IRREVERSIBLE IMPACTS

Recurrent disasters, clearance hurdles, opposition from local residents have made hydropower generation economically unviable

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WITH ITS abundant waterbodies and ideal topography to utilise the resource for electricity generation, the Himalayan region is regarded as the powerhouse of India. Government estimates show that the Himalayas, with an installed capacity of 46,850 MW, have a potential to generate 115,550 MW. To tap this potential, hydropower projects are mushrooming in the Himalayan arc—till November 2022, the 10 states and two union territories in the region, barring West Bengal, had 81 large hydropower projects (above 25 MW) and 26 projects under construction, and another 320 large projects in the pipeline, according to the Central Electricity Authority under the Union Ministry of Power. This despite the fact that the climate and seismic activities in the Himalayas make its river valleys prone to landslides, and that the risk posed by such events has been aggravated in recent years. In Uttarakhand's Joshimath town, where more than 800 buildings have developed cracks due to subsidence, the government on January 5, 2023 imposed a ban on

nstruction activities, including on the works at Tapovan Vishnugad hydropower project.

Anjal Prakash, research director at the Indian School of Business, Hyderabad, who was also the coordinating lead author of the 2002 Special Report by the Intergovernmental Panel on Climate Change, said that most of the existing or under-construction projects in the Himalayas were envisaged 10-15 years ago and there was a dire need to revaluate these based on current scientific data. Both eastern and western Himalayan region in India are part of a seismically active zone; scientists have been warning of a build-up of a major earthquake in Uttarakhand. The Himalayas are also one of the world's thickly populated mountain regions. Besides, changes in the climate are highly pronounced today. "The government should look at new science and then decide. Even if it decides in favour of the project, let the local panchayat give it in writing that they are in favour of the project," Prakash said.

Disasters linked to hydropower projects in the Himalayan region have become more frequent in recent years. In 2012, flooding in Assi Ganga River damaged the Assi Ganga hydroelectric projects (HEP) 1 and 2. The 2013 Kedarnath floods severely damaged Phata-Byung, Singoli-Bhatwari, and Vishnuprayag HEPs. In 2021, a rock and ice avalanche entirely destroyed the Rishi Ganga project and severely damaged the Vishnugad-Tapovan HEP, leaving over 200 dead, and with estimated losses of ₹1,500 crore. Vishnugad-Tapovan had already suffered recurring damages, due to terrain fragility, according to various media reports. On December 16, 2022, a significant slope failure occurred at the Urni landslide zone in Kinnaur district of Himachal Pradesh, where construction works have been going on at the 1,091 MW Karcham Wangtoo hydroelectric plant, according to a 2022 compilation of disasters near hydroelectric projects by the South Asia Network on Dams, Rivers and People (SANDRP), an informal network of organisations and individuals working on water sector issues, including large dams. Located on the banks of the Sutlej river, "the Urni landslide has evolved into a complex landslide in the last two decades (2000-2016), and has dammed the Sutlej partially since 2013, damaging about 200 m of the National Highway-5," stated a study by researchers with the Wadia Institute of Himalayan Geology and the Indian Institute of Remote Sensing, both located in Dehradun, Uttarakhand. These landslide dams usually result in impounding of lakes, landslide lake outburst flood, secondary landslides, channel avulsion and formation of flood terraces in the downstream region, affecting the downstream community and infrastructure, states the report, published in March 2019 issue of Geoscience Frontiers. The study warned that the slope exhibits further failure potential since rainfall storms are most influential trigger for complex landslides. In July 2022, flash floods following cloud burst in Malana village in Himachal Pradesh's Parvati valley and another near Choj village, about 15 km away, damaged the 100 MW Malana II HEP and led to four-five deaths, according to officials. In Arunachal Pradesh, whose waters have the highest hydropower potential (34 per cent) in the country, as per India Hydropower Policy 2008 document, a series of disasters have marred construction works at the 2,000 MW Lower Subansiri HEP being built by public-sector undertaking (PSU) National Hydro Power Corporation (NHPC)— the largest run-of-the-river hydropower project under construction in the country. The project is likely to be commissioned this year. In 2022 alone, following heavy rains in June, water overflowed from the dam and inundated about 100 villages in the downstream state Assam. In September, a flood struck the dam site following incessant rainfall in the upstream areas and caused parts of the tunnel to collapse, prompting protests by the All Assam Students' Union that demanded scrapping of the project. In October, two major landslides occurred at the dam site, triggering panic and protests. The 2022 compilation report by SANDRP shows that hydropower projects act as force multipliers when cloud bursts happen close to them. In 2021, at least 11 hydropower projects (four each in Uttarakhand and Himachal, two in Jammu and Kashmir and one in Ladakh) had faced cloud burst induced deluge and

