



# Promoting sustainable energy transition in the Ganges River Basin



Harpan Khola River and the surrounding landscape in Gandaki River Basin, Pokhara, Kaski District.

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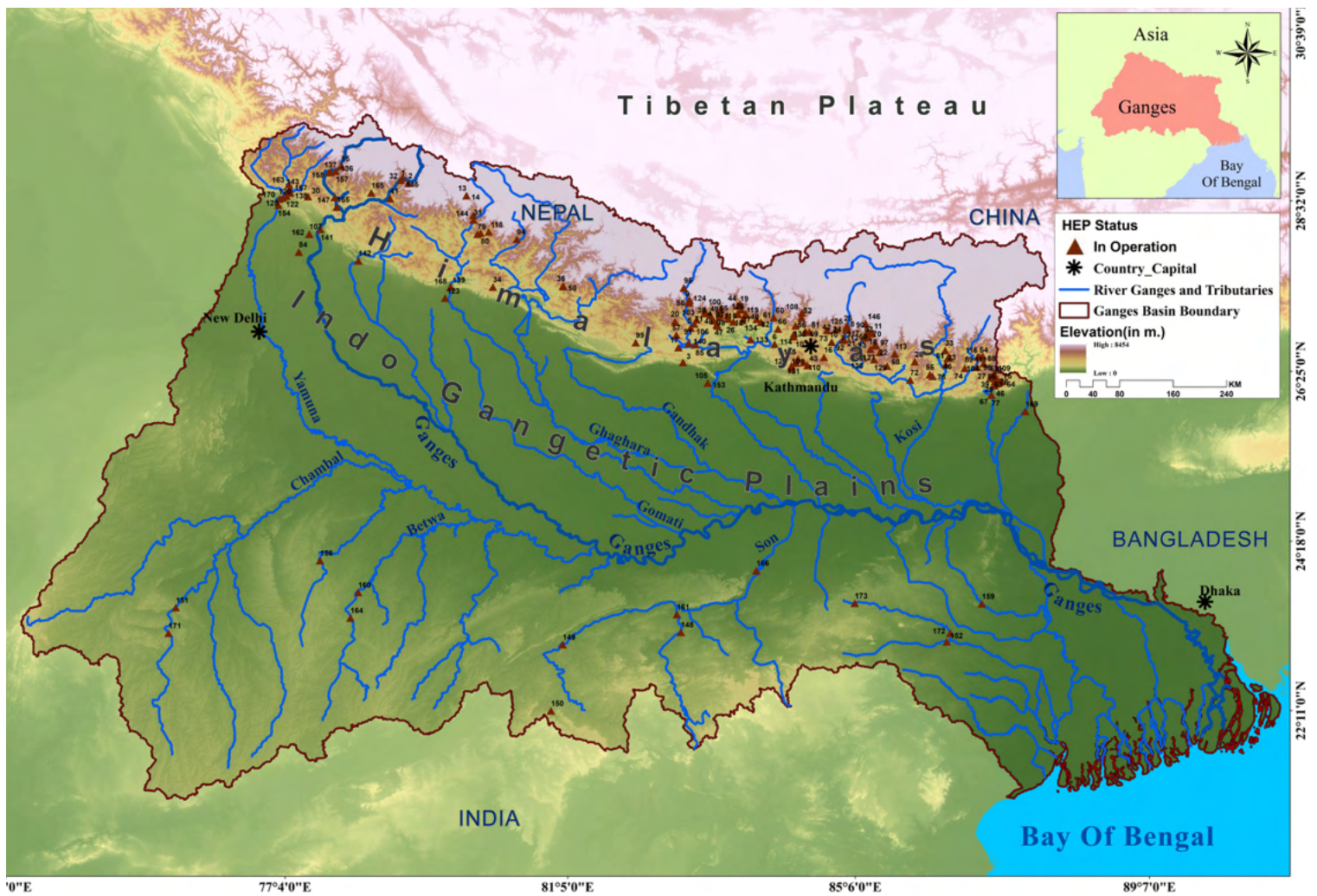
## Ganges River Basin Overview

The Ganges River Basin is shared by Bangladesh, China, India, and Nepal. The ecosystem services of the basin sustain the lives and livelihoods of 650 million people in South Asia and provide more than 30% of the region's water resources. The Ganges flows South-East through India before

it enters Bangladesh. The largest part of the Ganges basin drains in India, almost 79%, followed by 14% in Nepal, 4% in Bangladesh, and around 3% in China.

