Critical Issues in Streamlining Environmental Management of Hydel Projects in India[1]

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For some time past, however, I have been beginning to think that we are suffering from what we may call, "disease of gigantism". We want to show that we can build big dams and do big things. This is a dangerous outlook developing in India…. the idea of having big undertakings and doing big tasks for the sake of showing that we can do big things is not a good outlook at all.

We have to realise that we can also meet our problems much more rapidly and efficiently by taking up a large number of small schemes, especially when the time involved in a small scheme is much less and the results obtained are rapid. Further, in those small schemes you can get a good deal of what is called public co-operation, and therefore, there is that social value in associating people with such small schemes.

Jawaharlal Nehru, at 29th annual meeting of CBIP, Nov. 17, 1958

Hydropower development in India

India's installed Hydel capacity has gone up 43 times from 508 MW at the time of independence to 21 700 MW in 1996-97. Hydel energy production has gone up twenty seven times from 2.52 B kWh in 1950-51 to 68.63 B kWh in 1996-97. India's Ultimate hydel generation potential is said to be 600 B kWh per year as per the latest revised estimates. Ultimate potential for installed capacity is said to be 84 000 MW at 60% load factor. The pumped storage schemes are supposed to have additional potential of 94,000 MW. The government and other promoters are in tearing hurry to establish new hydropower projects. Issues like comprehensive river basin plans, options assessment, environment and social impact assessment and mitigation, transparency, accountability and participation of people are considered unnecessary roadblocks in that direction (GOI, 1999: 667-9).

Hydropower at what cost?

You (the president of CBIP) have said just now in your address that the cost of production in a small project is great. I am not at all sure if that is so, because the cost of a small project has to be judged after taking into account all the social upsets connected with the enormous concentration of national energy, all the national upsets, upsets of the people moving out and their rehabilitation and many other things, associated with a big project. Also it takes a long time to build a big project. The small projects, however, does not bring about these upsets nor does it involve such a large endeavor.

Jawaharlal Nehru, at 29th annual meeting of CBIP, Nov. 17, 1958

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3303 large dams have been constructed in India since independence. Some 700 more large dams are under construction. This has been possible only at very great national costs. Millions of Ha of forest and non-forestlands has been submerged. Rivers have died. Government has no data about how many people have been displaced in the process, but a sample survey of some 130 large dams based on government and the World Bank figures show that the figure must exceed 35 million. Even secretary of Union Ministry of Rural Development accepted in an open meeting earlier this year that large dams have displaced some 40 million people since independence. Most of these people have not been resettled. There is no record about these people. Destruction of wild life habitats, destruction of biodiversity, destruction of rivers, serious geomorphological impacts, etc. are some other impacts about which little organised information is available.

Downstream Impacts: The Death of the River

Downstream impacts of large dams are one of the most neglected areas. Even the World Bank and India's Environment ministry have been neglecting this impact till recently. These impacts can include the following.

⇒ Drying up of river in non-monsoon months, leading to drying of water source for the people living on the banks of the river.

⇒ Stoppage of groundwater recharge in the downstream regions.

⇒ Salinity ingress due to stoppage of fresh water flow.

⇒ Such salinity ingress can destroy the existing groundwater in the region and also affect the lands on the banks of the river.

⇒ Pollution concentration in the downstream region.

⇒ Destruction of mangroves in the downstream areas.

⇒ Destruction of riverine and estuarine fisheries and displacement of people thereby. This is contributed both by the stoppage of freshwater flow and also by the stoppage of silt in the reservoir behind the dam.

⇒ Flashfloods in the downstream area are generally more destructive than the floods without dams.

⇒ The stoppage of downstream flow can also affect use of river for navigation for the people on the banks of the river.

⇒ Geomorphological impacts are also important ones to be mentioned.

