CUMULATIVE IMPACT & CARRYING CAPACITY STUDY (CIA&CCS) OF BEAS SUB BASIN IN HIMACHAL PRADESH



FINAL REPORT

January 2019

Prepared for: MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE GOVERNMENT OF INDIA Indira Paryavaran Bhavan, Jorbagh Road, New Delhi - 110 003

Prepared by:



R. S. Envirolink Technologies Pvt. Ltd. 402, Bestech Chamber Commercial Plaza, B-Block, Sushant lok-i, Gurgaon

PH. +91-124-4295383, www.rstechnologies.co.in

EXECUTIVE SUMMARY

1 BACKGROUND

Directorate of Energy, Government of Himachal Pradesh undertook the task of conducting Cumulative Environmental Impact Assessment (CEIA) Study for Beas river basin in Himachal Pradesh with an objective to assess the cumulative impacts of hydropower development in the basin. In the meantime, MoEF&CC has taken over all the river basin/carrying capacity studies being conducted by Central/State agencies and therefore, all reports were submitted directly to MoEF&CC. RS Envirolink Technologies Pvt. Ltd. (RSET), Gurgaon has been awarded the study based on techno-commercial bidding. Expert Appraisal Committee (EAC) for River Valley and Hydroelectric Projects of Ministry of Environment & Forests (MoEF&CC) approved the Terms of Reference (TOR) for the study. The study was initiated during February 2016, an inception report was submitted in June 2016 to capture the progress made during first four months of the study period and a Rapid CIA report was submitted in November 2016, which captured progress in first 8 months. The draft report was discussed and appraised in 4th meeting of the Expert Appraisal Committee for River Valley and Hydroelectric Projects held on 12th April 2017, wherein a visit to the study area by a sub-committee of EAC was suggested, which was made during April 2018 and post visit the outcome was discussed in EAC meeting during the same month. Recommendations were discussed in detail and it was decided to share the recommendations with the state government and thereafter the final report will be discussed in EAC. Directorate of Energy, Government of Himachal Pradesh, on receipt of recommendations, has shared their views/observations on the recommendations and made a presentation during EAC meeting of June 2018. During presentation, EAC sought further information from state government to justify their observations and matter was discussed in subsequent EAC meetings of October and November 2018. EAC finally concluded all the discussions on Beas River Basin study and directed the Consultant to update/finalize the basin study report, keeping in view the matter discussed and recorded in various EAC meetings. The present report is the final report prepared by incorporating recommendations finalised by EAC in consultation with state government of Himachal Pradesh.

2 HYDROPOWER PROJECTS IN BEAS BASIN

Beas Basin in Himachal Pradesh has 4877.70 MW of power potential (for > 5 MW projects), distributed among 51 hydropower projects spread throughout the basin (**Table 1 and Figure 1**). Out of these 51 projects, 22 projects are commissioned (total installed capacity 2820.90 MW), 5 are under construction (total installed capacity 947 MW), 20 are at various stages of investigations (total installed capacity 1028.90 MW) and 4 are yet to be allotted.

Out of proposed 24 projects, many of which are under different stages of survey and investigation, only 4 projects have installed capacity of more than 50 MW i.e. requiring environment clearance as category "A" projects; two are with installed capacity greater than 25 MW but less than 50 MW i.e. environment clearance is applicable under category "B" and remaining 18 projects are less than 25 MW of installed capacity i.e. environment clearance is not applicable.



