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Uttarakhand Flood Disaster: Role of Human Actions

While we try to reconstruct the chronology of events that culminated in the tragedy at Kedarnath on the 16th and 17th June as well as the whole of Uttarakhand between 15th-18th June, we are faced with severe limitations: there are no daily rainfall figures for any regions worst hit by floods, rainfall and landslides. This includes Kedarnath, Badrinath, Gangootri, Pithoragarh and surrounding areas. In fact, while answering a question raised by Himanshu Thakkar in a program aired on national television[1], Vice Chairman of National Disaster Management Authority M Shashidhar Reddy accepted that we do not have the account of events with us. This shows the poor monitoring situation from all concerned. We do not have inflow and discharge figures from hydropower projects in the region, including 1000 MW Tehri Hydroelectric Project on Bhagirathi.

Central Water Commission's (CWC) flood forecasts and warning systems have failed in either giving flood warnings or monitoring the situation. In fact, the CWC has only one flood forecasting station in the entire Upper Ganga Basin that is Srinagar and that too failed to give a flood warning even as Srinagar faced disastrous floods!

What we do have is reconstruction of the event based on satellite images released (much delayed, had these been released when the events were unfolding it may have helped greatly) by National Remote Sensing Centre (NRSC), Indian Space Research Organisation (ISRO),[2] some expert analysis and most importantly, harrowing eye witness accounts. Based on this, we attempt a reconstruction of chronology of events that unfolded.

Chronology of Events: A combination of massive rainfall, glacier flow, snowmelt, debris and landslides From all accounts it is clear that areas around all four Pilgrimage centres (Gangotri, Yamunotri, Kedarnath and Badrinath) and the fifth one of Hemkunt Sahib faced severe rainfall and floods during 15-18 June 2013.In addition, areas of Pithoragarh (Goriganga basin), Himachal Pradesh (Kinnaur district,

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1 NDTV INDIA badi khabar programme on June 21 evening (see: http://khabar.ndtv.com/video/show/badi-khabar/280131)

2 http://www.nrsc.gov.in/

mainly Kashang area, a tributary of Sutlej) basin and adjointing parts of Nepal also faced flood disaster during the same period.

The rainfall events that led to these floods started on June 15 and went on till June 18. It is strange to see such vast area facing simultaneous high intensity rainfall. IMD officials tried to explain this (http://www.hindustantimes.com/India-news/NewDelhi/Westerlies-collided-with-monsoon-to-rain-death/Article1-1081810.aspx) as collision of western disturbance with the upcoming monsoon clouds. "It was the interaction between the well-formed low-pressure system of the south-west monsoon from east to west and the upper air westerly trough running from north-west Rajasthan to the east that resulted in the heavy rainfall over Uttarakhand", explains R Ramchandran (Frontline 260713). The catchments of all these basins in their uppermost ranges are not too far from each other.

There are no rain-gauges at Kedarnath and Badrinath and hence we may never know the rainfall at those sites. The best we have is weekly district wise rainfall in Uttarakhand districts for the week June 13-19, from India Meteorological Department:

Uttarakhand. The state received 322 mm of rainfall in the week, which was 847% higher than the normal rainfall of the week at 34 mm. This quantum and excess percentage seems unprecedented. Please do not do the mistake of adding up rainfall figures of different places as one of the senior correspondent and editor of National economic newspaper did in their July 1, 2013 edition. This was an example of how some newspapers can go overboard in N attempt to argue against the culpability of some of the hydropower developers. *Indian Express* is another newspaper guilty of such excesses. Its editor Shekhar Gupta does not seem to have an idea of river basins, and so goes on to claim that without Tehri (in Ganga basin), Delhi (in Yamuna basin) would have tasted *gangajal* (see interview of Uttarakhand CM in July 24, 2013 issue)!

Events of June 16-17 at Kedar Nath on the banks of Mandakini River, a tributary of Alaknanda

Based on information from various sources, it seems Kedarnath shrine saw two massive flood events, one starting around 8.15 pm on June 16 and second at 6.55 am on June 17. The flood witnessed at the shrine (located at 3584 m above msl) originated from catchment that includes two mountain peaks: Kedarnath and Kedarnath Dome (6831 m elevation).

Table 1 District-wise rainfall distribution from 13.06.2013 TO 19.06.2013

DISTRICT	ACTUAL (mm)	NORMAL (mm)	% DEP	CAT.
ALMORA	208.7	26.3	694%	E
BAGESHWAR	391.2	26.3	1387%	E
CHAMOLI	316.9	22.6	1302%	E
CHAMPAWAT	351	33.5	948%	E
DEHRADUN	565.4	36.8	1436%	E
GARHWAL PAURI	149.7	15.8	847%	E
GARHWAL TEHRI	327.7	22	1390%	E
HARDWAR	298.8	21.6	1283%	E
NAINITAL	506.5	38.8	1205%	E
PITHORAGARH	246.9	73	238%	E
RUDRAPRAYAG	366.3	53.9	580%	E
UDHAM SINGH NAGAR	157.7	40.2	292%	E
UTTARKASHI	375.6	25.8	1356%	E

Note that the actual rainfall in this week was upto 1436% of normal rainfall and was excessive in all districts of

Indian Express is also guilty of such excesses. Its editor Shekhar Gupta does not seem to have an idea of river basins, and so goes on to claim that without Tehri (in Ganga basin), Delhi (in Yamuna basin) would have tasted *gangajal*!

Cloud burst or not? While the high intensity rainfall event upstream of Kedarnath has been reported as a cloud burst, some experts disagree. Dr. Srinivasan from Divecha Centre for Climate Change Research, cloudburst occurs when hourly rainfall is more than 100 mm. According to him, satellite images (in the absence of rain gauges) do not suggest such high intensity rainfall. The

Vishnugad Dam filled with boulders, the river by passed the dam
(Photo: Matu Jansangathan)

highest spell which lasted for a few hours was of 20 mm/hr rainfall.[3]

This is further supported by David Petley, Wilson Professor of Hazard and Risk in the Department of Geography at Durham University in the United Kingdom. He says: "Automatic weather station at Chorbari reservoir recorded 315 mm rain on 15th and 16th June. This level of rainfall is not unprecedented, but usually occurs at the peak of the monsoon in July or August. The important factor here is that the rainfall fell at a time when there was still snow on the ground – and any high mountain landslide expert will tell you that the combination of heavy rainfall on melting snow is the tailor-made for landslides."[4] The effect of the heavy rainfall and rapid snow melt was to generate huge amounts of water in the landscape. Petley points out that the amount of debris and rubble below the glacier on the left side of the Kedarnath in a 1882 picture suggests that transportation of sediment and debris from the upper reaches was active even then, and adds that the steep slope that is upstream of Kedarnath would have aided rapid transportation. An initially reasonably small failure quickly accumulated sediment and water, turning into a highly energetic debris flow that swept to the foot of the slope, and then ran along the margin of the glacier before sweeping into the town in the evening on 16th June."[5]

Chorbari Glacier The Chorabari glacier that played a role in June 2013 Uttarakhand floods in Kedarnath lies between latitudes 30°442 503 N and 30°452 303 N, and longitudes 79°12 163 E and 79°52 203 E, from an altitude of approximately 6,000 m (20,000 ft) at the slopes of Kedarnath peak, to 3,800 m (12,500 ft). The glacier is around 7 km in length, while the basin area of the glacier is approximately 38 sq km and the glacier ice cover is 5.9 sq km. The glacier slope is around 11 degrees and faces south. The glacier has two snouts. It is hypothesized by R. K. Chaujar that an original single glacier covered the area, which while receding, split into two snouts. One of the snouts is the source of the Mandakini River at 3,865 m (12,680 ft). The other snout, at 3,835 m (12,582 ft), drains into the Chorabari Tal.

K Vinod Kumar, geologist, National Remote Sensing Center, Hyderabad was quoted by NDTV saying, "The Kedarnath town is situated in a glaciated valley which is fed by two major glaciers on the northern part. The whole area is vulnerable and in the surrounding areas, we have a lot of landslides. So this valley has the influence of the landslides, debris coming from the glaciers and also a chance of glacial lakes bursting."

The recommendations of the Expert Committee on Uttarakhand Glaciers included, "Monitoring of glacial lakes, their formation and potential for hazards... Risk assessment to understand the impact of glaciers on safety of dams, reservoirs and power projects." Unfortunately, none of these recommendations were implemented.

Petley says in the mountainous terrain around Kedarnath, there were two massive debris flows from above, a glacial-related flow from north-west and the glaciated area in the north-east. First the flow from the north-east came down the margin of the glacier and

3 http://www.thehindu.com/news/national/no-evidence-of-cloudburst-says-climate-scientist/article4895584.ece

4 http://blogs.agu.org/landslideblog/2013/07/04/reconstructing-the-events-at-kedarnath-using-data-images-and-eye-witness-reports/

5 http://blogs.agu.org/landslideblog/2013/06/27/new-high-resolution-images-of-kedarnath-the-cause-of-the-debris-flow-disaster-is-now-clear/

spread out to strike the town. Next, the north-west flow descended from the other glacier to the town on its west side, and struck it directly.

According to Petley, the debris flow from the north-east was triggered by a 75 m wide landslide caused by heavy rainfall, which then came down the steep slope about 500 m, gathering the debris in its path. The flow was initially channeled into a narrow gully formed by the glacier and on exiting it the flow spread out in the flood-plains before striking the town after traversing about 1200 m. The steepness of the slope would have given the debris enormous velocity.

In the north-west, the Chorabari glacier has retreated about 300 m since 1960 according to D.P. Dobhal, a glaciologist at the Wadia Institute of Himalayan Geology. The moraine left behind had created a block for a basin to form, allowing the water to build up in Chorabari Tal. The moraine was breached by the rapidly building water because of heavy rainfall and overtopping of the moraine wall. The breach led to the sudden release of the impounded water and resulted in a massive flood sweeping the Kedarnath valley.

According to the NRSC scientists, this lake would have had a depth of about 15 m, and the event is not considered a glacial lake outburst flood (GLOF), which occurs when a dam or moraine wall is breached because of the sheer pressure exerted by the stagnant glacial water and ice that it encloses. This was a case of lake flooding because of excessive rainfall and consequent overtopping of the moraine wall, which eventually breached. The breach created three flows: one moving south-east to join the earlier debris flow from the north-east and enhancing it. Another is a new channel that opened up, perhaps exploiting an existing old channel. Moving down the slope towards the town at great velocity, it gathered sediment and debris en route and resulted in a much-widened flow.

However, the bulk of the debris flow moved southwards towards Kedarnath town down the main channel on the south-western side, which is the normal channel for glacial water flow. According to Petley, this flow must have carried the many huge boulders and rocks seen in the post-flood image of Kedarnath. Closer to the town, the flow spread before striking. Petley suggests that this latter flow must have been more efficient because of the preceding events and also because it struck the town from both the west and the east simultaneously.

DP Dobhal told NDTV, "Early in the morning on 17th the lake burst. It rushed and took a lot of water together and just removed all the sediments, glacier material and threw it down the valley. And there is a 300 meter drop. All the water was vacated in just five minutes."

The glacial regions above Kedarnath had received fresh

> NRSC: "In the preliminary assessment, a total of 1356 landslides have been identified along the river valleys" in Alaknanda basin alone.

and excess snowfall when heavy rainfall hit the region, according to scientists of the National Remote Sensing Centre. Rainwater, with higher temperature, falling on the snow must have led to heavy snow melt and this runoff would have added to the rainwater runoff, resulting in a huge water flow that carried with it a huge debris flow, which struck the town with enormous ferocity. The snow cover has, in fact, increased in general subsequent to the extreme rainfall and flooding events (the NRSC image on May 28/June 1 shows less snow cover). The detailed dynamics of water flow due to snow melt caused by rain, particularly when snowfall is in excess, and the hydrology of it are not well understood.

