



HYDRO-ELECTRIC POWER DEVELOPMENT: AN INVITATION TO DISASTERS?

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Dams have had serious impacts on the lives, livelihood, culture and spiritual existence of indigenous people. Moreover, the physical environmental conditions of area have led towards drastic changes in the existing climatic conditions. The people have suffered disproportionately due to neglect and ignorance to secure justice, which has arisen because of such types of developmental activities.

Initially, development means fulfillment of basic needs for survival, but today development means construction of multi-story buildings, industries and construction of dams. Today, everybody talks about development but nobody is giving attention towards the environmental degradation which is further creating a natural imbalance. Development in Himachal is essential, but not at the cost of sacrificing our natural balance. Himachal is blessed with five perennial major rivers, which is giving meaning to life to thousands of people and at present state proceeding toward “*Hydroelectric State*” which is undoubtedly a noble idea but every care should be taken at every end that the interest of native people should not be at a stake.

Pressure on Rivers in Himachal Pradesh:

India has about 81% of generating capacity in South Asia, only 56% of its population has access to electricity; over 579 million live without this modern convenience. The per capita electricity consumption in India is 17.85% of world average. Energy starved India is increasingly depending upon the estimated 207,149 MW hydro-electric potential of Himalayan Rivers from J&K to Arunachal Pradesh¹. In Himachal Pradesh alone about 415 projects (Over 300 small and 115 medium and large) are planned, under execution or operational. To expedite capacity addition, Environment Protection Rules have been diluted or shelved affecting the livelihoods of estimated 128,000 households.

The hydro-electric power potential in Himachal Pradesh is estimated at 20,386 MW, which is 24.27% of India's total potential. Of this, 6,045 MW [29.65%] has been harnessed so far, 2720.5 MW [13.34%] is under execution. Techno-economic feasibility studies are complete

for 3,011 MW and in the process of completion for 3,671.5 MW. Survey has been completed for 4187 MW. Him Urja, a new agency administers micro-hydel projects (table: 1).

Table: 1 Showing Pressure of Hydro-power generation in Himachal Pradesh

Basin	Currently operational (in MW)	Under Execution (in MW)	TEFR Ready (in MW)	TEFR not Ready (in MW)	Survey completed (in MW)	Total (in MW)
Yamuna	0211.52	0110.00	0231.00	0000.00	0039.00	0591.52
Satluj	3150.25	1280.50	1402.00	2227.50	1360.50	9420.25
Beas	1634.50	1330.00	0736.00	0856.50	0025.00	4582.00
Ravi	1043.50	0000.00	0642.50	0348.00	0260.00	2294.00
Chenab	0005.30	0000.00	0000.00	0240.00	2503.00	2748.30
Total	6045.07	2720.50	3011.50	3671.50	4187.50	19636.07*

**small/mini/micro projects of Himurja (750MW) are not included*

Source: author's compilation from HP State Electricity Board

The Satluj basin is targeted for heaviest exploitation with 9420 MW projects spread over 37 locations. Beas basin comes next with 4,582MW, spread over 26 locations. Ravi and Chenab basins in chamba district, account for 5042MW spread over 46 locations together. Yamuna basin straddles two states (Himachal and Uttaranchal) and accounts for 591.5MW spread over 12 locations. Power project in 33 locations are currently producing 6045.07 MW in the state on five perennial river basins and projects on 12 locations with installation capacity of 2720.50 MW is under execution and targeted to be completed within next couple of years (table: 2).

Table: 2 Showing Status of Basin-wise Power Projects (No. of locations) in Himachal Pradesh

Basin	Currently operational (in MW)	Under Execution (in MW)	TEFR Ready (in MW)	TEFR not Ready (in MW)	Survey completed (in MW)	Total (in MW)
Yamuna	4	1	6	0	1	12
Satluj	9	5	2	8	13	37
Beas	8	6	8	3	1	26
Ravi	7	0	7	4	2	20
Chenab	5	0	0	1	14	20
Total	33	12	23	16	31	115

Author's compilation from www.hpseb.com and Himurja (2007 data)

There are 115 power projects in the state in the categories of large, medium and large project. Out of 115 projects, 23.5% (27) are large [over 200 MW], 37.4% (43) are medium sized [50-200MW] and 45 are of under 50MW capacity. Satluj, Beas and Ravi basins account for 72.17% medium, large and small/mini/micro projects. Power projects in these basins are

