Renewable, but is it sustainable?

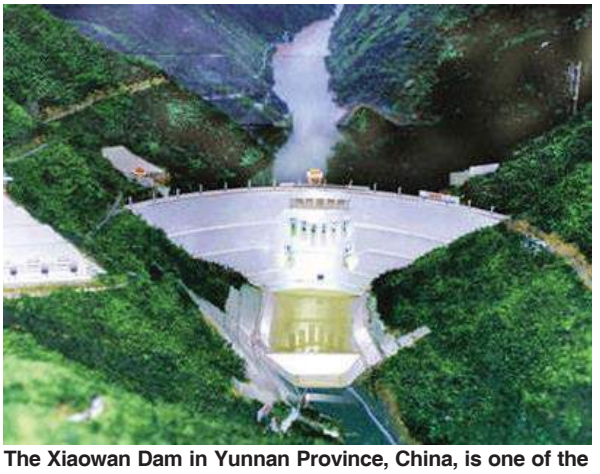
A clean and green source of energy is hydropower. Nothing burns, and no fumes are emitted to the atmosphere. But is it really sustainable in the holistic sense of the term? asks **G. Venkatesh**.

I stay in a country which generates over 40% of its electricity needs from hydropower. Its neighbour, a country I stayed in for the previous eight years or so, generates almost all its needs from hydropower and at times, has surplus to export to what is called the Nordic Grid up here in Europe. It is Sweden and Norway I am referring to, respectively. Browsing through a textbook of renewable energy, I note that over 85% of Brazil's electricity needs are fulfilled by hydropower (about 400 TWh per year).

The India story

I then am curious to find out about our country. I gather that about 15% of the total electricity needs of Indians is fulfilled by hydroelectricity. The current installed capacity is a little over 42 GW, and the plants operate at an average capacity factor of around 32% (in other words, the electricity supplied by them is 32% of the maximum they could supply). Can the percentage share be increased further? The difference between 15% on the one hand and '40+%, 85% and almost 100%' on the other, makes me think that India must strive to increase the share of its electricity coming from hydropower plants – clean and green, to power homes, factories, schools, hospitals and commercial complexes.

I gather, on further investigation, that while the technical generation potential is around 660 TWh per year, the economically exploitable (as-yet-unharnessed) potential is close to 445 TWh per year as far as large-scale hydropower plants are concerned. Add on the mini, small and micro-hydro capacity (in the kW range), and pumped storage schemes (wherein excess hydroelectricity is used to pump water upto reservoirs at a higher level, thus transforming the electrical energy to potential energy to be reconverted later on when the need arises), some more potential can possibly be brought on-stream. All this of course, is just on paper. From paper to plant to power is an arduous journey…at times. While I gather all this information, I also happen to read about the Mekong River and the dams being built on it (or on the anvil for the near future) in China, Laos and Cambodia. On the Chinese side, six hydropower plants with capacities ranging between 100 MW and 5000 MW are operational, eight are planned and five are under construction (between 100 MW and 1000 MW each). Laos has eight projects planned (100 MW to 1000 MW each), of which four are on international borders (with Thailand and Cambodia). A medium-sized one – 100 MW-plus capacity – is being built, at the time of writing. Not to be left behind, Cambodia, on the downstream of the Mekong, has planned two hydropower projects. While Laos intends to benefit by the sale of hydroelectricity to its neighbours (Thailand and Cambodia), China plans to bring on-stream several hydropower schemes (alongside nuclear power plants), in order to reduce its carbon footprint in the years to come.



The Xiaowan Dam in Yunnan Province, China, is one of the upstream dams along the upper reaches of the Mekong River

But it is not totally good news here. Power production is fine, but one cannot survive on electricity alone! There are downsides – affecting farmers and fishermen primarily (social impacts, and by extension economic as well), and the environment as well, by threatening the biodiverse spots in South East Asia. Vietnam, where the Mekong ends and drains itself into the ocean, unfortunately, cannot utilise the waters of this giant river-system for hydropower, and perhaps stands to just bear the brunt of such projects upstream. Then the thought occurs – what is it that matters the most in this century? Climate change mitigation?

