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Anurita Saxena

Abstract

Anxieties about climate change have given a fresh impetus to renewable energy enthusiasts. In India, most official and popular imagination describe these renewable technologies as being environmental friendly, decentralized, equitable, sustainable and accessible. But does such rhetoric actually translate into realities on the ground? The pursuit of hydroelectric projects in the state of Himachal Pradesh (North Western India), I will argue, provides an apt context to reconsider the strengths and pitfalls of renewable energy projects.

The government of Himachal Pradesh has been vigorously seeking, in recent years, to harness the states' hydro-power potential (23,000 MW). In fact, more than 8,347 MW have already been commissioned. But has this developmental strategy been appropriate and sustainable? Electricity generation has mostly been through run-of-the-river (ROR) technologies: considered to be more viable and environment friendly. These RORs, some argue, require minimum of submergence and relocation of communities. However, these structures also require diversion of waters through weirs and dams into tunnels. Constructing the latter entails massive muck dumping, diversion of rivers and streams, drying up of water sources and most importantly indirectly affecting

people and even entire village settlements. My paper will seek to explore the various tensions and points of discord that have erupted between the "indirectly affected communities" and the state government's enthusiastic pursuit of renewable energy. It will hope to pose the problem of renewable energy as a conceptual challenge to terms such as "appropriate", "sustainable" and "environmentally equity".

By the late 1970s, the euphoria that all societies could continually achieve economic growth through industrialization was losing its sheen. A slew of thinkers in the 'western developed' world, in particular, had begun to assemble a seemingly convincing critique not only of western consumerist lifestyles, the unrestrained use of natural resources but, pointedly as well, put modern technology at the heart of these dilemmas.[1]

Following the oil shocks of the 1970s and especially the Club of Rome reports, the idea of the 'limits to growth' had begun to gain ground. Such anxieties, while centrally playing upon the idea of rising human numbers or the problem of population, were also fuelled by concerns about technological choices. In effect, strong links were drawn between technology, social organization and environmental degradation.

One of the most incisive critiques of economic growth was E.F. Schumacher's book *Small is Beautiful* (1973) which turned out to be a great classic on modern environmentalism. Central to the argument was Schumacher's concept of appropriate technology,[2] which

[1] Some of the prominent thinkers conveying this anxiety were Murray Bookchin's, *The Ecology Of Freedom: The emergence and dissolution of hierarchy,* Black Rose Books, Canada, 1991. Also see Lewis Mumford's, *The Pentagon of power: The Myth of the Machine Volume Two',* A Harvest/HBJ books, New York, 1970, pp. 321–345; E.F. Schumacher's *Small Is Beautiful: A study of economics as if people mattered*, Vintage Books, London, 1993, pp.141–157.

[2] Appropriate technology was termed as 'intermediate technology' and 'technology with a human face' by Schumacher. The name was different but in essence it is the appropriate technology of today. Schumacher, *Small Is Beautiful,* pp. 120–131.

he had been evolving as an idea between the 1960s and 1970s to address the challenge of determining what was 'enough' for human need. As he compellingly states, 'What is "enough"? Who can tell us? Certainly not the economist who pursues "economic growth" as the highest of all values, and therefore has no concept of "enough".'[3] Schumacher became one of the first economists to question the appropriateness of using the expansion of the GNP along with the 'gigantic size' of the technology as an indicator of well being. Accordingly, as he argues, development does not start with goods; it starts with people and their education, organization and discipline, the aim ought to be to obtain the maximum amount of well being with the minimum amount of consumption. Thus, this 'enough' and 'becoming existence' has to be attained, according to Schumacher, through 'intermediate technology' or what we today understand as 'appropriate technology'. The question that arises here is what is meant by 'appropriate technology'? 'Appropriate' to whom and how? For Schumacher 'Appropriate technology' begins with the theory that local people understand local problems better and are thus more equipped to utilize local resources to meet their needs.

At about the same time that Schumacher's *Small is Beautiful* was published, in India. Amulya Reddy was beginning to flesh out his notion of Appropriate Technology. For A.K.N. Reddy, technology could be appropriate when it was kept 'appropriate to the factors of capital and labour *which the area* is endowed with'. (*italics mine*).[4] Simply

[3] Schumacher, *Small Is Beautiful,* pp. 12–13. Schumacher is not the only one who questions the limit to a man's needs (it was very early asked by Mahatma Gandhi). Mumford, Murray Bookchin and Amulya Reddy also raise similar questions. Bookchin says, 'The recent emphasis on "limit to growth" and "appropriate technology" is riddled by same ambiguities that have imparted a conflicting sense of promise and fear to 'high technology"'. He further says, 'By establishing quantitative criteria for "good life." it has dissolved the ethical implication of 'limits"'. *The Ecology of Freedom*, pp. 220–221. Lewis Mumford has explained this concept in the chapter 'The Removal of Limits' in *The Pentagon of Power*, pp. 172–175.

[4] Amulya Reddy explains it by saying that, 'the word "appropriate" has no meaning in itself, unless one specifies "appropriate to what?"'. The point is that technology is only an instrument, but like all instruments, it must be fashioned (i.e., made appropriate) to achieve the purpose for which it is

put, Amulya Reddy, like Schumacher, was tying technology to the idea of place. And hence, he resisted the idea of the transfer of technology to a place or to people in an indiscriminate fashion. Appropriate technology, hence, did not operate with a universal or generalized sense of efficiency but was firmly linked to the specific context of the locality. In effect, for both Schumacher and Amulya Reddy, Appropriate Technology would be characterized as conducive to decentralization, compatible with local ecology and culturally meaningful in its use of resources.