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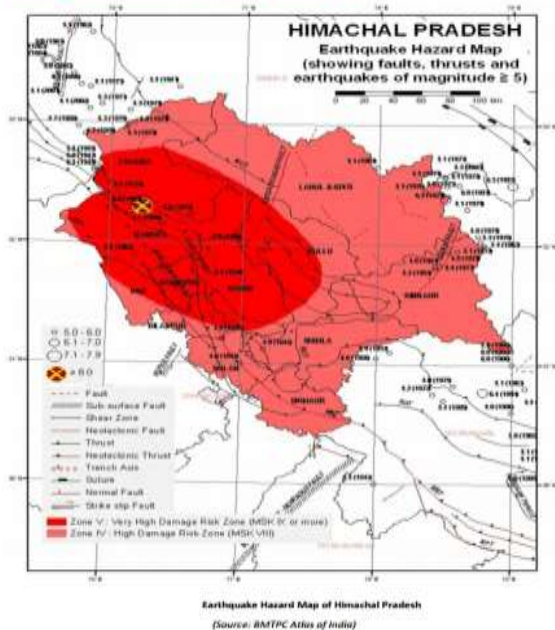
considerably affecting the physical as well as socio-economic environment of the state. It is also stated that these three basin covers maximum geographical area of the state and also having maximum population.

Table: 3 Showing Disturbances in Physical Environment because of Construction of some Projects in Himachal Pradesh

Name of the Project	Name of the River	Installation capacity in MW	Head Race Tunnel in Km	Tail race tunnel in Km	Total Diversion in Km
Nathpa-Jhakri	Satluj	1500	27.394	0.982	28.376
Rampur Baspa-II	Satluj Baspa (Satluj)	0415 0300	15.088 07.095	--- 0.475	15.088 07.570
Luhri Dehar Parvati-II	Satluj Beas Parvati	0775 0990 0800	38.138 06.065 31.052	0.454 --- 0.240	38.592 06.065 31.292
Parvati-III	Parvati (Beas)	0520	07.098	2.007	09.105
Chamera-I	Ravi	0540	06.400	2.004	08.404
Chamera-II	Ravi	0300	07.083	3.046	10.129
Chamera-III	Ravi	0231	15.093	---	15.093
Baira-suil	Baira-suil (Ravi)	0198	07.063	---	07.063
Total		6569	167.569	9.208	176.777

Author's compilation from different sources

The Earthquake Hazard Map of BMTPC, 2006 shows that Himachal Pradesh falls in one of the highest risk zone areas of the state (Zone IV & V).



Vulnerability in Himachal Pradesh: Sample GIS based assessment suggested more than 60% of total state population fall in very high vulnerable zone (highlighted with red colour) and this area is one of the 38 high vulnerable zones of the country. According to another assessment, 109 tehsils and sub tehsils have been identified highly vulnerable and can be divided in two highly vulnerable zones viz. *Kullu-Mandi-Sundernagar Corridor* and *Palampur-Dharamshala Kangra-Dehra Corridor*. The area of both corridors and the areas surrounding of *Chamba, Nurpur,*

Hamirpur and Bilaspur have also been identified as highly vulnerable zones (seismic Zone-IV and V).

Even though the intensity of past seismicity is more in districts like Chamba (33.63), Lahaul&Spiti (17.91), Kinnaur (16.82) and less in Kangra (7.05), Kullu (3.44), Hamirpur (0.36).

Vulnerability Zones: Vulnerability and risk zones wise whole state can be divided in three zones i.e. Zone-A, Zone- B, Zone-C. Chamba city includes in Zone-A, as depicted in the figure which is highly vulnerable from disaster point of view. Changing climatic conditions make it more vulnerable and needs to be addressed immediately with effective mechanism. More than 150 power projects (table:1) in one basin cannot be justified in Zone-A which is highly seismic.