S. No.	Name of Project	Capacity	Developer	Status	Year of
		(MW)			Commiss
					-ioning
1	Beas Sutlej Link	990	Bhakra Beas Management Board	Commissioned	1977
2	Parbati-III HEP	520	NHPC Limited	Commissioned	2014
3	Pong Dam	396	Bhakra Beas Management Board	Commissioned	1978-83
4	Allain Duhangan HEP	192	AD Hydro Power Ltd.	Commissioned	2010
5	Larji HEP	126	HPPCL	Commissioned	2006
6	Uhl-I (Shanan) HEP	110	Punjab State Power Corporation	Commissioned	1923
7	Malana-II HEP	100	Everest Power Pvt. Ltd.	Commissioned	2012
8	Sainj HEP	100	HPPCL	Commissioned	2017
9	Malana-I HEP	86	Malana Power Company Ltd.	Commissioned	2001
10	Uhl-II (Bassi) HEP	66	HPSEB	Commissioned	1970-81
11	Baragaon SHEP	24	Kanchanjunga Hydro Power Ltd.	Commissioned	2015
12	Patikari SHEP	16	Patikari Hydro Electric Project Ltd.	Commissioned	2008
13	Neugal SHEP	15	Om Hydropower Ltd.	Commissioned	2013
14	Baner SHEP	12	HPSEB	Commissioned	1996
15	Khauli SHEP	12	HPSEB	Commissioned	2007
16	Gaj SHEP	10.5	HPSEB	Commissioned	1996
17	Toss SHEP	10	Toss Mini Hydel Power Project	Commissioned	2008
18	Beas Kund SHEP	9	Kapil Mohan and Associates	Commissioned	2012
19	Binwa SHEP	6	HPSEB	Commissioned	1984
20	Baner-II SHEP	6	Podigy Hydro Power Pvt. Ltd.	Commissioned	2015
21	Sarbari-II SHEP	5.4	DSL Hydrowatt Ltd.	Commissioned	2010
22	Balargha SHEP	9	Sandhya Hydro Power Projects	Commissioned	2018
23	Parbati-II HEP	800	NHPC Limited	Under Construction	
24	Uhl III HEP	100	HPSEB	Under Construction	
25	Lambadug HEP	25	KU Hydro Power Pvt. Ltd.	Under Construction	
26	Lower Uhl SHEP	13	Trident Power Systems Ltd.	Under Construction	
27	Fozal SHEP	9	Fozal Power Pvt. Ltd.	Under Construction	
28	Nakthan HEP	460	HPPCL	Under S&I	
29	Thana Plaun HEP	191	HPPCL	Under S&I	
30	Triveni Mahadev HEP	96	HPPCL	Under S&I	
31	Dhaulasidh HEP	66	Satluj Jal Vidyut Nigam Ltd.	Under S&I	
32	Malana-III HEP	30	BMD Pvt. Ltd.	Under Stal	
33	Raison SHEP	18	HPSEB	Under S&I	
34		14	Puri Oil Mills Ltd.	Under Stal	
35	Uhl Khad SHEP	14	Kharnal Hydro Electric Project P Ltd.	Under Stal	
36	Parbati SHEP	12	Manimanesh Power Private Ltd.	Under Sal	
3/	Jari SHEP	12	WIL Power Projects Ltd.	Under Still	
38		12	Green Infra Limited	Under Still	
39	Sharni SHEP	9.6	Sharni Hydro Power Pvt. Ltd.	Under Sal	
40	Sarsadi SHEP	9.6	Himshakti Power Pvt. Ltd.	Under Still	
41		9.4	Hurla Valley Power Pvt. Ltd.	Under S&I	
42	Sarsaul-II SHEP	9	Aroma Colomsers Pvt. Ltd.		
43		9	Patchall bliang Power Pvt. Ltd.		
44	Vilbi Pabl CHED	7 5	Duri Oil Mille Ltd	Under Stil	
45	Makori	7.5	Sai Engineering Foundation		
40	Bhuiling	20.00	Sai Engineering Foundation	Under S&I	
4/	Kanda Pattan	20.00 20.00		Vet to be allotted	
40	Manalsu	21 00		Yet to be allotted	
50	Seri Rawla	13.00		Yet to be allotted	
51	Khauli II	6.00		Yet to be allotted	
	Total	4877.70			1

Table 1: Hydropower Projects in Beas Basin



Chapter-2

HYDROPOWER DEVELOPMENT IN BEAS BASIN

2.1 HYDROPOWER POTENTIAL

Himachal Pradesh, with five major rivers flowing through the state, has about a quarter of India's total potential hydropower resources. These five major rivers are Beas, Ravi, Satluj, Yamuna and Chenab. Total identified hydropower potential in the state is 27436 MW; out of which 10460.47 MW is under operation, 2438.24 MW is under construction; 9510.70 MW is under various stages of survey & investigation; and remaining 5026.59 MW is yet to be taken up (source: Directorate of Energy, Government of HP, abstract of Power as updated on June 2017).

History of hydropower development in Beas basin goes way back to 1923 when Shanan Power station (Uhl I - 110 MW) was commissioned as first megawatt scale project of country and later Uhl II (60 MW) got commissioned during 1970-71. Largest project of the basin i.e. Pandoh Dam, commonly known as Beas Satluj link project of 990 MW was commissioned in 1977. Another major project of the basin, Pong Dam (396 MW) was conceived way back in 1927, however after final design approval, construction work started in 1961 and project got commissioned during 1978-83 period.

