning of the Secretary Level Meeting, Secretary (WR), Government of India extended a warm welcome to the Nepalese delegation and stated that the Indo-Nepal Treaty on Mahakali river signed by the two Prime Ministers in February, 1996 and recently ratified by the Nepalese Parliament is a great step forward in Indo-Nepal Co-operation. He further stated that the DPR for Pancheshwar Project should be finalised expeditiously.

Secretary (WR), HMGN thanked the Secretary for the excellent arrangements made for their stay. He emphasised the need to expedite follow up action on the various Articles of the Treaty. He further indicated that a Monitoring Committee of the

Members of both Houses of Parliament constituted at the time of ratification of the Treaty by the Par1iament is reviewing and monitoring the progress in this regard.

1. DPR on Pancheshwar Project

It was decided that by the end of December, the comments would be made available by India on the Nepalese draft report with informal discussions as necessary. An official level meeting of the JGE could then be held for further discussions for finalisation of the DPR in the last week of January 1997 (Tentatively).

2. Constitution of Mahakali River Commission

It was decided that the Mahakali River Commission should be set up soon. The composition of the Commission suggested by Nepal envisaged eight to twelve members comprisingCo-Chairman from each side of the rank of Secretary (preferably a retired official) , Member (Water Resources Planning) , Member (Hydro) , Member (Irrigation and Agriculture), Member (International Law on Water) and Member (Economics) from each side with a five year term. Except one Member who would be a Government official; other Members could be from Non Governmental sector. In principle India has agreed to form Mahakali River Commission and took note of the Nepalese proposal. It was also agreed that both the sides would exchange draft proposals in this regard for further consideration.

3. Sapta Kosi High Dam Project along with Sunkosi Diversion Scheme.

The Sapta Kosi High Dam and Sunkosi Diversion Scheme are important projects to be considered seriously as these projects provide large benefits. Therefore, it was agreed that these projects could be discussed during the next JTE meeting which is scheduled during the first week of January, 1997.

4. Burhi Gandaki Project

Nepal's request to withdraw this project from the list of joint projects was accepted by the Indian side so that it could be opened for private sector investment.

5. Kamala and Bagmati Project

The Indian side stressed the need to take up Kamla and Bagmati dam projects since the existing irrigation in India has been seriously affected due to the construction of diversion structures for irrigation in Nepal. There was a need to augment the flows by constructing these two projects.

The Nepalese side informed that the latest studies of Kamala and Bagmati High Dam projects have revealed that these projects at this stage of development are not feasible and have serious environmental problems. Nevertheless, it was agreed to exchange all available data from both sides and discussions could proceed at the official level.

6. Arrangements for receiving the water from the Sarada Barrage till the completion of the Construction of the Head Regulator and Canal System at Tanakpur Barrage

The Nepalese side raised the issue of construction of the Head Regulator at the Tanakpur barrage for a discharge of 2000 cusecs. The Indian side pointed out that the

design for 2000 cusecs was necessary only if the Sarda barrage became non functional for any reason. Such a situation is likely to arise since the barrage envisages diversion of about 10,000 cusecs for irrigation in U.P. and as such the maintenance of this barrage is a top priority for India. The Nepalese side also desired that the sill level of the head regulator should be lowered and widened even though some works have already been carried out as the Treaty provides for drawing 2000 cusecs. The Indian side opined at this stage that it would be preferable to design the head regulator for 1000 cusecs only as per Article 2 of the Treaty.

The Nepalese side also requested its share of water from Tanakpur as per Article 2 of the Treaty to be drawn from the Sarda Barrage, till such time as the Head Regulator at the Tanakpur barrage and the linking canal upto the Nepal border as well as the canal system on the Nepalese side were completed. The Indian side said that they would consider this request positively. Commissioner (ER) from the Ministry of Water Resources was nominated a Contact Officer from Indian side and Joint Secretary, Ministry of Water Resources, HMG/N was nominated as the Contact Officer from Nepal side for examining this aspect for further consideration.

7. Construction of Head Regulator for the irrigation in Dodhara-Chandani area

After extensive discussions, it was decided that the Contact Officers, as nominated above, would also look into this matter and submit a report for further consideration.

8. Matters relating to the flood of Dodhara-Chandani area as a result of the release of water through the Negala escape

Problem caused to the Dodhara-Chandani area due to release of water through the Negala escape of Sarda canal was raised by HMGN and they wanted an immediate solution. The Indian side pointed out that the officers from both sides have inspected the problem area and identified the reasons for such flooding. In view of shifting of the river to the right bank and erosion of silt deposited there, some farms and houses have been affected.

To prevent such situations from recurring, it was decided that the Contact Officers from both sides would meet to plan the protection works required to provide a permanent solution for the problem. It was agreed that, from the Indian side Superintending Engineer, Irrigation Department, Gorakhpur, U.P. and from the Nepalese side the Project Manager of the Mahakali Irrigation Project, Mahendranagar, Kanchanpur would act as the Contact Officers.

In the above context, the Indian side also pointed out that there were many inundation problems caused in the border river areas. It was therefore agreed that the Inundation Committee which had not met for quite sometime would meet at the earliest possible juncture. Before the Inundation Committee meets, the Local Level Committees in the border areas would meet and submit a detailed report for consideration by the Inundation Committee.

9. Implementation of Lalbakaya embankment

The Nepalese side wanted to know the latest position with regard to the implementation of Kamla, Lalbakaya, Bagmati and Khando Projects. They indicated that in the order of priority, Kamla, Bagmati Khando and Lalbakaya would be their prefer-

ence. The Indian side pointed out that the Lalbakaya is now in an advanced stage of processing with modalities having been finalised and the project report prepared. The financial constraints and also the provisions in the 9th Plan starting from 1997 dictate the implementation of Lalbakaya first. It was also pointed out that project report for other three projects should also be finalised quickly so that a further view could be taken immediately after implementation of Lalbakaya. On the Minister's request it was also agreed to consider for implementation during 9th Plan with first priority to the Kamla embankment after Lalbakaya.

10. Gandak and Koshi Projects

Nepalese side apprised the Indian side about the damage from the Kosi river flood in the vicinity of barrage and flood embankments. If this problem is not promptly addressed it could cause a tremendous loss of life and property in both the countries. Hence, a study should be conducted for mitigation measures and necessary actions should be undertaken accordingly.

Also, there were several problems of maintenance of canal systems of these projects both in India and Nepal and there was an urgent need to convene the meetings of the Coordination Committee of these two projects to address the problems.

11. Gandak Western Canal

The Indian side pointed out that Nepal is proposing to connect the Nepal Western Gandak Canal with the navigation channel through a direct cut and this issue has been raised by the local authorities of Bihar with the local authorities in Nepal, but no positive response has been received. This is a matter which has not been referred either to the Gandak Project authorities or to the Government of India at any stage. It is necessary to examine this issue in the context of the Gandak Agreement. The Nepalese side assured to look into the matter.

12. Navigation

On the suggestion of HMGN, it was agreed to constitute a joint study team to study the possibility of navigation in the Kosi, Gandak and Karnali rivers flowing from Nepal to India.

Finally, it was felt that the Mahakali Treaty is beneficial both to India and Nepal and since the Treaty has been already signed, both the countries should implement the provisions of the Treaty with due diligence and expedition.

Sd.	Sd.
Shri D.N. Dhungel	Shri Mata Prasad
Secretary	Secretary
Ministry of Water Resources	Ministry of Water Resources
His Majesty's Government of Nepal	Government of India

New Delhi dated the 20th November, 1996.

Source: Personal collections of the Editors and Contributors.

Annex 17.5

Main Points of Joint Press Release of Talks Between Kumar Prasad Gyawali Foreign Secretary, Nepal and Krishnan Raghunath, Foreign Secretary of India, August 19-21, 1997, New Delhi

The Joint Working Group of the Indo-Nepal Joint Technical Committee on the Border would continue its discussions on the relevant facts relating to the demarcation of the boundary alignment in the western sector including the Kalapani area, and hold its 4th meeting at New Delhi in September.

The Nepalese side raised the question of down-stream benefits from multi-purpose hydroelectric projects which may be executed in Nepal. It was agreed that this matter would be discussed between the Ministries of Water Resources of the two countries.

Source: Personal collection of the Editors and Contributors

Annex 17.6

Minutes of 1st Meeting of the Nepal-India Joint Committee on Water Resources October 1-3, 2000, Kathmandu

The Nepal-India Joint Committee on Water Resources (JCWR) formed in pursuance of the decision taken by the Prime Ministers of Nepal and India during the visit of the Right Honourable Prime Minister of Nepal to India from July 31 - August 6, 2000 held its first meeting in Kathmandu from 1 to 3 October 2000. The Nepalese delegation was headed by Mr. BN Sapkota, Secretary, Ministry of Water Resources of His Majesty's Government of Nepal and the Indian delegation was headed by Mr. Z Hasan, Secretary, Ministry of Water Resources of the Government of India. The list of members of the delegation from India is attached in Annex-I and the list of the members from Nepal is attached in Annex-II. [Not attached]

Welcoming the Indian delegation, Mr. Sapkota pointed out that there existed ample opportunities for water resources development through joint endeavours whereby both countries could gain the maximum benefits for their people. Emphasising greater cooperation with India on water resources development, Mr. Sapkota noted that both countries can benefit by the utilization of surplus water in the spirit of goodwill, cooperation and equitable sharing of benefits.

Mr. Hasan expressed sincere thanks for the excellent arrangements and the warm welcome extended to him and to the members of his delegation. He expressed happiness that the first meeting of the JCWR was being held in pursuance of the decision of the two Prime Ministers. He said that India is ready to extend her fullest cooperation in resolving all issues in the spirit of trust and goodwill, and emphasised that India is keen to cooperate with Nepal on the development of water resources.

The agreed agenda for discussion during the meeting is attached in Annex-III. [Not attached] The JCWR, after deliberation on the agenda items, agreed as follows.

1. Terms of Reference of the Joint Committee

The JCWR agreed to adopt the Terms of Reference (TOR) of the JCWR as attached in Annex-IV. [Not attached]

2. Revisiting the Existing Committees Related to Water Resources

The JCWR reviewed the work of different committees in the water resources sector and agreed as follows:

a) The Standing Committee on Inundation Problems (SCIP) will continue. The Standing Committee on Inundation Problems (SCIP) will also [a] prepare master plan on flood management.
b) The Joint Team of Experts (JTE) on extension of embankments and the Joint Committee on Embankmeht Construction shall be merged and reconstituted as a sub-committee on embankment construction. This committee will look into planning, design and construction of embankments.
c) Recommend to the respective governments to dissolve the Co-ordination Committee on Kosi Project and the Co-ordination Committee on Gandak Project and form a new Joint Committee headed by the Director General of the Department of Irrigation, Nepal and Engineer-In-Chief (Bihar), India which will review and take necessary measures on issues pertaining to the operation and maintenance of the Kosi and Gandak projects. The composition of the committee has been attached in Annex – V [Not attached].
d) Recommend to the respective governments to dissolve the Committee on Karnali. The Karnali Co-ordinating Committee, a technical level committee, may continue. Its Terms of Reference and composition would be reviewed.
e) Recommend to the respective governments to dissolve the Sub-Commission on Water Resources as its mandate has been assigned to JCWR.

3. Inundation Problems in Nepal-Iindia Border Areas

3.1 Inundation in Banke District

It was noted that in pursuance of the decision taken by the two Prime Ministers in August 2000, joint inspections in Banke district of Nepal were carried out in August and September 2000, and the situation was closely monitored.

Some areas in India along the Rapti river in Shravasti district have been protected by construction of embankment. It was agreed in principle by India that the embankments along Rapti River for protection of Nepalese teritory in Banke district shall be taken up on priority basis. For this purpose, joint survey will be done by the contact officers and proposal will be submitted for the consideration of SCIP by December 2000.

3.2 Erosion of Sanedi Bund and Sarada Sagar Bund

With regard to the erosion of Sanedi and Sarada Sagar Bund in India, it was agreed that a model test be conducted at the earliest. New construction will start based on the result of the model test. It was agreed that a proposal of the model test will be prepared by India and submitted for discussion in the SCIP meeting. Nepal will assist in collecting all the data required for model test and India shall carry out the model test. A Nepalese representative will be involved in the model test.

It was also agreed that the problem resulting from the midstream shoal downstream of the Banbasa Barrage will be suitably addressed.

3.3 Erosion Problem on Left Bank of Gandak River down stream of the Gandak Barrage

It was agreed to entrust this matter to the SCIP, which will study all the technical aspects of the problem and propose remedial measures.

3.4 Erosion of Sotwa Nala at Banganga

In order to overcome the danger of likely avulsion of Banganga River in Nepal to the nearby Sotwa Nala, which is running close and parallel to Banganga, the JCWR instructed that the Contact Officers carry out the site survey and submit proposals to the next meeting of SCIP. It was agreed to conduct a joint visit to the site by a team headed by the Regional Director, Western Regional Irrigation Directorate of Nepal and Chief Engineer from the Government of UP.

3.5 Erosion in Dodhara-Chandani Area of Nepal

With respect to the problem of erosion in the agricultural land and settlements along the Jog Budha river of Dodhara-Chandani area of Nepal, it was agreed to review and reassess the situation by a team headed by the Regional Director, Far Western Regional Irrigation Directorate of Nepal and Chief Engineer (Flood) of UP within one month. The report will be submitted to the forthcoming SCIP meeting for further action.

3.6 Construction of Embankment in Lal Bakiya, Bagmati, Kamala, Khando Rivers

After reviewing the progress of the embankment construction of Lal Bakeya river, the Indian delegation agreed to start the construction of the embankment of Bagmati in the current fiscal year with a target to complete it at the earliest. It was also agreed that the works on Kamala and Khando embankments would follow.