It is argued in this paper that the displacing of the idea of place or locality in the framing of appropriate technology has enabled a substantial shift in the discourse on renewable technologies in India. In particular, whilst appropriate technology is still characterized as being environmentally friendly, decentralized, equitable, sustainable, and accessible, the idea of efficiency is now firmly rooted in a universalist notion. Thus, appropriate technology without 'local context' and a 'sense of place' has tended to bring about the familiar impacts of big technologies such as community displacement, environmental destruction and the impoverishment of local populations. A case example of the recent construction of hydro projects for generating electricity in the state of Himachal Pradesh (northwestern India) to underscore the author's claims. The intention is to underline how Appropriate Technology, as initially conceived by Schumacher and Reddy, was meant to define its environmental and equity challenges by being sensitive to the politics of locality/place.

Himachal Pradesh's Tryst with Hydroelectricity

The state of Himachal Pradesh, which dots a swathe of Himalayan north India, is criss-crossed by innumerable torrential rivers. These fluvial resources with their steep drops are ideal for tapping

intended. So, the definition of the word "'appropriate" must emerge from the purpose of technology in developing countries like India'. Amulya K.N Reddy, 'Technology and Development and Appropriate Technology', Lecture Series 4, 19 March 1988.*http://www.amulya-reddy.org.in/* site visited on 4 September, 2011.

hydroelectric potential. Estimates by the Planning Commission, in fact, put Himachal Pradesh's hydro-power potential at 23,000 mega-watts (MW); with the state generating a meagre 8,374 MW at present, though plans exist for the building a total generating capacity that will exceed 14,000 MW.[5] In the earlier years after the state was formed, Himachal Pradesh[6] was considered a 'poor state' dependent on the central government for financial support.[7] It is probable that a string of deficit budgets and expenditure constraints compelled the state planners to think of alternative sources for revenue generation and developing hydel power seemed to be the most promising one.[8]

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[5] Data obtained from official website of Department of Energy, Himachal Pradesh, *http://admis.hp.nic.in/doe/project.htm*

[6] In pre as well as during the colonial period a large part of Himachal was ruled by chiefs, called Ranas or Rajas. The British entered into these hills after the Anglo-Gurkha war of 1814–15, and occupied some of the areas which were under the gurkhas for about a decade. The British occupied some areas directly and a large part was allowed to be ruled by small hill chiefs. These princely states were called Punjab Hill States during the colonial period. The British developed hill stations and Shimla became the summer capital of the British in the late 19th century. For detailed history of Himachal, refer to M.S. Ahluwalia, *Social, Cultural and Economic History of Himachal Pradesh,*1998; Mian Goverdhan Singh, *Himachal Pradesh: History, Culture, Economy*, 1988; Raja Bhasin, *Shimla: The Summer Capital of British India*, 1992.

[7] P.S. Lokanathan, the then Director General of National Council of Applied Economic Research (NCAER) also stated, 'Himachal is a frontier territory, predominantly rural, with a large tribal population, highly inaccessible, historically neglected and undeveloped and heavily dependent on Central revenues for day-to-day administration', P.S. Lokanathan, 'Preface', *Techno-Economic Survey of Himachal Pradesh*, 1961, p. viii. Similar observations have been made by many other intellectuals such as Jean Drèze is a development economist and A. Sen, '*India Development and Participation*', OUP, New Delhi, 2002, pp. 101–102, Mian Goverdhan Singh, *Himachal Pradesh: History, Culture, Economy*, Bliss Offset Printing Works, Daryaganj, Delhi, 1988, p. 102.

[8] The press also welcomed the statehood of Himachal and felt that the state could only progress through Hydel development. 'The march towards the destiny can take place without further road blocks. But it will have to tap additional resources to ensure economic viability, a *sine qua non* of statehood. A revision of priorities involving the fullest exploitation of the State's vast hydel potential and its forest wealth will doubtless be among the immediate tasks to be tackled.' 'Himachal Comes of Age', *The Tribune*, Chandigarh,

The technology used for early hydro projects in Himachal Pradesh was based on the idea of impoundment.[9] This strategy, not unexpectedly, resulted in the submergence of large stretches of fertile agricultural land and inevitably gave rise to new types of ecological problems, and also brought about the vexed challenge of resettling thousands of dam displaced oustees.[10] Who exactly enjoyed the benefits by way of electricity and irrigation water was another political question. It was often argued that the people who suffered the loss of land, livelihood and their cultural roots were not the ones who benefitted from these schemes.[11]

Unleashing the state's hydroelectric potential to its fullest possible capacity, however, increasingly boiled down to overcoming two major

25 January, 1971, p. 4.

[9] Two major impoundment dams, Bhakra and Pong, were constructed in Himachal in 1964 and 1974 primarily to store water for irrigation and generate electricity.

[10] The oustees of Bhakra and Pong, who were asked to settle in the inhospitable terrain of Punjab and Rajasthan respectively, were not settled properly and completely. Their compensation and resettlement is an ongoing process even after a lapse of 40–50- years. For details see Renu Bhanot and Mridula Singh, 'The oustees of Pong dam: Their search for a home', in E.G. Thukral (ed.) *Big Dams, Displaced People: Rivers of sorrow; Rivers of change*, Sage Publications, New Delhi 1992; R. Rangachari, *Bhakra-Nangal Project: Socio-Economic and Environmental Impacts*, OUP, Delhi, 2006.