77.25% of hydropower potential of the Beas basin has already been established through operational (57.83%) and under construction projects (19.42%); the cumulative impact assessment study has kept this in view along with the impacts of proposed future development in the basin. The basin study is aimed at assessing the cumulative or aggregate ecological impact of all the HEPs planned or under execution on aquatic fauna and flora, biodiversity of the riverine ecosystem and surrounding areas and ecological integrity.

2.2 HYDROPOWER PROJECTS IN BEAS BASIN

Directorate of Energy, Government of Himachal Pradesh has assessed the total potential of Beas basin as 4099.60 MW as given in Table 1 of TOR and same is reproduced as **Table 2.1** below. In addition, they have also mentioned 5 projects at Table 8 of the TOR, which were under allotment at that time.

Sr. No.	HEP Category	No. of Projects	Capacity (MW)
1	Commissioned HEPs	19	2718.50
2	Under Construction HEPs	07	1068.00
3	Under Clearance HEPs	12	888.20
4	Under Investigation HEPs	05	70.90
5	Foregone HEPs	03	354.00
	Total	46	4099.60

Table 2.1: Total Hydropower Potential of Beas Basin

During the study period, the information/status of hydropower projects was updated and the final list of 51 projects (> 5 MW) were prepared as the total hydropower potential of the Beas basin. The same is given at **Table 2.2** below. Projects locations are shown in **Figure 2.1**.

Beas Basin in Himachal Pradesh has 4877.70 MW of power potential (for > 5 MW projects), distributed among 51 hydropower projects spread throughout the basin. Out of these 51 projects, 22 projects are commissioned (total installed capacity 2820.90 MW), 5 are under construction (total installed capacity 947 MW), 20 are at various stages of investigations (total installed capacity 1028.90 MW) and 4 are yet to be allotted.

Out of proposed 24 projects, many of which are under different stages of survey and investigation, only 4 projects have installed capacity of more than 50 MW i.e. requiring environment clearance as category "A" projects; two are with installed capacity greater than 25 MW but less than 50 MW i.e. environment clearance is applicable under category "B" and remaining 18 projects are less than 25 MW of installed capacity i.e. environment clearance is not applicable.

S. No.	Name of Project	Capacity (MW)	Developer	Status	Year of Commiss- ioning
1	Beas Satluj Link	990	Bhakra Beas Management Board	Commissioned	1977
2	Parbati-III HEP	520	NHPC Limited	Commissioned	2014
3	Pong Dam	396	Bhakra Beas Management Board	Commissioned	1978-83
4	Allain Duhangan HEP	192	AD Hydro Power Ltd.	Commissioned	2010
5	Larji HEP	126	Himachal Pradesh State Electricity Board	Commissioned	2006
6	Uhl-I (Shanan) HEP	110	Punjab State Power Corporation Limited	Commissioned	1923
7	Malana-II HEP	100	Everest Power Pvt. Ltd.	Commissioned	2012
8	Sainj HEP	100	HPPCL	Commissioned	2017
9	Malana-I HEP	86	Malana Power Company Ltd.	Commissioned	2001
10	Uhl-II (Bassi) HEP	66	Himachal Pradesh State Electricity Board	Commissioned	1970-81
11	Baragaon SHEP	24	Kanchanjunga Hydro Power Ltd.	Commissioned	2015
12	Patikari SHEP	16	Patikari Hydro Electric Project Ltd.	Commissioned	2008
13	Neogal SHEP	15	Om Hydropower Ltd.	Commissioned	2013
14	Baner SHEP	12	Himachal Pradesh State Electricity Board	Commissioned	1996
15	Khauli SHEP	12	Himachal Pradesh State Electricity Board	Commissioned	2007
16	Gaj SHEP	10.5	Himachal Pradesh State Electricity Board	Commissioned	1996
17	Toss SHEP	10	Toss Mini Hydel Power Project	Commissioned	2008
18	Beas Kund SHEP	9	Kapil Mohan and Associates	Commissioned	2012
19	Binwa SHEP	6	Himachal Pradesh State Electricity Board	Commissioned	1984
20	Baner-II SHEP	6	Podigy Hydro Power Pvt. Ltd.	Commissioned	2015