⇒ The people in the downstream that depend on the river for bringing water for diversion agriculture in the floodplains also get deprived of this when dam is built in the upstream area. This can bring lower harvests, drops in productivity and impoverishment. (Cernea, 1997: 4)

A very good example of how the downstream impacts can get neglected is the case of Sardar Sarovar Project, which is supposed to represent the state of the art project in dam building in India. Narmada River, on which this project is under construction in Gujarat, is a monsoon fed river. 80-90% of the annual discharge in the river flows away in the monsoon months and the non-monsoon months have only 10-20% of the flow. But SSP project authorities have allocated no water for the downstream regions. In fact, Gujarat State, while presenting its case before the Narmada Water Disputes Tribunal Award, requested NWDT to allocate separate water for the downstream area. The Tribunal told Gujarat to allocate water from its share of water from the river. And Gujarat, now, has allocated no water for the 150-km of river downstream from the dam. The SSP dam will not be able to store all the water in the river in the monsoon, but the

10-15% of the annual discharge available in the non-monsoon months will certainly get stalled behind and diverted by the dam.

Actual benefits much lower than claimed benefits

It is now well documented that most large dams are ill planned projects even from technical, geological, hydrological, environmental and social point of view (McCully 1997; Singh, 1997; the World Bank and many others). Comprehensive river basin plans have not been made for a single river basin in India till date. The Planning for large dams generally starts with identification of sites suitable for large dams, then its benefits are postulated and thus it is justified that the large dam must be built there. Options assessment is almost never done. This is the story starting from Bhakhra to Sardar Sarovar. The results are also well known. The costs are underestimated and invariably overshoot the projected costs. The benefits are overestimated and projected benefits are almost never achieved. Social and environmental issues are the worst sufferers.

Sustainability of present capacity

> Our river valley projects like Bhakra, Nangal, Damodar, Hirakud, Tungabhadra, etc. shall all remain land-marks for ever.
>
> Jawarharlal Nehru, at 24th Annual Meeting of CBIP, Oct. 26, 1953

The sustainability of the present hydel generating capacities is in serious question due to much larger than projected siltation rates, as can be seen from the following table. In case of most of the reservoirs, expected life is less than one third of projected life. (While not all the projects listed below have hydro components, they represent the situation of most reservoirs in India.)

Siltation Data of Selected Reservoirs

Reservoirs	Year of Impou-ndment	Annual Rate of Silting in ha m/ 100 sq km			% Loss of storage capacigy till 1975		
		Assumed	Observed	% increase	Dead	Live	Total
Bhakra (68)	1959	4.29	6.00	39.9	16.42	2.50	6.00
Panchet (21)	1956	2.47	9.92	301.6	38.90	19.67	13.02
Maithon (11)	1956	1.62	13.10	708.6	27.37	2.63	10.50
Mayurakshi (27)	1955	3.61	20.09	456.5	44.50	9.00	13.00
Matatila	1958	1.43	3.50	144.8	16.17	9.16	11.04
Shivajisagar	1961	3.42	15.24	345.6	NA	NA	NA
Tungabhadra (24)	1953	4.29	6.54	52.4	97.00	9.30	10.30
Hirakud	1956	2.52	3.84	52.4	NA	NA	7.80
Gandhisagar	1960	3.61	10.05	178.4	30.60	1.33	4.30
Ramganga (25)	1974	4.29	17.30	303.3	NA	NA	0.67
Kangsabati	1965	3.27	6.73	105.8	NA	NA	2.24
Ghad	1966	3.61	15.15	319.7	NA	NA	28.10
Dantiwada	1965	3.61	6.32	75.1	NA	NA	4.33
Ukai (34)	1971	1.47	4.97	238.1	NA	NA	2.18
Tawa	1974	3.61	8.10	124.4	NA	NA	0.63
Beas Unit II	1974	4.29	15.10	252.0	NA	NA	0.68

Source: The World Bank, 1991: 75 and Central Board of Irrigation and Power, as quoted by Singh (1997: 140-1)

Note: The figures in the Bracket next to the name of the project indicate the expected life of the reservoir as % of design life. These figures shockingly show that expected life in most cases is likely to less than one third of the design life. For Nizam Sagar Project in AP (not mentioned in table above), the expected life is likely to be just 6% of the design life. These figures are all from World Bank, 1991b: 75.

