Water Resources for Mutual Benefit- Nepal and India

Gyanendra Lal Pradhan

Abstract: The huge water resources including hydropower potential of Nepal may be mutually beneficial to both Nepal and India. Storage projects need to be developed to utilize the monsoon season flows to have regulated flow with multiple benefits such as irrigation, flood control, hydropower, etc. India will need an additional 200,000 MW of electricity by 2018. The cross border power trade will undoubtedly benefit both the countries. To exploit resources on mutually beneficial terms, we need to shift from "foreign policy" to "business mode," decreasing government engagements and increasing corporate relationships. Business to business initiatives will lessen any mistrust. Furthermore, water augmentation of the Kulekhani reservoir by pumping and constructing a high dam in the Jomsom area will significantly increase electricity generation in the existing plants.

Key words: Storage projects, flood control, regulated flow, hydropower export, India, Nepal

Introduction

Nepal and India by geography engage with each other in many spheres social, economic and political. Of all the engagements the two countries have to deal with, water resources and hydro energy are the most important. This is because water and hydropower is the most important natural resource that Nepal possesses, although most of it is yet to be exploited.

With more than 6,000 rivers and rivulets in Nepal, as per Hydro Solutions' estimates, the total hydropower potential of Nepal stands at around 200,000 MW against the popularly assumed, figure of 83,000 MW. The northern part of the country has numerous projects with high headworks, the mid-hill region has potentials for small and medium sized projects, and in the southern parts where 6,000 rivers merge to make the huge rivers like Mahakali, Karnali, Narayani and Koshi, there is a high possibility of generating hydropower through larger projects like Sapta Gandaki (600 MW), Pancheswor (6,400 MW), Karnali Chisapani (10,800 MW) and Sapta Koshi (3,500 MW). This potential (one million GW hour of electricity) is adequate to meet the total domestic and part of regional energy demands for many years.

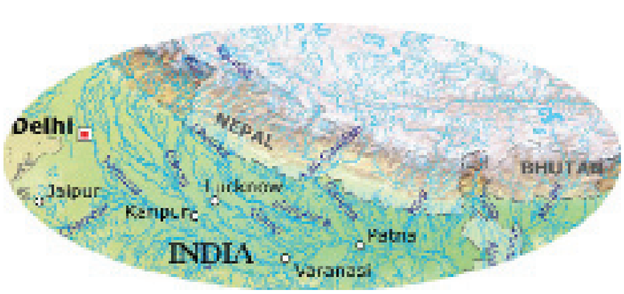

Figure 1. Rivers in Nepal and North India

Water cannot be regenerated. Less than 3% of the earth's fresh water is being used. Water has become a scarce resource. In 1995 the U.N. Food and Agriculture Organization (FAO) predicted that a serious risk of water becoming a casus belli in some of the arid parts of the world as populations expand, economies grow, and the competition for limited water supplies intensifies. Nepal has water abundance with an annual runoff of 224 billion cubic meter of water. The water available to a person is 20,000 liters per person per day. If 5,000 liters of water is available to a person in a day, all his water related needs

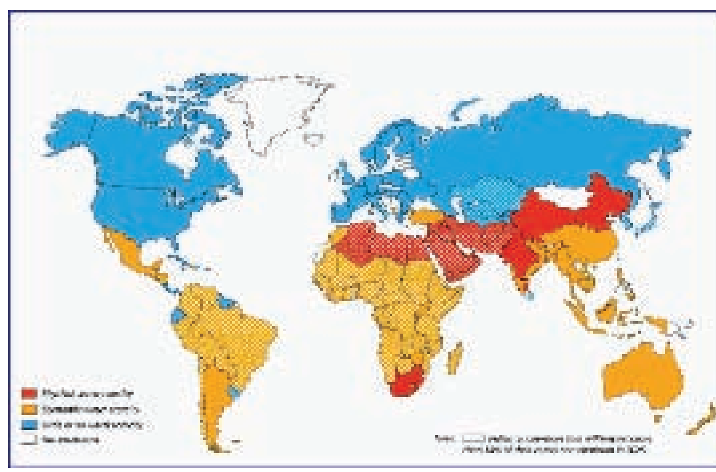

Figure 2. Global Water Scarcity Map

and chores can be achieved. About 70% of the waters in Nepal flow unregulated for four months of the year, to empty into salt seas in the Indian states, and getting polluted, adding up to a huge waste of this precious resource.