Uttarakhand Expert Committee on Glaciers Here it should bbe noted that the Expert Committee on Glaciers formed by the Uttarakhand government with B R Arora as Chairman submitted its report in Dec 2006 with short and long term suggestions. These suggestions included monitoring of the glaciers, formation of five study groups and action plan. The recommendations included, to illustrate, "Monitoring of glacial lakes, their formation and potential for hazards... Risk assessment to understand the impact of glaciers on safety of dams, reservoirs and power projects." Unfortunately, none of these recommendations were implemented.

Situation at Devprayag According to Dr. Bharat Jhujhunwala staying at Devprayag along the confluence of Bhagirathi and Alaknanda, peak floods happened on early morning of June 17, though severe flood event in Alaknanda started the previous evening. He also mentioned that the massive amount of muck deposited on the Alaknanda riverbed by the under construction 330 MW GVK Srinagar Alaknanda Hydropower Prooject (the project has no credible environmental impact assessment) accentuated the flood disaster in the downstream area.

It is interesting to note that if these accounts are correct, the peak of flood event at Devprayag and Kedarnath (separated by about 150 km) happened on the morning of June 17, which possibly indicates that there were multiple cloud burst or very high intensity rainfall events in Alaknanda valley alone. Uttarkashi Apda Prabanthan Jan Manch had sent a report with photos of unfolding disaster on the evening of June 16, 2013 itself so the high rainfall event and beginning of flood disaster at Uttarkashi began about a day earlier. The news channels were already showing live footage of the event unfolding in downstream Rishikesh and Haridwar on June 17, again indicating that the flood event in the upstream

mountains must have started at least two days earlier. Unfortunately we still do not have an accurate account of this whole episode from any of the official agency.

Over a thousand landslides In fact according to National Remote Sensing Centre, ISRO, a whopping 1356 landslides have taken place in only the Alaknnanda basin. "In the preliminary assessment, a total of 1356 landslides have been identified along the river valleys of Mandakini, Mandani, Kali, Madhyamaheshwar and parts of Alaknanda from Srinagar to Chamoli. Some of the towns included in this area are Kedarnath, Sonprayag, Gaurikund, Okhimath, Guptkashi, Mansuna, Phata, Agastmuni, Rudraprayag, Srinagar, Gauchar, Karnaprayag, Nandprayag, Chamoli etc."

Landslides upstream Kedarnath Dave Petley suggests that two landslides took place upstream of Kedarnath on the 16th, one from the North East and the other from the North West[6], both originating near glaciers. "In the north east, debris flow was initiated by landslide, which ran down the slope entraining debris en route. This flow eroded large amount of material, hence gaining in volume as it stuck the town. The second event, which came from the glacial area to the northwest, is very different. Landslides and morain left by retreating glaciers blocked drainage in this area, allowing water to build up a pool. Eventually this pool overtopped the moraine barrier –overtopping of the barrier occurred, it catastrophically breached. This generated a very rapid release of the impounded water. The flow was so large that it over-topped the moraine on the other side of the glacial area, such that three flows were formed. One went southwest to join the valley from the earlier debris flow before swinging to the south to strike the town. This exploited an existing channel. The second was a much smaller flow that reoccupied an palaeochannel. The volume of water and sediment that entered this channel was small, but it appears to have entrained debris en route (the channel widens downslope).Most of the debris flow travelled south, down the main channel. The flow travelled southwards, eventually starting to spread and deposit sediments before striking the town."

According to Report from National Institute of Disaster Management (NIDM),[7] "Seismo-tectonically, the area is traversed by several lineaments, faults and thrusts, which are considered to be geodynamically active. The area had suffered an earthquake on 29 March 1999 (M-6.8) which caused loosening of rock masses, ground cracks and landslides etc., besides killing more than a hundred people due to collapse of buildings. Thus, the natural terrain conditions combined with climatic / weather conditions and haphazard human intervention made a conducive environment for such a hazardous process to take place in this valley."

NIDM: "Thus, the natural terrain conditions combined with climatic / weather conditions and haphazard human intervention made a conducive environment for such a hazardous process to take place in this valley."

SANDRP

Useful Links:

1. For an account of Floods in Pithoragarh district of Uttarakhand, see: http://www.himalprakriti.org/?q=content/brief-report-spate-along-gori-river-basin-north-eastern-kumaon-uttarakhand-15th-17th-june; images of the Goriganga floods: http://www.himalprakriti.org/?q=content/images-gori-spate-june-2013; Before and after images of 5 Motighat hydropower project: http://www.himalprakriti.org/?q=content/and-after-images-uttarakhand-floods-2013
2. For a photo feature on damage to Vishnuprayag HEP, see: http://matuganga.blogspot.in/
3. For an excellent account of how Uttarakhand is a model of disaster, see: http://tehelka.com/uttarakhand-a-model-of-disaster/
4. Uttarakhand Disaster Mitigation and Management Centre: http://dmmc.uk.gov.in/
5. National Disaster Management Authority: http://ndma.gov.in/ndma/index.htm
6. National Institute of Disaster Management: http://nidm.gov.in/default.asp
7. India Meteorological Department: http://imd.gov.in/
8. Flood forecasting site of Central Water Commission: http://www.india-water.com/ffs/index.htm
9. Sphere India, coordinating disaster management from non govt agencies: http://www.sphereindia.org.in/
10. http://www.ndtv.com/article/india/uttarakhand-the-making-of-the-himalayan-tsunami-393901
11. http://www.frontline.in/the-nation/why-kedarnath-happened/article4894867.ece?homepage=true
12. http://chimalaya.org/2013/06/19/disaster-in-uttarakhand-india-huge-death-toll/

6 http://blogs.agu.org/landslideblog/2013/06/27/new-high-resolution-images-of-kedarnath-the-cause-of-the-debris-flow-disaster-is-now-clear/

7 http://nidm.gov.in/default.asp

Central Water Commission's (CWC) non-existent Flood Forecasting in Uttarakhand

Central Water Commission, India's premier technical body under Union Ministry of Water Resources, has once again failed in the Uttarakhand flood disaster. Even as the Uttarakhand state faced the worst floods in its history, CWC, which has been given the task of forecasting floods across flood prone areas all over India, completely failed in making any forecasts that could have helped the people and administration in Uttarakhand.

First principle of disaster management is prior warning. With prior warning, significant proportion of possible damages and destruction can be avoided. In that respect, one expected that CWC would play a key role in forecasting the floods. SANDRP has been monitoring CWC flood forecasts throughout the monsoon for some years. During June 15-17, 2013, when Uttarakhand was receiving the floods, CWC did not make any forecasts regarding Uttarakhand. As far as the most severely disaster affected areas of Ganga basin upstream of Devprayag are concerned (these include the worst affected Kedarnath and Mandakini valley, the Gangotri and Bhagirathi valley and Badrinath in Alaknanda valley), CWC has made no flood forecasts at all this year. Same is the case regarding other affected regions of Uttarakhand including Yamuna basin including Yamunotri and Pithoragarh including Goriganga basin. What is than the role of this premier technical body tasked with flood forecasting?

The only forecast that CWC made for Uttarakhand this June 2013 were for Rishikesh and Haridwar on June 18, 2013. Even in these instances, CWC's callousness is reflected. Normally when flood forecasts are made for any site in the first place, the forecasts would be low flood forecast (where water level is between warning and danger level for the site), and only in next stage, would medium flood forecast would be made (water level above danger level). However, in case of both Rishikesh and Haridwar, CWC straightaway made medium flood forecasts, missing the low flood forecasts.

In fact looking at the CWC flood forecasting site (http://www.india-water.com/ffs/index.htm), we notice that in entire Uttarakhand state, CWC has only three flood forecasting sites: Srinagar, Rishikesh and Haridwar, which means CWC would not be making any forecasts for the most vulnerable regions of Uttarakhand in any case! Even in case of Srinagar (which actually suffered the worst floods with hundreds of damaged houses), CWC site says the Highest flood level is 536.85 m, amazingly, below the warning level of 539 m! This means that even if water level goes above HFL, it won't forecast any floods since level could still be well below the warning level?

The callous performance of CWC does not end there. During June 2-7 this year, CWC flood forecasting site as also the flood forecasting site of NDMA which also depends on CWC, stopped functioning. After numerous emails and phone calls from SANDRP, the website started functioning again on June 7, 2013 and Shri V D Roy, Director (Flood Forecasting Management) of CWC wrote to us, "Due to technical reasons, the CWC FF site was not working since 2nd June. With consistent effort, the website was made functional w e f 7th June".

Pointing out a major blunder of CWC, we had written to CWC on June 12, 2013, "CWC forecast site reported that water level of Brahmaputra river at Neamatighat site in Jorhat district in Assam had reached 94.21 m at 0900 hrs (on June 11, 2013), which was 6.84 m above the highest flood level of the site at 87.37 m. The FF site also forecast that the level will be 94.15 m at 0900 am on June 12, 2013, that is today. Both the recording and forecast were clearly wrong, rather way off the mark. The site or the area in question or upstream and downstream levels do not match with what the CWC site said y'day." Needless to add there were no floods in Brahmaputra on June 11, 2013, in spite of such forecast by India's highest technical body! CWC is yet to respond to our emails on this issue. Instead of putting its house in order, CWC is acting as a lobby for big dams by making baseless claims about Tehri dam having saved downstream area of floods, as reported by Indian Express[i] on June 25, 2013. This is like adding salt to the wounds of the people of Uttarakhand who are suffering from the ill effects of lopsided development including dams and hydropower projects. It would be better if CWC tries to improve its flood forecasts rather than indulging in such lobbying efforts at such times of crisis.

CWC needs to seriously consider including key sites of Uttarakhand into its flood forecasting sites, even if the the duration available for such forecasting is smaller. In times of crisis even a few hours notice can save many lives and also help save other losses.

Uttarakhand: Existing, under construction and proposed Hydropower Projects:

How do they add to the disaster potential in Uttarakhand?

As Uttarakhand faced unprecedented flood disaster and as the issue of contribution of hydropower projects in this disaster was debated, one question for which there was no clear answer is, how many hydropower projects are there in various river basins of Uttarakhand? How many of them are operating hydropower projects, how many are under construction and how many more are planned? How projects are large (over 25 MW installed capacity), small (1-25 MW) and mini-mirco (less than 1 MW installed capacity) in various basins at various stages. This document tries to give a picture of the status of various hydropower projects in various sub basins in Uttarakhand, giving a break up of projects at various stages.

Uttarakhand has 98 operating hydropower projects (all sizes) with combined capacity close to 3600 MW. However, out of this capacity, about 1800 MW is in central sector and 503 MW in private sector, making it uncertain how much power from these projects the state will get. Moreover, it is universally true that local communities never get the power from large hydro projects.

River Basins in Uttarakhand Entire Uttarakhand is part of larger Ganga basin. The Ganga River is a transboundary river of India and Bangladesh. The 2,525 km long river rises in the western Himalayas in the Indian state of Uttarakhand, and flows south and east through the Gangetic Plain of North India into Bangladesh, where it empties into the Bay of Bengal. The Ganga begins at the confluence of the Bhagirathi and Alaknanda rivers and forms what we have called Ganga sub basin till the Ganga river exits Uttarakhand. Besides Bhagirathi, Alaknanda and Ganga sub basin, other river basins of Uttarakhand include: Yamuna, Ramganga (Western Ramganga is taken as Ramganga basin in this document, eastern Ramganga is considered part of Sharda basin) and Sharda. Sharda sub basin includes eastern Ramganga, Goriganga, Dhauliganga, Kaliganga and part of Mahakali basin.

Existing hydropower projects in Uttarakhand In the table below we have given the sub basin wise list of existing hydropower projects in Uttarakhand along with their capacities. The list has been prepared based on various sources including Central Electricity Authority, Uttarakhand Jal Vidhyut Nigam (UJVNL), Uttarakhand Renewable Energy Development Authority (UREDA) and Report of Inter Ministerial Group on Ganga basin.