3.7 (a) Construction of Embankments on Chandan and Pyas Rivers

The proposal for the construction of the embankments through the no man's land on rivers Chandan and Pyas to tie them to the Nepalese embankment was discussed. The JCWR agreed in principle to tie up these stretches and it was agreed to process this matter through the respective government channel by December 2000.

(b) Other Problems related to inundation in border area

For other problems related to inundation along the Nepal-India Border, it was recognised by both the delegates that the concerned contact officers should jointly monitor the problem, meet at least once in every three months and submit its report on the possible remedial measures required to be implemented to the SCIP. The reports shall be reviewed by the SCIP and shall be further reported to JCWR.

4. Flood Control and Flood Forecasting

Recognizing the importance of flood forecasting as one of the effective non-structural measures to forewarn and manage the flood disasters, the JCWR agreed to further enhance close cooperation in this field. Towards this end, it was agreed to form a Committee on Flood Forecasting (CFF). The composition of the Committee is attached in Annex VI [Not attached]. The committee shall meet by December 2000. The CFF will review the existing flood forecasting system and prepare a comprehensive Flood Forecasting Master Plan before the next Monsoon. The Master Plan will also include the upgrading of data transmission system and exchange of hydrological and meteorological data for an integrated flood management.

5. Works to be done Under the Provisions of the Mahakali Treaty

5.1 Pancheshwar Multipurpose Project

The JCWR expressed satisfaction at the progress on preparation of the Detailed Project Report (DPR) and instructed Joint Group of Experts (JGE) and the Joint Project Office— Pancheshwar Investigations (JPO-PI) to complete the work within the agreed time frame. The JCWR decided that the JGE may consider the enhancement of delegation of financial authority to the JPO-PI for timely completion of the DPR.

5.2 Construction of Head Regulator for Dodhara Chandani Area

It was agreed that this matter would be looked into in the next meeting of JCWR in light of the provisions of the Mahakali Treaty.

5.3 Sill Level of the Head Regulator for the Canal towards Nepal at Tanakpur Barrage

It was agreed that India will provide detailed information on the Tanakpur power house and the supply channel for further study and the matter will be finalised in the next JCWR meeting.

5.4 Supply of Power from Tanakpur Power House

It was noted that supply of 70 million units of free powçr to Nepal had started from January 1, 2000. The schedule for supply of this power had also been agreed to. Regarding the request from Nepal that the supply of peak power during the dry months, October to April, be increased to a level of 16 MW, it was agreed that the Power Exchange Committee would discuss the issue.

5.5 Tanakpur - Mahendra Nagar Link Road

The Indian delegation informed that the funds for the road construction are already available and requested the Nepalese delegation to expedite the land acquisition and the finalisation of exchange of letters. The Nepalese delegation informed that the land acquisition is underway and the exchange of letters will be expedited.

6. Saptakoshi-Sunkoshi Multi-purpose Project

The JCWR expressed satisfaction on the progress made so far. It was agreed that a written response to the Indian comments on the Inception Report of the Saptakoshi Multipurpose Project would be made available by Nepal before Diwali, 2000. It was also agreed that a back to back meeting of the technical level will be held in New Delhi followed by the meeting of the Joint Team of Experts (JTE) in which the composition of the study team, the location of the project/field offices and the cost estimates of the study would be decided. Efforts will be made to open these offices at the earliest and prepare the DPR as early as possible.

7. Nepal-India Power Exchange

It was brought to the notice of the JCWR that the Fifth Meeting of the Power Exchange Committee had recommended the enhancement of the quantum of power exchange between Nepal and India from the existing level of 50 MW to a level of 150 MW. This is under the consideration of the Government of India.

It was agreed that the construction of the three 132 kV transmission lines that were required for the enhanced power exchange be discussed in the forthcoming meeting of the Power Exchange Committee.

It was also agreed that the possibility of utilizing HVDC interconnection for power exchange between the two countries be discussed in the same meeting.

8. Kosi and Gandak Agreements

The JCWR discussed the various issues concerning operation and maintenance of the projects. It was agreed that all these matters shall be examined by the Joint Committee constituted at Para 2 (c) above. This committee will review and take necessary measures on issues pertaining to the operation and maintenance of the projects including the overall requirement of the Nepalese staff. The number of the Nepalese staff would be limited to 46 as agreed to and the staff requirement shall be reviewed before any fresh appointment.

9. Kamala and Bagmati Multi-purpose Projects

The JCWR discussed Kamala and Bagmati Multipurpose Projects. The Nepalese delegation explained that the projects may not be feasible because of social and environmental implications. The JCWR instructed the JTE on Saptakoshi-Sunkoshi Project to look into the irrigation requirements in the command areas of Bagmati and Kamala both in Nepal and India.

It was also agreed to exchange relevant data on the existing irrigation projects on Kamala for discussion.

10. Identification and Implementation of Hydro Power Project

Regarding the agreement in principle to cooperate in the development of a small/ medium hydropower project in Nepal and export of the generated power to India, the Indian delegation explained that the project could be taken up by an entity of the Government of India in line with the prevailing policy in private hydropower development of Nepal. The Nepalese delegation suggested the names of a few projects presently available, including Budhi Gandaki. It was agreed that an Indian team would visit Kathmandu in the third week of October, 2000 to finalise the project to be taken up.

11. Miscellaneous

11.1 Dhauliganga Hydro electric Project in India

It was agreed that India will supply related data on the Project.
The meeting was held in a cordial and friendly atmosphere.

Sd.	Sd.
BN Sapkota	Z. Hasan
Secretary	Secretary
Ministry of Water Resources	Ministry of Water Resources
His Majesty's Government of Nepal	Government of India

Sources: Ministry of Water Resources and personal collections of the Editors and Contributors.

Annex 17. 7

Minutes of the 2nd meeting of the India-Nepal Joint Committee on Water Resources, October 7-8, 2004, New Delhi

The 2nd meeting of the India-Nepal Joint Committee on Water Resources (JCWR) was held at New Delhi on 7-8th October 2004. The Indian delegation was headed by Shri V.K. Duggal, Secretary, Ministry of Water Resources, Government of India and the Nepalese delegation was headed by Mr. Mahendra Nath Aryal, Secretary, Ministry of Water Resources, His Majesty's Government of Nepal. The list of the delegates is attached at Annex I & II. [Not attached]

In his opening remarks, the leader of the Indian delegation welcomed the Nepalese delegation and appreciated the priority accorded by the Government of Nepal to the bilateral dialogue on water resources - in line with the recent political commitment, at the highest level, by both India and Nepal, to the advancement of cooperation in this sector. He emphasised the need to build on the mandate, given by the Prime Ministers of India and Nepal in their Joint Statement issued on the occasion of the recent visit of Rt. Honourable, Mr. Sher Bahadur Deuba, Prime Minister of Nepal to India and stressed the need to urgently find technically feasible solutions, to existing issues, that are acceptable to both sides.

Reaffirming the need for regular interaction in the JCWR and other bilateral fora, to impart a new momentum to addressing issues of mutual interest, the leader of

the Indian delegation also reiterated the need for both countries to rededicate themselves to intensify their joint endeavor to mitigate the devastation caused every year by the effect of flooding on both sides of the border. He assured the Nepalese side that the Government of India wished to address all issues in a spirit of cooperation and accommodation for the benefit of both sides.

The Leader of the Nepalese delegation expressed his gratitude for the excellent hospitality and friendly atmosphere provided to him and his delegation. He stated that water was an important natural resource for the economic development of Nepal and had immense potential which if harnessed would bring huge benefits to both Nepal and India. Highlighting on the recent policies and strategies related to water resources development adopted in Nepal, he said that they were to pave way for private sector involvement and regional and bilateral cooperation in the sector. Taking note of the positive outcomes of the meetings of the several bilateral committees that took place during recent weeks, he expressed his belief that water related issues would be resolved through collaboration and mutual consultation. Nepalese Team Leader invited the Indian Team Leader and his delegation for the next meeting of JCWR to be held in Kathmandu in April 2005. The agreed agenda for the meeting is attached at Annex III. [Not attached]. The JCWR deliberated on the agenda items and the following decisions were taken:

1. Mahakali Treaty including implementation of Pancheshwar Multipurpose Project

1.1 Pancheshwar Multipurpose Project:

The leaders of the two delegations briefed the JCWR on the outcome of discussions held during the 20th meeting (06.10.2004) of the Joint Group of Experts on the Pancheshwar Multipurpose Project and informed the JCWR about the setting up of a small Joint Group to look into a set of inter-related issues and give their recommendations by January, 2005. The JCWR expressed satisfaction at the outcome of the meeting of the JGE and emphasised the need for timely submission of the report by the Joint Group so that a time frame for completion of the DPR could be set.

1.2 Construction of Head Regulator for supply of water for irrigation for the Dodhara Chandani Area

The Indian side mentioned that the supply of 10 cumecs of water to Dodhara Chandani area under article 4 of the Mahakali Treaty was dependent on the implementation of the Pancheshwar Multipurpose Project under Article 3 of the Treaty. The Nepalese side stated that since Articles 3 and 4 are independent of each other and contended that since the area is in acute need of irrigation water, the technical and other details as stipulated in Article 4 need to be mutually worked out at the earliest. The JCWR decided that both sides would examine the interpretation of the provisions of the Treaty and discuss this further during its next meeting.

1.3 Sill Level of the Head Regulator for the Canal towards Nepal at Tanakpur Barrage

The Indian side informed that the detailed information on the Tanakpur Power House and the supply channel had been provided to the Nepalese side in accordance

with the decision taken in the 1st meeting of the JCWR. According to the Treaty, India is required to provide 28.35 m^3/sec. (1000 cusecs) of water during the wet season i.e. from 15th May to 15th October and 8.5 m^3/sec (300 cusecs) during dry season i.e. 16th October to 14th May. In order to fulfill this commitment, the Indian side pointed out that the head regulator on the left afflux bund of Tanakpur barrage with sill level at EL 245 m (sill already constructed before the treaty) was capable of diverting the committed water supplies with pond level at EL 246.7 m., which is always maintained (being the minimum level requirement) for the operation of the Tanakpur power house. The Nepalese side, however, contended that the sill level be lowered down to EL 241.5 m to match the sill level of head regulator on the right bank. After discussions, it was decided that a joint study including site inspection should be conducted to further study the issue and explore the possibility of finding a mutually acceptable solution and submit the joint report by January 2005. Based on the study a final decision be taken in the next meeting of JCWR. the Composition of the joint study team is attached in Annex IV [Not attached].

1.4 Supply of Power from Tanakpur Power House

It was intimated by the Indian side that 70 million units of free power was being supplied to Nepal as per the provisions of the Treaty and every effort was being made to accommodate Nepal's seasonal requirement.

1.5 Tanakpur Mahendra Nagar Link Road

It was informed by the Indian side that Consultants for preparation of the DPR for the project would soon be selected and would be in place by the end of the year 2004.

2. Comprehensive strategy for Flood Management and Control

In the Joint Press Statement issued on 12th September 2004, on the occasion of the visit of the Hon'ble Prime Minister of Nepal to India, the JCWR had been mandated to prepare a comprehensive strategy for flood management and control including measures that could be implemented in the short to medium term. In this connection, it was pointed out that the Standing Committee on Inundation Problems was already looking into preparation of the master plan for flood management. The "Approach Paper" prepared by the Indian side in this regard had been exchanged with the Nepalese side who had also communicated their observations and submitted their draft "Approach Paper". Recognizing the necessity for a comprehensive master plan for the flood management, the JCWR felt that in view of this year's floods both in India and Nepal, a short term strategy identifying the vulnerable areas along various rivers should be jointly worked out on priority. To undertake the above task, it was decided to set up a Joint Committee comprising 5-6 members from each side to identify the steps that could be taken by both sides to mitigate the devastation caused by the floods. It was decided that the said Committee should submit its report in 3 months, suggesting necessary remedial measures. The importance of afforestation in Siwalik regions of Nepal was also highlighted during the discussions.

The composition of the Joint Committee is given at Annex V [Not attached].

3. Review of activities of Various Bilateral Committees

(i) Standing Committee on Inundation Problems (SCIP)

The outcome of the recently held 13th meeting of the Standing Committee on Inundation Problems at Kathmandu was informed to the JCWR. The Committee decided to meet every 6 months alternately in India and Nepal, to find technical solutions which are acceptable to both sides. The JCWR appreciated the work of SCIP in addressing the outstanding issues in a spirit of mutual cooperation.

(ii) India-Nepal High Level Technical Committee (HLTC) on Inundation Problems

This Committee had been constituted in pursuance of the decision taken during the visit of the Hon'ble Prime Minister of Nepal to India during March 2002. The JCWR noted with satisfaction the positive progress made by the HLTC in resolving inundation problems in Banke (Nepal)/Shravasti (India) districts and hoped that the otherissue relating to the Lotan Rasiawal Khurd embankment would also be sorted out in due course. A Joint Technical Team had already been set up by the HLTC to reconcile and revalidate the survey maps prepared by both the sides.

(iii) Committee on Flood Forecasting (CFF)

As a follow up of a decision taken at the 1st meeting of the JCWR, a Committee on Flood Forecasting (CFF) was constituted. As mandated by the JCWR, the Committee held 3 meetings and finalised the Flood Forecasting Master Plan. JCWR , while appreciating the work done by the CFF, endorsed the Master Plan prepared by it and also accepted its recommendation for designating the CFF as a Standing Committee with the existing composition. It was also agreed that the standing Committee would work for the implementation of the master plan.