Table 2.2: Hydropower Projects in Beas Basin



c		Capacity			Year of
No	Name of Project	(MW)	Developer	Status	Commiss-
110.		(/////)			ioning
21	Sarbari-II SHEP	5.4	DSL Hydrowatt Ltd.	Commissioned	2010
22	Balargha SHEP	9	Sandhya Hydro Power Projects Balargha	Commissioned	2018
23	Parbati-II HEP	800	NHPC Limited	Under	
				Construction	
24	Uhl III HEP	100	Himachal Pradesh State Electricity	Under	
			Board	Construction	
25	Lambadug HEP	25	KU Hydro Power Pvt. Ltd.	Under	
				Construction	
26	Lower Uhl SHEP	13	Trident Power Systems Ltd.	Under	
				Construction	
27	Fozal SHEP	9	Fozal Power Pvt. Ltd.	Under	
				Construction	
28	Nakhtan HEP	460	HPPCL	Under S&I	
29	Thana Plaun HEP	191	HPPCL	Under S&I	
30	Triveni Mahadev HEP	96	HPPCL	Under S&I	
31	Dhaulasidh HEP	66	Satluj Jal Vidyut Nigam Ltd.	Under S&I	
32	Malana-III HEP	30	BMD Pvt. Ltd.	Under S&I	
33	Raison SHEP	18	Himachal Pradesh State Electricity	Under S&I	
			Board		
34	Uhl SHEP	14	Puri Oil Mills Ltd.	Under S&I	
35	Uhl Khad SHEP	14	Kharnal Hydro Electric Project Pvt.	Under S&I	
			Ltd.		
36	Parbati SHEP	12	Manimahesh Power Private Ltd.	Under S&I	
37	Jari SHEP	12	WIL Power Projects Ltd.	Under S&I	
38	Jobrie SHEP	12	Green Infra Limited	Under S&I	
39	Sharni SHEP	9.6	Sharni Hydro Power Pvt. Ltd.	Under S&I	
40	Sarsadi SHEP	9.6	Himshakti Power Pvt. Ltd.	Under S&I	
41	Hurla-I SHEP	9.4	Hurla Valley Power Pvt. Ltd.	Under S&I	
42	Sarsadi-II SHEP	9	Aroma Colonisers Pvt. Ltd.	Under S&I	
43	Palchan Bhang	9	Palchan Bhang Power Pvt. Ltd.	Under S&I	
	SHEP				
44	Bhang SHEP	9	Bhang Hydel Power L.L.P.	Under S&I	
45	Kilhi Bahl SHEP	7.5	Puri Oil Mills Ltd.	Under S&I	
46	Makori	20.80	Sai Engineering Foundation	Under S&I	
47	Bhujling	20.00	Sai Engineering Foundation	Under S&I	
48	Kanda Pattan	40.00		Yet to be allotted	
49	Manalsu	21.90		Yet to be allotted	
50	Seri Rawla	13.00		Yet to be allotted	
51	Khauli II	6.00		Yet to be allotted	
Total		4877.70			

Field observations in Beas III sub basin:

Larji HEP reservoir and Dam site:

Larji HEP (126 MW) utilizes water of Sainj Khad, Tirthan river and Beas river. There is a head race tunnel of 3 km (starts near Larji Dam and ends at Aut) along Kullu- Mandi highway. Hills are covered with vegetation. Accessibility in this area is very good. Pandoh HEP is another operational project located downstream Larji HEP on Beas river.



A view of reservoir of Larji HEP

Dam structure of Larji HEP



Outlet of Power House of Larji HEP

Bakhli Khad: Bakhli Khad is the left bank tributary of Beas river which meets near Pandoh HEP. There is an operational project Patikari SHEP (16MW) on this Khad.

4.7.9 Uhl Sub-basin

Uhl sub-basin comprises of the catchment area of Uhl river including catchment area of Beas river from downstream of Pandoh Dam to the confluence of Rana and Arnodi Khads with river Beas in Mandi district (**Figure 4.25**). Major tributaries joining river Beas at its right bank in the sub-basin are Uhl river, Kushak nala, Dev ki Khad, Luni Khad and Rana Khad, while the major tributaries joining river Beas at its left bank in the sub-basin are Suketi Khad, Kasani Khad and Arnodi Khad. Uhl river traverses about 73 km with a catchment area of about 755.6 sq km. Rana Khad meets Beas river near Tudal village. The length of the river is 27.3 km and catchment area of the river is 224.5 sq km. The sub-basin is densely populated, and a large area is under agricultural fields. Major settlements on the banks of river Beas are Mandi, Mangwai, Tamlu, Sari, Kot, Charori.