[11] Punjab, Haryana, Rajasthan, Delhi and Chandigarh (Union Territory) were the beneficiary states. Himachal was not a party to these benefits. In fact Himachal Pradesh was a union territory and the Centre was its custodian, yet the parameters of the Punjab Reorganization Act, 1966 were not actually implemented. Instead of allowing 7.19 per cent share in the entire BBMB projects systems, it was given ad hoc 2.5 per cent share in Bhakra Nangal system, 15 MW out of 990 MW (about 1.5 per cent) in BSL and no share out of Pong Dam. The state had to move the Supreme Court in 1994 against denial of share in power projects under BBMB and pleaded for 7.19 per cent in these on the basis of the Punjab State Reorganisation Act, 1966. The apex court on 2011 September 27, granted relief to Himachal Pradesh by allowing the share which amounts to Rs 4,250 crore. Though the High powered committee is playing ping pong with the outstanding amount and wants it to be reduced to Rs 3,400 crore, the decision is still pending. Virbhadra writes to PM over Himachal's share in BBMB projects', *Business Standard*, Tuesday 5 March, 2013.

challenges: a) the immense financial requirements and b) the appropriateness of the technology. The first got solved to a certain extent with the onset of economic liberalization in the 1990s,[12] which allowed private investment in the hydro sector. The planners started with the process of allocating identified potential sites to central government, public sector and private parties.[13] The answer to the second was, however, found in the form of a technology known as 'run of the river' (ROR) approach. The technology, though not new to the state (in fact the first big hydro project, the Shanan Project,[14] in pre-independent Himachal could be considered as an ROR), was preferred after the economic liberalization of 1990s to offset the drawbacks of impoundment dams.

Run-of-the-river projects do not entail any pondage and the impeller of the turbine is intended to be driven by the sheer force of running water. The river flow, in turn, is diverted by erecting a small weir and the water taken to the power house through a penstock via a tunnel. These tunnels could be as long as 30 km. After power generation is realized, the water is then either dropped back into the same river or diverted into some other river or channel. The ROR technology, in

[12] Private participation in the generation was allowed through amendments to the Indian Electricity Act, 1910 and Electricity (Supply) Act, 1948.

[13] The first two projects to be allotted to the private sector were Baspa II (300 MW) and Malana (86 MW) in 1992. The state government allotted the largest hydro-project of the state, Parbati project (2051 MW) to NHPC in 1998 and Kol dam (800 MW) to National Thermal Power Corporation (NTPC) in 2001. Under the new Hydro policy 2006, projects could be allotted to private investors with the stipulation that the project will revert back to the state government after a lapse of 40 years. These projects were also to give 12 per cent free electricity to the state for first 20 years, 18 per cent till 30 years and 30 per cent till it reverts back to the state. The new projects were also to pay money to various departments of the state to compensate for the protection of the environment under the provisions of the Environment Protection Act 1994.

[14] This project is an ROR project comprising diversion of the Uhl and Lambadug rivers by means of small weirs near village Barot in Mandi district of Himachal. This project utilizes a drop of about 518 m into a power house at Shanan near Jogindernagar. It was constructed by the Punjab government in 1925–32 with an installed capacity of 48 MW (4x12MW). In 1970, on improvement of hydrological data, PSEB renovated and extended the Shanan Project and now it has an installed capacity of 110 MW.

fact was envisaged for hilly terrains and was assumed to be ideal for boosting hydro generation. Many have, in fact, argued that ROR technologies can be efficient, appropriate, sustainable and replicable on any river or stream.[15] The most telling benefits, it was held, was the claim that it involved no massive submergence of land and most of all it produced so called 'green energy' without any emission of carbon-dioxide. However, with the passage of time the experiences of affected people tell a different story. The indiscriminate rush to allot as many projects[16] as possible in all parts of the state of Himachal Pradesh have brought a number of social tensions, conflicts and many undesirable environmental impacts.

Vanishing Rivers

According to Schumacher and Reddy, the idea of 'Appropriate Technology' (AT) was strongly rooted in the notion of the latter's environmental sustainability that was in turn defined and determined by interaction with local communities. Observations and the oral evidences that have been gathered of the impact of the ROR in Himachal, however, tell us a different story; RORs by diverting rivers and streams not only end up drying up water sources, result in massive muck dumping, damage to forest and common lands but also give rise to what has now begun to be termed as 'indirectly affected people'.[17]

[15] Dunu Roy, 'Hydro power in Uttrakhand: Is 'Development' the real objective', *Economic and Political Weekly*, Vol. 43, Issue 41, 11 October 2008, pp. 19–20.

[16] The total number of small, medium and large projects in Himachal is around 140. Additionally there are 52 mini and micro projects (less than 5MW) in the state. Data provided in the official website of Department of Energy and Himurja. *http://admis.hp.nic.in/doe/project.htm* and *himurja.nic.in/*

[17] There have been few official and private studies to assess the impacts of Hydro projects and climate change in Himachal Pradesh.

1. 'Scoping Study for Satluj River Basin, Himachal Pradesh Improving Capacity for Climate Change Adaptation 2011'. Full report available at *http://www.adb.org/Documents/Reports/Consultant/IND/43169/default.asp.*
2. 'Study on Compliance of Environmental Clearance conditions in Parbati II Project', by Navrachna and Kalpavriksh, full report available on *Parbati-II-case-study-final-revised-2112008.pdf.*
3. Study on Alaknanda and Sutluj basin commissioned by World Bank and done by Hydro Tasmania.