(iv) Sub Committee on Embankment Construction (SCEC)

The JCWR was informed that SCEC which was constituted as a follow up of a decision taken at its 1st meeting was responsible for planning, design and construction of the embankments on rivers Lalbakeya, Bagmati, Kamla, and Khando. It was noted that the work on Lalbakeya and Bagmati was at an advanced stage on the Nepal side while in Bihar, the work on the Bagmati embankment was yet to pick up which needs to be expedited. The Committee was apprised of the need for finalization of DPRs in respect of embankment schemes for Kamla & Khando rivers simultaneously for Nepal and Bihar portions as soon as possible. The construction of embankments on either side of the Indo-Nepal border will be taken up simultaneously duly taking into account the effects of embankment and jacketed flow of water on the existing structures along the rivers.

(v) Joint Committee on Kosi and Gandak Projects

The Joint Committee on Kosi and Gandak Projects was constituted as per the decision taken in the first meeting of the JCWR to look into the issues pertaining to the operation and maintenance of these projects. The Commissioner & Secretary, Water

Resources Department, Government of Bihar informed that the next meeting of the Committee would be held in November 2004. The JCWR directed the Joint Committee to look into all pending issues.

The Nepalese side raised the issue of under-generation from Gandak and Kosi HEPs due to poor maintenance of power canals. The Commissioner and Seceretary, Water Resources Department, Govt. of Bihar informed that Gandak and Koshi HEP renovation is scheduled to be completed by November 2005 and July 2005 respectively. The Nepalese side intimated the revised composition of the Committee of their side as given at Annex VI [Not attached].

(vi) Power Exchange Committee (PEC)

a. The Nepalese side stated that transmission line interconnections were required to be built to provide the infrastructure necessary for trading of power between Nepal and India. Three lines viz. (i) 132kV Anandnagar-Butwal D/C line, (ii) 132kV Birgunj-. Motihari line and (iii) 132kV Dhalkebar-Sitamarhi line had earlier been suggested in this regard. Works on Nepal's side of Anandnagar-Butwal line had already been taken up and funds for the other two lines had also been tied up by the Nepalese side with the expectation that these lines would be used by India for power trading.

The Indian side stated that the suggested interconnections had already been discussed in the 7th PEC meeting held in March, 2003 where, in regard to Birgunj-Motihari and Dhalkebar-Sitamarhi lines, it had been indicated to the Nepalese side that these lines could be considered later — "at a time when sufficient power would be available for transfer on these lines", citing the transmission constraints in evacuating power from the Eastern region to the Northern region in India (the possible buyer). Only the Anandnagar- Butwal line had been found to be a feasible link for import of power by India and all preparations for taking up the construction of this line on the Indian side had been completed-subject to finalization of the long-term commercial arrangement for sale of power from Nepal to India. The Nepalese side had indicated the quantum of saleable surplus power on long-term basis to PTC, the organization identified by Government of India as nodal agency to deal with trading of saleable power of Nepal. Based on this indication, PTC had, in right earnest, even signed an agreement with POWERGRID in December 2002 for construction of Indian portion of 132kV Anandnagar-Butwal line. The Indian side reiterated that a firm commitment for long-term sale of power was a pre-requisite (to identify buyers and tie-up a sound commercial agreement between PTC and NEA) before construction of this line by POWERGRID.

Both sides agreed that the above issue could be examined by the Technical Committee consisting of representatives from NEA, PTC, POWERGRID, CEA and HMG/ Nepal, which had been constituted as per the decision taken in 7th meeting of PEC. The Technical Committee would give its findings before the next PEC meeting so that recommendations of the PEC could be considered in the next JCWR meeting.

b. The Nepalese side requested that they were not in a position to absorb the power during wet season from Tanakpur point and they desired that the supply be made from other exchange points. The JCWR directed the Power Exchange Committee to look into the matter and come up with their recommendations

by January 2005. Based on the recommendation, JCWR would take necessary action in its next meeting.

4. Sapta Kosi High Dam Multi-purpose Project and Sun Kosi Storage cum Diversion Scheme

The JCWR expressed satisfaction at the setting up of the Joint Project Office in Nepal to take up field investigation and preparation of the Detailed Project Report on Sapta Kosi High Dam Multipurpose Project and Sun Kosi Storage cum Diversion Scheme. The Joint Committee on Water Resources hoped that the works for preparation of the detailed project report [DPR] would be completed in the given time frame. It was decided that next meeting of the Joint Team of Experts should be held soon to review investigations already carried out and the progress of work.

5. Kamala and Bagmati Multi-purpose Projects

The Indian side raised the issue of taking up of multi-purpose projects on Kamla and Bagmati rivers as the same were important both for India and Nepal from the irrigation, power and flood control point of view. The Nepalese side pointed out that Kamla Multipurpose Project was part of the Sun Kosi diversion scheme. The Nepalese side pointed out the social and environmental problems in implementation of these projects due to the presence of large settlements in the reservoir areas. After discussion, it was agreed that the feasibility study of the Kamala and preliminary study of Bagmati Multipurpose Projects would also be carried out by the Joint Project Office of Sapta Kosi - Sun Koshi Projects to ascertain the likely constraints in implementation of these projects so that these could be appropriately addressed.

6. Identification & implementation of Hydro Power Projects (including Upper Karnali)

As a follow up of the decisions taken during the first meeting of Joint Committee on Water Resources, the Upper Karnali Hydro Electric Project had been identified by His Majesty's Government of Nepal for the development by an Indian agency under the Hydro Power Policy of Nepal. It was noted that the National Hydro Electric Power Cooperation of India (NHPC) is currently discussing this project with the Nepal Electricity Authority (NEA). The Joint Committee on Water Resources advised the NHPC and the NEA to hold further discussions on this project. As regards the Burhi Gandaki Hydro Electric Project, it was brought out that the Government of India had already agreed in principal to prepare the detailed project report [DPR] through an Indian agency. Both sides agreed that the detailed project report [DPR] of 600 MW Burhi Gandaki Hydro Electric Project would be prepared by India. An MOU would soon be signed by both the Governments to undertake this work.

7. Other issues

(I) Kosi Power Tariff

Pursuant to a decision of the last meeting of the Power Exchange Committee, this issue was submitted for the consideration of the JCWR:

The Indo-Nepal Sub Commission on Water Resources (formed by Indo-Nepal Joint Commission on Water Resources in 1988) had fixed tariff for Kosi Project power

for the period 01.01.1988 to 31.12.1992 at a subsidised rate for supply of 10 MW of power. In February 1995, this facility of subsidised tariff was extended by Government of India to cover the period 01.01.1993 to 31.03.1995 with regard to 50% of the power generated. Subsequent to 01.04.1995, power generated from Kosi project and supplied from Kosi point was to be supplied at normal rate of power exchange. However, the Indian side requested for the revision of the tariff. The Nepalese side has taken the stand that the subsidised rate of power supplied should be continued in view of the objective of providing relief to the residents of the area affected by the Kosi project. Indian side clarified that in view of shortfall in generation from Kosi Project, power had actually been obtained from other sources for supply to Nepal. Continuance of this arrangement was not sustainable.

It was decided to constitute a joint group to analyse the issue under the Kosi Project Agreement together with the recording of Sub-Commission on Water Resources held in 1988 and mandate it to submit its recommendations within 3 months for a decision at the next meeting of JCWR.

The Group will comprise the following members:

Indian side	**Nepal side**
Shri V Ramakrishna, Chief, CEA	Mr. L.M. Singh Bhandari, Joint Secretary, MOWR
Mr. S. Atique Ullah, Chief Engineer, BSEB	Mr. Rajendra K. Kshatri, Executive Director, WECS
Ms. Gaitri I. Kumar, Director (North), MEA	Mr. Dinesh Bhattarai, Joint Secretary, MOFA

(ii) Dhauli Ganga Hydro Electric Project in India

As already agreed during the first meeting of the Joint Committee on Water Resources, the Nepalese side requested for the details about the above project. The Indian side will provide the detail as soon as possible.

(iii) Karnali Multipurpose Project

It was decided to initiate consultations in respect of development of the Karnali Multipurpose Project for which the Karnali Coordination Committee already exists. The next meeting of the Committee will be held in Kathmandu in April 2005.

The meeting was held in a cordial atmosphere.

Sd	Sd
V.K. Duggal	M.N. Aryal
Secretary	Secretary
Ministry of Water Resources	Ministry of Water Resources
Government of India	HMG/Nepal

Source: Personal collections of the Editors and the Contributors.

Annex 18

Speech of Maharaj and Prime Minister Chandra Sumshere JB Rana on the Inauguration of Pharping Hydro Electric Power Station, Jestha 23, 1968BS (May/June 1911AD)

गोर्खापत्र ॥ ३ ॥

श्री ३ महाराज बाट बक्स्याको स्पीच.

ईश्वरका अनुग्रहले आज हाम्रो मुलुकको बिजुलिको कार्खाना प्रकाश गर्न पाउनेभयो. नेपालमा एस किसिमको काम्मा यो पहिला कार्खाना हो. एस्तो यो कारखानासंग संसर्ग राख्नपाउनाको मौका र मलाइ मिलेको हुनाले लागिका प ैमानको यथार्थ बयान आज्ञा गर्न सकिन्न यो कारखाना हाम्रा श्री ५ सर्कारका बाहुलि बाट ऐलहे खोलि बक्सनेछ. एस बाट हाम्रा मुलुकको उद्योग उत्साहमा तथा सुगम हुनगयाभैं उन्नतिगराउने हाम्रा अनन्य आशाछ. ठूला ठूला कामहरु पनि उठानगर्दा नबिग्री भरसक उद्योगरि चलने हिसाबसंग गर्नुपर्ने हुनाले यो बिजुलिको धेरै कोरहता पनि हाललाइ खालि हाम्रो राजधानि भरमा बत्ति बालना निमित्त मात्र काम लिन सकेका छौं भरको बत्तिकोकाम् बाहेक यो बिजुलि बिना धुंवा गर्नाले कोठा गरम् गराउने काम समाख्यात भनेपनि हुनछ. नेपालखाल्डामा सहरसंग प्रशस्त दाउरा गोल पाइदैन बिजुलिले गोल दाउराको काम् दिनेभयाको तेसबाट पनि सुविस्ता हुनछ उद्योगको काम्मा उन्नतिगर्ने ठाउ हिसाबकेन तेस्तो उद्योगका कामहरुमा राम्रो यवसाय एकमाथसंग मनुष्यहरु काम् गरेदेखि बलियो बिलायतको इङ्गलन्डमाझै पानीगन नसकुने काम् कहिछैन ई प्रखर बाट दयाभयाको आफना मुलुकमा पाइनेवस्तु बाटै मिलन सकने फाइदा हामिले उठाउन सकेनौ भने तेसभन्दा पछुतोको कुरा केछ? एतिका खर्च र मेहनत लगाइ यो बिजुलिको कारखाना तयारभयाकोछ एसै बाट आइयाको बिजुलिका जोडबाट कामलि हामिले फाइदा उठाउनु योग्यछ. पैले मिस्टररत्ना गर्टेले खुलासा बयानगरे भैं यो बिजुलिको जोडलगाइ चिजवस्तु बनाउने काम कारखाना र अरु उद्योगमा लाउन कोसिसगर्दै गयौंभन्या हाम्रा झानिसबाट पनि अरु बाट भयाको काम हुनसक्ने केहिछैन पैसहे यो उनसबको अवलको सोझामात्र यो कुरा हामिले मन्मा बिर्से छोडन.

एघा थोटाकुरा केहुभने सर्व तरह बाट उन्नतिहुने कुराको बिचारगर्दा हाम्रो शहर सफाई तर्फमा अरु धेरै काम बाकी रहेको देखिनछ उन्नतिको मुख्यकुरा थोटो शफाइको कामपनिहो. बडो अर्थोपत्तिकि, हाम्रा राजधानि शहर ठाउ ठाउमा साझै मैला फोहरछ हाम्रो आहापानिको कलराखि पानिल्याइदेखि पानिबाट उत्पन्नहुने किसिमको रोगहरु बिशेष गरी घटतेगयाकोकता पनि सफाई तर्फको उन्नति तर्फ हामिले सदाबर्देरा बढते ध्यानदिनुपर्दछ एघा सरकार लाई दुनियाहरु बाट हारम्याहारहनु पर्ने अर्को पर्दछ सरकार बाट दुनियालाइ शहर सफाइको कामलाइ केहिदस्तुर लगायाको छैन, तेसो हुनाले मुलुकको बढियाहुने

काम्मा **सरकार** लाइ हारखाहारगर्नुपर्छ भनि दानलाभै पनि नगरि यो काम राम्रोगरि हुनसक्ने देखिदेन.