Major villages in the catchment of Uhl river are Bingahr, Bahladhar, Chumasagran, Tikkar, Ganwag, Chhudhal, Kalangehr, Kortong, Draggar, Chelang, Kaljhar, Garaman, Gahang, Madharwan, etc. Major villages in the catchment of Rana Khad are Banogi, Nauhli, Dagsali, Kaduna, Nagar, etc. Major villages in the catchment of Suketi Khad are Chhachol, Banna, pipli, Gagal, Kehr, Bhangrotu, Maltehr, Sianji, Sundarnagar, Ner Chowk, Tholag, Lohakar, Nanawan, Batwar, etc.



Figure 4.25: Drainage map of Uhl Sub-basin

The elevation varies from 650 m to about 5200 m (**Figure 4.26**). Majority of the sub-basin area i.e. around 32% lies in the 650 to 1200 m elevation range, followed by 1201 to 1800 m and 1801 to 2400 m elevation range which covers nearly 29% and 13% of the sub-basin area respectively. Elevation range from 2401 to 3000 m, 3001 to 3600 and 3601 to 4200m covers around 22% i.e. 9%, 6% and 6% respectively. Rest 4% area lies in the higher elevation band of 4201 to 5400 m.



Figure 4.26: DEM of Uhl Sub-basin

Field observations in Uhl sub basin:

Uhl river:

Uhl river is the right bank tributary of Beas river which meets near Mandi town. During field surveys it was observed that fishing is common practice in Uhl river. Area is covered with good vegetation cover. Lambadug HEP (under construction) is the upper most HEP in the catchment of Uhl river. Diversion site of Uhl-I HEP is located at the downstream of Lambadug power house site. Uhl I HEP (Shanan) is an operational project diverting water from Uhl river to Shannan Khad. Power house of Uhl-I HEP is located along Shanan Khad near Joginder Nagar (Mandi). Uhl II HEP (Bassi Hydro Project) is a tail race development of Uhl-I HEP. Tailrace waters of Uhl II HEP are utilized by Uhl III HEP. Power house of Uhl II HEP is located near Neri Khad near Joginder Nagar town. Power house of Uhl III HEP is at the downstream of Rana Khad-Beas river confluence discharging tailrace water in the reservoir of proposed Triveni Mahadev HEP on Beas river.

Lower Uhl HEP and Uhl SHEP are two under construction hydroelectric projects on Uhl river. Uhl SHEP (14MW) is located near Baltikar village being developed by USP hydro Energy Pvt. Ltd. Lower Uhl (13 MW) is a downstream project of Uhl SHEP located near IIT Mandi. Uhl Khad HEP is the most downstream project on Uhl river. Power house of Uhl Khad is on right bank of Beas river near Uhl-Beas confluence.



Final Report: Chapter 4



Fishing in Uhl River

Landside in Uhl river



Uhl river

Aquatic sampling in Uhl river



Diversion site of Uhl I HEP





Outlet of Uhl I HEP with open trench



4.7.10 Beas IV Sub-basin

Beas IV sub-basin comprises of the right bank catchment area of Beas river from the confluence of Rana and Arnodi Khads with river Beas up to Pong Dam (Figure 4.27). The major tributaries joining river Beas at its right bank in the sub-basin are Binno (Binwa) Khad, Chahan Khad, Ganunu Khad, Harori Khad, Mandh Khad, Neugal Khad, Lohar Khad, Tall Khad, Nakehr Khad, Baner Khad, Minnu Khad, Gaj Khad and Khauli Khad. Binno (Binwa) Khad meets river Beas on its right bank at elevation of 636m. Binwa Khad is also known as Binno Khad in higher reaches. The length of the river is 42 km and catchment area of the river is 375.35 sq km. Neugal Khad meets Beas river on its right bank near Alampur village. The length of the river is 55 km and catchment area of the river is 386 sq km. Baner Khad meets Beas river on its right bank near Mahora village. The length of the river is 63 km and catchment area of the river is 749 sq km. Gaj Khad originates from an altitude of 4400m and travels 64 km to join the Beas river on right bank a little upstream of Pong dam lake. The catchment area of the river is 1246 sq km. The sub-basin is densely populated and a large area is covered by agricultural fileds. Major settlements on the bank of river Beas are Tulah, Molago, Chamar, Tikri, Alampur, Sialkar, Kulehra, Jajwal, Kurhu, Borwari, Kother, Janota, etc. The major towns in the sub-basin are Joginder Nagar, Baijnath, Kangra, Gaggal, Palampur, Dharamshala, etc.



