

# MP-IDSA *Commentary*

## India-Bhutan Hydropower Cooperation

*Ishaani Singh*

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### **S***ummary*

The India–Bhutan hydropower partnership has fostered regional interdependence and mutual benefit.

Bhutan possesses considerable untapped hydropower resources, estimated at over 23,000 MW of technologically and economically viable capacity. As of 2024, its installed hydropower capacity stood at approximately 2,326 MW, a substantial portion of which has been developed through collaborations with India.<sup>1</sup> Hydropower is a cornerstone of Bhutan's economy, constituting a major share of its Gross Domestic Product (GDP) and export revenues. The sector constitutes approximately 20 per cent of the Bhutanese economy.<sup>2</sup> Hydropower also accounts for 63 per cent of Bhutan's total export revenues.<sup>3</sup>

India's energy requirements are substantial and continually growing, driven by its expanding economy and increasing population. While India is actively pursuing diversification of its energy portfolio, including a significant emphasis on renewable energy development, hydropower sourced from neighbouring countries like Bhutan offers a clean and dependable energy source, particularly valuable during periods of peak demand.<sup>4</sup>

India invests in Bhutan's hydropower projects, receiving clean, reliable energy in return. Power from projects like Chukha, Tala and Mangdechhu benefits eastern and northern Indian states. The import of hydropower from Bhutan not only assists India in meeting its escalating energy needs but also aligns with its climate change mitigation objectives.

In 2021, the electricity trade volume between India and Bhutan reached approximately 5,600 GWh. The ongoing and planned hydropower projects in Bhutan, supported by Indian investment and technical expertise, are poised to significantly augment this cross-border energy exchange.

India–Bhutan hydropower cooperation is structured through intergovernmental agreements and prioritises long-term partnerships for the development and operation of hydroelectric projects.<sup>5</sup> India and Bhutan's energy cooperation features reciprocal benefits, with India providing financial and technical aid, and Bhutan supplying clean energy. Financing models have shifted towards loans, compared to earlier grant-dominated structures.

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<sup>1</sup> [\*\*“Hydroelectric Power Projects with Aggregate Capacity of 15 GW Under Construction”\*\*](#), Press Information Bureau, Ministry of Power, Government of India, 5 April 2024.

<sup>2</sup> [\*\*“Bhutan Country Economic Memorandum: Maximizing Bhutan's Potential for Economic Diversification and Structural Transformation”\*\*](#), World Bank, 9 September 2024.

<sup>3</sup> [\*\*“Bhutan-India Hydropower Relations”\*\*](#), Royal Bhutanese Embassy, New Delhi, India.

<sup>4</sup> [\*\*“Tata Power, Bhutan's Druk Green Power Corp to Develop 5,000 MW Clean Energy Projects”\*\*](#), *The Hindu*, 19 November 2024.

<sup>5</sup> [\*\*“Bhutan-India Hydropower Relations”\*\*](#), Royal Bhutanese Embassy, New Delhi, India.

Notably, the Kholongchhu hydroelectric project represents a departure from previous Power Purchase Agreements (PPAs) through its establishment as a joint venture entity. This joint ownership model signifies a more integrated partnership, potentially involving shared risks, responsibilities and returns on investment. Earlier PPAs primarily focused on the purchase of power generated by Bhutanese-owned projects.

India–Bhutan hydropower cooperation began with the 336 MW Chukha project (1986–88). Subsequent joint ventures include Kurichhu (60 MW, 2001–02), Tala (1020 MW, 2007) and Mangdechhu (720 MW, 2019). Currently, Punatsangchhu-I (1200 MW, 2025), Punatsangchhu-II (1020 MW, 2025) and Kholongchhu (600 MW, 2025) are under construction. A recent Memorandum of Understanding (MoU) between Druk Green Power and the Adani Group for the Wangchu (570 MW) project signals renewed momentum, with considerations for both run-of-the-river and reservoir designs and a projected commencement around 2027.<sup>6</sup>

The delays and cost overruns experienced by projects such as the Punatsangchhu-I (1200 MW) and Punatsangchhu-II (1020 MW) are partly attributable to challenging geological conditions and the necessity for robust disaster risk management measures. A World Bank report cautions that rising temperatures, extreme rainfall and glacial melt, intensified by climate change, pose significant threats to hydropower infrastructure and energy generation in South and Southeast Asia, particularly in the vulnerable Himalayan region.<sup>7</sup> Increased greenhouse gases threaten long-term generation, demanding resilient development.<sup>8</sup>

The synchronisation of two units of the Punatsangchhu-II project with Bhutan's national grid in December 2024<sup>9</sup> marks a significant step forward, anticipated to increase Bhutan's power generation capacity and reduce its reliance on electricity imports from India during lean periods. Bhutan's electricity imports from India are primarily during the dry winter months (November to April) when the hydropower generation in Bhutan decreases due to reduced river flow. While Bhutan has a significant hydropower potential and is a net exporter of electricity overall, it relies on imports from India to meet its domestic demand during these lean periods. The peak power drawn from India can exceed 800 MW.<sup>10</sup>

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<sup>6</sup> [“Advanced Talks with TATA on 600 MW Kholongchhu Project”](#), *The Bhutanese*, 22 March 2024.

<sup>7</sup> [“Climate Change Action Plan: 2021-2025- South Asia Roadmap”](#), World Bank, 2021.