अब यो विजुलिको विषयको कुरामा म यो पनि भन्दछुकि, यो उठान्भयाको काम् राम्रोगरि तय भयेकोहुनाले हामिलाइ आनन्द गरायो कोनैकाममा पनि उठान्को काम् राम्रागरि तय हुनालाइ उकालो पर्तछन्छ. उठानमा परियाउने कठिन् एकपक्ट नाघि सकेपछी तेस्किसिमको काम आफसे आफ बढ्दै जानेगर्छ बिधिवगरि आफ्नै मुलुकका मानिसहरूका मेहनतले तयारभयाको यो विजुलिको कारखाना पूर्वदीपतर्फ रहेका अरु ये जतो कल कारखाना भन्दा के हिकुरामा घटिछेन भन्न्या कुरामला विचारगरिहेर्दा मलाइ बह्तै आनन्दलागि आउछ. राम्रोगरि दस्तुर माफिक काम् भै यो कारखाना चलायादेखि तेसबाटहुने आम्दानिले खर्चढाकि दिन् परदिन् आम्रा उद्योगका कामका रखानाहरु बढ्दैजाने देखिनाले लागीको भन्दा बढिसन्तोष अरु के होला? यो काम्मा बह्तै मेहनत्गरि कामगर्ने युरोपियन् हिन्दुस्थानि र नेपालिहरु सबैले यो कारखाना कोनै सुरतले पनि चलाइ छाड्नेलानभन्न्या हिकमत् लि कामगरेका हुनाले तिनिहरु लाई धन्यवाद्छ. बिच बिचमा गाह्रो र देवीपरि आर्ये ध्योतापनि आफ्नु अभिभाराको काम् तय गर्नालाइ मेहनत गर्नबाकी नराखि कामगर्ने मुख्य इलेक्ट्रिक्याल ईञ्जिनियर मिष्टर वार्नाउप्यालाइ खुसि:थ अन्तस्करण देखि म धन्यवादगर्छु इनको तुल्लो मेहनत र एकनासको भावनासाथको कामगराइ बह्तै तारिफ लायेकको छ तुन्ना नामि जनरल इलेक्ट्रिक कम्पनीका मानिस मिष्टरकिङ्ले पनि बह्तै उमदा तवरसंग कामगरेकाछन् उनलाइपनि मेरो धन्यवादछ यो काम्मा रहेका अफिसर र अरु मानिसहरूलेपनि तनदि कामगरेको सुन्दा मलाइ बह्तै सन्तोषभयो तिनिहरूको कामदेखि म खुसिछु यो इञ्जिनियरले तिनिहरूको लोसिफारसगरे तेस्को विचार तिनिहरूका आफ्ना आफ्ना आड्डाखाना डारागरिनेछ. तिनिहरु सके सगोल मेहनतले आज यो काम् सफलभयो यो काम् सफल भयाकोमा जनरल पद्मसम्शेर जङ्गबहादूर राणा लाइ म धन्यवाद दिन्छु. तिनिमाथि मैले जस्तो भर्पर्दि कामलायाकोथियो सो बमोजिम् सबै काम पूरा हिसाव सँग पार लाया, यो काम सुरु देखिनै भाइ कम्याण्डर इनचीफ लेगरेका महतको मैले बहुतै कदरमानेकोछु उनिलाइ पनि मेरो अन्तस्करण देखिको बह्तै बह्तै धन्यवादछ यो इस्पीच खतम्गर्नु अगाडि यो विजुलिको कामले हामिलाइ जो सिक्षादिन्छ तेसबारेमा म के हि भन्नचाहन्छु. हिकमत् को कामहरु प्रचार भै रहेको आजकालको जमानामा सो हिकमतको महिमाको शिरोमणिभै भयाका विजुलिले हाम्रो सभ्यताको बाटो राम्रो बनाइ आहो उन्नति गराउदै लगेकोछ. विजुलिका प्रकाश नहुदैका वखत्को र यो प्रकाश भयापछिका वखत्को बिचमा कहाँसम्मको अन्दाधुन्दको फरक देखिन्छ नेपालले पनि अब विजुलि आफ्ना दुनियामा प्रकाशभयाको देखि उन्नतिको यस्तो मुख्यकारण हो भन्न्या सिक्षा बिर्सनेछैन भन्न्या आशालागीकोछ, आजकालनभै नहुने अरुदि समभियाको हिकमतको विद्याजान्नुपर्छ भन्ना तिरपनि मनदर्दै जाला भन्ना हामिले आशागर्नु थोर नसक्ने कुरा के छैन यो विजुलिबत्तिको राम्रो उज्यालोसुनि बगोरहदा जस्तो त्यो बलिरहेको बत्ति निर्मलसफाछ उस्तै आफ्नु चालचलन पनि बेदागको गराउनुपर्छ भन्ना र जुनजोरबाटसोबत्तिबलेकोछ त्यो जोरलाइ छोइसके सम्म काम्माआइ फाइदाउठाउनुपर्छ भन्ना इटउत्साह पनि मानिसहरूले लिनन्भन्ना आशापनि लागीकोछ. रातको अन्धकार दूरभै जानाले हाम्रो मनको अन्धकारपनि दूरभै गै नजाद्धान पैदाभै अज्ञानसबै अन्धाइ हामिलेगरे कति सम्म हुनसक्ने रहेछ, कतिकुरा हामिलेग नुपर्छ भन्ना अन्तस्करणले देख्दै जानेछन् भन्न्यापनि आशाछ.

अघम कर्नेल म्यानर्स इस्मिथ साहेब र अरुलेंड भलादमि हरूले यसोकामा मेहरबानि साथ आइ शोभायमानगर्नु भयाको हुनाले म अन्तस्करणदेखि सुकर्गुजारि गर्दछु सावधानसाथ यो मेरो बोल्नेका कुराहरु एकचित्तले सुनि बक्स्याको मा **श्री ५ सर्कार महाराजाधिराज** का खिदमत्मा मेरो आदावछ, अरु सबैलाइ पनि मेरो धन्यवादछ **ईश्वर** सँग अब मेरो यहि प्रार्थनाछकि, यो हाम्रो काम्लाइ कल्याण गरुन्.

Source: Gorkhaptra weekly, May/June 1911 (Jestha 23, 1968BS): Courtesy Senior Journalist Bhirab Risal

Annex 19

List of Nepals' Independent Power Producers and their Projects

S.N.	Name of Company	Project	Capacity (kW)	Status
1	Butwal Power Company	Andhi Khola	5,100	In operation
2	Butwal Power Company	Jhimruk	12,000	Inoperation
3	Himal Power Ltd.	Khimti-1	60,000	In operation
4	Bhotekoshi Power Co.	Upper Bhotekoshi	36,000	In operation
5	Chilime Hydropower Co.	Chilime	20,000	In operation
6	National Hydropower Co.	Indrawati III	7,500	In operation
7	Syange Vidyut Co.	Syange Khola	183	In operation
8	Arun Valley Hydropower Development Co.	Piluwa Khola	3,000	In operation
9	Alliance Power Nepal	Chaku Khola	1,500	In operation
10	Sanima Hydropower P. Ltd.	Sunkosi Khola	2,500	In operation
11	Rairang Khola Hydropower	Rairang Khola	500	In operation
12	Gitec Nepal/China	Upper Modi	14,000	
13	Gorkha Hydropower	Daram Khola	5,000	
14	Khoranga Khola Hydropower	Pheme Khola	995	
15	Khudi Hydropower Limited	Khudi Khola	3,500	In operation
16	Molnia Power P. Ltd.	Mailung Khola	5,000	
17	Kantipur Hydropower Co.	Langtang Khola	10,000	
18	Unique Hydel Co.	Baramchi Khola	980	In operation
19	Sunkosi Hydropower Co.	Lower Indrawati	4,500	
20	Thoppal Khola Hydropower	Thoppal Khola	1,400	In operation
21	Gandaki Hydropower Devt.	Mardi Khola	3,100	
22	Bavarian Hydropower Nepal	Lower Nyadi	4,500	
23	Annapurna Group P. Ltd.	Madi-1	10,000	
24	Gautama Budha Hydropower	Sisne Khola	750	
25	Aadhisakti Power Dev.	Tadi Khola	970	
26	East Nepal Dev. Endeavour	Upper Mai Khola	3100	
27	Kathmandu Small Hydropower	Sali nadi	232	
28	Unified Hydropower	Pati Khola	996	

Source: Nepal Electricity Authority, Planning Department (NEA)

Annex 20

Nepal Electricity Authority's Performance Indicators

	2000	2001	2002	2003	2004	2005	2006	Increment taking 2000 as base year
No. of consumers	673,979	745,992	8,84,535	970,611	10,53,935	11,59,855	12,79,902	89.9%
Total sale of electricity (GWh)	1269.274	1407.127	1534.313	1696.816	1795.233	1918.35	2066.27	62.8%
Net system loss	23.9	23.6	24.56	23.66	22.90	24.83	24.70	3.35%
Average price of electricity	5.7	6.23	6.52	6.6	6.66	6.57	6.49	13.86%
Net income/loss MN/Rs	756.5	(1.9)	(717.44)	(455.9)	(1780.3)	(1312.8)	(2472.6)	
Peak load (MW)	351.9	391.00	426.00	470.33	575.24	557.53	603.28	71.4%
Total energy (Gwh)	1701.45	1868.42	2066.33	2261.13	2380.89	2642.75	2777.42	63.2%
Installed capacity (MW)	389.57	440.374	584.557	606.057	609.057	611.53	611.53	57% (222 MW)
Transmission line: (Ckt/km) 132kV	1568	1773	1881	1881	1881	1881	2076	508 km
66kV	488.3	527	554	554	561	568	593	104.7 km
33kV	1506	1536	2362	2362	2471	2471	2485	979 km
Substation (MVA)	813.60	813.60	813.60	902.45	949.85	1062	1089	275.4 MVA

Source: Nepal Electricity Authority, A Year in Review: 2000-2006

Annex 21

Agreement between His Majesty's Government of Nepal and the Government of India Concerning the Electric Power Trade, February 17, 1996

Whereas, His Majesty's Government of Nepal (hereinafter referred to as ("HMGN") and the Government of India (hereinafter referred to as "GOI") desire to further promote and strengthen the relations existing between them.

Whereas, both HMGN and GOI have adopted the policy of economic liberalization with the intention to promote participation of private sector also in the development of their respective countries;

Whereas, both HMGN and GOI have emphasised quicker and enhanced development of the power sector through participation of local and foreign private investors also, in the power industry of their respective countries;

Whereas, both HMGN and GOI envisage the development of a number of power projects within the foreseeable future in their respective countries, and

Whereas, both HMGN and GOI, in view of the upcoming power projects in their respective countries, have held mutual discussions and have reached an understanding that this Agreement shall facilitate the process of electric power trade between the two countries.

NOW, THEREFORE, HMGN AND GOI HAVE AGREED AS FOLLOWS.

Article 1

Any party, in Nepal or India, may enter into an agreement for power trade between Nepal and India irrespective of such parties being Governmental, semi-Governmental or private enterprise.

Article 2

The parties entering into such an agreement for power trade may determine the terms and conditions of such an agreement including the quantum and parameters of supply, the points of delivery and the price of supply of electrical power to be traded between them.

Article 3

The parties entering into such an agreement for power trade shall be afforded all necessary assistance by respective Governments, in accordance with the laws and regulations of respective countries, for conduct of surveys including field investigations and for construction, installation, operation and maintenance of facilities required for generation and transmission of power in the territories of both the countries, required for such power trading.

Article 4

The parties entering into such agreement for power trade, shall be granted all the incentives and concessions by respective Governments, available under relevant laws and regulations of respective countries, for generation and transmission of power.

Article 5

The parties entering into such as agreement for power trade, shall fulfil all necessary requirements stipulated in relevant laws and regulations of respective countries as well as comply with necessary technical requirements of each country.

Article 6

Notwithstanding anything contained herein, both HMGN and GOI may enter into separate arrangements between themselves or with third countries on power trading for the benefits of their respective countries.

Article 7

Any difference regarding interpretation and application of this agreement shall be resolved by mutual consultation between the two Governments.

Article 8

This agreement shall be subject to ratification and shall enter into force on the date of exchange of instruments of ratification. It shall remain valid for a period of fifty (50) years from the date of its entry into force and its validity shall be extended by mutual consent.

Article 9

The provisions of this Agreement shall be reviewed at ten (10) years interval or earlier as required by either Government and amended, if required, by mutual consent. Initialled at Mumbai, India, on this seventeenth day of February, NINETEEN HUNDRED AND NINETY-SIX in two (2) original copies in English Language.

on behalf of His Majesty's Government of Nepal.	on behalf of The Government of India.
Sd. Dr. DN Dhungel Secretary Ministry of Water Resources	Sd. P Abraham Secretary Ministry of Power

Source: Personal collections of the Editors and Contributors.

Annex 22

Minutes of the 1st Meeting of the Standing Committee Between Nepal and India on Inundation Problems, July 15 -17, 1986, Kathmandu

Mr. C.D. Bhatt, Director General, welcomed Mr. J. Bahadur, Chairman, Ganga Flood Control Commission and the other members Indian side and wished their stay in Nepal would be pleasant and comfortable. He expressed that the discussion on the inundation problems of Indo-Nepal border area is not being done for the first time but had been held before also at the Secretary level meetings. He gave a brief account as to how this permanent Standing committee of both the countries had come to be formed after the talks between His Majesty the King and the Rt. Hon'ble Prime Minister of India at the SAARC meeting in Dhaka in December 1985 and said that the formulation of a standing committee has shown the importance of the inundation problems and the eagerness of both the countries to solve them. He expressed the hope that this Standing Committee will be able to draw necessary guidelines to solve them effectively. He introduced the members of the HMG/N Standing Committee to the India delegates.

2. Mr. J. Bahadur expressed his thanks for the warm welcome and hospitality accorded to him and his colleagues. He introduced the members of the Indian side of the Standing Committee to the Members of Nepal. He expressed similar views about the usefulness of the Committee which has been formed on a permanent and continuing basis. He further expressed the hope that the Committee will be able to evolve mutually advantageous solutions to the various problems.

3. It was agreed that the Committee may be named as "Standing Committee between Nepal and India on inundation problems".

4. There was a detailed discussion regarding the scope of the Committee after which it was agree that the Standing Committee shall deal with problems of inundation that have occurred or are likely to occur in future due to activities in the vicinity of Indo-Nepal border and suggest both short-term and long-term, solutions. It was felt by the committee that the Chairmans of the two sides may obtain the approval of their respective Governments to the scope as defined above.

5. It was agreed that the Committee should meet as often as necessary but at least twice a year before and after monsoon. The venue of the meeting will be either Kathmandu or New Delhi.