Figure 4.27: Drainage map of Beas IV Sub-basin

The elevation varies from 400 m to about 4900 m (**Figure 4.28**). Elevation range from 401 to 600 m covers around 26% of sub-basin area. Majority of area i.e. 49% lies in 601 to 1200m elevation band. Only 10% of the sub-basin area lies in the 1101 to 1800m elevation range. Elevation band between 1801 to 2400 m and 2401 to 3000 covers around 12% of the area i.e. 6% each. The balance 4% area lies in the elevation band of 3001 to 4800 m.



Figure 4.28: DEM of Beas IV Sub-basin

Field observations in Beas IV sub basin:

Binwa Khad:

Binwa Khad is the right bank tributary of Beas river. Binwa SHEP (6MW) is an operational project on this khad. Another project is at the downstream of the Binwa SHEP at Binwa Khad named Kilhi Bahl which is in proposal stage. Binwa Khad passes through Paprola town which is famous for Baijnath temple. This is an archeological site and a famous religious and tourist place. Palampur is another tourist destination which is famous for tea gardens is approximately 16 km from Paprola. A metallic canal was made in Binwa khad near Paprola by the Irrigation Department for irrigation purposes.



Final Report: Chapter 4



Baijnath Temple

Metalled canal in Binwa Khad



Aquatic sampling in Binwa Khad



Terrestrial sampling in the study area

Khauli Khad, Gaj Khad, Baner Khad and Neugal Khad:

Khauli Khad, Gaj Khad, Baner Khad and Neugal Khad are the right bank tributaries of Beas river. On Gaj Khad and Khauli Khad; there are one operational projects i.e. Gaj SHEP (10.5 MW) and Khauli SHEP (12MW) and on Baner Khad, there are two operational projects named Baner SHEP and Baner II SHEP, and in Neugal Khad also there is an operational project called Neugal SHEP (15MW). The area is accessible by road from Dharamsala which is a tourist destination.



Gaj Khad

Khauli Khad

Final Report: Chapter 4

CIA&CCS- Beas Basin in HP



A view of Baner Khad

Outlet of power house at Baner Khad



Reservoir in Baner Khad

Power house site at Baner khad

4.7.11 Beas V Sub-basin

Beas V sub-basin comprises of the left bank catchment area of Beas river from the confluence of Rana and Arnodi Khads with river Beas up to Pong Dam (**Figure 4.29**). Total area of sub-basin is around 1589 sq km. The major tributaries joining river Beas at its left bank in the sub-basin are Jogi khala, Sun Khad, Sakrain Khad, Thuthuri Khad, Chanehd Khad, Jhangi Khad, Masaut Khad, Naled Khad, Bakar Khad, Sukahd Khad, Jangled Khad, Jamiri Khad, Riani Khad, Pung Khad, Salasi Khad, Kunah Khad, Masinh Khad, Sahri Khad, Nalsoha Khad, Karoa Khad, Barwara Khad, Thor Khad, Chanaur Khad, Bargolan di Khad, Dada Khad, Gurhala Khad. The sub-basin is densely populated and a large area is under agricultural fileds. Major settlements on the bank of river Beas are Bajrana, Dhandor, Khanaur, Haldwara, Baghera, Sujanpur, Majhot, Janglu, Nadaun, Nagrota, Kuhna, Kohala, Nangal, Thor, Chaplah, Kulher etc. The major towns in the sub-basin are Dharampur, Sandhol, Hamirpur, Bangana, Garli, Mairi, Bharwain, Dhaliara etc.





Figure 4.29: Drainage map of Beas V Sub-basin

The elevation varies from 380 m to about 2040 m (**Figure 4.30**). 25% of the sub-basin area lies in the 380 to 600m elevation band. Majority of area i.e. 70% lies in 601 to 1200m elevation band. Around 5% of the area falls under elevation range of 1201 to 2400 m.





Field observations in Beas V sub basin:

Beas River: On Beas river from the downstream of the Pandoh HEP and up to the Pong dam, there are three projects are which are under investigation stage namely Thana Plaun HEP (141MW), Triveni Mahadev HEP (78MW) and Dhaulasidh HEP (66MW). Pong HEP (396MW) is a project on the Beas river which is the border of Himachal Pradesh and Punjab.

Pong Dam Reservoir:

Pong dam reservoir was constructed on Beas river by Bhakra Beas Management Board (BBMB), Himachal Pradesh whose office is in located Talwara town lsituated near the Pong reservoir. The area is well connected by road and rail network. Mukeriyan is the nearest railway station which is approximately 30 km from Talwara town (near Pong reservoir). Topography of the area is almost flat.



Pong Dam Reservoir



Pong Dam Reservoir

Pong Dam downstream view