Hydro- Power Projects: An Invitation to Disasters

The Ravi River, a trans-boundary river of India and Pakistan, is an integral part of the Indus River Basin. It rises from glacier fields named as Bara Bhangal, in Kangra district in Himachal Pradesh, India [elevation 14,000 feet (4,300 m)]. Flowing between Peer Panjal and Dhauladhar ranges of Mid-Himalayas, it drains a total catchment area of 14,442 kms² (5,576mile²) in India covering 720 kms (450 miles). This perennial river is catering the socio-ecological needs of the people living on both sides since ages and has been evidence to many kingdoms and have also seen many socio-political changes.

After catering socio-ecological needs of the people since ages, in early 80s this basin has been targeted for hydro-based planned development by the state as well as central government. Ravi basin got first hydro-based developmental projects in early 80s named as Baira-suilHydel electric Power Project, which was first power project of Govt. of India enterprises i.e. NHPC (National Hydrel-electric Power Corporation Ltd). Prior to this professional execution of power project, King of erstwhile state of Chamba Raja Bhuri Singh developed a small power project on Saal tributary of Ravi near Chamba in 1908, which was the second power project in Asia. After then a series of power projects has been initiated by the Government.

Present Status of Ravi River:

As depicted in table:1, in Ravi basin there are 159 power projects of different magnitude are there which are of Small/medium/micro categories in Chamba district of Himachal Pradesh which is based on the information available on <http://himurja.nic.in/mousigned.html>. There are more than 40 small rivulets in Ravi basin which makes Ravi a perennial river, but the construction of 159 projects on these rivulets have a detrimental impact on the physical environment as well as on the other aspects of life of the people.

Table: 1 Showing No. of Power Projects in Ravi Basin in Chamba District of Himachal Pradesh

Sr. No.	Category of Project	No. of Projects	Installation Capacity (in MW)
1.	Project Allotted	117	372.55
2.	Other Projects	010	027.50
3.	Application filled	032	003.20
	Total	159	403.25

Table:2 Showing details of Power Projects in Ravi basin in Chamba District (HP)

Sr. No.	Name of Power Project	Name of River/ nallah	Classification	Installation Capacity (in MW)
1.	Chamera-I*	Ravi	Large	540.00
2.	Chamera-II *	Ravi	Large	300.00
3.	Chamera-III	Ravi	Large	231.00
4.	BairaSuil *	BairaSuil	Large	198.00
5.	Bhuri Singh *	SaalNala	Micro	000.45
6.	Tundah-I	Tundahnallah	Small	015.00
7.	Tundah-II	Tundahnallah	Small	030.00
8.	Bharmour Micro	Budhil	Micro	000.02
9.	Garola	Garolanallah	Micro	000.05
10.	Holi	Holinallah	Small	003.00
11.	Sal Stage –I	Saalnallah	Small	008.25
12.	Sal Stage –II	Saalnallah	Small	002.25
13.	Budhil	Budhilnallah	Medium	081.00
14.	Bharmour	Budhilnallah	Medium	045.00
15.	Harsar	Budhilnallah	Medium	060.00
16.	Kugti	Budhilnallah	Medium	045.00
17.	Kutehr	Ravi	Large	360.00
18.	Chindi	Ravi	Medium	120.00
19.	Bara Bangal	Ravi	Medium	160.00
20.	Thein Dam	Ravi &Sewa	Large	600.00**

*Indicates power projects in operation in Chamba district. **Thein dam (Maharaja Ranjeet Singh HE Power project with 600 MW Capacity at ShahpurKandi near Pathankot (Punjab) situated at interstate boarder of Jammu & Kashmir, Himachal Pradesh and Punjab

Table:1 and 2 the detailed description of power projects of different categories. It is mention-worthy here that more than 160 projects of mini/micro/small categories are in different stage

of their execution and are being executed in 39 small/medium and large rivulets in Ravi basin. These rivulets makes ravi a perennial river and rearing thousands of people by meeting eco-system needs of the area since ages. With the coming-up these power projects eco-system services are being affected and people have to come on the road for justice. More importantly, the Ravi catchment area falls in the most geologically weak area i.e. zone-A (as depicted in above figure). The geological composition of this area comprises of rocks and other components, which are in formation stage. It falls in Seismic Zone V that has high possibility of earthquakes. In 2005 a number of mild earthquake jolts of 3.7 to 4.8 Richter Scale has been experienced in Chamba. The earthquake of 1995 measuring 5.4 Richter scale immediately after the commissioning of Chamera-I in 1994 was the first retaliation of the nature with its epicenter at Kiani village, which is situated at the endpoint of 19-kilometer (Ravi side) reservoir of the Chamera-I. Table: 3 is the presenting present status of Ravi because of construction of some power projects:

Table: 3 Showing the Present Status of Ravi after the Installation of Power Projects

Name of the Project	River/tributary	Year of Commissioning	Installation Capacity (in MW)	Diversio for HRTs (in kms)	Diversion for TRTs (in kms)	Total diversion (in kms)
Baira-suil	Baira-suil	1984	0193	07.063	---	07.063
Chamera-I	Ravi	1994	0540	06.400	2.004	08.404
Chamera-II	Ravi	2003	0300	07.083	3.046	10.129
Chamera-III	Ravi	2012	0231	15.093	---	15.093
Total			1264	35.639	5.050	40.689

Table: 4 Showing Hammered Physical Environment because of the Installation of Power Projects in Ravi River in Chamba District of Himachal Pradesh

Ravi in Tunnel		40.689 Km	
Ravi in Reservoir		32.006 Km	
Total area tunnel +reservoir		72.695 Km	
Road distance from TRT Khairi to Dakog dam (Chamera-III)		98.00Km	
Ravi in its natural route (Now left and occasionally seen)		25.305 Km	
Dry patches of Ravi after diversion of water to HRTs	Name of the Project	Dry Patches	Distance in Km
	Chamera-I	HRT to TRT (Khairi to Chauhra)	14.400
	Chamera-II	HRT to TRT (Karian to Bagga)	16.200
	Chamera-III	HRT to TRT (Dharwala to Bakog)	20.300
	Total		50.900

The installation of power projects are largely responsible for the climatic changes, unseasonal rain, recently cloudburst in *Sarol* and *Rajpura* village, just one kilometer away from the top head of the Chamera-I reservoir, dry Ravi, large water body of 32.6 kilometer, underground blasting which has dried all vegetative cover and natural sources of water, above all tunnelization of Ravi (40.689 Km) are some areas of major concern which are disturbing the people of the area. The dry patches of perennial Ravi river (50.900 kms) because of the construction of three projects i.e. Chamera-I, II and III {from TRT of Chamera-I (Khairi) to HRT of Chamera-III (Kharamukh/Dakog)} have a detrimental impacts on the eco-system services which are being imparted to the native of these areas since ages. In these dry patches there is no water which further aggravate the problem by increasing temperature in these area and making life of the people more miserable as it was not so before the installation of the dams. It is violation of the order issued by Hon'ble High court of Himachal Pradesh regarding 15% availability of water in the downstream of any dam to sustain aquatic life and to meet out the eco-service needs of the people who are living in the downstream.

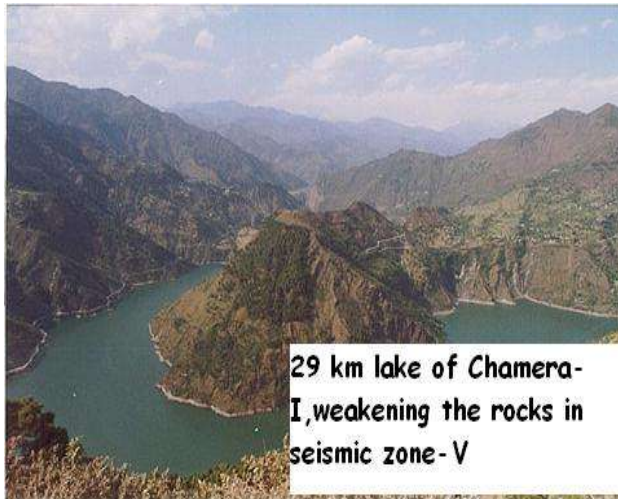
People feel concerned about the environmental hazards in form of earthquakes, in the most geologically weak region, they think that trespass in nature to this extent may be resulted into havoc consequences anytime.

Hammered Physical Environment:

Physical environment comprises of land, water and air, which further can be categorized in four interdependent spheres i.e. atmosphere, lithosphere, hydrosphere and biosphere. The impacts of the installation of power projects on these spheres is because of carving and construction activities, tunnelization (40.689 km) in form of Head Race Tunnels (TRTs), Tail Race Tunnels (TRTs), edits, shrun shafts, underground power houses, pressure shaft and allied construction related activities.

