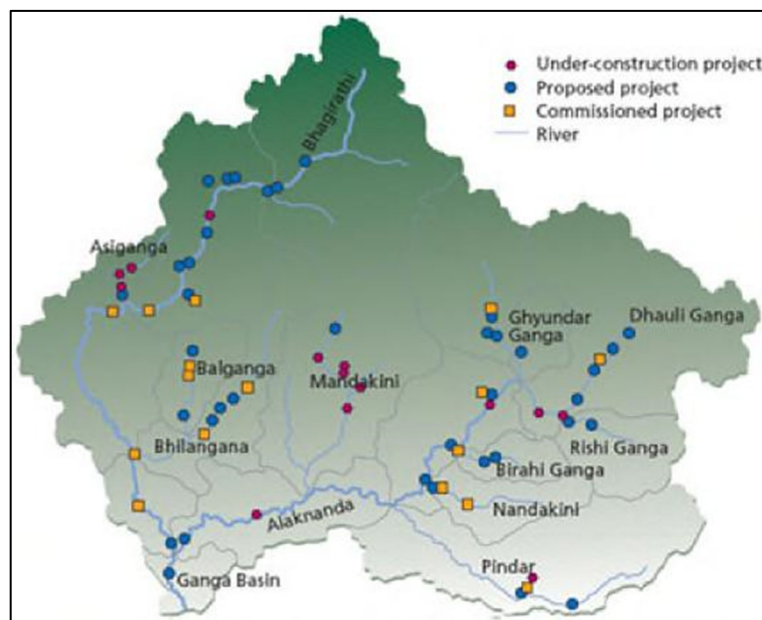


SEA supporting hydropower planning in the River Ganges upper basin

Source: NCEA (2021)



Uttarakhand is a small state in India located in the Himalaya Region with 8.5 million inhabitants. It has a hydropower potential of 20,000 MW, of which 16% has been utilized. Based on the state energy plan, 70 hydropower projects are located in two biodiversity-rich river sub-basins of the River Ganges, namely Alaknanda and Bhagirathi; 17 are commissioned hydropower projects with a total installed capacity of 1,851 MW; 14 projects of 2,538 MW capacity are in the advanced stage of construction; and 39 projects with an installed capacity of 4,644 MW are proposed for construction in the future (see figure below). Hydropower projects in Alaknanda and Bhagirathi Basins. The River Ganges is revered as a goddess in Hinduism, life-giving and life-sustaining for the environment, ecology, and socioeconomic wellbeing of the people of

India. For this purpose, certain minimum depths of flow and good water quality have to be maintained, particularly during the dry season. Concerns about the hydropower projects in the upper reaches of the Ganges have increased because of their anticipated environmental impacts that may threaten the status of the entire Ganges River system. An SEA was conducted on the assumption that the changes in the length of two free-flowing headstreams of the Ganges and the direct loss of terrestrial habitats would be the key factors leading to the aggregated impacts of multiple dams planned in the two sub-basins. These direct impacts may result in compounding effects on a range of receptors, including biodiversity, and on the flow of ecosystem benefits for a range of stakeholders.

The aims of the SEA were identified as follows:

- (i) Safeguard priority areas for conservation of terrestrial and aquatic biodiversity in the two basins;
- (ii) Provide a 'risk forecast' of dam-induced changes in environmental flows at the basin level that may impair the longitudinal connectivity of riverine ecosystems supporting rare and endangered fish fauna;
- (iii) Prioritize to what degree the biodiversity values and habitats should be protected and what ecosystem services would have to be maintained in the event all developments proceed as proposed in the state energy plan.

Therefore, the following four alternatives with different scales of hydropower development were assessed:

- Alternative 1: (N = 17): Assessment of commissioned projects (the no extra dam alternative).
- Alternative 2: (N = 31): Assessment of the combined impacts of commissioned projects (N = 17) and those under different stages of construction (N = 14).
- Alternative 3: (N = 70): Assessment of all projects, including commissioned projects (N = 17), those under construction (N = 14), and those that are still in the form of proposals for consideration (N = 39).
- Alternative 4: (N = 39) Assessing the proposed projects.

These alternatives provided the estimates of overall gains and losses for biodiversity and power production in the event of developments proceeding as planned or when regulated by proposing exclusion of some dams to optimize benefits for conservation and power development.

Influence of SEA

- Exclusion of 24 proposed projects (1,254 MW) in Uttarakhand state's energy plan.

- Recognition of the concerns to protect river ecosystems biodiversity conservation in the existing water management policies. Implicitly, such a shift in the biodiversity policy would also help to maintain cultural and religious services for human well-being.
- Adoption of environmental flow standards for all dams and a national policy on e-flow.