This also breaks the myth that large hydro is a renewable source of energy. The projects have limited life span, much smaller than what is made out to be the case. The costs and impacts of decommissioning of the plants once its useful life is over is not even part of benefit cost calculations of large hydro plants.

Electricity for Whom?

Diwali[3] days are barely behind us and we all have seen how freely electricity is available and is misused in cities like Delhi. Energy is available for all kinds of unjustifiable uses in urban areas. Indian industries are notorious for their energy inefficiencies. T & D losses in India are known to be large and are only now improving slowly, only in some areas. Agricultural pumpsets in India are known to be energy inefficient and mostly benefit the large farmers. And yet electricity provided for agriculture is practically free. Thus, electricity is demanded and is available for all kinds of uses that are not at all justifiable. At the same time, it is known that poor people have poorer access to electricity.

70% of rural households in India do not have access to electricity (*Housing and Amenities: A Database on Housing and Amenities for Districts, Cities and Towns*, Occasional Paper No 5 of 1994, Demography and Data Dissemination Division, Census of India, Office of the Registrar General and Census Commissioner, New Delhi, pp 67-69, quoted in CSE, 1999 Vol. 2: pp. 203-4). Other figures on access to electricity are even more striking.

- 95.9% SC and ST households in Bihar do not have electricity connection.
- 93.5% SC and ST Households do not have electricity connection in Orissa.
- 90% SC and ST households in West Bengal don't have electricity connection.
- 87.5% SC and ST households in UP don't have electricity connection. (NCAER, 1999: 238)

Thus, while new hydropower projects are put forward, it needs to be asked what for is the electricity to be provided and if that fits into the national priority. It also needs to be asked if all wasteful uses have been taken care of before going for new projects.

Options for Future

> It is the small irrigation projects, the small industries and the small plants for electric power, which will change the face of the country far more than half a dozen big projects in half a dozen places.
>
> Therefore, real value of a development lies in spreading out its influence all over India so that more and more of people can benefit by it. Thus the social value of a vast number of small projects is much greater than that of one, two, three, four or five big projects.
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> Jawaharlal Nehru, at 29th annual meeting of CBIP, Nov. 17, 1958

[3] Festival of light that is celebrated across the country with much gaity, in celebration of victory of the good over the evil.

- Better operation of existing plants: there is substantial scope for improving the operation rules of the existing hydro plants to see that the hydro projects are used largely for generating peaking power.
- Improve PLF of hydro projects: PLF of hydropower projects in the country have been falling consistently.

Falling Plant Load Factors of Hydro Projects in India

Year	PLF
1982-83	44.33
1983-84	43
1984-85	41.83
1985-86	40.4
1986-87	39.4
1987-88	35.67
1988-89	35.5
1989-90	35.73

Source: Adopted from Ministry of Power, Govt. of India, quoted in CSE, 1999: 200-1.

Note: Three-year moving average figures have been used for the PLF so that it gives more correct picture for the behaviour of the PLF. Figure in attached excel file illustrates this falling tendency.

Install pump storage systems at existing large dams, where such systems do not exist. Indian grid is known to have surplus non peak energy in 75% of the cycle period. It is only for the rest of the 25% time period that new capacity additions are justified.

- Develop all possible mini and micro hydro projects first. Provide incentives for their development. In the past, large hydro projects have been pushed to the exclusion of the other renewable options, in spite of the huge potential of Demand Side Management and Renewable options. This can be seen from the following tables.

Development of renewable sources relative to Large Hydro

Energy Source	Ultimate Potential	Potential created	% of Ultimate Potential used
Large Hydro	84 044 MW	21 644.8 MW	25.77%
Biomass + Bagasse based co-generation	20 000 MW	160 MW	0.80%
Wind	20 000 MW	1 024 MW	5.12%
Small Hydro (<15 MW)	10 000 MW	183.5 MW	1.83%
Solar PV	20MW/ Sq. km	47 MW	Negligible
Urban/ Ind. Waste Based generation	1 700 MW	7.75 MW	0.45%

Source: GOI, 1999; Web-site of MNES (Ministry of Non Conventional Energy Sources), September 1999.