6. Mr. C.D. Bhatt explained the existing inundation problems in Nepal due to the activities which have taken place on Indian side. The problems are listed in Annex I. [Not attached]

It was stated by the Indian side that for a proper understanding and assessment of several problems stated in Annex 1, further details including site verification will

be necessary. This can be done by local officers from both the countries identified as contact officers in Annex I and III. [Not attached]

It was also explained by the Indian side that in case of item Nos. 13, 21, 26 and 29 of Annex I, the design and siting [section] of the structures have been done in such a manner that there could be no inundation in Nepal area. However, Nepal side desired that it may be examined further and discussed in the next meeting. Some problems in Uttar Pradesh were mentioned by the Indian side which have been listed in Annex II. [Not attached]

The problem at serial 2 calls for immediate attention as the embankments constructed in Nepal had led to accentuation of peak flows and consequential inundation of large areas in India. As a remedial measure, the U.P. Government proposes to construct embankments on the concerned rivers in continuation of the embankments in Nepal.

7. It was agree that the inundation problems shall be inspected at site by the officers of both the sides as and when required starting from this monsoon period. Subsequently the joint observation report shall be submitted to the Member Secretaries of both the sides. However, the view of the inspection officers shall be sent independently to the respective Member secretaries. For this purpose the two sides exchanged the list of the local offices and/or officers to be entrusted with such responsibilities. The Indian side shall supplement the list after consultation with the concerned authorities. In case, on receipt of those reports, the Chairman of any side considers that the matter needs special attention, he will intimate this to the Chairman of the other side and both sides will take steps to ensure that an officer of the Ganga Flood Control Commission (Govt. of India) and an officer of the Department of Irrigation, Hydrology & Meteorology (HMG/Nepal) are associated in the study of the problem.

8. Mr. Bhatt drew the attention of the Indian side to the problem of submergence of Gaur Bazar area and emphasised keeping the sluices open so that the water reaching the Bairgania embankment gets drained off. The Indian side agreed that as decided by the Joint Technical Group at its meeting held at Kathmandu in July, 1982, the gates of the sluices would be kept fully open so that the water reaching the embankment from Nepal will flow without obstruction upto 200 cusecs. Progress of the actions on decisions taken in previous meeting of the Joint Technical Group in July 1982 was also reviewed. It was agreed that required follow-up action should be taken on the decisions recorded by the Joint Technical Group in July 1982.

The Indian side suggested that similar follow-up action should be taken on summary record of discussions held by the Committee of Indian and Nepalese delegations in May 1985 on Lohindra and Singhali rivers in Nepal and Parman river in India.

9. The Indian side explained that the Semari Regulator has been completed and it can drain the water of the enclosed area by Nepal bund, B-Gap bund, Link bund and Main Western Canal. So, the breach in Dhobha Nala in Nepal bund

should either be closed or a gated regulator should be provided keeping in view the effect on the escape channel of Surajpura power-house. Mr. M.D. Karki, Director, Pokhara, expressed the view that the area could be drained effectively only through Dhobha Nala as this lies in the lowest level and this is the old natural drainage course. The committee decided that this problem should be jointly observed and reported.

The Nepalese side stated that due to construction of embankment and spurs along the Mechi river the river is getting pushed towards west and the area south of Kakarvitta upto the Indo-Nepal border is experiencing flood problem. Similarly the works on Indian side on Mahakali River is creating erosion problem in Darchula head-quarters area. The Nepalese side wanted that while dealing with such border rivers, and while planning for any structures in the vicinity of the border the effect on the Nepalese side should be kept in view and such works should be implemented after mutual consultations.

The Indian team stated that in the case of Dharchula, only a wall had been constructed on the river bank on the Indian side without any encroachment into the river section to protect the vertical bank adjoining a thickly populated town. The wall needs further extension downstream up to P.W.D. suspension bridge; otherwise this bridge may be washed away due to bank erosion in that reach. Nepal had also constructed a similar wall on their side in a length of 300 m. The Indian side suggested that Nepal may extend this wall to match with the wall on the Indian side to confine the river and prevent bank erosion. After discussions, it was decided that another joint inspection may be carried out.

The Committee had planned to inspect the Gaur Bazar and Amarpatti (Parsa District) areas on 16th July, but it could not do so due to bad weather resulting in cancellation of aeroplane flight.

It has been decided that orders shall be arranged to be issued to the local officers to inspect these sites within a fortnight and to report to the Member-Secretaries of both sides immediately thereafter.

The discussions between the two sides were held in a most cordial atmosphere. The Indian side thanked the Nepalese side for the hospitality, facilities extended to the Indian side and for useful discussion on various problems.

Sd.	Sd.
CD Bhatt	J Bahadur
Director General	Chairman
Dept. of Irrigation, Hydrology and Meteorology	Ganga Flood Control Commission

Source: Personal collections of the Editors and Contributors

Annex 23

Minutes of the 14th Meeting of the Standing Committee on Inundation Problems between Nepal and India, August 30-September 1, 2006, Patna

The 14th Meeting of the standing committee was held from 30 August to 1 September 2006. The lists of the Nepalese and Indian delegates are at Appendix 1 and Appendix II respectively [Not attached].

The Leader of the Indian delegation, Mr. V.R. Sastry, Chairman, Ganga Flood Control Commission welcomed the Nepalese delegation led by Mr. N.P. Bhattarai. In his welcome speech, Mr. Sastry expressed his satisfaction for the accomplishments of the SCIP in the past two decades and also expressed his optimism that the pending problems would soon be resolved with mutually acceptable technical solutions in future.

In his reply, Mr N.P. Bhattarai, Leader of the Nepalese delegation thanked the Indian side for the warm welcome and hospitality extended to him and his delegation. He stated that achievements were required at a level that the flood affected people on both sides of the border have been aspiring for. He also stated that the situation in Nepal in the past couple of years had reduced the frequency of meetings of various Contact Officers across the border. He also pointed out that the prevailing institutional mechanism needed review and changes, if necessary, for resolving the inundation issues expeditiously.

The committee reviewed the progress on implementation of the decisions of the 13th SCIP meeting (September, 2004) and held detailed item-wise discussions. The summary of discussions and decisions of the committee are listed below:

Annex: Inundation Problems in Nepal

Item No. 1

Gaur Bazaar and its surrounding areas in between Bagmati and Lalbakeya Rivers in Rautahat District due to Bairgania ring bund in India

The Committee reviewed the progress made by the sub-committee on Embankment Construction (SCEC) till date. The Committee felt the necessity of typing up of the embankments on left bank of Labakeya and right bank of Bagmati Rivers to high ground in the upstream to prevent spillage of flood water into Gaur Bazaar. It was brought to the notice of the Committee that the issues concerning extending the embankments to high ground upstream in both the cases of Bagmati and Lalbakeya embankments are being taken up by the SCEC.

The Indian side informed the Committee that the sluice gates on the Bairgania ring bund were functioning well on which the Committee expressed its satisfaction. The Committee decided to continue on monitoring of the operation and maintenance of the sluices by the Contact Officers.

Contact Officers:

Nepalese side: Chief, WIDP Division Office No. 3, Parwanipur, Bara.
Ph: ++977-51-580032, Mobile: ++977-9855020839
Fax: ++977-51-524384

Indian Side: Superintending Engineer (SE), Drainage Circle, Motihari
Ph: 91-6252-22540 Fax: 6252-22365

Item No. 2

South Part of Mahottari District and Hathiyol, Balara and Madhubani of Sarlahi District

The Committee discussed the issue at length and noted that the inundation problems at Hathiyol, Balara and Mahdubani of Sarlahi District would be resolved once Package C and Package D of the Bagmati River Embankments were implemented. Regarding inundation problem in the south part of Mohottari District, the Nepalese side would soon review the scheme prepared jointly by the Contact Officers in the context of the prevailing site condition and send comments to Member Secretary, SCIP (India).

Contact Officers:

Nepalese Side: Chief, WIDP Division Office NO. 2, Janakpur, Dhanusa
Ph: +977-41-525901 Fax: +977-41-525902

Chief, WIDP Division Office NO. 3, Parwanipur, Bara.
Ph: ++ 977-51-580032, Mobile: ++ 977-9855020839
Fax: ++977-51-524384

Indian Side: SE, Headworks Circle, Sitamarhi
Ph: 91-6226-20435 Fax: 621-242269

Item No. 3 (a)

Phulbaria Village and its surroundings of Siraha District

The Committee noted that the issues regarding Phulbaria Village and surroundings of Siraha District had been addressed in the DPR on 'Kamala River Embankment and Protection Works', which was considered and found broadly in order in the 8th meeting of SCEC.

Contact Officers:

Nepalese side: Chief, WIDP Division Office No. 2, Janakpur, Dhanusha.
Ph: ++ 977-41-525901 Fax: ++977-41-525902

Indian side: SE, Flood Control, Darbhanga
Ph: 91-6272-40817 Fax: 6272-22224

Item No. 3 (b)

South Part of Musharniya and Mukhiyapatti villages of Dhanusha District

The Committee decided that a Representative (SDE) from DWIDP, Government of Nepal and SE, Headwork Circle, Sitamarhi from the Indian side would jointly visit the site during the middle of September, 2006 for the assessment of the site conditions so as to examine the applicability of the scheme prepared by the Nepalese side.

Contact Officers:

Nepalese side: Chief, WIDP Division Office No. 2 Janakpur, Dhunsha.
Ph: + 977-41-525901 Fax: +977-41-525902

Indian side: SE, Flood Control, WRD, Bihar, Darbhanga
Ph: 91-6272-40817 Fax: 6274 - 22224

Item No. 5 and Item No. 6

Govindpur and Lalapatti Villages and their surroundings of Saptari District and Tilathi Village and surroundings (including custom office) of Saptari District.

The Committee noted that the problem could only be effectively resolved taking the complex drainage pattern involving a number of drains in the area into consideration. The drainage/inundation issues in the above areas would be addressed while formulating the DPR on Khando River embankment by SCEC.

Contact Officers:

Nepalese side: Chief, WIDP Division Office NO. 2, Janakpur, Dhanusha.
Ph: + 977-41-525901 Fax: +977-41-525902

Indian side: SE, Barrage Circle, WRD, Bihar, Birpur
Ph: 06471-22011 Fax: 06472-22019

Item No. 11

Various areas near Siswa Sagar, Bajha Sagar, Marthi Sagar and Mahali Sagar

The Nepalese side brought to the notice of the Committee that there had been rehabilitation works including replacement of wooden gates with steel ones in some of the structures without prior information. The Indian side clarified that their were no changes in the crest level, which could result additional submergence.

The committee noted that the progress towards resolving the issues was not satisfactory, primarily because the concerned Contact Officers had been finding it difficult to meet due to adverse situation. The Committee decided that the Contact Officers would meet in the middle of November 2006 for the verification and reconciliation of levels and other required technical parameters, and report the facts on ground to their respective Member Secretary, SCIP. The Member Secretaries would then jointly inspect the site(s) in November 2006 and work out solutions to the problems.

Contact Officers:

Nepalese side: Chief, WIDP Division Office No. 5, Bhairahawa, Rupandehi.
Ph: +977-71 526509

Indian side: Executive Engineer, Irrigation Department, Sidarthanagar, UP
Ph: 22346 (O), 22127 (R)

Item No. 12

Dang Koilbas area (Gaurganja area)

The Committee noted that the Contact Officers could not meet so far.

The Committee decided to instruct the Contact Officers to meet at the earliest and report the findings to the respective Member Secretary, SCIP.

Contact Officers:

Nepalese side: Chief, WIDP Sub-Division Office NO. 3, Lamahi, Dang
Ph: ++ 977-82 540180

Indian side: Executive Engineer Chitaudagad Bandh Nirman Khanda, Balarampur, (UP)
Ph: 32452 (O), 32604 (R)

Item No. 13

Rapti River Obstruction, Submergence of Nepalgunj Area of Banke District

The issue is being addressed by the High Level Technical Committee (HLTC)

Contact Officers:

Nepalese side: Chief, WIDP Division Office No. 6, Nepalgunj, Banke
Ph: +977-81-525726

Indian side: SE, IX Circle, Irrigation Works, Bahraich. (UP)
Ph: 32452 (O), 32604 (R)

Item No. 21

Erosion of Karaulia, Haradauna, Saighorahawa, Semari, Itawa and Custom Office of Kapilvastu District

The Chief Engineer (Gandak) from the Indian side and DDG, DWIDP from the Nepalese side along with senior officials from both sides visited the site on 17 August 2006. The Committee decided that anti-erosion works were required in vulnerable stretches of Banganga River in Nepal to mitigate bank erosion and minimise the risk of avulsion of the river into Sotwa Nala.

The Committee decided that the Nepalese side would send a proposal to the Indian side, taking into account the field observation made on 17 August 2006 and the proposal received from the Indian side.

Contact Officers:

Nepalese side: Chief, WDIDP Division Office NO. 5, Bhairahawa, Rupandehi.
Ph: ++977-71 526509

Indian side: Executive Engineer, Siddhartha Nagar (UP)
Ph: 22346 (O) 22127 (R)

Item No. 31

Erosion Problem in Jogbura Area

The Nepalese side reported that the anti-erosion works implemented by the Indian side were inadequate for preventing bank erosion. The Indian side stated that the implemented works were adequate. The Committee decided that the team of experts constituted in the case of Item No. 19 of Annex II would visit the site in November 2006 and recommend measures, if necessary.

Contact Officers:

Nepalese side: Chief, WIDP Division Office NO. 7, Dhangadi, Kailali
Ph: +977-91-525048

Indian side: EE, Headworks Division, Bareily (UP)
Ph: 427119 (O) , 427120 (R)

Item No. 33

Inundation near Lahar Thakari, Pakaha-Mainpur Village due to Choking of C.D. structure at 69.2 R.D. Ghorasahan Canal

The Nepalese side suggested that the inundation problems in Parsa and Bara Districts of Nepal, attributed to the Ghorasahan Canal in India should be dealt with in an integrated manner. The Indian side informed the Committee that a major restoration scheme of the canal is being implemented from December 2006, which could address the inundation problems of the Nepalese side. The Committee decided that SDE, DWIDP, Nepal and Chief Engineer, Balmiki Nagar, India, together with the Contact Officers, would survey the concerned area in the middle of November 2006 and make recommendations for improvement in cross drainage, which would be considered by the Government of Bihar for incorporation in the canal rehabilitation scheme.