With increasing development and population pressure the energy demand is rapidly rising in the Ganges

river basin, and thermal and hydro-power currently dominate the energy mix. The race for countries to fulfill rapidly rising energy demand comes at a time when clean energy and the conversations around climate change are providing pressure to shift the region's future energy pathway to be less



Location of hydropower dams within Ganga River Basin.

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## 650

million people dependent on the Ganges River Basin

## 30%

of South Asia's water resources come from Ganges River Basin

## 79%

of the Ganges basin drains in India, followed by **14%** in Nepal, **4%** in Bangladesh, and around **3%** in China.

*Energy mix dominated by fossil fuel and hydropower*

carbon-intensive. Hydropower is treated as an important energy source in this conversation—but hydropower's future reputation and expansion will depend on the policies, management, and governance strategies that governments adopt and whether or not they prioritize developing hydropower in an environmentally friendly and sustainable manner.

The heavy reliance on coal and hydropower is leading to a number of impacts on livelihoods and biodiversity in the region. Government data suggests that more than 160 dams are operational and more than 100 are under construction across the Ganges basin in India and Nepal. Dams contribute to the fragmen-

tation of rivers and as cumulative seasonal storage in dam reservoirs increases, this could alter the seasonal flow of water and have significant impacts on fish migration and fisheries as well as on sediment flow, threatening the integrity of the delta and affecting the communities downstream.

This paper gives an overview of each country's energy needs and provides recommendations for improved energy integration in the region, including the opportunity to build new renewable (solar and wind) for more affordable and secure energy systems while maintaining the ecological integrity of the Ganges and limiting impacts to livelihoods and climate change.



## Nepal Energy Profile

Nepal has significantly increased its installed hydropower capacity in recent years, and has a target to produce 15,000 MW of hydropower by 2030 to meet rising electricity demand and bring income through exporting power to neighbours.

Over the last decades, Nepal has relied heavily on imported electricity from India to meet 13-37% of its demand. But this is changing, Nepal's domestic power generation is consistently growing and it sells increasing amounts of electricity to India. There is significant interest in formalizing additional electricity trade agreements between Nepal and Bangladesh, however, the trade would not be possible without India allowing greater access to its power grid. Nepal has seven transmission lines and four lines which are currently functional. Therefore, there are regulatory and structural

challenges to increase exports to India.

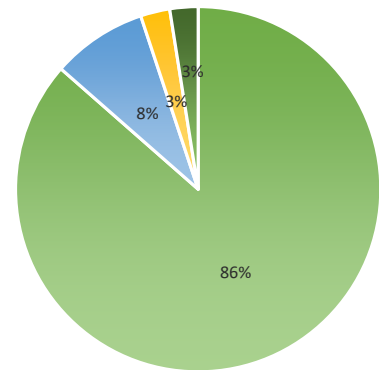
Also, hydropower development process in Nepal is based on a project-to-project approach, rather than having a strategic plan for energy investment and energy mix, which raises challenges in terms of the seasonality of hydropower and ensuring that power development matches market needs.

Nepal also has significant solar potential, estimated 50,000 terawatt-hours of electricity generation per year that need to be exploited to make the energy mix more sustainable in Nepal.

### Key messages

- Nepal can reduce the risk of over-dependence on hydropower by focusing on new renewables (solar and wind) and sustainable regional power trade
- Power supply will expand further

## Nepal energy mix 2022



- Large scale hydropower
- Small scale hydropower
- Solar
- Thermal

Source: Nepal Electricity Authority 2021/2022 Annual Report

with significant excess electricity but without a clear market.

- Invest in cost-benefit analysis and documentation of impacts of hydropower on people and ecosystem services (fisheries, biodiversity)

## Nepal's Renewable Energy

■ Aims to produce **15,000** MW by **2030**

■ **15%** of total energy demand to be met from renewable energy



### Wind

**Survey License issued**  
3 projects = **5** MW  
**Survey License (Technical Clearance)**  
1 project = **1** MW



### Hydro (more than 1 MW)

**Survey License issued**  
135 projects = **12,022.46** MW  
**Construction License issued**  
233 projects = **8,631.64** MW  
**Application for Survey License**  
21 projects = **1,063.37** MW  
**Application for Construction License**  
95 projects = **7,545.07** MW  
**Power Generation**  
122 projects = **2,123.54** MW



### Biomass

Biomass: **0**  
(Only for cooking, yet to generate electricity)