Changes in water levels in the sea, in rivers and lakes, in ice sheets and even under the ground has been one of the key consequences of global warming. As the climate changes, and in the context of rapid demographic growth, the importance of clean renewable power and clean water in the coming 10-30 years will be immense in the future (both at the domestic and regional front) which would need augmentation of the storage capacity for the available clean water. Water storage capacity of rivers of Nepal is 100 billion cubic meters, which is astounding in the region.

Because of the topography, Nepal and her southern neighbors would benefit immensely if this resource was 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 were properly harnessed, they would make substantial contributions to the socio-economic development of not only the people of Nepal but hundreds of millions of people living in the Gangetic belts of India and Bangladesh, as well.

Nepal and India enjoy an age-old relationship. Now, a new relationship has begun in the usage of clean water and hydro energy for the benefit of the region as a whole.

Nepal's Initiative

The first 500 KW Pharping powerhouse was established in 1911 AD in Nepal. In the past 99 years, about 560 MW of energy has been produced. But this figure cannot be referenced to determine the future because with Indian market opening in 2003 and Nepal opening in 1990, interest in hydropower has grown tremendously over the years albeit slowly.

Hydropower for Village Transformation

Hydropower is not only about energy production for productive sectors but also a powerful means of bringing in socio-economic transformation and development of villages. Completion of a single hydel project changes the economic and social landscape of villages. The poor as the target group can benefit from this because the socio-economic benefits from a hydropower project to the rural populace is extensive.

Flood Control

The flood months in Nepal are for four months, and the dry season lasts for eight months. Over 70% of the water during the flood months goes into the sea, gets polluted and remain unused. If this water is properly stored and used during the dry season when the water level recedes considerably due to low rainfall and low water flow, water can be significantly regulated to increase dry production. This is also associated with other multiple benefits, such as flood control in the country and adjoining Indian states like Bihar, increased regulated flow facilitating navigation and increased area under irrigation in lean season that open up the possibility of ushering in a new cycle of economic growth in the poverty stricken areas of the Ganges Basin.

The Sapta Koshi Multipurpose Project and Pancheswor Project (the centerpiece of the Mahakali Treaty signed in 1996) have not yet started to roll, after having been blocked for years due to mutual distrust. This is not sensible.

Energy Needs

Analyzing the Indian power sector, we see that an installed capacity is 134,925 MW, and an energy growth rate of 8-9% per annum. Due to a large number of thermal power stations and the low quality of coal, India has not been able to generate more than 86,000 MW. Nepal should establish transmission links with India as quickly as possible to cash in on the vast opportunity in the Indian market.

If we analyze the India's supply/demand situation by 2012, we see that the surplus power in the east and northeast regions is not adequate to meet the gap in demand. There is acute power deficit in northern India. India will need an additional 200,000 MW of electricity by 2018. The shortfall in northern region alone will be 14,000 MW by 2012, while the total shortfall will be 34,000 MW. In India, the negative effect is greater than 1.5% of GDP. Nepal's hydroelectric power can play a significant role to boost the economy of India.

Cross Border Power Trade: Both Countries Will Benefit

"Water has an economic value in all its competing uses and should be recognized as an economic good" (International Conference on Water and Environment, 1992).

By cross border power trade, Nepal will undoubtedly benefit but India will also benefit considerably in the exchange. After meeting its own domestic needs, Nepal can supply substantial power to India. Nepal's proximity to India is a big advantage. If Nepal could fasttrack projects to generate just 10,000 MW in 10 years, consume 2,000 MW itself and export the rest to India, it could earn US$2.4 billion a year. Furthermore, if Nepal is able to generate 25,000 MW of power within the forthcoming two decades, for its domestic consumption and export, it will be a long-term solution to all its power woes; the surplus can always be used as an attractive trading commodity to energize India's ever-growing power needs. Besides, building more hydel projects is not only for electricity but it will give chain impacts in both countries. If hydropower generation in Nepal is expedited, it would help in the industrial development of both Nepal and India.