Contact Officers:

Nepalese side: Chief, WIDP Division Office NO. 3, Parwanipur , Bara.
Ph: +977-51-580032

Indian side: SE, Trihut Canal Circle, WRD, GOB, Raxaul
Ph: 06252-61193 Fax: 06252-22365

Item No. 34

Inundation in and around Marchwar area of Rupandehi district due to the Construction of Lotun-Rasiawal-Khurd Bund on the Indian side

The issue is being addressed by High Level Technical Committee (HLTC).

Contact Officers:

Nepalese side: Chief, WIDP Division Office No. 5, Bhairahawa, Rupandehi.
Ph: +977-71 526509

Indian side: Executive Engineer, Siddharthanagar (UP)
Ph: 22346 (O), 22127 (R)

Item No. 36

Inundation in Harkatti and surrounding area of Siraha District due to the construction of Bund on the Indian side Close to No Man's Land

The Nepalese side stated that approximately 1000 ha of land in Harkatti and surrounding area of Siraha District of Nepal are getting inundated due to the construction of bund on the Indian side very close and parallel to the international border. They also stated that the constructed bund had also completely blocked the drains in the area. The Indian side stated that, as per the report from the DM, Madhubani, less than one km of bund had been constructed so far under the district funds to protect Ladania Block and Ladania Bazaar from floods; that construction had been stopped, following instructions from the Government of Bihar; and, that the construction work would be resumed, if at all, only after due consultation with the Nepalese side.

The Nepalese side requested the Indian side to take necessary measures immediately for the passage of flood water of the Nalas, which have been blocked by the constructed bund, in the current monsoon. The Committee decided that the Member Secretaries, SCIP would inspect the site in middle of September 2006 and make recommendations for necessary steps to resolve the issue.

Annex-II

Inundation problems in India

Item No. 2

Problem caused in Maharajgunj Tehsil in India due to Construction of Marginal Embankment in Nepal

The Indian side stated that the proposals for five schemes, as listed below, were sent to the Member Secretary (Nepal), SCIP long ago, but comments from the Nepalese side are still awaited. The Indian side emphasised the need for the expeditious response from the Nepalese side.

1. Rajapur Doulatpur Embankment
2. Bellar Motipur Embankment
3. Bakuldiha Chatia Embankment
4. Laxmipur Embankment
5. Sekhwani Embankment

It was decided that the Contact Officers should jointly visit the site by the end of September 2006 and send report to respective Member Secretary and further action may be taken up by the Member Secretaries after consultation and, if required, field inspection.

Contact Officers:

Nepalese side: Chief, Division Office No. 5, Bhairahawa, Rupendehi
Ph: +977-71-526509

Indian side: SE, Flood Control Circle, Gorakhpur
Ph: 201406 (O), 201700 (R)

Item No. 6

Extension of Embankments along the Kamala River in Nepal (Jainagar and surrounding area).

This item is covered in Item No. 3a of Annex -1

Contact Officers:

Nepalese side: Chief, Division Office No 2, Janakpur, Dhanusha
Ph: +977-41-525901-902 Fax: +977-41-525902

Indian side: SE, Flood Control, Darbhanga
Ph: 91-6272-40817 Fax: 6272-22224

Item No. 9 (a)

Remodeling existing 14- km …embankment on the left bank of upper Mechi upstream of Pani Tanki (Kakarbhitta Bridge) to check inundation into Naxalbari town in North Bengal. The Indian side brought to the notice of the Committee that the comments on flood protection scheme, covering the upper and lower reaches of Mechi River, prepared by the Government of West Bengal is yet to be received from the Nepalese side. The Nepalese side stated that new flood problems had

cropped up in Bhadrapur area, and hence, proposed that the works should be implemented simultaneously on both sides of the Mechi River. They also stated that as the river is a border between the two countries care must be taken while finalizing the scheme.

The Nepalese side informed the Committee that the comments on the West Bengal's scheme and Nepal's scheme to protect right bank of the Mechi River would be sent to the Indian side by the first week of October 2006.

The Committee decided that a Sub committee comprising of the Member secretaries, SCIP, Chairman, North Bengal Flood Control Commission: Representative of MOWR (Government of Nepal); and the Contact Officers would visit the site in November 2006 and make necessary field verification of Nepalese and Indian proposals.

Item No. 9 (b)

Problem of inundation on the left bank of the lower Mechi River in West Bengal at the Indo-Nepal border

This item has been covered in Item No 9 (a)

Item No. 11

Protective measures for solution of problems of inundation of North Bihar and Eastern Uttar Pradesh by the rivers originating in Nepal

In pursuance of the decision taken in the second meeting of JCWR, the India Nepal Joint Committee for Short-Term Strategy for Flood Management and Control (FMC) has been constituted. It was noted that the FMC had completed Part I of its report covering the area between Gandak and Kosi Rivers. The Committee has completed draft version of its report for Part II covering area between Kosi and Mechi Rivers. The works for the Part III of the report covering the area between Gandak and Sarada Rivers would be taken up shortly.

The Committee noted that the Approach Papers to the comprehensive Master Plan for Flood Management have been exchanged. The Committee also noted that the report of the FMC would help in undertaking immediate flood protection measure on priority basis and would provide vital inputs for the preparation of the Master Plan.

Item No. 13

Extension of Embankments on Sunsari River on both banks in Nepal territory

This item has been dropped.

Item No. 14 (Reinstated)

Inundation in Tatarganj and No. 5 Colony village due to diversion of Chaudhar river by Nepal (Mahakali Project Stage II)

The Indian side informed the Committee that diversion of Chaudhar River into Wamni River has again caused inundation problem in the Indian area. The Committee decided that the Contact Officers would visit the site and recommend remedial measures, if required.

Contact Officers:

Nepalese side: Chief, Division Office No 7, Dhangadi, Kailali
Ph: ++ 977-1-91-525048

Indian side: SE, V Circle, Baraily (UP)
Ph: 427119 (O), 427120 (R)

Item No. 15

Construction of Lotun-Rasiawal Khurd bund located within eight kilometer of Indo-Nepal border in Maharajganj-Sidhartha Nagar district of UP to check inundation of 85 (eighty-five) villages in India

The issue is being addressed by High Level Technical Committed (HLTC).

Contact Officers:

Nepal side: Chief, Division Office No 5, Bhairahawa, Rupandehi
Ph: +977-71-526509

Indian side: Executive Engineer, Siddharthanagar (UP)
Ph: 22346 (O), 22127 (R)

Item No. 16

Avulsion of Banganga river into Sotwa Nala through local drain in Nepal. This has been dealt with in Item 21, Annex I

Contact Officers:

Nepalese side: Chief, Division Office No 5, Bhairahawa, Rupendehi
Ph: +977-71-526509

Indian side: Executive Engineer, irrigation Department, Siddharthangar,UP
Ph: 22346 (O) 22127

Item No. 17

Channelization of Mahao Nala in Indian territory within eight km of the Indo-Nepal border for solution to the inundation problem in Maharajgunj District in UP due to spilling of Ghonghi (Danda) river into Mahao Nala.

The Indian side informed the Committee that the required scheme was under preparation.

Contact Officers:

Nepalese side: Chief, Division Office No 5, Bhairahawa, Rupandehi
Ph: +977-71-526509

Indian side: Executive Engineer Maharajgunj (UP)
Ph: 22138 (O) 22134

Item No. 19

Anti erosion measures for preventing erosion of Sanedi Bund and Sharada Sagar Bund on the right bank of Sharada River

The Indian side informed the Committee that the physical model that was kept for observation had been dismantled in August 2005. The Indian side stated that the flood protection works in Nepal had further been extended, although the SCIP, in its

13th meeting , had decided that status quo be maintained. The Nepalese side stated that there had not been any such extension since SCIP's 13th meeting and only maintenance of the existing works had been undertaken.

The Committee decided that the Contact Officers should observe the actual site condition jointly and prepare a report and submit it to the respective Member Secretary.

The Committee also decided that a meeting at Member Secretary level would be convened in Sarda Headworks / Mahendranagar (Nepal) to visit the sites along the Sarda River.

Contact Officers:

Nepalese side: Chief, Division Office No 7, Dhangadi, Kailali.
Ph: +977-91-525048

Indian side: SE, V Circle, Baraily (UP)
Ph: 427119 (O) , 427120 (R)

Item No. 20

Erosion problem on left bank of Gandak River Downstream of the Gandak Barrage.

As the problem is internal to India, this Item has been dropped.

Item No. 21

Construction of Sekhwani embankment on the left Bank of Baghela river in District Maharajgunj (U.P.)

This item has been covered in Item No. 2, Annex II.

Item No. 22

Inundation Problem due to Shifting of Course of various Rivers between Bagmati and Kamala Rivers

Considering the proximity of the problem areas and recommendations from the present Contact Officers, the Committee decided to include additional Contact Officers from both sides, which are as follows:

Contact Officers:

Nepalese side: Chief, Division Office No. 2, Janakpur, Dhanusha
Ph: +977-41-525901-902 Fax: +977-1-525902

Indian side: 1) SE, Flood Control, WRD, Bihar, Darbhanga
Ph: 91-6272-40817 Fax: 6272-2224

Additional Contact Officers:

Nepalese side: Chief, Division Office No. 3, Parwanipur, Bara
Ph: ++ 977-51-524384 Fax ++977-1-5523528

Indian side: SE, Headwork Circle, WRD, Bihar, Sitamarhi
Ph: 91-6272-40817 Fax: 6272-22224

Item No. 23

Anti erosion measures for preventing erosion of right bank of Sarada River in Banbasa barrage area

The Indian side informed the Committee that there was a necessity of protecting right bank of Sarada River in the upstream as well as downstream of Sarada barrage at Banbasa for which a scheme had also been prepared. The Indian side requested the Nepalese side to make a review on the scheme and provide consent for the implementation at the earliest. The Nepalese side requested the Indian side for a copy of the scheme.

The Committee decided that the proposed field visit and meeting, as mentioned in Item 19 of Annex II would discuss various aspects of the scheme and take necessary steps.

Contact Officers:

Nepalese side: Chief, Division Office No. 7, Dhangadi, Kailali.
Ph: +977-91-525048 Fax:

Indian side: EE, Headwork Division, Bareily (UP)
Ph: 427119 (O), 427120 (R) Fax: ……..

General

The Committee stressed the need for quick implementation of the SCIP decisions and recommendations. It decided that meetings of Contact Officers, co-chaired by Member secretaries, should be held regularly. It agreed to identify key pending issues, for which the follow up measures would be directly supervised by the Member Secretaries. The two team leaders agreed to remain in regular contact to review progress on resolution of pending issues and deal with new problems.

The Committee recognised the need for development projects and flood protection measures in the border areas of both countries. It, however, emphasised better coordination between the two sides for exchange of information and consultation regarding public construction works undertaken in the vicinity of the border.

The meeting was held in a cordial atmosphere. Government of Nepal would host the next meeting in January 2007.

Signed at Patna on the 1st day of September 2006.

Sd	Sd
V.R. Sastry	N.P. Bhattarai
Chairman	Director General
Ganga Flood Control Commission	Dept. of Water Induced Disaster
Ministry of Water Resources	Prevention
Government of India	Ministry of Water Resources
Patna, India	Government of Nepal
	Kathmandu, Nepal

Source: Personal collection of the Editors and Contributors.

Annex 24

Letter of the Secretary Ministry of Water Resources to his Counterpart at the Ministry of Foreign Affairs, Government of Nepal on Lotan Rasiaval Khurd Bund, July 6, 2001

प.सं. : ०५७/५८ मितिः २०५३।०३।२२
च.नं. ११३

विषय : **लोटन रैसवाल खुर्द वण्ड सम्बन्धमा ।**

प्रिय सहकारीज्यू,
रुपन्देही जिल्ला सिद्धार्थनगर नगरपालिका क्षेत्र भई भारत तर्फ बहने डण्डा नदी (घोंगी) को दायाँ किनार स्थित लोटनदेखि रैसवाल खुर्दसम्म भारतद्वारा नेपाल भारत सिमानाको समानान्तर करिब १० कि.मी. बाँध २०४० साल भन्दा पहिले देखिनै निर्माण गरी सडकको रुपमा समेत उपयोग हुँदै आएको बुझिन्छ । यो बाँध नेपाल भारत सिमाको समानान्तर पूर्व पश्चिम निर्माण भएको देखिन्छ । यसको पश्चिम पट्टिको बिन्दु (End Point) भन्दा करिब ३.५ कि.मी. पश्चिमबाट दानव नदीको बाँया किनारा तर्फपनि अर्को वण्ड पहिले देखि नै निर्माण भई यी दुई बीचको उक्त करिब ३.५ कि.मी. भाग गत वर्षसम्म खुला रुपमा रहेको थियो । तर हाल सालै भारत सरकारले यो खाली भाग जोड्न वण्ड निर्माण गरिरहेको र यस वण्डमा तीन ठाउँमा पानी बग्ने संरचनाको निर्माण हुन लागेको स्थलगत निरीक्षणबाट अवगत भएको छ ।