Notes: Ultimate potential for Large Hydro figure is given at 60% load factor. The created potential at 60% load factor would come to 13 000 MW. By this figure, 15.5% of ultimate potential has already been created and additional 7% of ultimate potential (again at 60% PLF) is to be available through ongoing and cleared schemes.

Generation Potential through Improvements and Alternatives

Sector	MW
1% improvement in PLF(which was 64% in 1996-97) equals	650
1% reduction in T & D losses (which are 21.4% by official estimate and 30-40% by researchers; in China they are 7%)	800
Efficient use of power in agriculture – equivalent of adding:	15,000
Reduction in electricity demand through Rain water harvesting equivalent to an addition of generation capacity	5000
Demand management by efficient utilities (10% saving) equivalent of	5000
Micro, mini hydel potential (7000 MW, identified by Central Electricity Authority and 2039 MW by Ministry of Non-Conventional Energy Sources). In China installed capacity is 15,000 MW	10,000

Longer term perspective	MW
a) Wind 45,000 Biomass 17,000 Municipal wastes 1,700 (Wind farm first demo in 1986 attracted private investment because of relatively low investment needs of such projects. Against a target of 100 MW in 8th Plan, achievement was 860 i.e. over eight times)	63,000
b) Recoverable energy sources growth 1993 25 MW 1998 1365 MW Capacity expected by 2010	10,000
c) Ocean Thermal Energy Potential:	1,80,000
d) Pumped storage facilities – using excess power generated in off-peak hours to pump water in higher reservoirs (63 sites identified) potential estimated by Central Electricity Authority:	94,000

(The last two tables have been drawn from the draft paper prepared by Prof. Nirmal Sengupta of Madras Institute for Development Studies, prepared for the India Country Study for the World Commission on Dams.)

The above tables shows the bias of the government in favor of development of large hydro as against development of small hydro and other renewable energy sources, in spite of the huge potential possible from alternative sources (this is also well illustrated in specific case of Kerala through a separate SANDRP (South Asian Network on Dams, Rivers and People) submission to WCD, titled: “Renewable Energy and Restructuring of Society: The case of Small Hydro in Kerala”. The paper can be request from SADRP email: cwaterp@del3.vsnl.net.in). The argument that the renewable energy sources are too expensive and hence non viable has two fatal weaknesses. Firstly, the large hydro projects seem cheaper only when social and environmental costs are not properly counted. Secondly, very little resources have been put in to make other renewable sources cheaper and more viable. This can be achieved through economic incentives and by allocation of resources for research. Neither has been done. That the potential from renewable sources can be realised if proper incentives are provided is proved by the development of wind energy in the 1990s in India and across the world. That this bias continues to this date is evident from the fact that the Ninth Plan has allocated 1.6% of energy sector allocations for renewable sources (Prayas, 1999: 3)

- Develop all possible other renewable energy measures first. These could include wind, solar, biomass, urban waste, etc. Provide necessary research infrastructure and incentives for this.
- Develop all conservation based potential first. Provide all incentives for this.
- Develop all possible demand side management options first. Provide all possible incentives for these.
- Set up credible mechanisms to stop theft of power. It is well known that industries are the biggest culprit in this respect. This has been going on hands in glove with the power set up in the country.
- Develop national, regional and local prioritised development plans across the country with participation of the people.

⇒ Establish credible future demand scene. It is now well known that future exaggerated future demands are projected to justify all kinds of projects. As recently as last month, the future electricity demand has been substantially downscaled.

⇒ Give top priority to all possible conservation efforts.

⇒ Give next priority to local projects.

⇒ Give third priority to setting up of pump storage or generation schemes on existing dams and canals.

⇒ Give next priority to non large dams options in such projects.

A World Bank study for two states in India, despite being conservative in their approach, found that the ‘Green Scenario’ (incorporating the efficiency and renewable sources) is among the least-cost policy options for reducing environmental impacts (Prayas, 1999: 8).