In fact, the felling of trees had started to become one of the major concerns for all in Himachal; so much so that the state's High Court took *Suo Motu* cognizance of the escalating environmental impacts and constituted a one-man 'Shukla Committee' in 2009 to look into the matter.[18]

The most noticeable impact of this technology is on rivers and streams which appear to be literally vanishing. The dramatic diversion of the river from its channel and flow regime has two crucial engineering aspects deployed as a sequence in any ROR design. One, where the water is diverted through usually long tunnels into a power house for electricity generation; and the second, when the water is again released into a river. With many ROR structures being built, one after the other, on the same river, the latter soon enough becomes a collection of a maze of tunnels, often with barely a few kilometers of the river's original flow now running on the surface.[19] The entire stretch of 70 km of the Ravi river (from Chamba to Bajoli), currently flows only for 3 km on the surface of its original bed and the remaining volumes are telescoped through a collection of tunnels.[20] Similar will be the fate of the once mighty sections of the Satluj river and its many tributaries after the execution of all the projects: Khab; Jhangi-Thopan; Thopan-Powari; Shontong-Karcahm; KarchamWangtoo; Nathpa-Jjhakri; Rampur and Kol.

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4. 'In the Name of Clean Energy: A report on Asian Development Bank Financed Projects in Himachal Pradesh', Himdhara and SANDRAP, full report is available on *http://www.sandrp.in/hydropower/Report_Adb_Financed_HEPs_HP%20210511.pd.* Many reports on environment impact assessment by Environment Research and Action Collective Group which also goes by the name HIMDHARA.

[18] On 23 Dec. 2009 the High Court of Himachal constituted a one-man High Power Committee after taking a *suo motu* cognizance of a news item which appeared in the daily edition of *Indian Express* dated 18-11-2009. The news item highlighted that ten lakhs green trees have been felled while undertaking construction of 150 hydel projects in Himachal. It was also to look into other impacts of hydroprojects in Himachal as well. Mr. Avay Shukla, ACS Forest, was appointed member of the committee.

[19] The tunnels can be as long as 30–35 km in length.

[20] 'The Shukla Committee Report', p. 32.

After diversion and power generation, the water is not always released into the same river but in several instances dropped into another river altogether. The integrated designs of some of the large ROR projects entail inter-basin water transfer or river-to- river water transfer for augmenting power generation. Diversion of Beas at Pandoh in Mandi district to augment the capacity of the Bhakra dam has rendered the river in the city practically waterless for most part of the year.[21] Under construction Parbati project II and III also have provisions for transfer of water of not only the Parbati river but also the small rivers and *nallahs* in this area. Similar is the case in Satluj and Ravi basin where most of the upcoming projects like Kashang, entail diversion of whole streams. Such efforts to transfer volumes into many other rivers and *nallahs* in the under-construction projects shall render the riverbed dry for most part of the year as no water is allowed to go 'waste', especially during the lean seasons.[22]

This engineering strategy does not just impact the main river or its ecology; but also the smaller streams and other natural water sources that were connected to the now diverted streams. In inter-basin transfers consequently there may be unintended or unknown deleterious impacts on water availability for local communities. Some allege that Mandi town has begun to suffer water shortages for many months in a year due to the diversion of the Beas by the BSL project. The Hurla valley and Jiwa valley in Kullu is expected to face the same fate, after their diversion for the Parbati III project.[23] The recent agitation by villagers

[21] This diversion for BSL project has brought a perceptible change in the culture and ethos of Mandi town along with impacts on flora and fauna. The project has also given rise to peculiar silt disposal problem in Balh Valley. The silt problem has been examined by NEERI and is under the watchful eye of the Central Pollution Control Board. *Environmental Management Plan for Silt Disposal from BSL Project, Sundernagar, Himachal Pradesh,* A Report by National Environmental engineering Research Institute, Nehru Marg, Nagpur, December 2000.

[22] Pratibha Chauhan, '15 per cent water discharge into river: State plans law to cover all power producers', *The Tribune*, Shimla, 10 September, 2011; Rakesh Lohumi, 'Rivers in state set to go "nocturnal": Power projects to store water for peak-load requirement during daytime', *Tribune News Service*, Shimla, 24 February, 2012.

[23] Archita Bhatta, 'Against the flow', *Down to Earth*, 30 November 2007, pp. 22–23.

at Lippa in Kinnaur district apparently revolves around the issue of the diversion of their water source.[24]

Moreover, as argued by some geologists,[25] such diversions, tunnelling and blasting can potentially disturb rock alignment in the mountains and disrupt delicate links between the sources for springs, *nallahs* and *baulis.*[26] Water in these sources gradually start to dry up; while many of them get totally defunct, others are left with diminished water supply. Irrigation and drinking water schemes, according to Irrigation and Public Health department (IPH), dependent on them, start becoming redundant.[27]

With the main rivers already exhausted, the next target for hydro generation are the tributaries. In fact, wherever tributaries have been dammed or diverted, protests have been quick to erupt.[28] The Hurla

[24] Integrated Water Resources Management (IWRM) Scoping Study for Satluj River Basin, Himachal Pradesh: Improving Capacity for Climate Change Adaptation, ADB RSC-C006 (IND), ADB, GOI, Himachal Pradesh, April 2011, pp. 72–73; Ravinder Makhaik, Himachal: Kinnaur 'tribals for scrapping hydro project', *The Times of India*, 4 Jan. 2013**;** Pratibha Chauhan, 'Residents oppose power projects', *Tribune News Service,* Shimla, 3 January 2013.

[25] Different geologists have conducted many studies over the years in Himachal. S.K. Bartarya, N.S. Virdi, & M. P. Sah, 1996; R.K. Mazari, & M.P. Sah, 2003, 2004; M.P. Sah, S.K. Bartarya and R.K. Mazari, 2003; Jagdish C. Kuniyal and Reeju Sharma, 2002.

[26] Local terms for traditional water sources.

[27] The Irrigation and Public Health Department (IPH) has drawn up an exhaustive list of water sources which have either dried up or dwindled due to the construction activities of numerous hydro projects all over the state. For further details the official files in the IPH offices can be consulted.