### Solar

**Power Plants**  
5 projects = **24.18** MW  
**Survey License issued**  
45 projects = **1,244.99** MW  
**Construction License issued**  
21 projects = **133.56** MW  
**Application for Survey License**  
8 projects = **49.6** MW  
**Application for Construction License**  
3 projects = **15** MW



### Thermal

**Power Plants**  
2 projects = **53.41** MW



### Co-Generation

**Survey License issued**  
1 project = **15** MW  
**Construction License issued**  
2 projects = **6** MW  
**Power Plants**  
1 project = **3** MW

Source: Department of Electricity Development (January 17, 2023)

## India Energy Profile

India is both a rapidly expanding electricity market and the world's third-largest energy consumer. India's energy demand has doubled over the last two decades. Projections from the International Energy Agency (IEA) indicate that India will make up the biggest share of energy demand growth at 25% over the next two decades, overtaking the European Union as the world's third-biggest energy consumer by 2030. This means that India's decisions have key implications not only in terms of ensuring electricity access and reliability for its population and the region but also for global trends on carbon emissions.

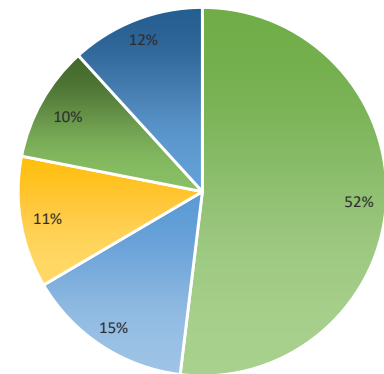
India currently has electricity grid connectivity with four of its neighbors: Nepal, Bhutan, Bangladesh, and Myanmar. To facilitate electricity trade, India launched the India Energy Exchange (IEX), which provides a nationwide

trading platform for the sale and delivery of electricity. In November 2021, India approved Nepal's participation in India Energy Exchange (IEX). Since then Nepal has been participating in electricity sales and purchases through IEX, and there are plans to bring in power generators and purchasers from Bangladesh and Bhutan in the near future.

### Key messages

- Provide leadership for the sustainable energy transition in the Ganges river basin by creating an environment that promotes trade in new renewable (solar and wind) through regional energy grid and technology transfer.
- Encourage Indian businesses to invest in renewable energy in Nepal and neighbouring countries instead of focusing only on developing hydropower projects.

India energy mix 2022



- Coal
- Solar
- Hydropower
- Wind
- Others (biogas etc)

Source: Ministry of Power, Government of India

## India's Renewable Energy

■ **3rd** largest energy market in the world

■ Ranked **3rd** in Renewable Energy Country Attractiveness Index (2021)

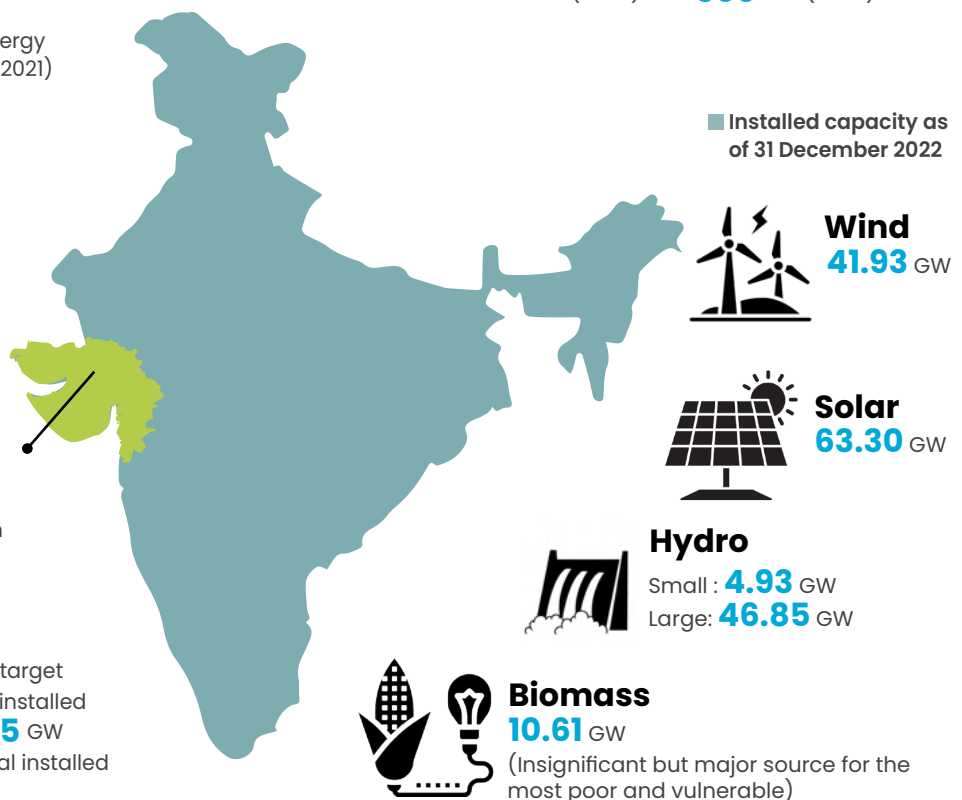
■ **45** solar parks of aggregate capacity **37** GW have been approved in India.