Critical issues for future:

1. The first thing that the hydropower lobby, if it wants to build any future hydro stations, needs to do is to gain some credibility. As of now it stands completely discredited due to its past performance. (See for example, Kothari, 1998.) Some of the steps that can be taken to gain some credibility can be:

- Stop building new hydro power stations.
- As far as ongoing schemes are concerned, the construction needs to be stopped pending complete, independent, open and participatory review of the projects. Options assessment needs to be done to see what options exist for minimising the social and environment impacts of the proposed plants.
- Do a post facto review of the performance of past projects against the projected costs, benefits and impact, versus the actual costs, benefits and impacts.
- Properly and justly resettle all those people who have been displaced till date and not resettled.
- Based on post facto review, decide in case of which dams, will it be more beneficial to decommission the dams and decommission them.

2. Put forward a comprehensive impact assessment framework for assessment of social and environmental impacts of the projects. Generate a public debate for this. The call for debate will have some credibility if it is announced that no new hydropower project

will be taken up pending such a framework. Appoint an independent and credible team for formulating such a framework. Some of the crucial aspects missing from the present framework include the following.

- No options assessment is done. Assessment of all options to achieve prioritised sets of objectives is a must to choose from various options keeping all costs and benefits into consideration.
- Utter lack of transparency. All information pertaining to these so-called "public purpose projects" must be in public domain. The government and the promoters must be asked to pay for the expenses implied.
- No credible consultation process.
- No transparent decision making process.

3. Set up an independent and credible authority to assess, sanction and monitor the social and environmental aspects of hydropower projects. (This can be one of the many possible mechanisms as an alternative to the present set up.) The present set up under Union Ministry of Environment and Forests lacks credibility now looking at its past performance. In stead of working as environmental watchdog, it seems to be working as facilitating body for large hydro and other large dam projects. The independent authority must have powers to stop projects when they see that minimum safeguards and mitigation plan are not being followed or that the social and environmental impacts are likely to be in access of those projects or when the actual benefits are likely to be lower than the claimed benefits.

4. Most of the times, the environmental assessment gets done by consultants or consulting organisations that have shown consistent loyalty to dam promoters. Hence there is need for some independent regulation in this respect too. Possibly the authority suggested above can be asked to blacklist those individuals and organisations that have shown such tendency in the past. This can be assessed in the course of post facto assessment of large hydro we have mentioned above.

5. Situation in future, with efforts to privatise large hydro projects gaining momentum, is likely to get worse in this respect as recent experience with projects like Maheshwar hydro project in Madhya Pradesh shows. Privatisation hence is going to be fiercely opposed. In any case, today there is even greater need for such independent, credible mechanism.

6. The new social and environmental impact assessment framework must include the following points among others. These are absent from present framework.

- The project will have to show that all non-large dam options have been exhausted across the nation and the project fits into national and regional prioritised development plan.
- The very first principle of impact assessment should be to minimise the impacts. The question of mitigating the impacts will come only at a latter stage.
- The benefit cost calculations must include all costs, including social and environmental costs. The benefits should be net of the consumption of energy by the plants including in its construction phase, net of the consumption by the dam itself. Many times, the dams are net consumers of electricity. For example, in case of ongoing Sardar Sarovar Project, at its full completion stage is to produce only 50 MW. As against that, the process of lifting water into Saurashtra and Kutch branch

canals is going to consume more than 60 MW net of its own generation (Ram, 1993: 31-33)

- Comprehensive land based resettlement plan, linked with submergence. The rehabilitation plan has to include all those impacted by the project. Minimum of two ha of irrigation land must be provided. Social or community resettlement should be mandatory.
- Comprehensive impact assessment must a be part of river basin plan, impacts in upstream, downstream and submergence areas, cumulative impact with other existing and ongoing projects in the valley, seismologic, hydrological and geomorphological impacts, carrying capacity studies, impact due to green house gas emissions, among others. Downstream impacts are invariably neglected in the past even in environment impact studies.
- Complete catchment area treatment plan must be part of the project. No large dam project in India in the past has had complete catchment area treatment at project cost.

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