[28] There are three main groups functioning in Himachal to safeguard its environment and biodiversity and fight against the over exploitation of natural sources. One is Himalaya Niti Abhiyan, a non-registered voluntary organization formed in 2004, an offshoot of Himalaya Bachaoo Andolan of 1994. It was inspired by the Chipko Movement and its founder Sunderlal Bahuguna. The main objective is to advocate for mountain-specific developmental model and appropriate policies to support it and safeguarding of the livelihood of people based on natural resources. The second group is Him Lok Jagriti Manch, again a non-registered voluntary organization formed in September 2008. It is a small intellectual group whose main objective is to create awareness amongst the people and the bureaucracy regarding the environmental violations and

nallah protest in the Beas basin, the Lippa village protest in Kinnaur, rallying against the Baspa project and the agitations against the Hul project in Chamba and many more are some examples. Loss to riverine fisheries has also been alleged by villagers who have complained regularly to the Fisheries department.[29] It has also been pointed out that the construction of the Pandoh, Larjee, Kol and Rampur HEP, Chamera I and II, Parbati I and II and many more are hampering the migratory run of the riverine fisheries in all the basins.[30]

The state governments in its attempt to find a solution to these substantial water diversion impacts have recently sought to contain the damage by passing an order that a minimum flow of 15 per cent (now 20 per cent as stipulated by MoEF since April 2011) will have to be adhered to by all project authorities, even during the lean season.[31] The question which many environmentalists and affected people nevertheless ask is whether 15 per cent (if adhered to) is enough to sustain the flora-fauna and the needs of the communities living below the diversion point? And how will one ensure that the water will be released by all project authorities all the time?[32] Alongside the efforts to address the problems of maintaining minimum flows, the government

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degradations. They also educate people regarding their natural rights in their natural their natural surroundings. The Third group is known by the name Himdhara, an environment research and action collective group. It is involved in lot of research regarding the impacts of hydro project in the state.

[29] 'Status of Fisheries Development in Himachal Pradesh', B.D. Sharma, *Fishing Chimes*, Vol. 26, No. 1, April, 2006, p. 121.

[30] L.K. Sehgal, 'Brief report on impact of construction and completion of Beas Project on liminology and fisheries of river Beas', National Research Center on Coldwater Fisheries, Haldwani, UP; Kuldeep Chauhan, 'Heavy silt discharge into rivers hits fish life', *Tribune News Service*, Mandi, 14 August, 2010;

[31] Vide Notification no. PC-F (2)-1/2005, by the Principal Secretary, Pollution Control, Government of Himachal Pradesh, dated 9 September, 2005.

[32] 1. The Shukla Committee report has also stated that none of the 11 projects it inspected is adhering to this condition. Most of the projects have some or the other excuse for not being able to release the mandatory discharge. This is the situation in the projects, the smaller ones are even more difficult to monitor as they are mainly on the tributaries and not easily accessible, p. 32.

2. Many Project Authorities have not accepted this order and have gone to the court against it. BBMB and NHPC are the front runners.

has also included a provision that will compensate the loss from any water source that has been rendered defunct from a diversion project. The IPH department is expected to prepare a list of such destroyed water sources and look for new sources to keep the water supply on for the affected villages. But can the compensation money recreate the lost water sources, remains a troubling and open question?

Muck and Mountains

An equally intense crisis has also been generated in the project sites by what is now termed as the problem of muck disposal. The blasting and excavation for tunnels, adits,[33] desiltation chambers, roads, and power houses generates a huge amount of muck. This muck needs to be disposed off, but the question is where and that too in a hilly terrain? The solution, according to official rules, requires the project contractors to use pre-designated sites in the Environment Management Plan (EMP).[34] But in reality, as has been observed, the same is not being adhered to. The muck is being dumped just about everywhere and anywhere; in the rivers, streams and *nallahs* and forest areas.[35]

[33] Adit is a tunnel dug to reach the Head Race Tunnel, firstly for construction and later on for maintenance.

[34] The Environment Management Plan (EMP) of respective HEPs is supposed to have site specific engineering designs for scientific muck management including the swell factor of 45 per cent. Dumping sites are demarcated according to the amount of muck estimated to be generated. And if the generated muck is more than estimations then new sites are demarcated (mostly forest or agricultural land). These dumping sites are supposed to have proper breast and crate walls (which need to be maintained regularly) in order to check the spillage of the muck down the slope and into the rivers. Muck has to be dumped at these sites in a way that 23–30 m thick layer is formed and the dumping sites have to be levelled and restored once they are filled to capacity. Then these sites have to be properly afforested with suitable plants. This is done so that the degradation which might occur due to the unscientific dumping of muck could be minimized.

[35] 1**.** Rahul Saxena, 'Environmental and Forest violations in the Parbati Hydro project in Himachal', Compliance and Monitoring of Environment Clearance conditions of Parbati Hydro-electric Project II in Himachal Pradesh. A Case Study by Kalpavriksh Environmental Action Group, New Delhi, February 2008. *Parbati-II-case-study-final-revised-2112008.pdf*

The Satluj and Ravi basins are facing the most severe problem as their mountainous sections are very fragile. The Chamera project in Chamba and Karcham Wangtoo in Kinnaur are excellent examples of unscientific dumping quoted by the 'Shukla Committee'.[36]

Even the designated sites are not being protected adequately; this is resulting in muck rolling down into the rivers. These large quantities of soil and rock then tend to block natural drainage lines and pose serious threats to life and property, pollute water sources, disrupt agricultural fields and increase flood intensity. The infamous Pulia Nallah disaster in Kullu valley in which about 20 men were killed was traced to the muck crises.[37] In the forest area the muck does not allow any vegetation to survive beneath it and it also creates an artificial water channel which destroys the green cover on the mountains.