उक्त अनुसार लिंक वण्ड निर्माण गरिएको कारण नेपालबाट सिमापारी खुलारुपमा बग्ने पानीको प्राकृतिक बहाव (Shet Flow) को बहाव रोकिनाले नेपाल तर्फ १८ गाउँहरु पिपरहवा, पिपरहवा टोल, भदौली, थुग्वहवा, भुरहवा, तरैनी, गुलरिया, बनगवा, मुडिला, मजिगवा, बनगाई, बरवासि, पिपरी, करौता, बन्सिडिह, हरवरहवा, पकडिहवा, गणेशपुरमा पानी जम्न गई डुवान समस्या उत्पन्न हुने देखिएको छ । नेपाल भारत संयुक्त डुवान समस्या समाधान कमिटी (Indo Nepal Standing Committee on Inundation Problem) को गत जनवरी ७ देखि १२, २००१ सम्म काठमाडौंमा भएको ११ औं बैठकमा भारतीय पक्षले उक्त समस्या प्रस्तुत गरेकोमा छलफल हुँदा दुवै देशका सम्पर्क अधिकृतहरुले संयुक्त रुपमा स्थलगत अध्ययन गरी मार्च २००१ सम्ममा संयुक्त प्रतिवेदन पेश गर्ने सहमति भएकोमा सो नगरी भारतबाट एक तर्फी रुपमा उक्त लिंक तटबन्धन निर्माण गरेको देखिन्छ । यसबाट यो निर्माण कार्य दुवै देश बिच भएको आपसी सहमती विपरित भएको स्पष्ट छ ।

यसर्थ उक्त तटबन्धको निर्माण कार्य नगर्न र त्यस क्षेत्रको प्राकृतिक निकासलाई पुरानै अवस्थामा कायम गर्ने सम्बन्धमा भारत सरकार समक्ष अनुरोध गर्न आग्रह गर्दछु ।

श्री सचिवज्यू
परराष्ट्र मन्त्रालय
काठमाडौं ।

द
लोकमानसिंह कार्की
सचिव

Source: Arjun Pd. Shrestha MS. Paudel, S.B.Regmi and S K Sharma, Report on Inundation Impact of Lotan Resival Khurda Dam on Nepalese Territory, Ministry of Water Resources, Government of Nepal, Kathmandu, Bhadra 2058 i.e. August/Septemeber 2001

Annex 24.1

Letter of the Embassy of India, Kathmandu to the Ministry of Foreign Affairs of Nepal on the Lotan-Rasiaval Khurd Embankment, August 1, 2001

Embassy of India
Kathmandu (Nepal)

No. Kat/ECW/3/2001

The Embassy of the Republic of India in Nepal presents its compliments to Ministry of Foreign Affairs, His Majesty's Government of Nepal and has the honour to refer to Note Verbale No., SA/63-68/3566 dated July 6, 2001 regarding the Lotan-Rasiaval Khurd Embankment.

As has been discussed in the Standing Committee on Inundation Problems between India and Nepal (SCIP) in its various meetings, including in its 11th Meeting held in Kathmandu in January 2001, the proposed Lotan-Rasiaval Khurd Embankment is part of the 47.5 km long Kura-Ghoghi embankment built in the 1950s. The proposed 12.5 km long new construction with a height of 2.2 meters is to fill the gap in and complete the old Kura-Ghoghi embankment. The Embassy of India has the honour to state that all construction activities at this site have been stopped on July 10, 2001.

According to the directive issued by the SCIP in its 11th Meeting, the Indian and Nepalese Contact Officers for this issue were to make a joint site visit and to report to the two secretaries by March 2001, which unfortunately did not materialise as the Nepalese Contact Officer did not participate in the meeting that was held on March 16, 2001 in Sunauli. The Embassy of India requests that a joint site visit by the two Contact Officers be held at an early date, preferably August 6 or 7, 2001.

The Embassy of the Republic of India in Nepal avails itself of this opportunity to renew to the Ministry of Foreign Affairs, His Majesty's Government of Nepal, the assurances of its highest consideration.

Embassy of India Stamped
Kathmandu, August 1, 2001

The Ministry of Foreign Affairs
His Majesty's Government of Nepal
Shital Niwas
Kathmandu.

Copy to HE Mr. Lok Man Singh Karki, Secretary, Ministry of Water Resources, Kathmandu

Source: Arjun Pd. Shrestha MS Paudel, S.B.Regmi and SK Sharma, Report on Inundation Impact of Lotan Resival Khurda Dam on Nepalese Territory, Ministry of Water Resources, Government of Nepal, Kathmandu, Bhadra 2058 BS (Agusut/September 2001).

Annex 25

Minutes of the High Level Nepal-India Technical Committee on Inundation Problems in Rupandehi (Nepal) Siddharth Nagar (India) and Banke(Nepal)/ Shravasti Districts (India) May 3-6 2002, Kathmandu

Pursuant to the mandate give at para 23 of the India - Nepal Joint Press Statement issued on March 23, 2002 on the occasion of the visit of the Rt. Hon'ble Prime Minster of Nepal to India, a High Level Nepal-India Technical Committee on Inundation Problems in Rupandehi (Nepal)/Siddharth Nagar (India) and Banke (Nepal)/Shravasti (India) Districts meet in Nepal from May 3 to 6, 2002. The Nepalese delegation was led by Mr. A. P. Shrestha, Executive Director, Water and Energy Commission Secretariat, His Majesty's Government of Nepal and the Indian delegation was led by Shri. M.L. Goyal Commissioner (Eastern Rivers), Ministry of Water Resources, Government of India. The list of the two delegations may be seen at Annexure I.

2. The joint Committee undertook an inspection of the areas of concern in Rupandehi / Siddharth Nagar on May 4 and 5, 2002 and subsequently held discussions both at Bhairahawa and at Kathmandu. Keeping in view the mandate given to the joint committee, the two sides agreed as under:

Rupandehi (Nepal)/Siddharth Nagar (India)

3. In order to resolve the problem of inundation in Nepal and India, it was decided that a joint survey of the area be undertaken from Marchawar Pump House in Nepal up to the Lotan-Rasiawal Khurd bund (LRK Bund) as follows:

    i) Department of Survey of His Majesty's Government of Nepal and Survey of India would undertake a Joint survey to establish three common Bench marks in the area at Marchawar Pump House, on a permanent structure on Lotan - Rasiawal Khurd Bund and at Boundary Pillar No. 32. This work would be completed before June 15, 2002.

    ii) A joint survey of the Bangain-Thumba Road from Marchawar Pump House in Nepal extending up to 1 kilometer beyond the LRK Bund in India along the Lotan-Nepal Sima Marg. This Joint Survey will be undertaken by the authorised representatives of the respective Departments of both the countries. The broad parameters of this Survey would Include - L section of the road and cross-sections at intervals of 200 meters extending up to 500 meters on each side (or up to the bank of the Dano river, which ever is less) of the road at every 25 metre intervals. The levels thus derived will be based on to the Common Bench Marks established.

    iii) Joint survey (L-section) of the existing LRK bund based on the common Bench Mark, shall be undertaken.

    iv) Joint River Survey of Dano /Kunhra rivers stretching from Lomtihawa village in Nepal to Rasiawal Khurd in India shall be carried out. The parameters of the joint survey would include the L-section of the river and

the cross-sections at intervals of 200 meters or at lesser intervals where there is a change in the course of the river.

v) The cross-sections of the river Kunhra (Dano) from Rasiawal Khurd up to one kilometer down stream of the Mohana bridge will be undertaken by the Indian side at intervals of 500 meters. Similarly, it was also agreed that the Indian side will undertake the cross-section of the Ghonghi river from the international border upto one kilometer downstream of the Lotan bridge at an interval of 500 meters. These cross-sections will be communicated to the Nepalese side. It was agreed that, if required, joint survey of the river Ghonghi would also be undertaken.

vi) The daily rainfall data recorded at the stations maintained by the Nepalese side including at the Marchawar Pump House station will be communicated to the India side during the monsoon period.

vii) With a view to mitigate the probable inundation problems of the villages on either side of the border, the following measures were agreed upon for the coming monsoon:

   a) The Nepalese side will keep the existing cross drainage works on Bangain-Thumba road open. The efficient working of the drainage outlets will be jointly monitored during the monsoon period.
   b) Both sides will jointly observe and record the extent of the flood situation by installing water level gauges at appropriate, easily accessible and mutually agreed places on either side of the border. These gauges will be marked with reference to the established Common Bench Marks. The observations will be conducted at six hourly intervals each day during the entire monsoon season of 2002-03.

4. The costs of all the joint surveys and observations referred to above will be borne by the respective governments.

Banke (Nepal)/Shravasti (India)

5. The two sides discussed the issue relating to inundation problems in the Banke/ Shravasti District. Both sides felt the necessity of a field visit before working out the modality and solution of the inundation problem of Banke and Shravasti districts of Nepal and India respectively. The site visit will be undertaken at a mutually convenient date before the coming monsoon.

Source: Personal collections of the Editors and Contributors.

Annex 25.1

Minutes of the 3rd Meeting of High Level Nepal-India Technical Committee (HLTC) on Inundation Problems in Rupandehi (Nepal)/Siddhartha Nagar (India) and Banke (Nepal)/Shravasti (India) Districts September 27-28 2004, Kathmandu

Pursuant to the mandate given at para 23 of the India-Nepal Joint Press Statement issued on March 23, 2002 on the occasion of the visit of the Rt. Hon'ble Prime Minister of Nepal to India, a High Level Nepal-India Technical Committee on Inundation Problems in Rupandehi (Nepal)/Siddharth Nagar (India) and Banke (Nepal)/ Shravasti (India) Districts was formed. The Committee met from May 3 to 6, 2002 in Kathmandu, Nepal and from August 11 to 12, 2003 at Lucknow, India.

The 3rd meeting of the HLTC was held from September 27 to 28, 2004 in Kathmandu. The Nepalese delegation was led by Mr. Uma Kant Jha, Executive Director, Water and Energy Commission Secretariat, His Majesty's Government of Nepal and the Indian delegation by Shri M.L. Goyal, Commissioner (Eastern Rivers), Ministry of Water Resources, Government of India.

The lists of the delegates are at Annex-I. and II. **(Not attached)**

The High Level Technical Committee recalled the mandate given to it in the Joint Press Statement of March 23, 2002, which reads as follows:

'The Nepalese side raised the problems of inundation in Rupandehi and Banke District. The two Prime Ministers directed the two sides to undertake a Joint survey at the level of Chief Engineers to clarify the facts on ground and work out agreed proposals by the end of April 2002 and undertake necessary measures before this coming monsoon so that there would be no adverse effects on the lives and livelihood of people on either side of the border. With regard to inundation in Banke, the decision taken earlier by the Joint Committee on Water Resources (JCWR) would also be taken into consideration'.

On this issue, the Committee also recalled the decision of the first meeting of JCWR, which reads as follows:

'It was noted that in pursuance of the decision taken by the two Prime Ministers in August 2000. joint inspections in Banke district of Nepal were carried out in August and September 2000, and the situation was closely monitored.

Some areas in India along the Rapti river in Shravasti district have been protected by construction of embankment. It was agreed in principle by India that the embankments along Rapti River for protection of Nepalese territory in Banke district shall be taken up on priority basis. For this purpose, joint survey will be done by the contact officers and proposal will be submitted for consideration of SCIP by December 2000.'

The Committee further recalled the decision of the 11th meeting of the Standing Committee on Inundation Problems (SCIP) held in January 2001 as follows:

"The Nepalese side handed over to the Indian delegates the proposal for the construction of embankment in the Rapti River. The members of the Committee made

a site visit on 9th January 2001 to some critical locations. The Committee agreed on the alignment of the proposed right embankment with minor modifications. The Committee also agreed on the alignment of the left embankment as proposed by the Nepalese side up to the Bhais Budhawa Nala from downstream. Regarding the remaining part of the proposed left embankment, the Committee decided that the alignment should be reviewed by the Nepalese side keeping in view the existence of the old course of the Rapti River nearby as well as the likely effects of the proposed right embankment and the final proposal with cost estimate be prepared accordingly.

Regarding opening of the Gandheli and Sotia Nalas, proposed by the Nepalese side, to drain the area surrounded by the proposed right embankment and the existing embankment constructed parallel to Indo-Nepal border in India, the Indian side proposed a drain along the embankment. The Nepalese side, however, stated that the existing watercourses of the two nalas be maintained. The Indian side agreed that the proposal of the Nepalese side would be considered if the proposed drain did not function satisfactorily to drain the water of the area affected".

Having taken into account the above directions and decisions, the Committee held extensive discussions and agreed as follows:

1. Review of Progress made since the First Meeting of HLTC

The Committee reviewed the progress of works identified during the first meeting of HLTC. The survey jointly carried out by field teams of the two sides and the data collected by them were taken note of and the survey drawings separately prepared by the two sides based on the above data were studied. The committee expressed satisfaction over the progress made.

2. Inundation problem in Banke (Nepal) /Shravasti (India) districts

The committee had undertaken a joint inspection of the areas in Banke / Shravasti districts on August 9-10, 2003 and visited the Kalkalwa embankment.

After extensive discussion of this issue and interpretation of the information collected, the Committee, in its 3rd meeting, came up with the following agreed proposals:

a. The construction of embankments on the Rapti river be taken up with priority on the lines of the decision taken at the 11th meeting of the SCIP for which proposals as required would be submitted by the Nepalese side in respect of Nepal portion and by the Indian side in respect of Indian portion (for extension of embankment up to Laxmanpur barrage). As regards the cost of construction of embankments on the Nepalese territory in Banke district, the Committee recalled the decision made at the first meeting of the JCWR in October 2000 in Kathmandu.
b. With reference to the functioning of the toe drain discussed under item No 13, Annex I at the 11th meeting of SCIP in January 2001, Nepalese proposal for an appropriate opening in the Kalkaiwa embankment made during the said 11th SCIP meeting, was discussed and it was agreed that appropriate unregulated opening be provided to allow natural passage of the Gandheli and Sotia nalas.