Table 1: Existing Hydropower projects in Uttarakhand

Projects	Installed Capacity (MW)
Projects in Alaknanda River Basin	
1. Vishnu Prayag (P)	400
2. Tilwara	0.2
3. Soneprayag	0.5
4. Urgam	3
5. Badrinath II	1.25
6. Rajwakti (P)	3.6
7. Tapowan	1
8. Jummagad	1.2
9. Birahi Ganga (P)	7.2
10. Deval (P Chamoli Hydro P Ltd on Pinder)	5
11. Rishiganga (P)	13.5
12. Vanala (P Hima Urja P Ltd Banala stream)	15
13. Kaliganga I (ADB)	4
Alaknanda Total	**455.45**
Projects in Bhagirathi River Basin	
14. Maneri Bhali-1 (Tiloth)	90
15. Maneri Bahli-2	304

Projects	Installed Capacity (MW)
16. Tehri St-I	1000
17. Koteshwar	400
18. Harsil	0.2
19. Pilangad	2.25
20. Agunda Thati (P Gunsola hydro Balganga river)	3
21. Bhilangana (P - Swasti)	22.5
22. Bhilangana III (P - Polyplex)	24
23. Hanuman Ganga (P – Regency Aqua)	4.95
Bhagirathi Total	**1850.9**
Projects in Ganga River sub basin downstream of confluence of Bhagirathi and Alaknanda	
24. Chilla	144
25. Pathri	20.4
26. Mohamadpur	9.3
Ganga sub basin Total	**173.7**
Projects in Ramganga basin	
27. Ramganga	198
28. Surag	7
29. Loharkhet (P Parvatiya Power P Ltd Bageshwar)	4.8
30. Kotabagh	0.2
31. Sapteshwar	0.3
32. Gauri	0.2
Ramganga Total	**210.5**
Projects in Sharda River Basin	
33. Dhauliganga	280
34. Tanakpur	94.2
35. Khatima	41.4
36. Chirkilla	1.5
37. Taleshwar	0.6
38. Suringad	0.8
39. Relagad	3
40. Garaon	0.3
41 Charandev	0.4
42. Barar	0.75
43. Kulagad	1.2
44. Kanchauti	2
Sharda Total	**426.15**
Projects in Yamuna River Basin	
45. Chibro	240
46. Dhakrani	33.75
47. Dhalipur	51
48. Kulhal	30
49. Khodri	120
50. Galogi	3
51. Tharali	0.4
Yamuna Total	**478.15**
Grand Total	**3594.85**

***Note**: (P) in the bracket suggests the project is in private sector, throughout this document. The eastern Ramganga river, which is part of Sharda basin, is included in Sharda basin. Where-ever Ramganga river is mentioned in this document, it refers to Western Ramganga, which is a tributary of Ganga.*

In the next table we have given available list of existing mini and micro hydropower projects in Uttarakhand, based on UREDA information.

Table 2: List of projects up to 1 MW under operation

S.N.	Project	Ins Cap (MW)	Dist	Basin
1	Milkhet	0.1	Chamoli	Alaknanda
2	Bamiyal	*	Chamoli	Alaknanda
3	Bursol	0.2	Chamoli	Alaknanda
4	Choting	0.1	Chamoli	Alaknanda
5	Ghagaria	0.1	Chamoli	Alaknanda
6	Ghagaria Extension	*	Chamoli	Alaknanda
7	Ghes	0.1	Chamoli	Alaknanda
8	Gulari	0.2	Chamoli	Alaknanda
9	Niti	0.025	Chamoli	Alaknanda
10	Sarma	0.1	Chamoli	Alaknanda Nandakini/ Maini Gad
11	Wan	0.05	Chamoli	Alaknanda
12	Bank	0.10	Chamoli	Alaknanda Pinder
13	Gamsali Bampa	0.05	Chamoli	Alaknanda Dhauliganga/Ganesh Ganga
14	Kedarnath II	0.2	Rudraprayag	Alaknanda
15	Badiyakot	0.1	Bageshwar	Alaknanda
16	Kunwari	0.05	Bageshwar	Alaknanda
17	Borbalada	0.025	Bageshwar	Alaknanda Pindar/ Chhiyaldi Gad
18	Dokti	0.02	Bageshwar	Alaknanda
19	Dior IInd Phase	*	Pauri	Alaknanda/ Ganga
20	Chandrabhaga Gad	*	Tehri	Bhagirathi
21	Jakhana	0.1	Tehri	Bhagirathi Bhilangana/Balganga
22	Gangotri-I	0.1	UttarKashi	Bhagirathi Kedar Ganga
23	Kanwashram	0.1	Pauri	Ganga
24	Bilkot	0.05	Pauri	Ramganga
25	Dior Ist Phase	0.1	Pauri	Ramganga
26	Gogina II	0.05	Bageshwar	Ramganga
27	Sattshwar	0.05	Bageshwar	Ramganga
28	Toli	*	Bageshwar	Ramganga
29	Ramgarh	0.1	Nainital	Ramganga
30	Lathi	0.1	Bageshwar	E Ramganga/Sharda
31	Liti	0.05	Bageshwar	E Ramganga/Sharda
32	Liti-II	0.05	Bageshwar	E Ramganga/Sharda
33	Ratmoli	0.05	Bageshwar	E Ramganga/Sharda
34	Baghar	0.05	Bageshwar	E Ramganga/Sharda
35	Baicham	0.1	Bageshwar	E Ramganga/Sharda
36	Jugthana	0.1	Bageshwar	E Ramganga/Sharda
37	Kanol gad	0.1	Bageshwar	E Ramganga/Sharda
38	Karmi	0.05	Bageshwar	E Ramganga/Sharda
39	Karmi -III	0.05	Bageshwar	E Ramganga/Sharda
40	Karmi-II	0.05	Bageshwar	E Ramganga/Sharda
41	Bhikuriya Gad	0.5	Pithoragarh	Sharda
42	Kanchauti	*	Pithoragarh	Sharda
43	Lamabager	0.20	Bageshwar	Sharda Saryu
44	Lamchula	0.05	Bageshwar	Sharda Saryu
45	Tarula	0.10	Almora	Sharda Saryu/Jataya Ganga
46	Taluka	0.025	Uttarkashi	Yamuna Tons/ Gattu Gad
47	Bhadri Gad	0.02	Tehri	Yamuna

From *http://ahec.org.in/, capacity of some of the projects is as per the UJVNL website. The capacity comes to 3.815 MW for the 41 projects for which capacity is available. * means capacity is not known.*

Overview of hydropower Projects in Uttarakhand Based on above two tables, in the following table we have provided an overview of operating hydropower projects and their capacity, with basin wise and size wise break up. Uttarakhand has total of 98 existing hydropower projects, with total installed capacity of close to 3600 MW. At least eleven of these projects are in private sector with total capacity of over 503 MW. An additional about 1800 MW capacity is in central sector. It means that majority of the power generation capacity in the state is not owned by the state and there is no guarantee how much of that power would be available to the state.

MW. This mis-match is not possible to resolve since MNRE does not provide full list of operating SHPs in Uttarakhand.

Under Construction Hydropower projects in Uttarakhand In the table below we have given available list of under construction hydropower projects in Uttarakhand. Actual list of under construction projects is likely to be larger than this, since clear and upto-date information is not available on official website. The list does not include the mini and micro hydropower projects that are under construction. Even in case of small hydro projects (1-25 MW capacity), the list is not complete.

Table 3: Basin wise number of operating hydro projects in Uttarakhand

Basin	Large Hydro projects (above 25 MW)		Small Hydro projects (1-25 MW)		Mini-micro Hydro projects (below 1 MW)		Total Hydro projects	
	No of projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW
Alaknanda	1	400	10	54.75	21	2.22	32	456.97
Bhagirathi	4	1794	5	56.7	4	0.4	13	1851.1
Ganga Sub basin	1	144	2	29.7	1	0.1	4	173.8
Ramganga	1	198	2	11.8	9	1.05	12	210.85
Sharda	3	415.6	4	7.7	21	4.45	28	427.75
Yamuna	5	474.75	1	3	3	0.445	9	478.195
TOTAL	**15**	**3426.35**	**24**	**163.65**	**59**	**8.665**	**98**	**3598.665**

Here we should note that as per the Union Ministry of New and Renewable Energy sources, in Uttarakhand, by March 2013, 98 small hydro schemes has been installed with total capacity of 170.82 MW. If we add the small and mini-micro projects in above table, we have 83 operating schemes with installed capacity of 172.315

According to this list, 25 projects with 2376.3 MW capacity are under construction in Uttarakhand. 6 of them are large hydropower projects and rest 19 are small hydro projects. Of the 6 large hydropower projects, three are in private sector and three are in central sector, none in state sector.

Table 4: List of Hydropower Projects under construction

SN	Project	Ins Cap (MW)	Dist	Sub-Basin
1	Srinagar	330	Pauri	Alaknanda
2	Phata- Byung	76	Rudraprayag	Alaknanda
3	Singoli-Bhatwari	99	Rudraprayag	Alaknanda
4	Lata Tapovan	171	Chamoli	Alaknanda
5	Tapovan Vishnugad	520	Chamoli	Alaknanda
6	Madhmaheshwar (ADB)	10	Rudrprayag	Alaknanda
7	Kaliganga-II (ADB)	6	Rudrprayag	Alaknanda
8	Bgyunderganga (P)	24.3	Chamoli	Alaknanda
9	Birahi Ganga-I (P)	24	Chamoli	Alaknanda
10	Devali (P)	13	Chamoli	Alaknanda
11	Kail ganga	5	Chamoli Pinder	Alaknanda
12	Khiraoganga (P)	4	Uttarkashi	Alaknanda
13	Sobla I	8	Pithoragarh	Alaknanda
14	Hafla	0.2	Chamoli	Alaknanda Hafla Gad
15	Nigol Gad	0.1	Chamoli	Alaknanda Nigal Gad

SN	Project	Ins Cap (MW)	Dist	Sub-Basin
16	Wachham	0.50	Bageshwar	Alaknanda Pindar/SunderDhunga Gad
17	Tehri stage-II	1000	Tehri	Bhagirathi
18	Asiganga-I	4.5	Uttarkashi	Bhagirathi
19	Asiganga-II	4.5	Uttarkashi	Bhagirathi
20	Suwarigad	2	Uttarkashi	Bhagirathi
21	Limchagad	3.5	Uttarkashi	Bhagirathi
22	Kaldigad (ADB)	9	Uttarkashi	Bhagirathi
23	Balganga-II	7	Tehri Garhwal	Bhagirathi
24	Jalandhari Gad (P)	24	Uttarkashi	Bhagirathi
25	Kakora Gad (P)	12.5	Uttarkashi	Bhagirathi
26	Kot-Buda Kedar (P)	6	Tehri	Bhagirathi
27	Siyangad (P)	11.5	Uttarkashi	Bhagirathi
28	KotiJhala	0.2	Tehri	Bhagirathi Bal Ganga
29	Pinsward	0.05	Tehri	Bhagirathi Bal Ganga
30	Dunao	1.5	Pauri	Ganga sub basin
31	Gaudi Chida	0.25	Pauri	Ganga sub basin E Nayar
32	Rotan	0.05	Pithoragarh	Sharda E Ramganga/Rotan
33	Duktu	0.025	Pithoragarh	Sharda Kali/ Nati Yanki
34	Nagling	0.05	Pithoragarh	Sharda Kali/ Nagling Yanki
35	Sela	0.05	Pithoragarh	Sharda Dhauli Ganga/ Seal Gad
36	Kutty	0.05	Pithoragarh	Sharda Kali
37	Napalchu	0.05	Pithoragarh	Sharda Kali/ Piear Yanki
38	Bundi	0.05	Pithoragarh	Sharda Kali/ Pulung Gad
39	Rongkong	0.05	Pithoragarh	Sharda Kali/ Dangiang Yanki
40	Chiludgad	0.10	Uttarakashi	Yamuna Supin/Chilude Gad
41	Khapu Gad	0.04	Uttarakashi	Yamuna Supin/Khapu Gad

Total Under Construction 2378.115 MW

Note: Projects like Loharinag Pala, Pala Maneri, Bhairoghati and other projects along Bhagirathi upstream of Uttarkashi along the Eco Sensitive zone have been dropped from this list. Rest of the list is from the IMG report or from UJVNL website. P in the bracket indicates the project is in privte sector. ADB in the bracket indicates that the project is funded by the Asian Development Bank.