■ World's largest renewable energy park of **30** GW capacity solar-wind hybrid project is under installation in Gujarat.

■ India has achieved its NDC target with total non-fossil based installed energy capacity of **159.95** GW which is **41.4%** of the total installed capacity.

■ Ambitious targets - **175** GW (2022) and **500** GW (2023)

■ Installed capacity as of 31 December 2022



# Bangladesh Energy Profile

Bangladesh's electricity demand is rising by approximately 10% every year. The country has historically struggled to provide enough electricity to meet the demand. This has made sustainable electricity supply one of the most urgent priorities for the government of Bangladesh.

Bangladesh's energy mix is currently dominated by natural gas. In recent decades liquid fuels such as furnace oil surpassed coal-based thermal power to become the second largest contributor to the energy mix. The government's ambitious national power plan envisions reaching a total generation capacity of 57,000 MW by 2041. Most of this future power is projected to come from natural gas, however, this may not be readily achievable as domestic natural gas reserves are on the decline.

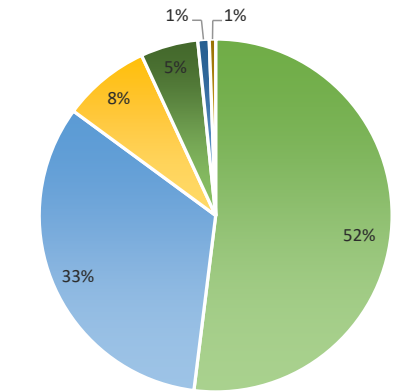
Bangladesh imposes a strict ban

on the use of agricultural land for solar and wind purposes as this may compromise the availability of prime farming land and consequently the annual agricultural produce.

### Key messages

- Bangladesh's heavy dependence on imported Liquefied Natural Gas (LNG) and coal may be a quick short-term solution but there are risks of increasing global prices. Grid modernization is necessary to support high levels of deployment for solar and wind energy.
- Bangladesh should consider developing a tripartite understanding and agreement with Nepal and India for regional electricity trade, as Nepal is a viable and attractive supplier of seasonal power while India needs to provide the transmission lines.

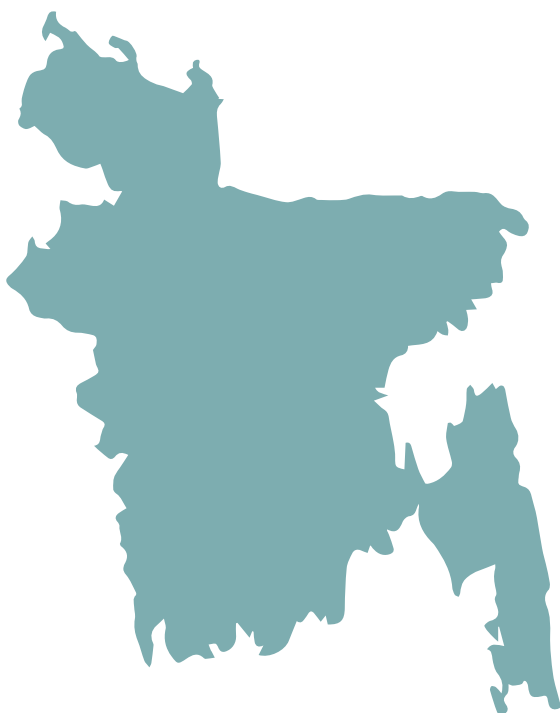
Bangladesh energy mix 2022



- Gas
- Oil
- Coal
- Imports
- Hydropower
- Solar

Source: Bangladesh Power Development Board (Annual Report 2020-21)