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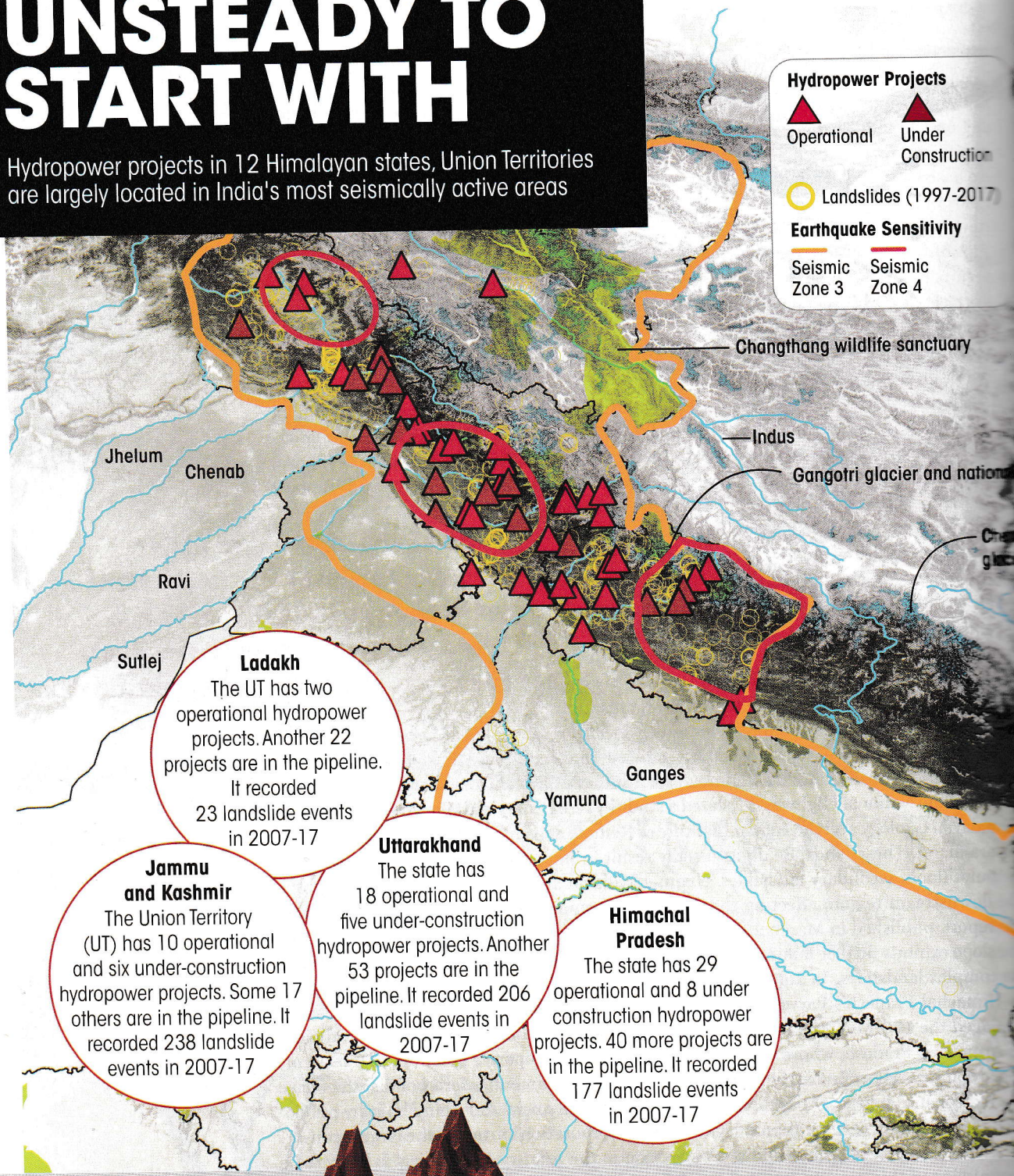
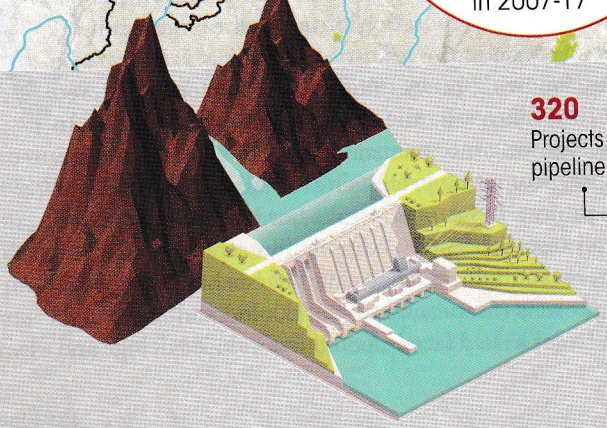
UNSTEADY TO START WITH

