



Hydropower-based collaboration in South Asia: The case of India and Bhutan

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ABSTRACT

India's increasing growth in GDP, which rose from 3.7% annually in 1961–7.9% annually in 2015, has resulted in a rising demand for energy that almost doubled between 2000 and 2015. This trend is expected to continue due to urbanization, industrialization, and expansion of domestic manufacturing, encouraged by the Make in India initiative. A framework that considers a long-term road map for energy security is necessary to transform India from a country of chronic power shortages to one with reliable sources of energy. Elements of this framework include a sustainable energy mix, stronger reliance on green energy sources like hydro, solar and wind power, less dependency on coal, and strengthened cooperation on energy trade with neighbouring countries in South Asia. This paper discusses the long-term transboundary energy collaboration between India and Bhutan and the benefits for India in terms of diversification of energy sources and overall energy security. By assessing reciprocal benefits for India, we attempt to substantiate our claim that the India-Bhutan energy collaboration is strongly based on the principle of mutual benefits that extend to overall security. Cooperation between India and Bhutan is unique rather than a model in the region mainly due to mistrust and geopolitics.

1. Introduction

South Asia, comprising Pakistan, India, Nepal, Bhutan, Bangladesh, Sri Lanka and Maldives, is the fastest-growing region in the world with approximately 25% of the global population. Rapid economic and social growth has meant that the region requires continuous and reliable supplies of energy that respond to the demands at the national levels.

All countries in the region face serious challenges to achieve energy availability. These include increasing energy deficits, energy portfolios that rely mostly on a single type of fuel, high dependence on traditional fuels, limited exploitation of renewable energy resources, rising import dependence, and lack of energy infrastructure (SAARC Secretariat, 2010). Most important, 13.5% of the 1.744 billion people in the region still live in extreme poverty, making initiatives that support economic growth and poverty alleviation essential. Energy availability has the potential to contribute toward these ends (Srivastava and Misra, 2007).

Energy demand in the region is expected to increase at a compounded annual rate of 5% between 2010 and 2020, including natural gas, crude oil and coal. Among the commercial energy sources, electricity is expected to have the fastest growth in demand, at around 9%. Table 1 shows the electricity supply and demand in SAARC (South

Asian Association for Regional Cooperation) countries. Demand far surpasses the installed capacity in all these countries.

There is a wide variation in the potential of harnessing domestic energy resources and energy demand among individual countries in South Asia (Wijayatunga and Fernando, 2013). In terms of hydropower, for instance, Nepal has a theoretical potential of 83,000 MW, out of which at least half (close to 43,000 MW) is said to be commercially and technically viable (CII and IPAN, 2006; Shukla and Sharma, 2017). Similarly, Bhutan has an estimated hydropower development potential of 30,000 MW (Wijayatunga and Fernando, 2013; SARI/EI, 2014). Both Nepal and Bhutan have limited domestic demand for electricity which opens many doors for export-oriented hydropower development to cater to markets like India, Pakistan and Bangladesh that host large populations and an expanding industrial sector without having sufficient resource endowments to meet future energy requirements (Shukla and Sharma, 2017).

Collaboration among the countries in the region for inter- and intra-regional energy trade has been identified as the most cost-effective way to address growing demand, including increasing energy supply and diversifying energy sources (World Bank, 2008; SAARC Secretariat, 2010; Rahman et al., 2011). At present, energy trade in South Asia is

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Table 1
Electricity supply and demand in SAARC countries (South Asian Association for Regional Cooperation) (2013–2014).

	Installed generation capacity (MW)	Peak demand (MW)	Generation (GWh)	Demand (GWh)
Afghanistan ^a	620	700	880	3890
Bangladesh	9821	9268	42,195	36,233
Bhutan ^a	1510	282	6750	1640
India	237,742	129,815	957,734	802,567
Maldives	141	N/A	290	270
Nepal	787	1200	3558	3448
Pakistan ^a	22,860	23,953	92,860	76,860
Sri Lanka	3362	2164	11,962	10,632

Source: Annual reports from respective ministries, departments and utilities. In: [Wijayatunga et al. \(2015\)](#). Cross-Border Power Trading in South Asia: A Techno Economic Rationale, South Asia Working Paper Series No. 38, Asian Development Bank.

^a Data from the year 2011/12.

limited to India and Bhutan, India and Nepal and India and Bangladesh ([USAID, SARI/EI, IRADe, 2017](#)). Trade in petroleum products is mostly between India and Nepal, Bhutan, Bangladesh and Sri Lanka. Increased electricity trade would be based on greater political will and trust, a regional power market, energy supply availability, energy trade infrastructure and mutually-agreed legal and regulatory frameworks as well as effective dispute settlement mechanisms ([Wijayatunga and Fernando, 2013; Shukla and Sharma, 2017](#)).

Increased energy trade would result in numerous benefits on electricity supply costs, installed generation capacity, electricity generation and cross-border transmission capacity in the region. For example, electricity generation capacity in Bangladesh, India and Pakistan, mostly fossil fuel-based, could be replaced with increased hydro capacity in Bhutan, Nepal and Afghanistan ([Islam and Khan, 2017; Timilsina and Toman, 2016](#)). Associated policy, legal and regulatory, political, commercial and legal uncertainties could be mitigated through bilateral agreements ([Wijayatunga, Chattopadhyay and Fernando, 2015](#)).