Proposed hydropower projects in Uttarakhand In following tables we have provided available list of proposed hydropower projects in the Alaknanda, Bhagirathi, Yamuna, Sharda and Ramganga basins in Uttarakhand. The list is likely to be longer than the list in these tables since full and upto-date information is not available. Also there are different agencies involved in proposing, sanctioning and executing these projects and there is no one agency who would provide comprehensive picture of what is happening in the basin. However, even this available list is frightening.

Table 5: Proposed Hydropower projects in Alaknanda Basin

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
1	Vishnugad Pipalkoti (WB)	444	Chamoli	Alaknanda	Construction to be started
2	Kotli Bhel (IB)	320	Pauri	Alaknanda	EAC ok/FAC u/consideration
3	Alaknanda (P Badrinath)	300	Chamoli	Alaknanda	EC & FC ok IA not signed
4	Devsari Dam	252	Chamoli	Alaknanda	EC & FC ok CEA concrnce?
5	Kotli Bhel II	530	Pauri	Ganga sub basin	EAC ok/FAC u/consideration
6	Bowla Nandprayag	300	Chamoli	Alaknanda	EAC TOR Approved
7	Tamak Lata	280	Chamoli	Alaknanda	EC ok, DPR under revision
8	Nand Prayag	100		Alaknanda	DPR returned
9	Jelam Tamak	108	Chamoli	Alaknanda	EAC ok in June 2013

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
10	Maleri Jelam	55	Chamoli	Alaknanda	PFR prepared
11	Rishiganga I	70	Chamoli	Alaknanda	PFR prepared
12	Rishiganga II	35	Chamoli	Alaknanda	PFR prepared
13	Gohana Tal	60	Chamoli	Alaknanda	PFR prepared
14	Rambara	24	Rudraprayag	Alaknanda	IMG report
15	Birahi Ganga-II (P)	24	Chamoli	Alaknanda	DPR under revision
16	Melkhet (P)	56	Chamoli	Alaknanda Pinder	Proposed
17	Urgam-II	3.8	Chamoli	Alaknanda	Under S&I
18	Bhyunder Ganga	243	Chamoli	Alaknanda	FC under consideration
19	Nand Pyayag Langasu	141	Chamoli	Alaknanda	EAC TOR Approved
20	Rambara	76	Rudraprayag	Alaknanda	EAC TOR u/consideration
21	Bagoli	90	Chamoli	Alaknanda	Proposed
22	Bangri	44	Chamoli	Alaknanda	Pinder
23	Madhya Maheshwar	350	Chamoli	Alaknanda	Proposed
24	Ming Nalgaon	114	Chamoli	Alaknanda	Pinder
25	Padli	66	Chamoli	Alaknanda	Proposed
26	Thapli	44	Chamoli	Alaknanda	Proposed
27	Utyasu-I	70	Chamoli	Alaknanda	Proposed
28	Utyasu-II	205	Chamoli	Alaknanda	Proposed
29	Utyasu-III	195	Chamoli	Alaknanda	Proposed
30	Utyasu-IV	125	Chamoli	Alaknanda	Proposed
31	Utyasu-V	80	Chamoli	Alaknanda	Proposed
32	Utyasu-VI	70	Chamoli	Alaknanda	Proposed
33	Rampur Tilwari	25	Rudraprayag	Alaknanda	Proposed
34	Chunni semi	24	Rudraprayag	Alaknanda	Proposed Mandakini
35	Kosa	24	Chamoli	Alaknanda	Dhauliganga
36	Vijay nagar- Rampur	20	Rudraprayag	Alaknanda	Proposed
37	Nandakini-III	19.5	Chamoli	Alaknanda	Proposed
38	Nayar	17	Pauri	Ganga sub basin	Nayar
39	Alaknanda I	15	Chamoli	Alaknanda	Proposed
40	Buara	14	Bageshwar	Alaknanda	Pindar
41	Duna Giri	10	Chamoli	Alaknanda	Dhauliganga
42	Alaknanda II	10	Chamoli	Alaknanda	Proposed
43	Balkhila-II	10	Chamoli	Alaknanda	Proposed
44	Mandani Ganga	10	Rudraprayag	Alaknanda	Mandakini Mandani ganga
45	Rishiganga	8.25	Chamoli	Alaknanda	Proposed
46	Subhain	8	Chamoli	Alaknanda	Dhauliganga
47	Son	7	Rudraprayag	Alaknanda	Mandakini son gad
48	Kalp ganga	6.25	Chamoli	Alaknanda	Proposed kalpganga
49	Lustar	6	Rudraprayag	Alaknanda	Mandakini Lustar
50	Madhya maheshwar -II	6	Rudraprayag	Alaknanda	Mandakini madmaheshwar
51	Hom 6	6	Chamoli	Alaknanda	Dhauliganga
52	Amrit ganga	6	Chamoli	Alaknanda	Amrit ganga balsuti gadera
53	Gaddi	5.25	Chamoli	Alaknanda	dhauliganga Gaddi Gadera

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
54	Deval	5	Chamoli	Alaknanda	Proposed
55	Ghrit Ganga	5	Chamoli	Alaknanda	Proposed
56	Jumma	5	Chamoli	Alaknanda	Proposed
57	Ringi	5.5	Chamoli	Alaknanda	Dhauliganga
58	Tamak	5	Chamoli	Alaknanda	Proposed
59	Balkhila-I	5.5	Chamoli	Alaknanda	Proposed Balkhila
60	Basti –I	4	Rudraprayag	Alaknanda	Proposed
61	Basti –II	4	Rudraprayag	Alaknanda	Proposed
62	Laxmanganga	4	Chamoli	Alaknanda	Proposed
63	Nil ganga	3	Chamoli	Alaknanda	Proposed
64	Santodhar – I	2	Pauri	Ganga sub basin	W Nayar
65	Santodhar – II	2	Pauri	Ganga sub basin	W Nayar
66	Birahiganga	4.8	Chamoli	Alaknanda	Proposed
67	Byaligaon	2.25	Pauri	Ganga sub basin	E Nayar
68	Ghirit Ganga	1.3	Chamoli	Alaknanda	Proposed
69	Jummagad	1.2	Chamoli	Alaknanda	Proposed
70	Kailganga	3	Chamoli	Alaknanda	Proposed
71	Kakra	1	Rudraprayag	Alaknanda	Proposed
72	Kali Ganga	3	Chamoli	Alaknanda	Proposed
73	Garud Ganga	0.6	Chamoli	Alaknanda	Proposed
74	Gansali Bampa	0.05	Chamoli	Alaknanda	Dhauliganga/Ganesh Ganga
Alaknanda Total		**5199.25**			

Table 6: Proposed Hydropower projects in Bhagirathi Basin

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
1	Kotli Bhel (IA)	195	Pauri	Bhagirathi	EC/FAC stage 1
2	Jhalakoti (P)	12.5	Uttarkashi	Bhagirathi	Proposed dharamganga
3	Bhilangana II A	24	Uttarkashi	Bhagirathi	Proposed
4	Karmali	140	Uttarkashi	Bhagirathi	IMG, on Eco-sensitive zone?
5	Jadhganga	50	Uttarkashi	Bhagirathi	IMG: PFR prepared
6	Bhilangana IIB	24	Tehri	Bhagirathi	Under S&I
7	Bhilangana IIC	24	Tehri	Bhagirathi	Under S&I
8	Pilangad-II	4	Uttarkashi	Bhagirathi	Proposed
9	Bhela Tipri	100	Uttarakashi	Bhagirathi	Proposed
10	Nelong	190	Uttarakashi	Bhagirathi	Proposed
11	Asiganga-III	9	Uttarkashi	Bhagirathi	Proposed
12	Gangani (P)	8	Uttarkashi	Bhagirathi	Proposed
13	Balganga-I	5	Tehri Garhwal	Bhagirathi	Proposed
14	Khirao ganga	4	Uttarkashi	Bhagirathi	Proposed
15	Lagrasu (P)	3	Tehri Garhwal	Bhagirathi	Proposed
16	Songad	3	Uttarkashi	Bhagirathi	Proposed
17	Jalandhari Gad	3	Uttarakashi	Bhagirathi	Proposed
18	Jalkurgad I	2	Tehri Garhwal	Bhagirathi	Proposed jalkur gad
19	Rataldhara	0.4	Tehri Garhwal	Bhagirathi	Proposed Jalkur Gad
20	Lamb Gaon	0.4	Tehri Garhwal	Bhagirathi	Proposed Jalkur gad
21	Dhatirmouli	0.4	Tehri Garhwal	Bhagirathi	Proposed Jalkurgad
22	Gangi-Richa	0.2	Tehri	Bhagirathi	Bhilangana/ Re Gad
Bhagirathi Total		**801.9**			

Table 7: Proposed Hydropower projects in West Ramganga Basin

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
1	Babas Dam	88	Almora	Ramganga	Proposed
2	Khati	63	Bageshwar	Ramganga	Proposed
3	Lumi	54	Bageshwar	Ramganga	Proposed
4	Kuwargarh	45	Bageshwar	Ramganga	Proposed
5	Bawas Gaon	34	Nainital	Ramganga	Proposed
6	Jamrani Dam	30		Ramganga	Proposed
7	Khutani	18	Bageshwar	Ramganga	Proposed
8	Sarju Stage-II (P)	15	Bageshwar	Ramganga	Proposed
9	Sarju Stage-III (P)	10.5	Bageshwar	Ramganga	Proposed
10	Sheraghat	10	Almora	Ramganga	Kho
11	Baura	14	Bageshwar	Ramganga	Proposed
12	Sarju Stage-I (P)	7.5	Bageshwar	Ramganga	Proposed
13	Balighat	5.5	Bageshwar	Ramganga	Proposed
14	MehalChaura-I	4	Pithoragarh	Ramganga	Proposed
15	MehalChaura-II	3	Pithoragarh	Ramganga	Proposed
16	Agarchatti	2	Pithoragarh	Ramganga	Proposed
17	Kho I	2	Pauri	Ramganga	Kho
18	Kho II	2	Pauri	Ramganga	Proposed
19	Harsila	0.7	Bageshwar	Ramganga	Proposed harsila gad
20	Kalsa	0.3	Nainital	Ramganga	Proposed
Ramganga Total		**408.5**			

Table 8: Proposed Hydropower projects in Sharda Basin

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
1	Mapang Bogudhiyar (P)	200	Pithoragarh	Sharda	EAC TOR Approved
2	Bogudhiyar Sarkaribhyol (P)	170	Pithoragarh	Sharda	EAC TOR Approved
3	Sarkaribhyol Rupsiabagar	210	Pithoragarh	Sharda	EAC TOR Approved
4	Rupsiabagar Khasiabara	260	Pithoragarh	Sharda	EAC Ok / FAC Rejected
5	Bokang Baling	330	Pithoragarh	Sharda	Proposed THDC
6	Chungar Chal	240	Pithoragarh	Sharda	Proposed NHPC
7	East Ram Ganga Dam	30	Pithoragarh	Sharda	Proposed
8	Khartoli Lumti Talli	55	Pithoragarh	Sharda	Proposed
9	Budhi	192	Pithoragarh	Sharda	Mahakali
10	Garba Tawaghat	610	Pithoragarh	Sharda-Mahakali	Proposed NHPC
11	Garbyang	131	Pithoragarh	Sharda	Mahakali
12	Lakhanpur	160	Pithoragarh	Sharda	Proposed
13	Malipa	138	Pithoragarh	Sharda	Mahakali
14	Pancheshwar	6000	Pithoragarh	Sharda	Indo Nepal Project
15	Purnagiri Dam	1000	Champawat	Sharda	Indo Nepal Project
16	Tawaghat - Tapovan	105	Pithoragarh	Sharda	Mahakali
17	Taopvan Kalika	160	Pithoragarh	Sharda	Mahakali
18	Tapovan Chunar	485	Pithoragarh	Sharda	Proposed