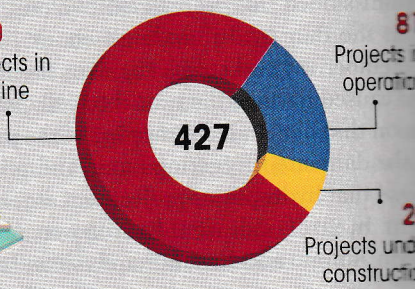
Hydropower projects in 12 Himalayan states, Union Territories are largely located in India's most seismically active areas

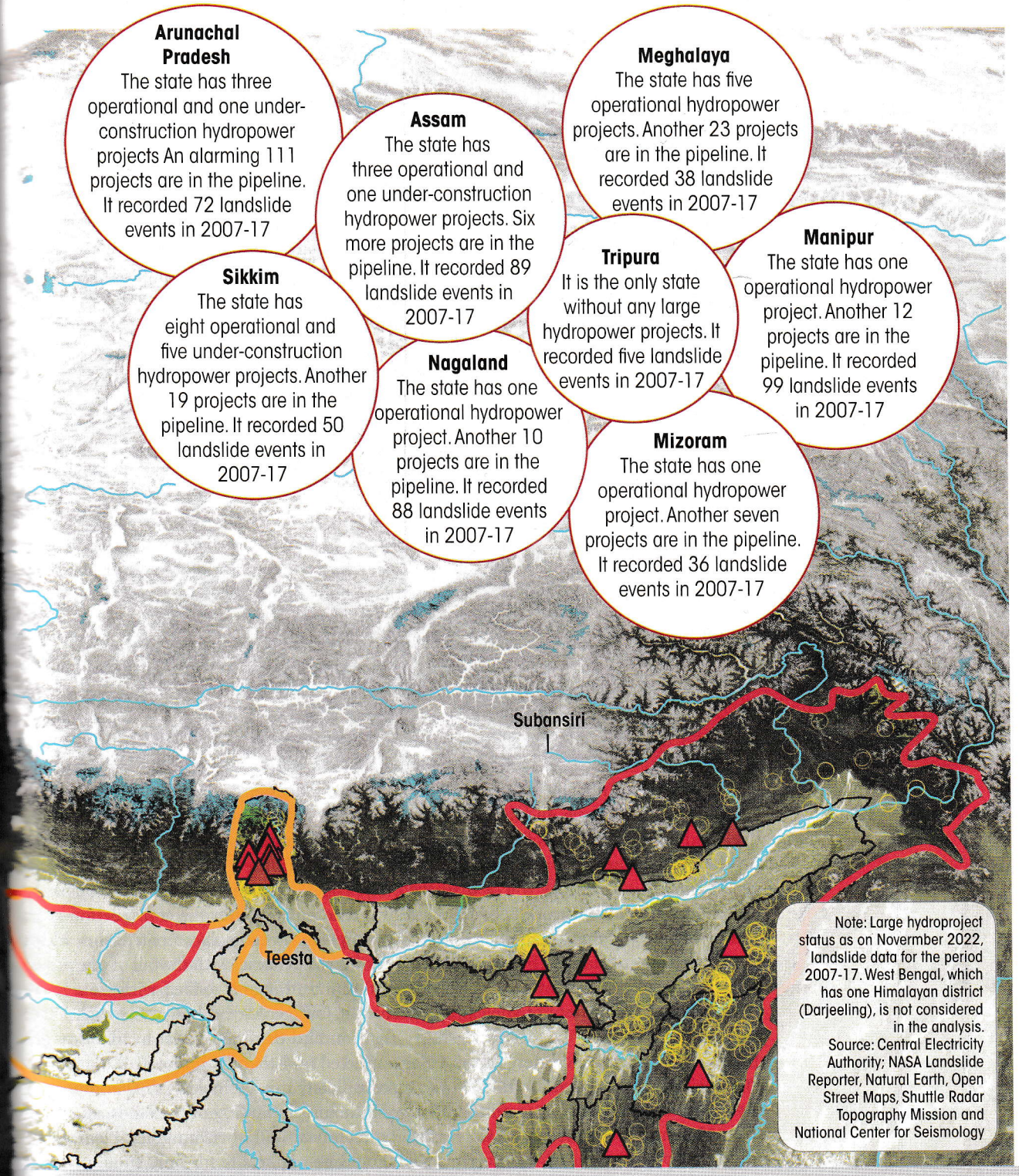


MASSIVE THRUST

There are currently 81 large hydropower projects in the unstable Himalayan region, with another 26 under construction. An alarming 320 additional projects are in the pipeline, which, if constructed, will lead to irreparable damages

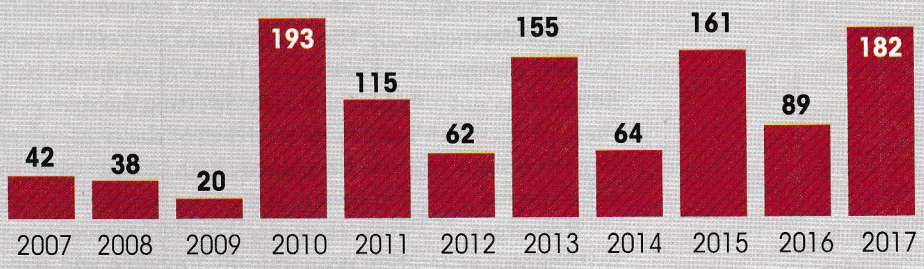






CRASHED

The 12 Himalayan states and Union Territories saw a massive 1,121 landslides between 2007 and 2017



damages in lesser or greater degrees. Sushil Goswami, retired professor and head in the department of applied geology at Dibrugarh University in Assam, said landslides cause huge devastation if they occur on the reservoirs. Hydropower project developers should, therefore, create slope stability map, identify vulnerable portions and demarcate the reservoir area. "No such exercise has been done for dams in Arunachal Pradesh, even though three-fourths of the state is highly prone to landslides," said Goswami. Following the Kedarnath flash floods of 2013 that killed at least 5,000 people, the Supreme Court had imposed a moratorium on development of hydropower projects in Uttarakhand pending a review by the Union environment ministry on the role such projects had played in amplifying the disaster. Led by environmentalist Ravi Chopra, a 17-member expert committee was set up by the ministry to examine the role of 24 such hydropower projects in the Alaknanda and Bhagirathi basin, which contains the Ganga and several tributaries.