What Should Nepal and India Do?

Nepal side

The Nepal Government has a big role to play in hydropower development. Hydropower is a highly capital intensive affair. The government's resources are not adequate for investments in big hydel projects; therefore, it needs increased private sector and foreign direct investment (FDI). Power projects in Nepal that are built by the private sector or through FDI are in effect projects being built for the government of Nepal, as this project will need to be handed over to the government within 30 years (at the end of the license period). This must be looked at as added benefits by the government. Foreign investors, including the private sector, however, would be more comfortable making the required investments if the government could provide some kind of assurance/ guarantee, in writing. This would help make investing in this sector more encouraging and agile.

Nepal should adopt a two-tier approach for the development of hydropower. Both catering to domestic needs and exporting power for meeting regional markets need to go hand in hand.

Nepal should target allocation of minimum 5,000 MW projects on a priority basis to start construction by 2010/11. For this we need to develop consensus to insulate economic decisions from evolving political process. Nepal should select many storage projects, like Budhi Gandaki A Project (600 MW), to regulate water to increase dry production. Further delay will only worsen the situation in the country.

There has to be single window mechanism for issues like land acquisition, etc. An investment friendly environment should be created in the country, without which investments cannot be guaranteed.

Plans	Period (AD)	Target (MW)	Generation (MW)	Percentage (%)
Before Plans	1911-1955	1.1	1.1	100
I	1956-1961	20.0	0	0
II	1962-1965	22.0	2.4	10.90
III	1965-1970	60.0	0.2	0.33
IV	1970-1975	40.3	11	27.29
V	1975-1980	59.0	15	25.42
VI	1980-1985	145.0	75.6	52.13
VII	1985-1990	107.0	10.1	9.43
VIII	1993-1997	320.3	20.6	6.43
IX	1997-2002	580.0	260.2	44.86
X	2002-2007	315.0	41.2	13.07
XI 3 Years	2007-2011	2115.0	70	3.30
	Total	**3784.7**	**634.0**	**16.75**

Table 1. Targets of Past Periodic Plans

The power generation during the 10th Five Year plan has remained far below the target. As a result, we are now facing the energy crisis. As can be seen from the Table 1, planning has always been good but due to weak monitoring mechanisms/arrangements, generation has suffered. If we do not act today, the problem will be more severe in coming years. A coordinated approach between the Ministry of Energy, the National Planning Commission, and other stakeholders is urgently required.

Combating load shedding in Nepal

The energy crisis is a major problem faced by the nation today. The effects of the shortage of energy has seriously crippled all sectors of the society; its negative consequences have had a ripple effect on education, employment, and environment. Hydroelectric rich Nepal has a whopping 17 hours per day of load shedding for parts of the year. Demand-Side Management (DSM) efforts adopted to reduce energy consumed for lighting, which represent a significant proportion of total electricity demand at the peak load times, have helped reduce electricity flowing through upstream networks, thus reducing losses and freeing up generation output for other productive uses. Electricity produced by the Nepal Electricity Authority (NEA) from the Middle Marshyangdi Project currently cost US$5,000/KW. The current demand of electricity in the nation is about 840 MW and there is deficiency of about 450 MW. If the NEA was able to convince 25% of its household consumers to use fluorescent lamps, it could save around 50 MW.

During the months of December and January, the demand for electricity reaches a peak point, but the supply remains at its lowest ebb. The NEA distributes just 450 to 490 megawatt of electricity in these two months, whereas demand stands at ~800 MW. The DSM efforts through the use of compact fluorescent lights (CFLs) in Nepal has been a successful campaign to save a significant 50 MW of power to date.

Load shedding occurs during both the wet season and dry seasons. To meet the power needs of the country, power import from India is the first option. Besides this, there are other ways by which load shedding can be minimized. During the wet season, load shedding can be minimized through optimization of present power plant capacity (design vs actual generation), of the both NEA and Independent Power Producers (IPPs). For example, the Khimti HPS (60 MW) capacity can be augmented to 100 MW. Buying excess energy available with the IPPs can also contribute to the energy needs during the wet season.