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
19	Sela Urthing	230	Pithoragarh	Sharda	Proposed
20	Urthing Sobla (P)	340	Pithoragarh	Sharda	Proposed
21	Sobla Jhimjingao	145	Pithoragarh	Sharda	Proposed
22	Kalika - Baluwakot	120	Pithoragarh	Sharda	Mahakali
23	Kalika Dantu	230	Pithoragarh	Sharda	Proposed
24	Dhauliganga Intermediate	200	Pithoragarh	Sharda	Proposed NHPC
25	Gauriganga III A & B	140	Pithoragarh	Sharda	Proposed NHPC
26	Madkini (P)	39	Pithoragarh	Sharda	Proposed
27	Burthing - Purdam	5	Pithoragarh	Sharda	Proposed Jakula
28	Jimbagad	7.7	Pithoragarh	Sharda	Proposed
29	Suringad-II	5	Pithoragarh	Sharda	Proposed
30	Tanga (P)	5	Pithoragarh	Sharda	Proposed
31	Tankul	12	Pithoragarh	Sharda	Proposed
32	Motighat (P)	5	Pithoragarh	Sharda	Proposed
33	Painagad	9	Pithoragarh	Sharda	Proposed
34	PhuliBagar- Kwiti	4	Pithoragarh	Sharda	Proposed Jakula
35	Kumeria- Garjia (Bawas)	12.5	Nainital	Sharda	Kosi
36	Balgad	8	Pithoragarh	Sharda	E Ramganga
37	Kuti SHP	6	Pithoragarh	Sharda	Maha Kali/ Kuti yangti
38	Palang SHP	6.5	Pithoragarh	Sharda	Maha Kali/ Plang gad
39	Najyang SHP	5.5	Pithoragarh	Sharda	Maha Kali/ Najyang gad
40	Simkhola SHP	8.75	Pithoragarh	Sharda	Maha Kali/ Simkhola gad
41	Birthi	1	Pithoragarh	Sharda	Balchinn
42	Baram	1	Pithoragarh	Sharda	Dhauli Ganga/ Baram Gad
43	Unchiya	0.05	Pithoragarh	Sharda	Dhauli Ganga/ Khari Gad
44	Murtoli	0.02	Pithoragarh	Sharda	Goriganga/ Martoligad
45	Burphu	0.03	Pithoragarh	Sharda	Goriganga/ Martoligad
46	Ralam	0.03	Pithoragarh	Sharda	Goriganga/ Ralangad
47	Ram Gad-II	0.1	Nainital	Sharda	Kosi/ Ramgad
48	Watcm	0.1	Pithoragarh	Sharda	Ramgad E/ Watchraila
Total Sharda Basin		**12022.28**			

Table 9: Proposed Hydropower projects in Yamuna Basin

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
1	Lakhwar	300	Dehradun	Yamuna	EAC TOR Approved
2	Vyasi	120	Dehradun	Yamuna	EAC Recommended
3	Arakot Tuni	81	Uttarkashi	Yamuna	EAC TOR Approved
4	Tuni Plasu	66	Dehradun	Yamuna	EAC TOR Approved
5	Mori-Hanol (P)	63	Uttarkashi	Yamuna	EAC TOR Approved
6	Naitwar Mori (Dewari Mori)	60	Uttarkashi	Yamuna	EAC Recommended
7	Hanol Tuni (P)	60	Uttarkashi	Yamuna	EAC Recommended
8	Jakhol Sankri	45	Uttarkashi	Yamuna	EAC TOR Approved
9	Kishau	600	Dehradun	Yamuna	Proposed

SN	Project	Ins Cap (MW)	Dist	Sub-Basin	Status
10	Chammi Naingaon	540	Uttarakashi	Yamuna	Proposed
11	Chatra Dam	300	Uttarakashi	Yamuna	Proposed
12	Taluka Sankri	140	Uttarkashi	Yamuna	Proposed
13	Taluka Dam	112	Uttarakashi	Yamuna	Proposed
14	Sankri Mori	78	Uttarakashi	Yamuna	Proposed
15	Barkot Kuwa	42	Uttarakashi	Yamuna	Proposed
16	Hanuman Chatti Sianachatti	33	Uttarakashi	Yamuna	Proposed
17	Barnigad Naingaon	30	Uttarakashi	Yamuna	Proposed
18	Rupin Stage V (P)	24	Uttarkashi	Yamuna	Proposed
19	Damta - Naingaon	20	Uttarkashi	Yamuna	Proposed
20	Tons	14.4	Uttarkashi	Yamuna	Proposed
21	Supin	11.2	Uttarkashi	Yamuna	Proposed
22	Rupin Stage IV (P)	10	Uttarkashi	Yamuna	Proposed
23	Rupin Stage III (P)	8	Uttarkashi	Yamuna	Proposed
24	Barnigad	6.5	Uttarakashi	Bhagirathi	Proposed
25	Pabar	5.2	Dehradun	Yamuna	Proposed
26	Badyar (P)	3	Uttarkashi	Yamuna	Proposed
27	Lagrasu	3	Tehri	Yamuna	Proposed
28	Rayat (P)	3	Tehri	Yamuna	Proposed
29	Ringali	1	Tehri Garhwal	Yamuna	Proposed Aglar Ringaligad
30	Purkul	1	Dehradun	Yamuna	Tons
31	Paligad	0.3	Uttarkashi	Yamuna	Proposed Paligad
32	Rikhani Gad	0.05	Uttarkashi	Yamuna	Rikhanigad
33	Bijapur	0.2	Dehradun	Yamuna	Tons
Yamuna Total		**2780.85 MW**			
Grand Total		**21212.78 MW**			

***Note**: EAC: Expert Appraisal Committee of MoEF; FAC: Forest Advisory Committee of MoEF; EC: Environment Clearance: FC: Forest Clearance; TOR: Terms of Reference (of EIA); for Alaknanda, the first 17 projects are listed as given in IMG report and for Bhagirathi first 8 projects are as listed in IMG report. However, many of these projects have been recommended to be dropped by the WII (Wildlife Institute of India) report. Also, IMG and others have said that no other projects should be taken up in Bhagirathi and Alaknanda basins. The projects listed above in the Bhagirathi basin beyond serial number 8 and those in Alaknanda basin beyond 17 would in any case not be taken up.*

Overview of Hydropower Projects In the table 10 we have provided and overview of proposed hydropower projects in Uttarakhand based on the information from above five tables.

Table 10 Overview of Proposed Hydropower Projects in Uttarakhand

Basin	Large Hydro projects (above 25 MW)		Small Hydro projects (1-25 MW)		Mini-micro Hydro projects (below 1 MW)		Total Hydro projects	
	No of projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW
Alaknanda	29	4823	43	375.6	2	0.65	74	**5199.25**
Bhagirathi	5	675	13	125.5	4	1.4	22	**801.9**
Ramganga	6	314	12	93.5	2	1	20	**408.5**
Sharda	26	11920	16	101.95	6	0.33	48	**12022.28**
Yamuna	17	2670	13	110.3	3	0.55	33	**2780.85**
TOTAL	**83**	**20402**	**97**	**806.85**	**17**	**3.93**	**197**	**21212.78**

Overview of hydropower projects in Uttarakhand In the table 11 we have given basin-wise figures of total large, small and mini-micro hydropower proejcts (including existing, under construction and proposed) projects in Uttarakhand. According to Union Ministry of New and Renewable energy, total potential of small hydro in Uttarakhand is 1707.87 MW from 448 small hydro projects. If we take that into account the figures in the following tabes would change (go up) accordingly.

Table 11: Basin wise total capacities for large, small and mini HEPs in Uttarakhand

Basin	Large Hydro projects (above 25 MW)		Small Hydro projects (1-25 MW)		Mini-micro hydro projects (<1 MW)		Total Hydro projects	
	No of projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW
Alaknanda	35	6419	61	524.65	26	3.67	122	**6947.32**
Bhagirathi	10	3469	28	266.7	10	2.05	48	**3737.75**
Ganga Sub basin	1	144	3	31.2	2	0.35	6	**175.55**
Ramganga	7	512	14	105.3	11	2.05	32	**619.35**
Sharda	29	12335.6	20	109.65	35	5.155	84	**12450.405**
Yamuna	22	3144.75	14	113.3	8	1.135	44	**3259.185**
TOTAL	**104**	**26024.35**	**140**	**1150.8**	**92**	**14.41**	**336**	**27189.56**

In the table 12 we have put together the number and capacities of existing, under construction and proposed hydropower projects in various basins of Uttarakhand. Uttarakhand government has plans to have total of 336 hydropower projects with total capacity of 27189.56 MW. Largest number (122) of such projects are in Alaknanda basin, the largest capacity is proposed to be in Sharda basin at 12450.405 MW.

Table 12: Overview of all Hydropower projects in Uttarakhand

Basin	Existing Hydro projects		Under construction		Proposed HEPs		Total Hydro projects	
	No of projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW	No of Projects	Capacity, MW
Alaknanda	32	456.97	16	1291.1	74	5199.25	122	**6947.32**
Bhagirathi	13	1851.5	13	1084.75	22	801.9	48	**3737.75**
Ganga Sub basin	4	173.8	2	1.75	-	-	6	**175.55**
Ramganga	12	210.8	-	-	20	408.5	32	**619.35**
Sharda	28	427.75	8	0.375	48	12022.28	84	**12450.405**
Yamuna	9	478.195	2	0.14	33	2780.85	44	**3259.185**
TOTAL	**98**	**3598.665**	**41**	**2378.115**	**197**	**21212.78**	**336**	**27189.56**

Basin Maps Maps of Hydroelectric Projects in various sub basins of Uttarakhand are available at the following links. Please note that the maps are based on information available when the maps were created in 2011:

http://sandrp.in/basin_maps/Hydropower_Projects_in_Ganga_Basin.pdf, http://sandrp.in/basin_maps/Bhagirathi%20150411.jpg

http://sandrp.in/basin_maps/Alaknanda%20150411.jpg, http://sandrp.in/basin_maps/Mandakini150411.jpg

http://sandrp.in/basin_maps/Goriganga150411.jpg, http://sandrp.in/basin_maps/Major_Hydro_Projects_in_Yamuna_Basin.pdf

How do the hydropower projects increase the disaster proportions? This is a question that a lot of journalists, TV anchors and other have been asking since the Uttarakhand disaster. Here is a quick response to that question:

- Almost all hydropower projects of Uttarakhand involve deforestation. Deforestation directly increases the potential of erosion, landslides and floods since water now just runs off to the rivers, soild becomes exposed annd without any binding that forests provided. Moreover the compensatory afforestation and catchment area treatment, even when done, usually involves planting of commercially important variety of trees like pine and teak and not broad leaf tress like oaks that not only adds to humus in the soil, but also allow rich under growth. Pine does not allow this

Almost all hydropower projects of Uttarakhand involve deforestation. Deforestation directly increases the potential of erosion, landslides and floods since water now just runs off to the rivers, soild becomes exposed and without any binding that forests provided.

to happen. This change in character of forests is something Gandhiji's disciple Mira Behen has been warning since independence, but there is little impact of this on the forest department.