# Bangladesh's Renewable Energy

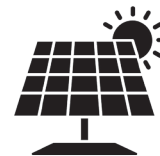


- Development of renewable energy has been outpaced by non-renewables such as coal, gas and nuclear
- Commitment to reduce greenhouse gas emissions under the Paris Agreement ensuring **10%** of energy consumption by **2030** from renewable sources
- Aims to reach total generation capacity of **57,000** MW by **2041**

■ Installed capacity as of 31 December 2022



**Hydro**  
230 MW



**Solar**  
Power Plants:  
198 MW  
347 MW  
(household panels)

# Regional Energy Profile



Nepal

**2,190 MW**  
 Installed Capacity  
**1,964 MW**  
 Peak Demand (2022)  
**12%**  
 Demand Growth  
 (through 2025)  
**15,000 MW**  
 Generation Plan  
 (by 2030)  
**267 kWh/person**  
 Per Capita Electricity  
 Consumption (2020)



Bangladesh

**22,031 MW**  
 Installed Capacity  
**13,000 MW**  
 Peak Demand (2019)  
**10%**  
 Demand Growth  
 (through 2025)  
**57,000 MW**  
 Generation Plan  
 (by 2041)  
**422kWh/person**  
 Per Capita Electricity  
 Consumption (2021)



India

**405,773 MW**  
 Installed Capacity  
**210,793 MW**  
 Peak Demand  
**7%**  
 Demand Growth  
 (through 2027)  
**165,300 MW**  
 Generation Plan  
 (by 2027)  
**1,208 kWh/person**  
 Per Capita Electricity  
 Consumption (2021)



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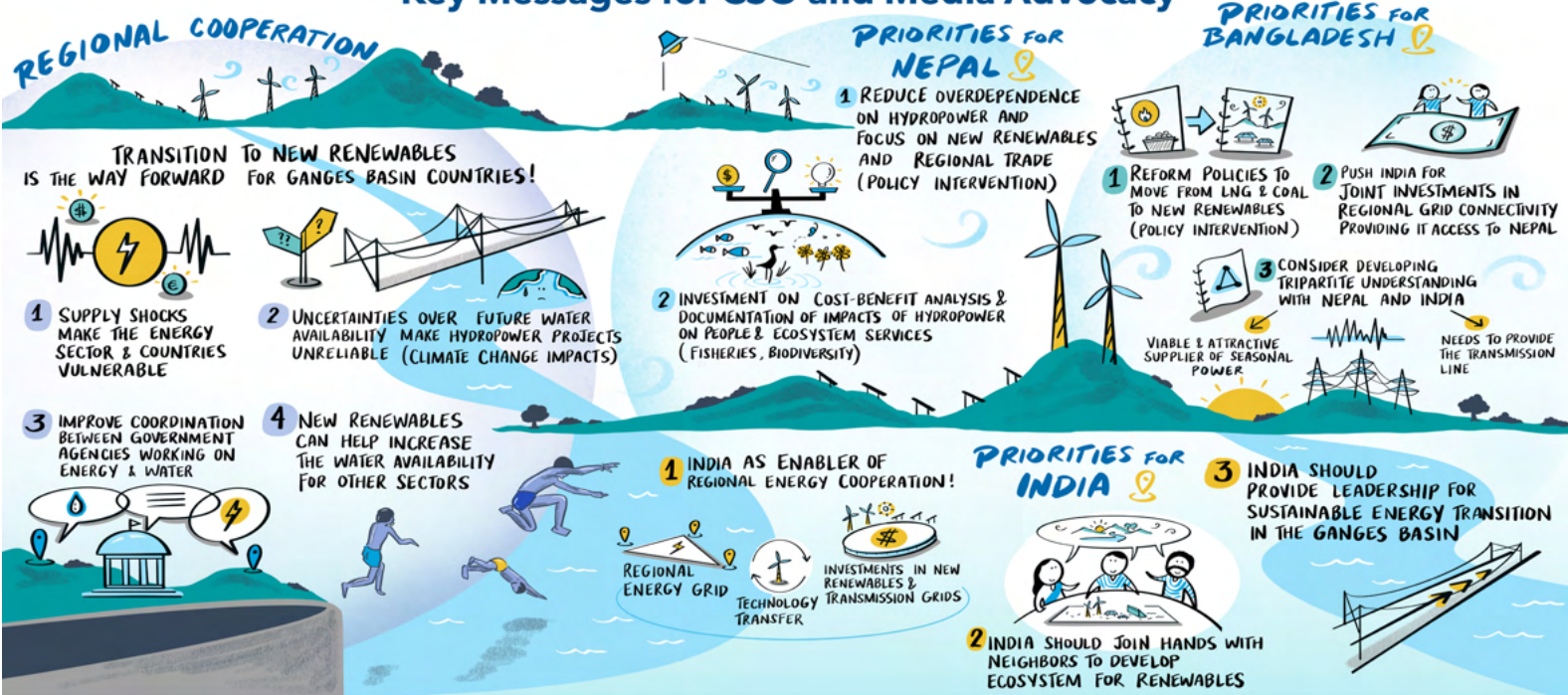
Encasing of a penstock in Rasuwagadhi hydropower project in Rasuwa, Nepal.