The blasting, as reported, is also triggering minor and major landslides in all the project areas and causing flash floods.[38]

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2. Tarun Gupta and Sanjay Verma, 'Report on Parbati Hydro-electric project Stage II' Conducted by State Council for Science, Technology and Environment, Shimla, April 2005, pp. 198–201.

3. Implementation of Environment Management in Parbati Hydel project– An Inspection Note– August 16–17, 2005'. Conducted by Environment Planning Unit SCSTE, Shimla, p. 5.

4. Sanjeev Sharma, J.C. Kuniyal and J.C. Sharma, 'Assessment of Man-made and Natural Hazards in the Surroundings of Hydro-power projects under construction in the Beas Valley of North Western Himalaya', *Journal of Mountain Sciences*, Vol. 4, No. 3 (2007), pp. 221–236.

5. Arun Srivastava, 'Are We Destroying the Himalayas', *Voice your opinion*, 13 November 2007. *www.thepeoplesvoice.org*

[36] Shukla Committee Report, pp. 22–23.

[37] R.K. Mazari and M.P. Sah, 'Pulia Nal Cloudburst of July 16, 2003, District Kullu, Himachal Pradesh: Lesson for Policy Implementation', Wadia Institute of Himalayan Geology Dehradun. Himalayan Geology; Vol. 25 (2), 2004. The incident was quotes in all the leading News Papers; *The Tribune*, 17 July 2003, 18 July 2003, 19 July 2003 and 24 July 2003, *Rashtriya Sahara,* 18 July 2003, *The Hindu,* 25 July 2003, and all the vernacular newspapers.

[38] This fact has been well established by many geologists, private researchers and News paper reporting. Different geologists have conducted many studies over the years in Himachal. S.K. Bartarya, N.S. Virdi, & M.P. Sah, 1996; R.K. Mazari, & M.P. Sah, 2004; M.P. Sah, S.K. Bartarya and R.K. Mazari, 2003;

Environmentalists and local people allege that the Ravi basin is suffering due to reckless cutting and digging of hillsides for the widening of the Chamba Bharmour highway for the Chamera project. Landslides also threaten dams on the Ravi river including Chamera. Similar incidences can be quoted from the Satluj valley.[39]

Silting adds further miseries. Plans provide flushing of excess silt through desiltation chambers as the rate of sedimentation is high in the Himalayan region, but most of the time, no specific mention of the disposal plan in the EMP is available. It is generally discharged in the water bodies or on dry river beds downstream of the diversions, with the hope that these lumps of soil, sand and stone will be carried away by peak monsoon flows. The muck, moreover, when flushed with flooding waters enters fields and renders them infertile. The entire Balh valley in Mandi district is facing this unique muck problem, with no respite in sight.[40]

Jagdish C. Kuniyal and Reeju Sharma, 2002, John Stackhouse, 'Hydro Project under Scrutiny', *The Globe and Mail*, 25 April 1992, Balakrishan Prashar, 'Landslips threaten hydel projects', *The Tribune*, 27 November 1998, Balakrishan Parashar, ' Reckless cutting of hills may trigger landslides' , *The Tribune*, 14 May 2007, Arun Srivastava, 'Are we destroying the Himalayas'.

[39] One major example is the Jakhri landslide of 23 February 1993. This damaged a 500 m long stretch on National Highway 22 and created a lake in the Satluj gorge which blocked the highway for 12 hours but was able to cut through the blockade partially and overflow it in the early hours of 24 February 1993. In the same year on 8 July**,** another landslide precipitated by the construction activities of Nathpa project, stopped the flow of Satluj river for about 30 minutes and created a lake 6 km long and 200–250m wide covering an area of 1.20 to 1.50 sq km. The lake totally submerged the Bailley Bridge on approach to the Sanjay Vidyut Pariyojna (SVP) powerhouse from Nathpa Jhula. The water entered through TRT of SVP, damaging the machinery of the powerhouse. The power generation from SVP stalled over three months resulting in a revenue loss of crores of rupees.

[40] The details have been recorded in unpublished PhD thesis 'A Historical Study of the Socio-environmental Impact of Hydro-Power Projects in the Beas Basin of Himachal Pradesh (1908–2007)' in the Library of Shimla University, HP. Also see *Environmental Management Plan for Silt Disposal from BSL Project, Sundernagar, Himachal Pradesh,* A Report by National Environmental Engineering Research Institute, Nehru Marg, Nagpur, December 2000.

Diverting the Forest

The ROR projects might not be evidently submerging major portion of forests but they do end up removing dense forests to lay roads to the project sites and erect transmission lines.[41] At times, an entire mountain side has been stripped of its forest cover.[42] In fact, the forest cover is the first to go even before the construction of the project starts. This has been reported from all the basins of Himachal: Allaihain Duhangan and Parbati project in Kulluand Chamera in Chamba are prominent examples of this. The Jiwa Nallah approach road for Parbati III has been constructed through rich Chir forest and resulted in the total devastation of the forests and has led to landslides.[43] Diversions and road construction also impacts the wild life.[44] Felling of trees led to the one-man 'Shukla Committee' being constituted in 2009 to look into the matter.

As officially mandated, any forest loss has to be compensated by recreating a forest cover elsewhere in the region. The Forest department is in fact authorized to collect compensation money under the heads of Catchment Area Treatment (CAT), Compensatory Afforestation (CA)[45] and Net Present Value (NPV), i.e. compensation

[41] Most of this deforestation is for the approach road to reach the project location or the adits location. The official data reveals that 9,131 hectares forest land has been diverted for non-forestry purpose from 1980 after the enactment of forest Conservation Act (FCA) till date. Hydro projects have the maximum share of 3,929 hectares with 2,226 hectares for transmission lines. The details are provided in the official site of the Forest Department of HP. *www.hpforest.nic.in*, site accessed on 24 March 2011.