The committee had concluded an "irreversible impact" on the ecology of the region by 23 projects. Another committee, led by Vinod Tare of the Indian Institute of Technology, Kanpur also concluded that these projects could have a significant environmental impact. However, even after 30 hearings in the case since then, a clear policy of the government on hydropower projects remained elusive. Analysts said most hydropower plants being built in the Himalayas, particularly in its upper reaches, followed run-of-the-river design, which appeared to have low environmental impact. Unlike conventional hydroelectric plants with an impoundment facility (which typically uses a large dam to store river water in reservoir), run-of-the-river projects do not require large-scale displacement of people, forest diversion or land to be submerged. But in such projects, the impacts are only delayed. "The design of such projects are such that you dam the water and divert it into a tunnel drilled underground, give it a steep slope and wherever the tunnel opens back on the river bed you build a turbine powerhouse over there. The river, instead of flowing on the river bed will flow in this tunnel," said environmental activist Manshi Asher, with Himdhara, an environmental research and action collective based Himachal Pradesh. She was part of a dossier prepared by Himdhara, an environmental research and action collective, on the hidden impacts of the disturbances triggered by construction of tunnels and other underground components of hydropower projects. "But when you are doing underground work in the Himalayas then obviously geology and geo-hydrology will be disturbed. The effects on the people living on top of that mountain (where such work is being done) will emerge only after the construction starts and as the safety of the village gets affected, it prompts indirect displacement," Asher added.

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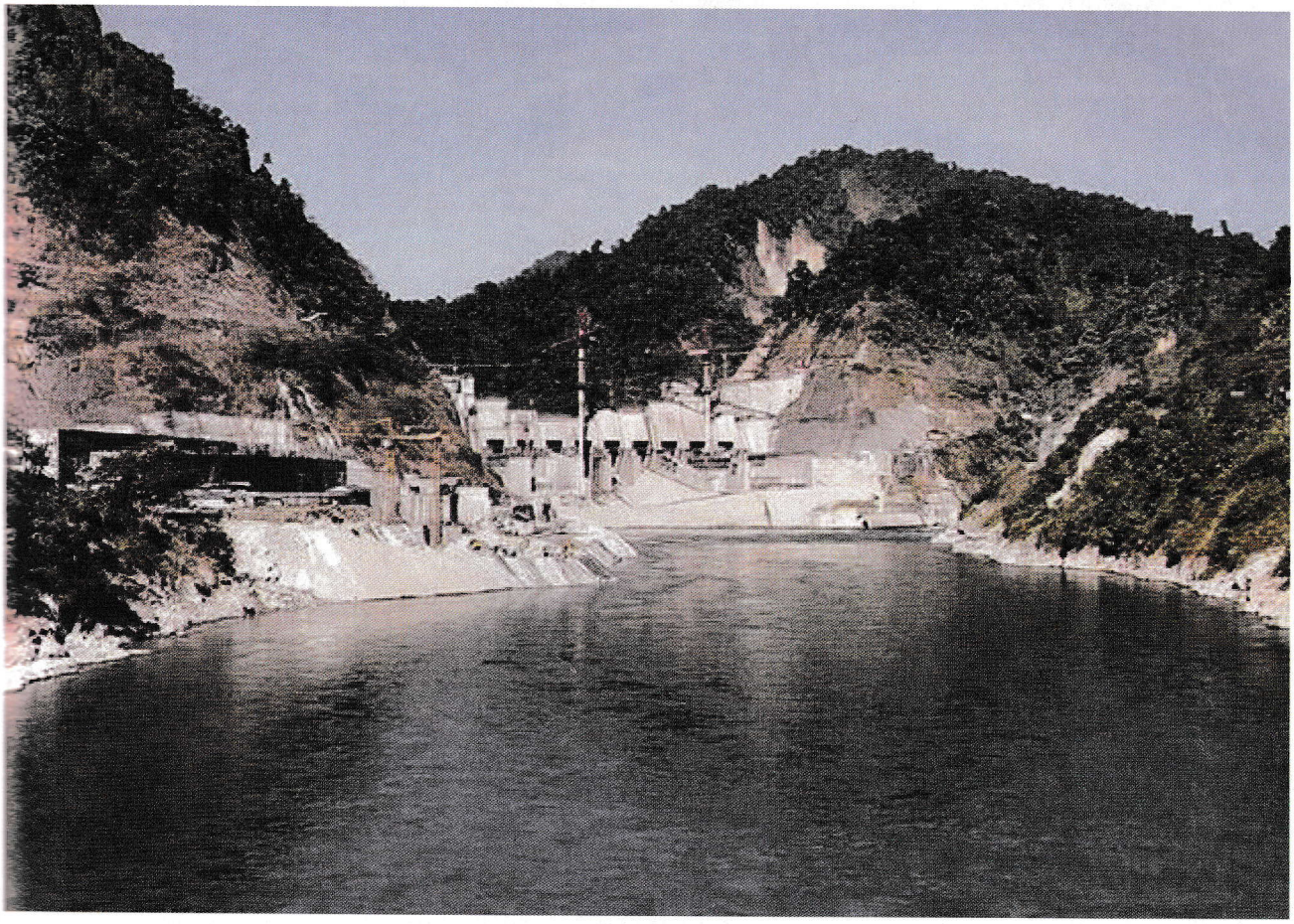
As projects are planned bumper-to-bumper on a river course, with the tail of one project being the head of the next project, the same mountain range is drilled without a break. "The cumulative impacts of such projects are not just geological but also social. When underground springs start disappearing, irrigation and drinking water availability gets affected, along with the safety of the village affected and there is indirect displacement. The environment regulatory framework has completely missed looking at the impacts of the run-of-the-river projects and there is very little understanding of the landscape in the scientific studies that are done for feasibility, technical and environmental clearances," she said. Typically run-of-the-river project should be applicable for only small or micro hydropower projects (under 25 MW). It should let the river flow and, at the same time, generate electricity, said Himanshu Thakkar, coordinator at SANDRP. The "run-of-the-river" projects mushrooming across the Himalayas should be called a demand-a-tunnel power house. They not only have dams, by diverting the river water through underground tunnels, these projects can leave large stretches of the river, spanning 10 km to 30 km, dry. Most large and some projects have dams, with storage capacity as high as hundreds of million cubic metres.