## Regional energy cooperation and benefits

South Asia offers huge potential for energy trade and cooperation. In recent years, bilateral and trilateral arrangements have paved the way for energy development in the region to meet its growing demands. Though India has started opening doors for multilateral cooperation on energy trade, one example being the growing India-Nepal energy partnership, there are still gaps in terms of actual implementation of various bilateral agreements due to the unavailability of grid connection among the countries sharing the Ganges River Basin.



## Key Messages for CSO and Media Advocacy



VISUAL STORY BY:  
TOFU CREATIVES

### Supply shocks make the energy sector and countries vulnerable

Ganges River Basin countries are increasingly vulnerable to energy supply shocks, like recent hikes in gas prices, which makes the case for a transition to new renewables in the basin even more urgent. If there is sufficient investment in a diverse energy portfolio, if Bangladesh, India, and Nepal provide the policy support needed to expand alternative energy resources like solar and wind, and if projected prices of these alternatives continue to fall, then the pathway for renewable energy transition may accelerate.

### Climate Change impacts cause disasters and affect hydropower productivity

In 2023, at least 30 hydropower projects in eastern Nepal suffered damage, estimated at USD 64 million, due to floods and landslides during the first spell of the monsoon. Temperature changes have direct implications for glacial melt and hydropower productivity across the Ganges basin. Studies indicate a shift in glacial melt

earlier throughout the Himalayan region, meaning that more water is available early in the crop season, but less meltwater will be flowing through the system later in the year when crops are growing (ICIMOD). Shifts in the amount of melt and the timing of melt could lead to unanticipated surges of water, with implications both for humanitarian disasters and hydropower generation.

### Improve coordination between government agencies working on energy and water

Ensure that future policies, regulations, and decisions are made in a holistic and all-inclusive manner with consultations with all relevant stakeholders in the energy, climate, water, and policy sectors. For example, in 2018, Nepal merged its Ministries of Energy, Irrigation, and departments of Alternative Energy and Meteorology to ensure greater cross-sector coordination.

### Promote accountability and engagement of diverse stakeholders in decision making

All stakeholders—including media and civil society organizations, should identify, track, and advocate to resolve challenges that hamper investments and developments in the renewable energy sector—such as land competition or concerns over waste management for solar panels – early to avoid disruptions to the sustainable energy transitions in Ganges basin. Media and civil society stakeholders should jointly promote active discussion of alternative energy development pathways and engage with policymakers for dialogue on how to respond to technological advancements and market shifts.

### A drop in prices makes new renewables more relevant

Between 2010 and 2019, the price of solar power has fallen by over 80%, and wind (off-shore and onshore) by 30-40%. While the cost of traditional energy sources (nuclear, hydropower, and coal) has either increased or seen only a slight drop during the same period. This has made solar and wind an affordable energy option and can compete with fossil fuel and hydropower.





Reservoir of Upper Bhotekoshi hydropower plant in Sindhupalchowk, Nepal.

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## Credits

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## Further readings

[Bangladesh-Nepal power-sharing potential and an unexplored regional green energy outlook](#)

[Hydropower threatening biodiversity](#)

[Thousands of people at risk of being displaced by hydropower in central Nepal](#)

[How Hydropower Projects are disrupting Nepal's river ecology and local livelihood](#)

[Landslide in Arun III dam highlights threats to Nepal's hydropower projects](#)

[Beyond hydropower](#)

[Lighting up Nepal's Future by Marrying its Hydro and Solar Sectors](#)

[Where is Bangladesh in the global race toward renewable energy?](#)

## Civil Society and Media: Partnership for the Sustainability of the Ganges River Basin

Implementing Agency



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Journalism for Sustainability

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