Food security? Biodiversity? Reliable sources of income for the lower strata of societies? Electricity to light up homes and increase industrial production? In a way, don't we need all this? But how must one prioritise? And who decides? Sample these lines borrowed from *Water for All and other poems*, a book by this writer published in December 2014 – '*Big brother west of the border/ built four hydropower plants/checking the free flow of the rivers/into the neighbouring lands./Electrify, my dear friends/buy some power from us/Keep in step with changing times/Embrace the wave of progress./'That is fine, dear big bro/but our fish are dying in shoals/ Less water to irrigate our crops/we are becoming dust bowls./No worries, my little brothers/no worries at all, you see/ We can also sell you fish and food/they are already en route, by sea.*' This sums up grave concerns in a lighter vein… with a dose of sarcasm.

The expert view

I was drawn to write to the International Hydropower Association (IHA) based in the UK to seek their expert viewpoints on the right and the wrong, so to say. Alex Trembath of IHA had this to convey, "*India ranks fourth in the world, behind Russia, China and Canada, in undeveloped hydropower potential in absolute terms. On the basis of proportional use of hydropower potential, India has developed far less than the norm for the developed world. On this basis, it would not be unrealistic for India to at least double its current level of deployment. Much of the undeveloped potential is in the northern and north-eastern states along the southern Himalayas, which calls for more coherent national and inter-state policies in sync with today's capital markets.*" It seems then that what is true on an international level in Africa (difficulty to arrive at a consensus to develop markets, trade and transport agreements, and cross-border flow of expertise, labour and knowledge), is perceived to apply on an inter-state / inter-regional level in India. We are after all, in effect, a 'United States of India', quite like the USA or when you factor in the great diversity, the EU (European Union). Of course, the question of whether what is renewable is also sustainable crops up, and Alex agrees – "*For hydropower to be successful, it has to be developed sustainably, with benefits shared equitably. Its operational flexibility can assist in backing up the input from other renewables, helping to ensure the optimum contribution from all clean-energy sources. It is very much in the hands of the Government of India to seize the opportunity that hydropower presents from the perspective of clean energy systems, responsible freshwater management and climate-change solutions. Currently, India is revisiting its policies to remove difficulties that have arisen in recent decades of less coordinated development of hydropower.*"

It is necessary to hear all sides of a story and present the same to the readers. Here is what Bharat Seth of International Rivers, an NGO, has to say. This would throw light on the 'what, how and *why/why*-not' of hydropower in India in the years to come. He asks himself the question – "Can more hydropower be generated without 'appreciable socio-economic-environmental damage'," stressing on the word 'appreciable'; and believes that the phrase "good large-hydropower dam sites", if anything, is an oxymoron. From an Indian perspective, he says, such 'good sites' may not exist. An ideal project, in Seth's view, would have minimal human displacement, minimal population in the catchment areas downstream impacted by digging, tunneling and blasting and low flows due to diversion, less human dependence on the river be it for fish, sand collection, limestone or driftwood, lesser cultural or spiritual value attached to the river by the people in the catchment areas, and additionally, very poor biodiversity in the area. While the IHA believes that there is tremendous potential for furthering hydropower in the southern Himalayan-regions of northern India, Seth would like to disagree. He insists that benefits ought not to be overstated and costs underestimated; and further, when a cost-benefit analysis is done, the discount rate plays a key role! One would agree with him when he says, "You'd be hard pressed to find a single project in India, or for that matter the world over, which has delivered stated benefits at the stated cost." That would perhaps tempt one to conclude that hydropower is not the best way to combat climate change. Then what is? Seth would pitch for solar and wind, while insisting on hydropower, for what he calls integrated resources planning with the river basin considered as a single unit. IHA and International Rivers need not be at loggerheads with each other; and they are not for that matter. The insistence on integrated resources planning is not a very big ask, readers would agree…

Nothing's easy. Decision-making at higher levels (a pun on the reservoirs) particularly. Change and 'flowing or blowing with the times' are needed; the latter an intended pun for wind power. Water will flow and the wind will blow… we need to decide how best to harness the energy available therefrom! ■

G. Venkatesh is Senior Lecturer, Department of Engineering and Chemical Sciences, Faculty of Health, Science and Technology, Karlstad University, Sweden. He is also a freelance writer for several magazines around the world.