Recurrent disasters, clearance hurdles, opposition from local residents have made hydropower generation economically unviable and power generation from hydropower



MONOJ GOGOI

is showing diminishing returns for developers. In six years, from 2016-17 to 2021-22, India's large hydropower projects had contributed just around 10 per cent of the total power generation, going as low as 9.68 per cent in 2017-18. In three of these six years, large hydropower projects contributed less than 10 per cent, recovering only marginally in the rest of the years, thanks to surplus monsoon, said an analysis on power generation by hydropower projects by SANDRP, released in November 2022. The analysis said hydropower generation had declined since 1993-94. Over the last three decades, generation has been uneven; in 1993-94, some 3.9 million units were generated per mega watt installed capacity. By 2003-04, it was around 2.5 million; in 2007-08, it rose to 3.4 million units, but then fell to 2.8 million units in 2009-10. In 2021- 22, hydropower generation was closer to 3.2 million units per megawatt installed capacity. "If we talk about Himachal Pradesh, these projects have been facing revenue losses because they are running into time and cost overruns. Bad loans in the Parvati NHPC project which is stuck for years are around Rs. 46,000 crore. And the cost of the power is high and none of the discoms are buying this power. So a lot of the MoUs that the Himachal Pradesh government had with discoms to buy the power, began to lapse. Companies that had not been able to take up their projects were demanding the premium they had paid up front," said Asher. On January 10, 2023 the Arunachal Pradesh government decided to handover five stalled hydropower projects to central PSUs, with a target to produce 2,820 MW and generate annual revenue of Rs. 500 crore. The state government had earlier signed agreements with private power developers for implementing the projects but the contracts were terminated following long delays in execution of the same. ■