<sup>8</sup> V.P. Haran, [“Water and Hydropower Cooperation in BBIN Countries: Policies and Way Forward”](#), *International Journal of Water Resources Development*, 28 August 2022.

<sup>9</sup> [“Synchronization of Unit 3 of Punatsangchhu-II Hydroelectric Project”](#), Embassy of India, Thimphu, Bhutan, 19 March 2025.

<sup>10</sup> [“Bhutan Gearing up to Import Electricity from India for Extended Period: Report”](#), *The Economic Times*, 29 September 2023.

## Going Forward

India and Bhutan are exploring opportunities for new hydropower projects, as articulated in the joint vision document on energy released during Prime Minister Narendra Modi's visit to Thimphu in March 2024, which also includes a focus on green and solar energy initiatives alongside hydropower.

The India–Bhutan hydropower partnership is navigating a shifting geopolitical landscape influenced by China's growing regional engagement. While formal diplomatic ties remain absent, China and Bhutan held the 25<sup>th</sup> round of boundary talks in October 2023,<sup>11</sup> building on progress achieved through Expert Group Meetings. The signing of a Cooperation Agreement concerning the Joint Technical Team (JTT) to implement the Three-Step Roadmap signals a commitment to resolving boundary issues.

The first step involves expert-level technical discussions and field surveys to gather comprehensive data and delineate contested areas. The second step entails political negotiations at higher levels, utilising the technical findings to reach mutually acceptable boundary alignments. Finally, the third step focuses on the formal demarcation and delimitation of the border through the signing of a legally binding treaty and the establishment of physical boundary markers.

The increasing engagement between Bhutan and China, though focused on boundary demarcation and broader bilateral relations, necessitates a recalibration by India to ensure the sustained mutual benefits and relevance of its hydropower cooperation with Bhutan, particularly given the Himalayan region's vulnerabilities.<sup>12</sup>

Bhutan's Sustainable Hydropower Development Policy of 2021<sup>13</sup> articulates a strategic vision for the continued advancement of its hydropower sector, emphasising principles of sustainability and maximising national benefits. The policy underscores the imperative of enhancing energy security through the promotion of power generation via reservoir and pumped storage schemes, alongside the integration of variable renewable energy sources.

It also prioritises the development of value chains within the domestic market, seeking to leverage the clean energy resource for industrial growth and employment generation. The document highlights the critical need for integrated watershed management and catchment area protection to ensure the long-term viability and

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<sup>11</sup> [“Joint Press Release on the 25<sup>th</sup> Round of Boundary Talks between Bhutan and China”](#), Ministry of Foreign Affairs and External Trade, Royal Government of Bhutan, 24 October 2023.

<sup>12</sup> Ashish Shukla, [“Sub-regional Cooperation under BBIN Framework: An Analysis”](#), Indian Council of World Affairs (ICWA), 4 January 2019.

<sup>13</sup> [“Bhutan Sustainable Hydropower Development Policy”](#), Ministry of Economic Affairs, Royal Government of Bhutan, 2021.

climate resilience of hydropower resources, acknowledging the increasing impacts of global warming on water availability from glacial sources.

Himalayan hydropower sustainability also faces climate change risks. Glacial retreat and altered precipitation threaten water availability. Erratic rainfall impacts power generation and increases flood/landslide risks, evidenced by the July 2023 Bhutan flash flood. Long-term project viability requires addressing these vulnerabilities.<sup>14</sup>

The World Bank's December 2024 financing amounting to US\$ 40 million aims to strengthen Bhutan's institutional and technical capabilities in managing the escalating risks posed by climate change and natural disasters. A key objective is to bolster the resilience of critical infrastructure, notably hydropower projects, through the implementation of integrated catchment management approaches.

Furthermore, the financing supports the enhancement of early warning systems for natural hazards, including glacial lake outburst floods (GLOFs) and wildfires. It also seeks to improve the financial resilience of communities by promoting disaster risk insurance and ensuring immediate liquidity in the aftermath of adverse events through the catastrophe deferred drawdown option, allowing Bhutan to defer debt service payments for up to two years following a declared disaster.<sup>15</sup>

The future success of energy cooperation within the BBIN (Bangladesh, Bhutan, India, Nepal) region and across South Asia, meanwhile, is contingent upon the development of adequate transmission infrastructure and the establishment of enabling regulatory and policy frameworks. Regional cooperation within the BBIN sub-region holds substantial promise for addressing the energy needs of South Asia.<sup>16</sup> The long-term sustainability and resilience of hydropower projects in the face of climate change and disaster risks, coupled with the geopolitical influences of other nations, will be critical determinants shaping the future trajectory of India–Bhutan hydropower relations.

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<sup>14</sup> [“July 2023 Bhutan Hydro Project Disaster: 23 Dead and Missing”](#), South Asia Network on Dams, Rivers and People (SANDRP), 23 July 2023.

<sup>15</sup> [“World Bank Supports Bhutan to Strengthen Climate and Disaster Resilience”](#), World Bank, 10 December 2021.

<sup>16</sup> Uttam Kumar Sinha, [BBIN SUB-REGION Perspectives on Climate-Water-Energy Nexus](#), Pentagon Press LLP, New Delhi, 2024.

## About the Author

**Ms. Ishaani Singh** is Research Intern at the Manohar Parrikar Institute for Defence Studies and Analyses, New Delhi.

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