Construction activities hammering physical environment in various power projects like in *Baira-suil Hydro-electric Power Project*, road approached to Suil weir from Dhargala to Suil weir via Baroti, from Surangani to powerhouse, from Nakrore to Baira weir has been constructed in Baira-Suilhydel electric power project. Along with these construction of roads, the existing road Chamba- Salooni, Chamba- Surangani, Chamba- Tissa roads have been widened, undoubtedly the widening of roads has made a good contribution but the physical environment has badly affected and furthermore the conditions of these roads has become worst as the projects are over.

In Chamera-I road from Barangal to Dandi, Khairi to pressure shaft over underground powerhouse, Chohra via- pass has been constructed. In Chamera –II from Rajera to Jarangala via Gagla, from Rakh to Gurad, which is proposed to be extend up to Bindla village then to Lihal village near underground powerhouse of under construction Chamera-III. In this regard it is worthy to be mentioned here that all the construction of roads are just to have access to the sites of construction of the projects.



Reservoirization of Ravi (40.689 kms) in Himachal and if the length of Thein Dam is added then it would come out $40.689+42=82.689$ kms just in the stretch of 110kms from Madhopur to Dhakog (dam site of Chamera-III) in geologically weak zone are not desirable. As accepted by NHPC, the area of BairaSuil, Chamera-I and Chamera-II are geologically weak and

whole area falls in Seismic Zone-V. After the installation of power projects in this region the possibility of earthquake has increased manifold. According to the *World Commission on Dams*, the possibility of Earthquakes measuring 3 to 3.5 Richter Scale in the reservoir is a routine phenomenon. After 1995 this area has experienced many minor jolts of earthquakes. Along with earthquakes, the whole area has also experienced the newly erupted *phenomena of cloudburst*. The cloudburst is happening almost every year and is responsible for the loss of life and property in form of fertile soil, trees and other forest commodities. So, it is submitted with conviction that such types of developmental activities are not desirable as well as viable especially in Seismic Zone V.

Final Comments:The age-old Ravi which has been sustaining the livelihood of thousands of people since ages and has been giving meaning to thousands of people in the catchment area, but today Ravu is being brutally looted in the name of development. Today Ravi seen occasionally at the patch of 15 km from TRT Karian to Udaipur village in the remaining track it has been diverted from its natural route and confined in the reservoir and tunnels. The eco-system services which are being provided by Ravi since ages, has been totally affected with the coming-up of power projects. With the installation of power projects round 1100 MW if the situation is like this, then what would the socio-environmental condition when more 150

projects of different magnitudes execute in this basin? It is undoubtedly a matter of great concern for policy makers, executors, and all concerns, we have to think again on the power generation policies with a thought that whatever we are developing, that is at WHAT cost? If the cost is more than benefits, if the cost is not local people oriented, if the cost is not at the cost of aspiration of people who are living there since ages, then research argue that this is not the best way to bring prosperity and development in the region. Any development, which is not bringing desired change in the lives of people of area in particular and of whole region/country in general, then policy makers must re-think and re-consider proposed developmental initiatives in any part of the world including Ravi basin on Himachal Pradesh. It is because of the fact that ultimately, Who own rivers? Who own natural resources? And who is getting benefits out of development? Rivers/natural resources are being own by the people of area where any developmental initiative is being taken which is being blessed by the nature to the people of that vary area. Undoubtedly, national interest is there, it is also a fact electricity can generate only in the hills where water is available and particularly states in Indian Himalayan Region is a place where it is available in abundance, but what is maximum limit, what is carrying capacity of *Mother Earth* as well as hills of that vary area? So, we must have to re-think on these issues and should take a lesson from Kedarnath tragedy which occurred recently (June, 2013) otherwise the cost would be so high and cannot met out of profit which is being earned by the executors. Most important fact is that profit is being earned by the executors but cost is to be paid by the local people, local people who are unfortunately or fortunately living in the vicinity of these developmental mills would be the real bearer of the cost, they will lose their property, everything which belongs to them and even their lives, not the executors. Executor can lose the machineries, production, profit but not what native are losing. So, it is high time to think again, before it will be too late and we must manage our water resources effectively, because everything can be generated but water cannot!

With a new hope.....!!!!