During the dry period, due to receding water levels and the related/associated underutilization of power plants and low utilization factors, energy becomes very expensive. Load shedding during the dry season can be minimized through water regulation enhancement (design vs. actual generation); increasing the storage capacity (pumped storage hydroelectricity facility). For example, it might be possible almost to double the generation of the Kulekhani Nos 1, 2 and 3 HPS by pumping water drawn into the Kulekhani storage reservoir. The diversion of the surplus Bagmati river water from Kathmandu valley to Kulekhani reservoir could be a very simple and at the same time cost effective proposition. Upstream regulatory dam construction is another option. For example, by constructing a dam in the Jomsom area in Mustang District, Kaligandaki A (installed capacity 144 MW, whose electricity generation capacity goes down to as low as 40 MW during the dry season) could significantly increase its generation capacity in the dry season. And, as mentioned above, import from India is also essential.

India Side

Hydropower is the key to economic prosperity and stability of both the countries. Indian IPPs can play a key role for hydro development in Nepal if they are provided a level playing field.

For the sale of power by IPPs in Nepal to India, India should have realistic and balanced approach to protect the long-term interests of all stakeholders and push for building high voltage cross border transmission corridors by addressing grid compatibility issues. India should strengthen Business to Business (B2B) initiatives in both countries. This is the key to eliminating suspicion and negative thinking on both sides.

S.No.	Description	Production Capacity (MW)	Benefit Sharing
1	Pancheswor (Mahakali)	6400	Electricity, Irrigation, Flood Control and Others
2	Karnali (Chisapani)	10800	Irrigation, Flood Control and Others
3	Saptakoshi High Dam	3500	Irrigation, Flood Control, Water Transportation and Others
4	Sunkoshi-Kamala Diversion	55	Irrigation

Table 2: Multipurpose Projects (Nepal-India Joint Project)

The Way Forward

People who remember the blackouts and load shedding of yesteryears have a reason to worry. Thanks to inadequate planning and misplaced priority, in the next few years' time Nepal could face a situation worse than today if it continues to do the same.

Political instability, inadequate institutional capacity, and lack of a competent and transparent regulatory mechanisms are other factors. Red tape and policy ambiguities also serve as hindrances in attracting foreign direct investment as well as domestic investment.

The formulation and implementation of hydropower projects in Nepal have been discouraged in the past in the name of safeguarding national interest. Nepal and India should not repeat the same mistakes. First, policy stability and political stability should be maintained. Second, long term national strategies for export-oriented hydropower development and genuine mutually beneficial partnerships should be developed.

Bhutan's model may be useful in the case of Nepal, too. Project agreements should be based on selling electricity, not on the sharing of water. India and Bangladesh are two major viable markets for Nepalese hydropower. The role of India is critical. Emphasis should be on implementation of the projects based on the concept of Build, Operate, Own and Transfer (BOOT).

Hydropower development has to be a multi-pronged approach with all the players demonstrating unity as well as coordination. In order to capitalize on Nepal's hydro opportunities, a modern outlook is required. There is a need to engage directly with the emerging Indian market. There also is a need to change from the "foreign policy" mode to a "business" mode, to help build and strengthen corporate relationships, and thus minimize government engagement, and strategies to explore and harness new opportunities in India's open market.

In short, we need to treat hydropower as a commodity, not just for export but also for our own growing domestic use. We need to delink power from geopolitics, and governments must leave the business of business to business.

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Gyanendra Lal Pradhan, *hydropower specialist and entrepreneur, is an Electrical Engineer by training. He is currently Executive Chairman at Hydro Solutions, Director of Butwal Power Company, Chairperson for Nepal Hydro & Electric Ltd. (NHE) and Khudi Hydropower Ltd. He is also the Executive Member of the Independent Power Producers' Association, Nepal (IPPAN), Federation of Nepalese Chambers of Commerce & Industry (FNCCI), Nepal India Chamber of Commerce &Industry (NICCI), Nepal German Chamber of Commerce & Industry (NGCCI), and Nepal China Chamber of Commerce & Industry (NCCCI). Mr. Pradhan has received the prestigious Best Entrepreneur Award, won the Manager of the Year 2006 award, and has been conferred with other recognitions for his contributions to the field of hydropower and clean energy.*

Corresponding address: gyanendra@hydro-solutions.org