- The largest amount of deforestation in Uttarakhand has happened basically for HEPs.
- All the run of the river projects involve building of a dam, diversion structure, desilting mechanism, tunnels that could have length of 5 to 30 km and width sufficient to carry three trains side by side, as also roads, townships, mining, among other components. All of these components increase the disaster potential of the area in one or the other way. Cumulative impacts of all the components of any projects and all the projects in a given basin is likely to be larger than the addition of the impacts of individual projects in many cases.
- Blasting of massive proportions is involved in construction of all these components, which add to the landslide risks. In fact Uttarakhand's Disaster Mitigation and Management Centre in their report of Oct 2012 after the Okhimath disaster of Sept 2012 recommended that no blasting should be allowed for any development activity anywhere in Uttarakhand, but Uttarakhand government did nothing about this recommendation.
- The massive tunneling by itself weakens the young and fragile Himalayan mountains, increasing the disaster potential.
- Each of the hydropower projects generate massive amount of muck in tunneling, blasting and other activities, a large hydropower project could easily generate millions of cubic meters of muck. The large projects are supposed to have muck disposal plan, with land acquired for muck disposal, transportation of muck to the designated sites above the High Flood levels, creation of safety walls and stabilization process. But all this involves costs. The project developers and their contractors find it easier to dump this muck straight into the nearby rivers. In the current floods, this illegally dumped muck created massive disaster in downstream areas in case of 330 MW Srinagar HEP, the 76 MW Phata Byung HEP and the 99 MW Singoli Bhatwari HEP. When the flooded rivers carry this muck, boulders and other debris, has much greater erosion capacity and also leaves behind massive heaps of this muck in the flooded area. In Srinagar town about 100 houses are buried in 10-30 feet depth of muck. Such debris laden rivers also create massive landslides along the banks.
- Wrong operation of hydropower projects can also create greater disasters in the downstream areas. For example the operators of 400 MW Vishnuprayag HEP on Alaknanda river did not open the gates when the river was flooded on June 16-17, possibly to maximize power generation. However, this lead to accumulation of massive quantities of boulders (for photos of dam filled with such boulders see: http://matuganga.blogspot.in/) behind the dam, so much so that that there was no space for water to flow. The river than bypassed the dam and started flowing by the side of the dam, creating a new path for its flow. This created a sudden flashflood situation in the downstream area, creating new disaster there.

Blasting of massive proportions is involved in construction of all these components, which add to the landslide risks. In fact Uttarakhand's Disaster Mitigation and Management Centre in their report of Oct 2012 after the Okhimath disaster of Sept 2012 recommended that no blasting should be allowed for any development activity anywhere in Uttarakhand, but Uttarakhand government did nothing about this recommendation.

- The incomplete, broken and ill designed protection wall of the Maneri Bhali projects in Uttarkashi lead to erosion and landslides in the downstream areas.

Damaged Hydro Projects A large number of hydropower projects are likely to have suffered damage due to the flood disaster in Uttarakhand. Some of the projects that have suffered damage include:

- According to the update from http://www.energylineindia.com/on June 27, 2013, the **520 MW under construction Tapovan Vishnugad** HEP has suffered damaged by rains on June 16, 2013: "While construction of diversion tunnel was completed in April this year, the same was washed away due to heavy rains on June 16. Diversion dyke has washed away and damages have been observed in chormi adit approach road. In August last year, the flash floods had caused serious damages in the coffer dam of the project."
- **400 MW Vishnuprayag HEP of JP Associates has suffered serious, but as yet unassessed damage**(http://www.indianexpress.com/news/jaiprakash-power-tanks-15–as-plant-shuts-down-in-uttarakhand/1133083/). As per MATU PR (http://matuganga.blogspot.in/), the project has also been

cause of damage in Lambagad village, which was also flahsed on front page of TOI on June 25, 2013, though without mentioning the project. The blog also provides the before and after pictures of the upstream and downstream of the project.

- **76 MW Phata Byung HEP of Lanco in Mandakini Valley in Uttarakhand**
- **99 MW Singoli Bhatwari HEP of L&T in Mandakini Valley in Uttarakhand** NDTV India reported that the water level of the river has gone up due to the silt dumped by dams. This is likely to be due to the Phata Byung and Singholi Bhatwari HEPs.
- **Kali Ganga I, Kali Ganga II and Madhyamaheshwar HEP, all in Mandakini Valley, all of UJVNL, all hit by mudslides** (http://www.indianexpress.com/news/uttarakhands-r500-crore-request-to-prevent-landslides-pending-since-2009/1132351/)
- **Assiganga projects on Assiganga river in Bhagirathi basin in Uttarakhand**
- **5 MW Motighat I HEP in Goriganga basin in Pithoragarh** (Himalprakriti report)
- **280 Dhauliganga Project of NHPC in Pithoragarh district of Uttarakhand** (reports said the power house was submerged, but is now working, part of the township was submerged.)
- The Himalaya Hydro (HH) Tanga Phase I for 5 MW, located along the Paina gad in Goriganga basin, is badly damaged. The dam has got smashed by a deluge of huge boulders. One sluice gate is torn through. The metal filter-gates are all choked with boulder debris, and the remnant concrete and gate pulleys of the dam are now stranded mid-river, with both banks eroded and the river now running along the true-left bank. (Himalprakriti report)
- The UREDA 500 KW Motigad microhydel on Moti gadh (a tributary of Paina gadh) at Bindi (Dani Bagad) is also badly damaged. The water has broken through the wall, cut under the foundation, inundated the turbines with water and debris, and smashed the housing for the electrical distribution system. (Himalprakriti report)
- The 5.5' diameter head race waterpipes taking water to the HH Phase II, located on the Gori opposite Seraghat, has also been damaged. The generator and housing for the HH Ph II has collapsed into the river. All this damage is said to have happened on the evening of 17th June. People working as non-skilled labour have been sent home for a few months, but welding work on the new pipes feeding the powerhouse is still underway! (Himalprakriti report)

Each of the hydropower projects generates massive amount of muck. A large hydropower project could generate millions of cubic meters of muck. The projects are supposed to have muck disposal plan, with land acquired for muck disposal, transportation of muck to the designated sites above the High Flood levels, creation of safety walls and stabilization process. But the project developers find it easier to dump this muck into the rivers. In the current floods, this illegally dumped muck created massive disaster in downstream areas.

It has been now reported (http://www.business-standard.com/article/companies/gvk-l-t-hydel-projects-hit-by-floods-113062300394_1.html) that the 330 MW Srinagar project, a cause for downstream destruction, has itself suffered massive damages on June 17, 2013, with breach of its protective embankment. The report also mentions the damage to the L&T's Singoli Bhatwari HEP on Mandakini river.

Down to Earth (http://www.downtoearth.org.in/content/hydropower-projects-suffer-severe-damage) has given some details of damage to some of the HEPs, quoting UJVNL sources. It says: 19 small hydropower projects have been completely destroyed, while others have been damaged (see table below).

Table 13: Estimated losses to hydel Projects in Uttarakhand

Project	Location	Capacity, MW	Esimated loss
Dhauli Ganga	Pithoragarh	280	30 Cr (power house submerged)
Kaliganga I	Rudraprayag	4	1819 (Power house and 4 houses washed away)
Kaliganga II	Rudraprayag	6	Rs 16 Cr (Power house and 4 houses washed away)
Sobla	Pithoragarh	8	Rs 14 Cr (completely washeda away)
Kanchauti	Pithoragarh	1.5	Rs 20 Cr (part of the project washed away)
Chirkila	Pithoragarh	1.5	Rs 20 Cr (part of the project washed away)
Manneri Bhali I & II	Uttarkashi	304 + 90	Rs 2 + 5 cr (walls collapsed, silt in barrages)

In addition, a large number of projects had to stop generation temporarily due to high silt content, including Maneri Bhali I and II, Tanakpur, Dhauli Ganga, Kali Ganga I, some of the Yamuna basin projects among others.

Conclusion This article was intended to give an overview of hydropower projects in Uttarakhand. However, we should add that there are many glaring issues related to these hydropower projects, some of the key issues on environment governace include the following.

Most of these projects are out of the environmental governance. Projects below 25 MW do not require EIA, Social Impact Assessment, public consultation, environmental clearance, environmental management plan or monitoring. This is clearly wrong as all projects have environmental impacts, and they are particularly serious in Himalayan region with multiple vulnerabilities. We have for years demanding that all projects above 1 MW should need environment clearance, EIA and so on.

Wrong operation of projects can also create greater disasters in the downstream areas. The operators of 400 MW Vishnuprayag HEP on Alaknanda river did not open the gates when the river was flooded on June 16-17, possibly to maximize power generation. However, this led to accumulation of massive quantities of boulders behind the dam. The river than bypassed the dam and created a new path. This created a sudden flashflood situation in the downstream area, creating new disaster there.

- Even for projects above 25 MW we do not have any credible environmental or social impact assessment. Former Environment Minister Jairam Ramesh is on record having accepted that most EIAs are dishonest cut and paste jobs. We do not have any credible process in place to ensure that EIAs are proper and those that are not are rejected and consultants are black listed. Jairam Ramesh did put in place a process of registration of EIA consultants under the Quality Council of India, but that is completely non transparent, unaccountable and ineffective process. It is amazing that reputed NGOs like the Centre for Science and Environment are on board of this process, but they have completely failed to achieve any change and have chosen to remain quite.
- The Environment clearances of the River Valley Projects (which includes hydro projects and dams) is considered by the Expert Appraisal Committee on River Valley Projects appointed by Union Ministry of Environment and Forests. However, the ministry chooses members of the EAC such that they rarely object to any project. As per SANDRP analysis in six years ending in Dec 2012, the EAC had not said NO to any project for environment clearance. Its appraisal of projects, EIAs, public consultation process and its own minutes were found to be inconsistent, unscientific and loaded in favour of the project developers.
- Our environment compliance system is non-existing. The projects are supposed to implement the environment management plan *pari passu* with the project work, they are supposed to follow the conditions of environment clearance, follow the environmental norms, but who is there to ensure this actually happens? The Union Ministry of Environment and Forests which is supposed to ensure this compliance has no capacity the officials tell us. The officials do not have time to even check if six monthly compliance reports are being submitted or make any surprise visits. However they do not even seem to have will, since we have seen no change in this situation for decades. Nor do they seem to have willingness, since even when NGOs present photographic and video and other evidence of violations they refuse to take action.
- One way to achieve compliance is to have a project monitoring committee for each project where over 50% of the members are from local communities and other independent persons and such committees ok must be required each stage for the project to go ahead. We have been suggesting this for long, but the MoEF has shown no willingness to follow this.
- More pertinently, none of the assessment reports look at the impact of the projects from their impacts on the disaster potential of the area. Each of these projects have significant impact on the disaster potential of the area, particularly in the context of vulnerable state like Uttarakhand. This should be a must for all such projects.
- Similarly the projects must also be seen through the climate change lenses, again in vulnerable area like the Himalayas. How the project will impact the local climate, how it will have impact on adoption capacity of the local communities and also how the project itself will be impacted in changing climate. This again we have been writing to the MoEF numerous times, but without any success so far.
- Most significantly, the only impact assessments that we have is for specific projects of over 25 MW capacity. However, we have no credible cumulative impact assessment for any of the river basins of Uttarakhand, which also takes into account carrying capacity of the river basins and all the interventions that are happening in the basins. As our critique of so called cumulative impact assessment of

Bhagirathi-Alaknanda basins done by AHEC of IIT Roorkee shows (http://www.sandrp.in/hydropower/Pathetic Cumulative Impact Assessment of Ganga Hydro projects.pdf), it was not much of a cumulative impact assessment. WII (Wildlife Institute of India, Dehradun) report was somewhat better within the mandate given to it (assessment of hydro projects on aquatic and terrestrial biodiversity), but the most important recommendation of the WII report that at least 24 projects should be dropped has not been accepted by the MoEF, so what is the use of the cumulative impact assessment in such a situation?