Given that the countries in South Asia have vast renewable energy potential, development of hydropower and cross-border interconnections have become distinct possibilities to encourage development opportunities ([ADB, 2015](#)). Contribution of hydroelectricity to total commercial energy is approximately 50% in Bhutan, 17% in Nepal, 13% in Pakistan, 6% in India and 4% in Afghanistan. In terms of contribution to the total electricity supply, this is 100% in Bhutan, 92% in Nepal, 33% in Pakistan, and 17% in India ([Mukherji et al., 2015](#)).

In the region, India provides one of the largest markets for energy import. It has the world's fastest-growing economy and was ranked third in the world after China and the United States in total energy consumption in 2013 ([US Department of Energy, 2016](#)). Domestic projections show an estimated annual growth of 7.4% between 2012 and 2047 ([NITI Aayog, 2015a](#)). This is bound to generate a larger demand for energy with serious implications for water, food and environment security. Concurrent with its projected rise in share of world energy consumption is India's global commitment to deploy renewable energy sources and replace traditional fuels with alternative energy resources ([Planning Commission, 2006; NITI Aayog, 2015b](#)).

The Government of India is taking steps to provide clean energy as a key component of its programmes on socio-economic development and poverty alleviation, including universal electrification by 2022 ([NITI Aayog, 2017](#)). The country has also initiated the RE Roadmap Initiative to facilitate development of a future power system that encompasses a combination of renewable energy sources to respond to the future energy needs ([NITI Aayog, 2015b](#)). According to the Draft Electricity Plan released by the Central Electricity Authority, the apex government body handling power generation, no new thermal power plants will be installed before 2027 besides the ones already under construction ([Central Electricity Authority, 2016a](#)). The objective is to accelerate the

use of low-carbon-emitting technology, focusing on solar and wind power generation, biomass and hydropower ([NITI Aayog, 2015b](#)), resulting in reliable, cheap and clean energy. These are greatly needed to alleviate poverty and aim to achieve sustainable economic growth.

At the same time, there is a growing recognition of the role of foreign policy, especially with respect to its neighbouring countries, in securing India's energy future in terms of availability, accessibility and affordability of energy resources for its present and future needs ([Planning Commission, 2006](#)).

In spite of the potential for collaboration among the countries, South Asia is a region that is mired in political complexities and historic rivalries, hindering regional cooperation ([Lama, 2007; Dhungel, 2008; Singh, 2009](#)). The Ganga-Brahmaputra-Meghna basin is the second largest hydrological system in the world covering over five countries – India, China, Bangladesh, Bhutan and Nepal and contains the largest concentration of the world's poor ([Biswas, 2001; Mukherji et al., 2015](#)). It remains one of the most underdeveloped regions largely because resources have not been utilized to the maximum possible for benefits for all riparian parties ([Ahmad et al., 2001; Biswas and Uitto, 2001](#)).

In this context, the case of India and Bhutan stands out as perhaps the only example in the region where a forward-looking perspective on water and energy issues have resulted in positive outcomes for both the countries. Given Bhutan's “middle path” approach to development [exemplified by its vision of achieving *Gross National Happiness* ([Royal Government of Bhutan, 2009](#))], its shared historic and cultural ties with India as well as small-sized economy and population, collaboration between the two neighbouring countries may be considered unique, instead of a representative or replicable model of diplomacy. Six decades of diplomatic relations and more than three decades of inter-governmental cooperation on hydropower have helped strengthen the positive bilateral relationship ([Ministry of External Affairs, 2012](#)).

It is argued that such collaborations reap smaller gains for larger countries like India, in relation to the gains for smaller neighbours like Bhutan ([World Bank, 2010; Biswas, 2012](#)). While in absolute terms this holds true, we argue that the benefits for India of this collaboration are very significant. We discuss this in detail in [Section 4](#) on benefits of India-Bhutan hydropower-based collaboration.

Additionally, the strategic importance of Bhutan for India is immense: the countries share strong economic linkages; Bhutan acts as a buffer zone between India and China, which otherwise would have to share additional 6000 km border; Bhutan has lent support to India in numerous occasions, including security treats in the case of the Indian northeast states ([Personal communication, 2015, 2016](#)). They have represented landmarks for the close collaboration of both the countries in maintaining peace and security in the region, including energy security. We analyse these issues in depth elsewhere ([Saklani, Tortajada and Biswas, forthcoming](#)). Examining such dimensions is crucial in untangling complex foreign policy choices that are intimately tied with opportunities, and explaining whether and how water and energy can serve as catalysts for regional development.

In the following sections, we discuss India's current energy scenario, focusing on its underexploited hydroelectricity sector. It sets the stage for understanding the importance of hydropower collaboration between India and Bhutan, including benefits beyond energy imports that present a strong rationale for Indian investments in Bhutan's hydropower sector. Analysis of the benefits for both the countries include the findings of fieldwork carried out in the two countries in different periods in 2015 and 2016. Finally, the paper concludes with a reflection on the potential of electricity imports in meeting present and future domestic energy requirements, not only in India but in the region, in an overall context of security.

2. India's energy scenario – an overview

Energy development is vital for India's economic growth. The period between 1990 and 2013 saw an impressive increase in gross national

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