[42] It had been predicted by Ashwini Chhatre and Vasant Saberwal in April 2002 in their article, 'The Parvati and the Tragopan Politics, Conservation and Development', *www.indiatogether.org/environment/articles/ghnp/politics.htm*. Site accessed on 27 October 2008**.**

[43] This was the case with most of the large dams project be it Sardar Sarovar, Damodar valley or others. Amita Baviskar, *In the Belly of the River;* Arundhati Roy, The greater Common Goods.

[44] 'Power projects major threat to wildlife: Expert, Rakesh Lohumi', *Tribune News Service*, Shimla, 15 June 2011.

[45] In case of CA if the non-forestry area is available than the loss of 1 hectare land is to be compensated by planting 1 hectare of forest. But if non-forest land is not available than in lieu of the loss of 1 hectare forest 2 hectares of forested area has to be densely forested.

for loss of the ecological contribution of the forest land diverted. Despite millions of rupees getting collected under the CAMPA[46] scheme the supposed additions of new forests has not been realized.[47] In addition to CA and NPV**,** an innovative scheme known as Payment for Environmental Services or PES is also emerging, but for now it is the local inhabitants living close to these project sites who have to bear the brunt of the loss of their resources.

Sadly enough, RORs because they are deemed to be green are not considered a threat to forests lying in ecologically sensitive national parks. The Great Himalayan National Park in Kullu, Sainj wildlife sanctuary and Lippa Asrang Sanctuary are some examples.[48] As the newer ROR projects are moving towards the glaciers in remote and relatively untouched areas, there are understandable fears that they might have severe impacts on pastures and the temperate forest of *Deodar*, *Chilgoza (piniusgerardiana)* and *Birch* trees.[49] The role of construction workers is these fragile regions is also beginning to get attention. Moving in a large workforce may often cause huge demands on the limited resources of the local communities.[50]

[46] The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) was notified for the purpose of management of money towards compensatory afforestation, NPVs, and any other funds recoverable in pursuance of the court's orders in 2004 but was operationalized in 2006. It was only in 2009 that the CAMPA has released 10 per cent of the accumulated amount of each state, and the State CAMPA sanctioned proportionate amount for each project to be spent from 2010–11.

[47] It was only in 2009 that the CAMPA has released 10 per cent of the accumulated amount of each state, and the State CAMPA sanctioned proportionate amount for each project to be spent from 2010–11.

[48] In 1999 the government decided to exclude an area of 10 square km from the Great Himalayan National Park in Kullu district adjoining the area allocated for Parbati Project. This was primarily done to allow building of a wide approach road to the dam site on the Jeeva Nallah. The details are well recorded in Ashwini Chhatre and Vasant Saberwal's, *Democratizing Nature-Politics, Conservation, and Development in India,* OUP, India, 2006.

Apart from GHNP, Sainj wildlife sanctuary and Lippa Asrang Sanctuary will be impacted due to the construction of Sainj project and Kashang project II.

[49] *Chilgoza* and *Birch* are rare trees in Himachal found only in the Kinnaur district of Himachal Pradesh.

[50] The damage to the forest by the labour force is not a new phenomenon and has been observed before in Western Ghats, Silent Valley, Rajasthan, Gujarat

All these environmental losses are supposedly to be addressed in the EMP and EIA and later on dealt with to prove the sustainability and appropriateness of the RORs. There is even a provision for public consultation, but as observed in most of the cases, local people are not well informed and neither are they provided full EMP in their local languages.[51] People's concerns and objections are seldom recorded and addressed before a project starts. This has mostly reported in almost all project locations at all basins.[52]

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and many other places. The problem is to find suitable sites for their camping, timber for their huts and fuel. For it they cut forests recklessly, as they have no long-term interest in their preservation. As of 1994, all river valley and hydroelectric projects needed to seek mandatory environment clearance as per the procedures laid out under the Environment Impact Assessment (EIA). Notification was issued under the Environment Protection Act, 1986. While granting EC, the nodal impact assessment agency i.e., the Ministry of Environment and Forests (MOEF) puts down a set of conditions based on which clearance is granted. In the case of river valley and hydroelectric projects these conditions include parameters around muck/debris disposal, road construction, catchment area treatment, fuel supply to labourers, conservation effort etc. These conditions are to be mandatorily adhered to by the project authorities.

[51] A study was conducted by A. John Sinclair and Alan P. Diduck, 'Public Involvement in Hydro Development in Kullu District, Himachal Pradesh, India', funded by Shastri Project on Urban Development and Environmental Impacts in a Mountain Context, Technical Report No. 13, June, 1999 for Parbati II, III and Malana projects in Kullu. The general observations were: 1. information available on the EIA process that could assist people in understanding the purpose and objectives of EIA is scant and not user friendly. 2. The summary documents were written in technical language without providing a glossary of key terms. 3. Changing the location of the sessions of hearing on the day of the hearing discourages participation.

[52] A Public Hearing for the World Bank funded Luhri Hydro Electric had to be cancelled after public protests making it clear that the environmental and social impacts of Hydro power projects as well as the increasing gap between their promise and performance, especially in the Himalayan region have become issues of serious concern. 'Report questions ADB funded projects under the 'Himachal Clean Energy Development Programme', 27 May 2011, *http://chimalaya.org/2011/05/27/report-questions-adb-funded-projects-under-the-himachal-clean-energy-development-programme/* ;'Power project: Admn forced to call off hearing at Karsog due to protests', *HimVani*, 7 May 2011; Kuldeep Chauhan, 'Samiti to move HC against public hearing, *Tribune News Service*, Mandi, 4 August 2011.