Unless we address all of the above issues in a credible way, there is little wisdom in going ahead with more hydropower projects in Uttarakhand. They will invite greater disaster. Uttarakhand has many other options for development. Firstly Uttarakhand people should get first right over all the power that is getting generated within Uttarakhand. Secondly, this is not a plea for no projects, but to address the crucial issues without addressing which we are in no situation to even know the impacts or address the issues. Thirdly, Uttarakhand needs to take up power generation options that do not accentuate the disaster potential of the area. Such options include micro hydro, hydro kinetics, and solar and biomass based power in addition to better utilization of existing infrastructure.

In response to my question on a programme on *Headlinestoday* channel anchored by Rahul Kanwal on July 8, 2013 (in presence of panel that also included Dr Vandana Shiva and Vimlendu Jha), the Uttarakhand Chief Minister Shri Vijay Bahuguna agreed that he will institute an enquiry into the damage due to the hydropower projects and hold them accountable for such damage. Let us see how soon and how independent and credible enquiry he institutes.

Unfortunately, going ahead with more hydropower projects in current situation would be invitation to greater disasters. In fact, the Uttarakhand government should not allow even the damaged and under construction hydropower projects until al the conditions mentioned above are satisfied.

Some of the hydropower projects that have surely seems to have added to the disaster proportions of current Uttarakhand flood disaster include the 400 MW Vishnuprayag HEP, the 280 MW Dhauliganga HEP, the 330 MW Shrinagar HEP, the 304 and 90 MW Maneribhali II and I HEPs, the 99 MW Singoli Bhatwari HEP and the 76 MW Phata Byung HEP, the last two on Mandakini river. In response to my question on a programme on *Headlinestoday* channel anchored by Rahul Kanwal on July 8, 2013 (in presence of panel that also included Dr Vandana Shiva and Vimlendu Jha), the Uttarakhand Chief Minister Shri Vijay Bahuguna agreed that he will institute an enquiry into the damage due to these hydropower projects and hold them accountable for such damage. Let us see how soon and how independent and credible enquiry he institutes.

Himanshu Thakkar

References:

1. http://envfor.nic.in
2. http://www.uttarakhandjalvidyut.com/eoi/list_of_projects_self.pdf and many other UJVNL documents.
3. http://www.ahec.org.in/shp%20sites/uttarakhand/Hydropower%20stations%20in%20operation%20and%20under%20construction%20in%20uttarakhand.pdf
4. http://cleanhydropower.blogspot.in/2009/07/brief-description-of-small-hydro-power.html
5. http://ureda.uk.gov.in/pages/show/130-micro-hydro-programme and other sites of UREDA.
6. http://sandrp.in/env_governance/TOR and EC Clearance status all India Overview Feb2013.pdf
7. http://sandrp.in/ IMG report on Ganga has Pro Hydro Bias June2013.pdf
8. http://www.sandrp.in/hydropower/Pathetic Cumulative Impact Assessment of Ganga Hydro projects.pdf
9. 2012-13 Annual report of Ministry of New and Renewable Energy: http://mnre.gov.in/file-manager/annual-report/2012-2013/EN/chapter3.html

SANDRP's blogs on Uttarakhand disaster :

1. http://sandrp.wordpress.com/2013/06/21/uttarakhand-deluge-how-human-actions-and-neglect-converted-a-natural-phenomenon-into-a-massive-disaster/
2. http://sandrp.wordpress.com/2013/06/23/uttarakhand-floods-disaster-lessons-for-himalayan-states/
3. http://sandrp.wordpress.com/2013/06/25/uttarakhand-and-climate-change-how-long-can-we-ignore-this-in-himalayas/
4. http://sandrp.wordpress.com/2013/06/25/central-water-commissions-flood-forecasting-pathetic-performance-in-uttarkhand-disaster/
5. http://sandrp.wordpress.com/2013/06/28/uttarakhand-floods-truth-about-thdc-and-central-water-commissions-claims-about-tehri/
6. http://sandrp.wordpress.com/2013/06/29/lessons-from-uttarakhand-disaster-for-selection-of-river-valley-projects-expert-committee/
7. http://sandrp.wordpress.com/2013/06/25/climate-justice-statement-on-the-uttarakhand-catastrophe/

THDC & CWC Claims about Tehri: Truth versus the Hype

The claim of THDC, CWC and Uttarakhand Chief Minister that in absence of Tehri dam, Rishikesh and Haridwar (and even western Uttar Pradesh, as the Uttarakhand Chief Minister repeatedly claimed including in Indian Express interview on July 23, 2013) would have been washed away is completely baseless and unfounded, nothing but a hype. Facts show that if Tehri were not there, the water level in downstream areas may have gone up earlier than it eventually did on June 18 (as per CWC, peak level in Rishikesh was 340.8 m and in Hridwar at 295.1 m), but lower than the water levels of June 18. THDC and CWC should refrain from making such claims as they are more like adding salt to the wounds that the people of the state are now experiencing and where dams and hydro projects have played a big role.

From all accounts, it is clear that peak flood of 6900 cumecs in Bhagirathi River on which Tehri dam is situated, occurred on June 16 and the peak flood of 11000 cumecs in Alaknanda occurred on June 17, so it would not be rational to add the two peaks happening at different points of time to claim that Tehri saved downstream areas. If Tehri was not there, there could have been floods in downstream a day earlier, but that does not mean peak levels would have been higher than what was the case with Tehri Dam. From the records available on the websites of Central Water Commission (http://cwc.gov.in/Reservoir_level.htm), Central Electricity Authority (http://cea.nic.in/daily_hydro.html) and Northern Region Load Despatch Centre (http://nrldc.org/), it is clear that water level in Tehri reservoir rose from 757.3 m on June 16 to 776.8 m on June 18 (water levels for June 17 is not available for some strange reason), this translated to increase in water storage by about 502 Million Cubic meters (MCM).

THDC claims that they experienced peak inflow of 244 000 cusecs and moderated that to an outflow of 14000 cusecs. To achieve this moderation for a day would take storage capacity of around 563 MCM, so it is plausible that they achieved this moderation on June 16, when Bhagirathi was experiencing peak flow. However, as we noted earlier, the peak flow in Alaknanda happened on June 17.

THDC should make hourly figures of flow in Bhagirathi and Alaknanda on June 15-20 public, as well as outflow from Tehri on each of those days, level of Ganga at Devprayag, Haridwar and Rishikesh, so that everyone can assess the reality of their claims. Such information should routinely be be in public domain.

It may also be added that areas downstream of Tehri dam faced avoidable and unprecedented flood disaster in September 2010 (for details see p 20 of Aug-Sept 2010 issue of *Dams, Rivers & People*: http://sandrp.in/drp/DRP_Aug_Sept_2010.pdf). On that occasion the sudden water release from the dam also damaged the downstream Koteshwar project, suffering losses of over Rupees hundred crore.If the dam operation is not done properly, we may be in for a repeat later this season. It should also be recalled that Tehri is a ticking time bomb in the context of large earthquake that is imminent in the state as seismologists are telling us.

Tehri dam has also been cause of large number of landslides along periphery of the reservoir. People affected by the Tehri dam have still not been rehabilitated. Rs 1,483 crore (17% of the project cost), has been spent, THDC claims, on rehabilitation and resettlement for famillies belonging to old Tehri town, 24 villages fully affected, 88 villages partially affected, 13 villages due to acquisition of land for project / colonies. Recently (http://www.energylineindia.com/ on July 23, 2013), the Administrative Staff College of India (ASCI), having affected relevant studies on THDC's R&R scheme, has said that better standards of PAPs and infrastructure facilities be deployed at resettlement colonies. This speaks volumes about the claims about R&R by the THDC. The dam has also not been delivering the peaking power it could, as noted by Central Electricity Regulatory Authority. The dam is also silting up much faster than envisaged, reducing its water holding and power generation capacity. *In fact, CWC has failed miserably in its flood forecasting.* ***Uttarakhand Chief Minister, CWC and THDC need to put their house in order rather making unfounded claims.***

Suspend ECs to Hydropower Projects in Uttarakhand; Institute independent enquiry into the role of HEPs in increasing the disaster

The scale and impact of the Uttarakhand tragedy was magnified by the unprecedented number of Hydel projects commissioned and under construction in the State. Still, hundreds of projects are planned or are in line for clearances from the Ministry of Environment and Forests. A letter endorsed by over 20 individuals and organisations, has demanded that Environmental Clearance granted to projects should be suspended and no new clearance should be granted unless an independent inquiry investigates into the role of Hydropower projects in magnifying the disaster. The letter was sent on 20th July 2013 to Union Minister and Secretary, Ministry of Environment and Forests. Its relevant sections are reproduced here.

A letter endorsed by over 20 individuals and organisations, has demanded that Environmental Clearance granted to projects should be suspended and no new clearance should be granted unless an independent inquiry investigates the role of Hydropower projects in magnifying Uttarakhand disaster.

1. **Uttarakhand Disaster and Hydropower projects** It is now beyond doubt that existing and under construction hydropower projects in Uttarakhand have played a significant role in increasing the magnitude of disaster in Uttarakhand this June 2013. Here are a few examples just to illustrate:

   - **Srinagar HEP** This 330 MW project under construction had been illegally dumping the muck into the river or piling heaps on the slope without an adequate retaining wall. Moreover, it is learnt that the project closed the gates of the dam on the evening of June 16, 2013, but opened them up suddenly in the early hours of next morning, which led to flooding of hundreds of houses and buildings in the downstream Srinagar town. The piled muck heaps were washed into the town. The town was submerged in not only water, but also 10-30 feet of muck. The project itself has suffered damages.
   - **Singoli Bhatwari and Phata Byung HEPs on Mandakini river** The 99 MW Singoli Bhatwari and the 76 MW Phata Byung HEPs are both under construction projects on Mandakini river in Rudraprayag district. Both projects have been illegally dumping muck along the river banks, which was carried by the river to the downstream villages and towns upto Rudrapayag and beyond. Both the projects have suffered severe damages. Water levels in the Mandakini River rose 30 to 40 feet at various locations, destroying roads, private and public properties. All bridges downstram of the S-B project were washed away snapping links across the river and causing enormous hardships to the local people, rescue, relief and rehabilitation efforts.
   - **Vishnuprayag HEP on Alaknanda River** The operators of the 400 MW project did not open the gates in time, leading to the reservoir behind the gates filled with boulders, see before and after photos at: http://matuganga.blogspot.in/2013/06/press-note-30-6-2013.html. The river then bypassed the project and created a new path as can be seen in the photos, firstly, creating a huge flash flood in the downstream area and also eroding the banks and the road. Lambagad market and Govindghat township have suffered massive destruction of private property and public property, including the bridge to the Hemkund Sahib trek, endangering the lives of pilgrims and tourists.
   - **Maneri Bhali I and II** Due to **lack of protection wall and lack of timely opening of the gates**, the people residing on the banks of the project suffered huge flood disaster, large number of houses were washed away and lives lost. Maneri Bhali I is itself damaged and yet to start generation, even Maneri Bhali II started generation only after July 12, 2013.
   - **Dhouliganga HEP** This 280 MW Dhouliganga HEP of NHPC is also being held responsible for floods in the downstream area, the power house of the project itself was submerged and project is yet to start generation.
   - **Small HEPs** A large number of small HEPs have suffered damages and are also being held responsible for increased disaster impacts. Such projects include 4 MW Kaliganga I and 6 MW Kaliganga II, 9.5 MW Madhyamaheshwar HEP, 5 MW Motighat HEP, Assiganga I and II HEPs, among others. We have been urging the MoEF to amend the EIA notification to include all hydro projects above 1 MW under category B1 so that they all have EIAs, EMPs, ECs, EAC sanction and public consultation process. Kindly make this change urgently.

