



## Hydropower as a catalyst for regional cooperation in South Asia

Much has been discussed about the potential that hydropower has to foster socio-economic development in countries in South Asia, mainly among Bangladesh, Bhutan, India and Nepal, also known as the BBIN countries. Given the vast renewable hydropower potential of Bhutan and Nepal, development of hydropower and cross-border interconnections have the potential for the four countries to improve energy supplies, promote navigation, alleviate floods and encourage connectivity, and add significantly to socio-economic development. Improved regional cooperation can benefit the millions of people in the region who live in extreme poverty and whose lives can be improved with initiatives that support economic growth (Dhakal et al., 2019b; Srivastava & Misra, 2007).

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 the growing demand for energy, including increasing the supply and diversification of sources (Rahman et al., 2011; SAARC Secretariat, 2010). At present, energy trade in South Asia is limited to India and Bhutan, India and Nepal, and India and Bangladesh (United States Agency for International Development (USAID), 2017). Collaboration has been encouraged with regional cooperation, first with the SAARC framework (South Asia Subregional Economic Cooperation, 2016) and then with BIMSTEC (<https://bimstec.org/>).

Countries in the region share strategic interests that go beyond hydropower development and which include development cooperation, political stability and good neighbourly relations. One example is Bhutan and India, where Bhutan's economy is tightly tied to its political relations with India, just as India's energy security needs (mainly in the northern states) are significantly fulfilled by Bhutan. 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; and Bhutan has lent support to India on numerous occasions, including security treaties in the case of the Indian north-east states. They have represented landmarks for the close collaboration of both countries in maintaining peace and security in the region, including energy security (Tortajada & Saklani, 2018). Examining technical but also political dimensions is crucial for understanding complex relations that are intimately tied with opportunities for cooperation on mutually beneficial areas.

This special issue includes papers presented during a workshop organized by the Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore, and the International Centre for Integrated Mountain Development (ICIMOD) in Kathmandu, Nepal. The papers were reviewed by the authors in the light of comments received during the workshop, and then peer-reviewed before being published. The special issue also includes papers submitted separately, but which are a valuable contribution to the topic of hydropower collaboration in South Asia. This publication is part of a project on Bhutan–India hydropower regional development supported by the National University of Singapore.

The papers in this special issue discuss the potential of electricity trade for hydropower development in South Asia from the technical and political viewpoints. Both aspects are of utmost importance for the realization of hydropower development, grid connectivity, promotion and establishment of an energy market, and the necessary regulations within a framework of long-term collaboration in the region. The authors who have contributed to this special issue agree that meeting electricity demand at present and in the future is feasible if there is proper planning of infrastructure development for hydropower integrating it with other energy options, that there are effective financial mechanisms to develop hydropower, that sufficient regulations can be developed, and that grid connectivity and also the promotion and establishment of an energy market are possible. A major concern is that politics can hinder progress affecting the four countries and their populations.

The introductory paper by Vaidya et al. (2021), on 'The future of hydropower in South Asia', presents a framework for the risk-analysis of sustainable hydropower, and reviews the relevant literature to present insights into the future of hydropower. The paper argues that while hydropower will be important in South Asia's energy mix, the extent of hydropower development will depend on several risk factors, including the cost of alternative energy sources, climate change, the environmental sustainability of hydropower and social issues of equitable development. With the cost of alternative clean energy sources such as solar and wind decreasing, and the environmental and social equity questions being raised, the role of hydropower may be less than many expect, but it will remain important in the energy mix, and importantly, can play an important role in stimulating alternative energy sources. The paper offers appropriate measures to be taken by governments, civil society and the private sector to manage the risks, facilitate efficient capital markets and honour societal values so that hydropower will become a catalyst for proliferating economic growth and low-carbon energy development in South Asia.

The second paper by Timilsina (2018), on 'Regional electricity trade for hydropower development in South Asia', discusses the importance of hydropower development in the region as well as that of cross-border transmission interconnections and regional electricity trade. It also quantifies the potential of hydropower development and trade under alternative scenarios. The findings of the study indicate that an unconstrained cross-border electricity trade provision would expand hydropower capacity by 2.7 times over the next two decades. In addition, that a moderate carbon tax imposed on the power sector in addition to the regional trading facility would result in an increase in hydropower capacity by more than three-fold by 2040. The caveat, as mentioned by the author, is that regional cooperation in general, and the above achievements in particular, depend on political leadership, which can be unpredictable in a region with a long history of geopolitics.

Following this line of thought, the next two papers by Haran (2018) and Pillai and Prasai (2019) discuss policies and politics of hydropower development and cooperation in South Asia. On his analysis, Ambassador Haran discusses 'Water and hydropower cooperation in BBIN countries: policies and way forward' and argues that, in spite of the enormous potential for cooperation among the BBIN countries, the inability to achieve cooperation even in mutually beneficial areas has been due, to a large extent, to political and emotional reasons. He also discusses that lack of progress within the SAARC framework has been primarily due to political concerns between India and Pakistan. However, for him, the BBIN represents a more conducive framework for the four countries to collaborate on hydropower development and cross-border energy trade. A similar argument is supported by Pillai and Prasai (2019) in 'The political

economy of electricity trade and hydropower development in eastern South Asia'. They argue that progress in both electricity trade and hydropower development in the region can be hindered by mixed demand signals and the turbulence of geopolitics. The authors discuss the health of distribution companies in India and governance aspects that predetermine their decisions; the role of hydropower in India's ambitious intention to increase the installed capacity of renewables; Bangladesh's power crisis and import dependency; and the governance of regional electricity trading arrangements.