Works on the opening and the Rapti right embankment construction will be sequenced in such a way that the opening becomes operational once the right embankment is completed.

c. The above works shall be jointly monitored to ensure that they effectively comply with the decisions made.
d. Following steps were identified for arriving at the design discharge to determine the appropriate size of the proposed opening in Kalkalwa embankment.

i) Catchment /drainage area

This will be measured from the topographical maps to be provided by the Nepalese side.

ii) The estimate of design rainfall

The time of concentration of the area in question is to be estimated using available standard formulae. The time of concentration will give the indication on the duration of the design rainfall to be considered. The available rainfall data with Nepal and India was also discussed and it was agreed that the daily rainfall data of all the influencing rainfall stations in and around the catchment would be made use of in deriving the design rainfall. It was also agreed that average annual one-day maximum observed rainfall would be used in estimating the design rainfall. Both sides will exchange the rainfall data of all the stations available with them in and around the catchment.

iii) Runoff Coefficient

The third parameter for estimating the runoff volume is the estimation of runoff coefficient for the given area. In the absence of direct information available for runoff coefficient it was agreed to search the published literature and information for the region and adopt a mutually acceptable runoff coefficient for the given area.

iv) Estimation of Design Discharge

Using the above three parameters, a suitable mutually acceptable 'rational formula' will be used to arrive at the design discharge. Further an acceptable velocity considering the hydraulics of the downstream area will be used for working out the size of the opening under consideration.

A Joint Team consisting of three members from each side has been constituted for the above task as under.

Sr No	Indian Side	Nepalese Side
1.	Dr. D.K. Gupta, Chief Engineer, Saryu-I, Faizabad, Govt. of UP (Team Leader)	Shri S.K. Sharma, Dy. Director General, WIDP, HMGN (Team Leader)
2.	Shri R.K. Gupta, Director (Hydrology), Central Water Commission, New Delhi	Shri Keshav Dhoj Adhikari, SDE, Water and Energy Commission Secretariat
3.	Shri R.N. Pandey, Executive Engineer, SNK-I, Bahraich, Govt. of UP (Contact Officer)	Shri Rameswar Khadga, Chief, WIDP Div. No. 6, Nepalgunj

The above team would complete the assigned task by the end of November 2004.

3. Inundation Problem in Rupandehi (Nepal)/Siddharth Nagar (India)

In pursuance of the decision of first meeting of HLTC held in May 2002 the survey maps prepared by both the sides based on the joint survey were examined in detail and it was agreed that some of the maps require reconciliation and validation with level book data. For this purpose a joint team was constituted as follows:

Sr No	Indian Side	Nepalese Side
1.	Shri Shyam Lal, Superintending Engineer, Gandak Flood Circle, Basti, Govt of UP (Team Leader)	Shri SK Sharma, Dy. Director General, DWIDP, HMGN (Team Leader)
2	Shri Ram Sagar, Executive Engineer, Siddharth Nagar, Govt. of UP	Shri Puspa Lal Shrestha, Chief River raining Project DWIDP
3	Shri RK Gupta, Director (Hydrology), Central Water Commission, New Delhi	Chief, WIDP Div. No. 5, Bhairahawa

It was agreed that a joint visit to the site could be undertaken by the team as required. The requirement of further monitoring of the inundation problems including repositioning of the gauges, as required, would be taken up.

Both sides expressed their commitment to fully utilise the existing mechanisms to resolve inundation problems through, inter alia, regular meetings.

The Committee decided to hold its next meeting latest by December 2004, the date for which will be communicated through diplomatic channels.

The meeting was held in a cordial atmosphere of mutual trust and understanding, maintaining the commitment of both sides to identify mutually acceptable feasible solutions.

Sd.
U.K. Jha
Executive Director
Water and Energy Commission Secretariat
His Majesty's Government of Nepal

Sd.
M.L. Goyal
Commissioner (Eastern Rivers)
Ministry of Water Resources
Government of India

Kathmandu,
September 28, 2004

Personal collections of the Editors and Contributors.

Annex 26

Letter of Embassy of India, Kathmandu on Mahali Sagar to the Ministry of Foreign Affairs, Government of Nepal, March 14, 2003

Embassy of India
Kathmandu, (Nepal)

No. KAT/DCM/2003 March 14, 2003

The Embassy of India in Kathmandu presents its compliments to the Ministry of Foreign Affairs, His Majesty's Government of Nepal and with reference to the latter's Note Verbale No. SA/63-68/2167 dated 10th March, 2003 regarding Mahali Sagar, has the honour to convey the following:

i) Mahali Sagar was constructed in 1901. Agreement with Nepal was reached on this prior to the construction.
ii) The Sagar has two Escape regulators, one ungated at FRL 92.6 meters and the other gated with crest level at 91.6 meters.
iii) The gated regulator was damaged about 12 years ago.
iv) Information regarding the intention of India to repair the regulator was given to the Nepalese side and it was decided on 4th September 2000 between the contact Officers of India and Nepal to construct the gated escape regulator keeping the crest levels some as was in the old structure before damage.
v) The designs were approved by DIO, Kapilvastu on 4th December, 2002.
vi) With the change of the Contact Officer on the Nepalese side, it appers that the Indian side was informed to stop construction.

The Embassy would like to draw the attention of the esteemed Ministry to the fact that the gate repairs were being done as per levels existing before the damage and, therefore the repair work could not passible inundate any new areas. The Embassy would like to request the esteemed Ministry to inform it of the reasons for request by His Majesty's Government of Nepal for stoppage of the work of repairs of this more than hundred years old structure.

The Embassy of India avails itself of this opportunity to renew to the Ministry of Foreign Affairs, His Majesty's Government of Nepal the assurances of its highest consideration.

Ministry of Foreign Affairs,
His Majesty's Government of Nepal,
Sheetal Niwas,
Kathmandu

Source: Personal collections of the Editors and Contributors.

Annex 26.1

Media Statement of Embassy of India on Mahalisagar

Embassy of India
Kathmandu, (Nepal)

No. Kat/14/2004 March 15, 2004

The Mahali Sagar is a reservoir partly in India and partly in Nepal containing water of the *Masai Nala*. The parameters of the Sagar were mutually agreed upon in 1876 between the then Governments of India and Nepal. The reservoir has two escapes in Indian territory which allow the water to flow out – one gated and one ungated escape. The gated escape was damaged some years ago and a new gated escape was sought to be built. The design for the new escape was sent to the competent Nepalese authority for approval and it was so approved in December 2002. Shortly thereafter, the construction of the new gated escape was begun on the Indian side on the basis of agreed parameters.

As the Nepalese side had desired that more water i.e., 102 cumecs of water, should be discharged through the escape, the new escape was designed to contain 15 bays with the following agreed overall parameters:-

- Full reservoir level – 92.76 meters above mean sea level
- Crest level or level of the bottom of the regulator – 91.60 meter above mean sea level

Increasing the number of bays from the earlier 5 to 15 makes no difference to the extent and depth of the reservoir as that is controlled by the height of the escape which is unchanged. Construction of the escape was completed in April 2003. The laying of the slab above the escape is now in progress and it covers around 6 out of 15 bays. None of the gates have been installed on this structure so far. A representative of the Embassy of India has visited the site and verified these matters. The Contact Officers of the two sides have recently met on the site and verified the status of the construction.

Thus all the construction is being carried out on the Indian side in full view of the Nepalese side and with the approval of and under information to the competent Nepalese Government authority. At present, there are puddles of stagnant water on the Nepalese side in about 28 hectares of land of about 20 cms depth and in about 10 hectares of land in Indian territory.

During the non-monsoon or dry season, crops are raised extensively on the reservoir bed in the Nepalese side and at present, standing crops of wheat and mustard are to be seen on the reservoir bed in the Nepalese territory. Even in the monsoon season, paddy cultivation is practiced in large areas of the reservoir on Nepalese side as the amount of standing water in those parts is suitable for paddy cultivation. During the monsoon, the average depth of water in the reservoir is around 3.38 feet (1.16 m). No Nepalese village or habitation is within the limits of the reservoir.

The canal system from this reservoir provides irrigation to 158 hectares of land in Kharif season and 118 hectares in the Rabi season, on the Indian side.

There are 3 other sagars or reservoirs close to the Mahali Sagar which are governed on similar principles and under similar agreements as the Mahali Sagar. It appears that the Mahali Sagar alone has generated controversy because some of the land of the reservoir has changed its ownership around three years ago. Whereas this land was owned earlier by the former ruler of Shohratgarh on the Indian side, it was sold 3-4 years ago to persons living on the Nepalese side. The new owners, it appears, are trying to ensure that the reservoir is made non-functional so as to maximise their use of the land, which is already available to them for farming for 8 months of the year.

The Government of India believes that cooperation on issues of inundation and mutually beneficial use of water resources can only be achieved through informed discussion with the bilateral institutional framework established for the purpose. It is in this spirit that we intend to approach any existing or future issues that may arise between our two countries.

Source: www.south-asia.com/embassy-India/press_release_for_2004/15.2004%20-statement.Mahalisagar.doc

Annex 27

Press Release of the Embassy of India, Kathmandu (Nepal) on Laxmanpur Barrage, July 25 2000.

No. KAT/23/2000
July 25, 2000

1. We have come across several reports emanating in the media and other circles, which suggest that there has been large-scale inundation in the Banke District of Nepal due to construction of a barrage on the Rapti River at Laxmanpur in India. It has also been suggested that the barrage has been constructed in violation of international norms. The facts are different and are given below.
2. The construction of the Barrage on the Rapti at Laxmanpur village in Uttar Pradesh was undertaken as part of the Saryu Canal Project. The construction of the main barrage structure, along with the guide bunds, was completed way back in early 1990s. This barrage has not resulted in, and is not likely to result in, any inundation or submergence of villages on the Nepalese side. This is obvious from the following facts:

    - The Laxmanpur Barrage is located 8 kilometers downstream of the India-Nepal border; the submergence is well within Indian territory.
    - The barrage is a structure for diverting non-monsoon flows; it is not a storage reservoir, it allows for free passage of water during floods, and therefore, there is no question of increase in the water level or of consequent inundation during such periods.
    - It may also be noted that the pond level of the Barrage is RL 127.60 meters while the general ground level on the Nepalese side is of the order of RL 131 meters, which is higher than the pond level.
    - The barrage is not yet operational as its gates have not been lowered and, therefore, the question of any submergence being caused in Nepal due to operations of the Barrage does not arise.
    - The main Barrage structure and its right afflux bund, also located well within Indian territory, have been constructed as per internationally-recognised technical norms; for instance, the alignment of the afflux bund is more than Lacey's Perimeter at every place, thereby ensuring that there will not be any adverse impact on the river due to construction of the afflux bund and no inundation will be caused due to the structure.

3. It may be noted that there is a problem of flooding in this area, including flash floods in the river Rapti, on both sides of the border, which predates the construction of the Barrage and is unrelated to it. There is absolutely nothing to suggest that there will be any additional flooding on the Nepalese side due to the construction of the Laxmanpur Barrage or its right afflux bund.

4. All issues relating to the Laxmanpur Barrage and its afflux bund have been discussed in detail with Nepal in the Standing Committee on Inundation and other forums, including before construction was undertaken. All queries raised by the Nepalese side have been responded to.
5. The Government of India have also taken note of apprehensions that that [sic] the flood protection embankment constructed since November 1999 in Bahraich District of Uttar Pradesh may cause inundation or submergence within Nepal. It may be clarified that this newly-constructed stretch of flood protection embankment is located at considerable distance from the Laxmanpur Barrage and its right afflux bund. The Barrage and the embankment are not even inter-linked. The embankment is constructed entirely within Indian Territory. It is not constructed "on" river Rapti, as reported, but at a considerable distance from the river. About 8 Nepalese villages are located in between the river and the embankment. If flash floods were to occur in the river, these villages would be affected, whether or not there is an embankment on the India side. It may be also noted that the general ground level of these villages is about RL 135 meters or above, whereas the general ground level at the embankment is about RL 132 meters, which is lower than the level at which the villages on the Nepalese side are located.
6. It may be pointed out the during the joint field inspection conducted by experts of the two countries from 21 to 23 June, 2000, no submergence of any of the Nepalese villages was observed in the vicinity of the embankment (or of the Laxmanpur Barrage). The situation had remained unchanged when a team of officials from the Government of India visited the area of 12 July, 2000. There was accumulation of rainwater along the embankment but it was mainly on the Indian side.
7. However, the Government of India has taken serious note of the apprehension expressed by the Nepalese side that the newly-constructed flood protection embankment may obstruct the natural flow of a local "nullah" (Drain) at Santaliya. We are closely monitoring the situation and taking action to ensure that the natural flow of the local drain at Santaliya is unaffected. A toe drain, which will ensure that the drainage of the "nullah" at Santaliya is not blocked, is well under construction. The situation on the ground will continue to be monitored closely and steps taken to prevent any obstruction of natural flow of local "nullah" by the embankment.
8. The Government of India takes the Nepalese concerns of inundation seriously and is ready to address them. Differences on this issue should be resolved through dialogue and technical studies, in a constructive manner on the basis of facts as it behoves two countries like India and Nepal, which enjoy the friendliest of relations.
9. It may be pointed out that the Indian authorities also have at times reservations about embankments or other structures erected on the Nepalese side. For instance, the Nepalese side has taken up the work of construction of a 19.5 kilometer "bund" along the right bank of the Sarda river downstream of Banbasa Barrage, reportedly to protect the Dodhara-Chandni area of Nepal, without the

concurrence of the Government of India. The embankment constructed so far is, at many places, very close to the riverbank, if not on the riverbank itself. Due to the construction of this embankment, there has been disturbance in the river regime in its downstream reaches in Indian territory, causing erosion of Sanedi Bund and Sarda Sagar Bund and extensive damage of property in the Sarda Sagar dam area. Despite these serious concerns, the issue is being discussed in a sober and objective manner with His Majesty's Government of Nepal, without in any way affecting the excellent relations between the two countries.

Source: Embassy of India, Kathmandu

Index