Towards a Conclusion: How appropriate is Appropriate Technology?

For A.K.N. Reddy, one of the pioneers of appropriate technology in India, the benefit of the Appropriate Technology 'must start with the people at the project site and then radiate outwards'.[53] For Reddy as much as for Schumacher, as has been pointed out earlier, Appropriate Technology must operate not only at the local scale but it must be integrated and must be judged keeping in mind local or place-based sensibilities about use, efficiency and desired outcomes. The ROR technology experiences in Himachal Pradesh, as we have just outlined, suggest an entirely opposite set of implications involving a host of negative impacts on local livelihoods, agricultural lands, water sources and fisheries.[54] Put differently, RORs undermine local communities and tend to be disruptive of a long history of ecological relationships and dependence that people have established with their forests and rivers in the region.[55]

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2. The villagers of Udaipur-Tindi region of Lahaul-Spiti alleged that the company and the officials of proposed Saili power project deliberately conducted the public hearing in freezing temperatures in the snowbound Lahaul-Udaipur even as the 13,050-foot-high Rohtang Pass had been declared officially closed on 31 October. 'Tribesmen say no to Saili power project', Kuldeep Chauhan, *Tribune News Service*, Mandi/ Udaipur, 18 November 2011;

3. A. John Sinclair and Alan P. Diduck, 'Public Involvement in Hydro Development in Kullu District, Himachal Pradesh, India', study conducted by Shastri Project on Urban Development and Environmental Impacts in a Mountain Context, Technical Report No. 13, June, 1999.

[53] 'Amulya Reddy: An Autobiography', S. Ravi Rajan, (Ed.), *Amulya Reddy: Citizen Scientist.* Orient Black Swan, New Delhi, 2009, pp. 13–15.

[54] Arun Srivastava, 'Are We Destroying the Himalayas', *Voice your opinion*, 13 November 2007. *www.thepeoplesvoice.org*; Sanjeev Sharma J.C. Kuniyal and J.C. Sharma, 'Assessment of Man-made and Natural Hazards in the Surroundings of Hydro-power projects under construction in the Beas Valley of North Western Himalaya', *Journal of Mountain Sciences*, Vol. 4, No. 3 (2007), pp. 221–236. 'Socio-Economic impacts of Hydro-power Electric Projects: Himachal Pradesh', an unpublished study by Society for Economic Development and Environmental Management, Ford Foundation, New Delhi, 2008.

[55] For details see Anderson, *Forest Settlement Report*, 1887; Dreze and Sen, *India Development and Participation*, 2002; Chetan Singh, *Natural Premises: Ecology and Peasant Life in the Western Himalaya, 1800–1950*, OUP, 1998, Chhatre and Saberwal, *Democratizing Nature,* 2006.

The continued use of the sobriquet Appropriate Technology for RORs, nonetheless, needs to be explained, especially in the case of Himachal Pradesh and its recent dramatic shift to generate hydroelectricity. In part, the ability to reconcile Appropriate Technology with RORs was brought about by an epistemic shift in the 1990s to universalize the notion of Appropriate Technology. This systematic reconsideration in redefining appropriate technology was, brought about by the compelling arguments of Amory Lovins and Arjun Makhijani. By initiating the debate from the vantage of energy,[56] Appropriate Technology, in their opinion, was defined as being 'chiefly energy efficient',[57] 'reproducible' and 'replicable' anywhere. That is, Appropriate Technology, for them, should not have any inherent tensions of scale and locality.

Even as they couched their rhetoric on Appropriate Technology as 'less demanding on ecology' and 'based more on local renewable sources for long term sustainability', they, nevertheless, concluded that 'energy efficiency can greatly expand and speed renewable supplies by making them smaller, simpler, cheaper, and more effective.'[58] In effect, for Lovins and Makhijani, Appropriate Technology could be

[56] Arjun Makhijani has compellingly summed up the energy crisis, 'A three-fold global energy crisis has emerged since the 1970s; it is now acute on all fronts. 1. Severe climate change, caused mainly by emissions of carbon dioxide from fossil fuels burning and associated emissions of other greenhouse gases; 2. The security of oil supplies, given the political and military turmoil in much of the oil exporting world, centred in the Persial gulf region; 3. Nuclear weapon proliferation and its potential connections to the spread nuclear energy to address climate change'. He has further highlighted the main concern points of climate change in the 'Preface' of his book. Arjun Makhijani, *Carbon-Free and Nuclear: Free: A Roadmap for U.S. Energy Policy*, IEER Press, Takoma Park, Maryland, 2007, pp. xv–xviii.

[57] Energy efficiency has been accorded a new term by Lovins as 'negawatts'. Negawatt power is a theoretical unit of power representing an amount of energy (measured in watts) saved. The energy saved is a direct result of energy conservation or increased efficiency. The term was coined by Amory Lovins in 1989. Negawatts currently cannot be precisely measured, only theoretically. *en.wikipedia.org/wiki/Negawatt_power*

[58] Amory Lovins, 'Expanding Nuclear Power Makes Climate Change Worse', *www.cleanairalliance.org/node/581*. Accessed on 8 August 2011.

universalized as technologies that essentially had properties involving size, costs and efficiency rather than as qualities or functions defined and determined by specificities of locality or place. For them, thus, Appropriate Technology was a universalist technology that could be operable without a sense of place. A reworked notion of Appropriate Technology without a local context, in other words, was therefore inserted into the development imagination in Himachal Pradesh without having to qualify the relevance of ROR for local communities or contexts. RORs in Himachal Pradesh could be inserted into this reworked technical vision of Appropriate Technology, by the late 1990s, even though many of its debilitating impacts were suffered locally and by place based communities.

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