The fifth paper by Vaidya et al. (2019), on 'Electricity trade and cooperation in the BBIN region: lessons from global experience', reviews four cases of regional power trade and cooperation and experiences that could be valuable for the BBIN region. These are the Greater Mekong Subregion (GMS) energy programme; the Central American Electricity Interconnection System (SIEPAC); the South African Power Pool (SAPP); and the Nordic power pool (Denmark, Finland, Norway and Sweden). They identify key elements in terms of policies, institutions (national and supranational) and infrastructure in each case study and discuss what the BBIN countries could learn from them. Based on the study, immediate actions are suggested for countries in the region. Key messages of the paper regarding the BBIN countries include the implementation of the open access policy on transmission grid networks for transit to a third country; the expedition of power sector reforms in all the countries; the provision of access of existing power exchanges to all countries; a permanent regional coordination centre to manage decision-making processes; and the engagement of external support to finance technical studies, capacity-building and infrastructure.

The sixth paper by Rasul et al. (2019), on 'Beyond hydropower: towards an integrated solution for water, energy and food security in South Asia', discusses the fact that the hydropower projects that have been planned or are under construction in upstream areas of Bhutan, India, Nepal and Pakistan are often designed for electricity production without full consideration of the co-benefits that could be generated for both up- and downstream riparian populations if better planning and collaboration were considered. The authors suggest that reservoirs in the Himalayas would help to bring more agricultural land under irrigation, and also help to sustain the existing canal irrigation systems, which are declining due to a shortage of water in the dry season. In terms of navigation, the development of waterways provides a basis for subregional connectivity for Bangladesh, Bhutan, the north-eastern states of India and Nepal. This would contribute enormously to open opportunities to improve transportation and trade.

The seventh paper by Ogino et al. (2020), on the 'Effectiveness of hydropower development finance on Bhutan and Nepal', analyses the financing approaches for hydropower projects that are feasible in both the countries but which are under geopolitical constraints. They discuss that while Bhutan and Nepal have significant hydropower potential, there are clear differences in the way they have approached their development, the external funding sources at the country level and the outcomes obtained. For example, Bhutan has accelerated hydropower development, but Nepal has been just the contrary; Bhutan has benefitted from surplus power generation and export revenues, but Nepal has suffered from power shortages and import deficits; and Bhutan has attracted external finance to large projects for power export, but Nepal has failed to plan and use external funds from donors and private investors, resulting in small projects limited to domestic consumption. Financially speaking, the lessons learnt from the study point towards the need to prioritize strategically to select and consolidate international funds.

The eight paper by England and Haines (2018), on 'Topography and the hydraulic mission: water management, river control and state power in Nepal', is historical in nature. The authors examine the role of the Nepali state in water management over time and space and present a long-term analysis of the development of water management, governance and hydropolitics in the country. They start their analysis in the 1800s, the period of Rana rule, when state water management was concentrated in the Kathmandu valley. They then move to the modern period, from 1951 to 2018, when legal frameworks for water management were introduced and established, there was a rapid rate of public canal irrigation construction in the Terai, participatory processes were introduced, and the hydraulic mission was consolidated. They also study the 1990s, when a consolidating hydraulic mission translated into hydropower development. The authors argue that over time, topography has played a determining role in the application of state power and water control through infrastructure development.

The ninth paper by Pakhtigian et al. (2019), 'The role of hydropower in visions of water resources development for rivers of Western Nepal', discusses the role of hydropower in the visions of water resources development for rivers of western Nepal with a focus on the Karnali and Mahakali river basins. They identify three main visions of development in western Nepal: state-led development, demand-driven development and conservation of ecosystem integrity. The analysis emphasizes water-use trade-offs, including those resulting from national priorities such as infrastructure-based hydropower and irrigation, from local drinking water demand, and from environmental conservation concerns. The authors conclude that while the visions of water resources development diverge, common trends appear, including the acknowledgement of water management's role in expanding energy access and increasing agricultural productivity.

The last paper by Dhakal et al. (2019a), on 'Cross-border electricity trade for Nepal: a SWOT-AHP analysis of barriers and opportunities based on stakeholder's perception', identifies the key limitations and opportunities for cross-border electricity trade and provides insights into the possible strategies for Nepal. This would require issues such as reform in the electricity sector aimed at abolishing monopoly power generation and trading, introducing competition wherever possible, political will from India so that Nepal and Bangladesh can access the Indian transmission network and trade directly, among others. The authors conclude that the most feasible opportunity for Nepal is the growing demand for electricity in India and Bangladesh, and the regional and global interest for renewable sources of energy, both of which can be provided by Nepal.

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