2. **List of Uttarakhand Hydropower projects with EC on the MoEF website** As per the legal norms under the EPA 1986 and EIA notifications of 1994 and Sept 2006 (both are relevant since some of the projects got clearance under earlier notification), the developers are supposed to send six monthly compliance reports to MoEF and it is also legal obligation of MoEF to put such compliance reports on the MoEF website, see section 10(i) and (ii) of the EIA notification of Sept 2006. It is very important to note that these reports are supposed to reflect the extent to which the projects are complying with the conditions of environment clearance and environment management plans. These reports are an important mechanism for MoEF to know about the status of compliance of the projects. A perusal of the Environment clearance site of the MoEF (http://environmentclearance.nic.in/Search.aspx) and looking for the Uttarakhand river valley projects granted Environment clearance, we find that the site displays a list of seven hydro projects, in which since Srinagar project figures twice, the site effectively contains only six names. In the first place this is the first illegality of MoEF, since this is not a complete list. To illustrate, the 76 MW Phata Byung HEP under construction on Mandakini river does not figure on this site, there are other projects too that does not figure on this list. We urge MoEF to kindly put up the full list here and also fix responsibility for this legal lapse for not putting up full list.
3. **Compliance reports of Under Construction of HEPs not available** Since full list of under construction HEPs of Uttarakhand is not displayed on MoEF website, the MoEF is also unable to fulfill its legal duty of putting up compliance reports. Even among the project displayed on the MoEF website, latest compliance report is available only for one project, namely Singoli Bhatwari HEP (it is file of massive size at 30 MB, most people won't be able to download this, MoEF should ask for file size of 1 MB or below and upload them in smaller size segments). So for the rest of the projects there is no compliance report on the MoEF website. This is clearly a serious violations on the part of the MoEF and MoEF needs to urgently hold accountable those who are responsible for this serious legal lapse. The MoEF also needs to take urgent action against those that have not submitted the reports as required, suspension of their environment clearance can be the first step.
4. **Suspend Environment Clearance of the projects *prime facie* responsible for disaster damages** MoEF should urgently suspend environment clearance of those projects that have been found to be *prime facie* responsible for the damages. We urge MoEF to suspend the clearances of following projects: Singoli Bhatwari, Phata Byung, Srinagar (all under construction projects), Vishnuprayag, Dhouliganga, Maneri Bhali I and II (all operating projects), for the reasons described in para 1 above. As a direct consequence there off, MoEF should also ask these projects to suspend their work including repair and reconstruction work till further orders. These are also required from the point of view of future safety of the downstream people and areas and also to revisit the features of the projects from this perspective.

It is legal obligation of MoEF to put such compliance reports on the MoEF website, see section 10(i) and (ii) of the EIA notification of Sept 2006. These reports are supposed to reflect the extent to which the projects are complying with the conditions of environment clearance and environment management plans. However, MoEF has failed to comply with this legal obligation.

Such suspension is also necessary since the projects need a review considering that following issues have not been considered while giving clearances to the projects:

1) Change in climate due to HEPs leading to, among other changes, more erosion and landslides, more irregular rainfall patterns, more violent cloudbursts.
2) Inadequate assessment of landslide impacts of the project by GSI and MoEF.
3) The only norm for use of explosives has been made by Director General of Mines Safety for mines and pucca houses. These norms are being mindlessly applied to the fragile Uttarakhand hills and structures there.
4) Impact on forests of explosives via (1) losening of soil; (2) depletion of aquifers.
5) Impact on global warming by deforestation and depletion of aquifers.
6) Impact of project on disaster potential and implied cost of disaster.
7) Reservoir Induced Seismicity. NCSDP only looks at the safety of the dam structure. There is no agency that looks into the impact on the area, including hills, forests, water sources, houses and other structures.
8) The performance of the projects in view of changing climate, receding glaciers, possibilities of increased flashfloods, landslides and so on.

5. **Institute credible, independent enquiry** MoEF should urgently institute credible, independent enquiry into the disaster impacts due to the wrong and illegal functioning of the projects mentioned in first para above, including the impacts on people, their lives and property, on the property of the state and other institutions. This should be done on urgent basis so that an assessment of the existing situation can be done urgently before the ground realities change significantly and while the memory of the events are fresh in everyone's mind.
6. **Change EIA notification to include all hydro projects above 1 MW** As noted in last bullet in para 1, we urge the MoEF to amend the EIA notification to include all hydro projects above 1 MW under category B1 so that they have EIAs, EMPs, ECs, EAC sanction & public consultation process.
7. **Change EIA notification to include commissioned projects to send six monthly compliance reports and also undergo 5 yearly review** For example, in US, the Federal Electricity Regulatory Commission has detailed regulations as to what happens once a project undergoes such emergency situation (http://www.ferc.gov/industries/hydropower/gen-info/regulation/dam-safety.asp). FERC regulations include, "Every 5 years an independent consulting engineer, approved by the Commission, must inspect and evaluate projects with dams higher than 32.8 feet (10 meters), or with a total storage capacity of more than 2,000 acre-feet (2.5 MCM)… The Commission staff also evaluates the effects of potential and actual large floods on the safety of dams. During and following floods, the Commission staff visits project dams and licensed projects, determines the extent of damage, if any, and directs any necessary studies or remedial measures the licensee must undertake."

Most hydropower projects of Uttarakhand would come under above description and MoEF as a regulator should be following similar comprehensive review process for all projects sanctioned by it every five years and also ensure that even projects once commissioned also send six monthly reports to MoEF ensuring compliance of the norms, irrespective when they were given clearance and what was the EC norms than. Make necessary changes in EIA notification for this. Such a mechanism has also been recommended by the BK Chaturvedi committee.

Hence we urge MoEF to urgently review the EIA notification to ensure submission of six monthly compliance reports for commissioned projects, mandatory annual visits by MoEF staff and also ensure 5 yearly review of the environment clearances.

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NEWS

Uttarakhand reconstruction: Parts of the problem cannot be part of the solution As the Uttarakhand and central government get into the reconstruction mode, we all need to remember the famous saying of Albert Einstein that those who are part of the problem cannot become part of the solution. In Uttarakhand, the World Bank is funding the 444 MW Vishnugad Pipalkoti Project on Alaknanda, which will increase the disaster potential of the area, which had not had comprehensive EIA or Cumulative Impact Assessment and a complaint is under investigation by the Inspection Panel. Asian Development Bank has also been funding hydropower projects in Uttarakhand without proper assessment. Hydropower developers are guilty of a lot of disastrous consequences and illegalities. Now the World Bank and the ADB has offered to help in reconstruction, but involving them would bring disastrous consequences.

Lessons not learnt in Uttarakhand from Past Disasters or Reports

In the context of June 2013 Uttarakhand disaster, it should be noted that over the past months and years, Uttarakhand had several warnings, recommendations from many different authentic sources and many official sources. Uttarakhand has been consistent in ignoring all such warnings and prudent recommenndations. Here we provide details of various reports and sources that gave warnings about impending disaster as well as recommendations which could have avoided it.

Warnings of impact of climate change ignored There is little doubt that the climate change played significant role June 2013 flood disaster in Uttarakhand. Ministry of Environment and Forest's 2010 4X4 climate assessment report that had identified Himalayan region as one of the four most vulnerable regions of India from climate change perspective and had warned of increased floods, including flashfloods, landslides, glacier melt and Glacial Lake Outburst Floods in Himalayan region. However, there was no impact of these warnings on decision making or even impact assessment in Uttarakhand. This is major failure of Uttarakhand government, MoEF, Prime Minister's Council on Climate Change. The Inter Ministerial Group report on Upper Ganga basin hydropower projects (for detailed critique see cover story in April May 2013 issue of *Dams, Rivers & People*) submitted in April 2013 or the note from Sunita Narain from Centre for Science and Environment in the report did not even mention climate change. All these show failure of taking climate change into account while looking at development in Uttarakhand.

> DMMC after Aug 2012 Uttarkashi disaster: *"It is therefore highly important to strictly regulate developmental initiatives in close vicinity of streams and rivers. Appropriate legislative interventions would be required for formulating a policy in this regard and firm executive action in accordance with letter and spirit of this policy would be required to ensure compliance of the same."* Nothing was done about this recommendation.

Past disasters and their lessons ignored: August 2012, Uttarkashi In August 2012, Uttarkashi district (one of the epicentres of current tragedy) saw similar tragedy which left 29 dead and many more missing and extensive damages. The Uttarakhand State government's Disaster Mitigation and Management Centre (DMMC) report of this disaster in Oct 2012 concluded, *"It is therefore highly important to strictly regulate developmental initiatives in close vicinity of streams and rivers. Appropriate legislative interventions would be required for formulating a policy in this regard and firm executive action in accordance with letter and spirit of this policy would be required to ensure compliance of the same."* **Nothing was done about this recommendation.**

September 2012, Okhimath, Rudraprayag Similarly in Sept 2012, Okhimath in Rudraprayag District (another of the epicentres of current tragedy) saw monsoon induced landslides killing 69 people among other damages. The state DMMC report of this tragedy in Oct 2012 made a number of recommendations to reduce the risks of landslides in landslide prone state, one of them read, *"Use of explosives in the fragile Himalayan terrain for infrastructure developmental works introduces instability in the rocks and therefore use of explosives should necessarily be banned."* And *"This provision would automatically ban habitation in the close proximity of seasonal streams and rivers. In case people are already residing in such areas provision has to be made for their timely relocation."* **Again nothing was done about these recommendations.**

In fact Rudraprayag has faced monsoon related major disasters seven times in last 34 years, including in 1979, 1986, 1998, 2001, 2005, 2006 and 2012, each involving death and destruction.

If implemented, these recommendations could have saved many lives. Each of the hydropower project in the state involves blasting on a massive scale, but there are no regulations in place about this, even after clear warning from State DMMC.

Geological fault lines ignored Prof KS Valdiya, an honorary professor at Bangalore's Jawaharlal Nehru Centre for Advanced Scientific Research, said the heavy loss of life and property in the deluge was a result of "criminal oversight" over the decades of the state's geological features and water channels by various authorities. These features are well-mapped and documented. But engineers and builders choose to overlook them, said Valdiya. The geologist identified four major ways in which constructions flouted scientific norms. First, he said, the seismic fault-lines of this earthquake-prone state were not kept in mind while building roads (and other infrastructure). "These tectonic fault-lines, which are active and see back-and-forth movements, have been cut in many places by roads. More dangerously, roads are built along the fault-lines at many places. As a result, tiny seismic movements in the fault-lines weaken the rocks at the base of the roads, making these stretches susceptible to cave-ins and slides," Valdiya said.

The second area of rampant neglect, he pointed out, was drainage. "I have never seen road engineers provisioning for draining out all rainwater that can possibly enter the stretch. Where one to two metre bridges are required, they build small culverts. At places where drains have been provided for, these are usually filled with debris." Buildings have been constructed over old drains and streams, blocking the natural pathways of rainwater, he said. "One of the reasons for the devastation at Kedarnath was that people had constructed houses **on the stream of the Mandakini river that had been dry for decades. When the river returned to its old course following the deluge, these constructions were washed away**," he added.

Valdiya said another type of transgression, similar to the previous one, was construction taking place on river flood ways. A flood way is the area covered by the river at the time of its biggest flooding in the past 100 years. "In places along Alakananda/ Ganga such as Karnaprayag and Rishikesh, constructions have taken place on the lower terraces which are part of the flood way. Sooner or later, water would get to these places," the expert said.

Prof K S Valdiya: "I have never seen road engineers provisioning for draining out all rainwater that can possibly enter the stretch. Where one to two metre bridges are required, they build small culverts. At places where drains have been provided for, these are usually filled with debris. One of the reasons for the devastation at Kedarnath was that people had constructed houses on the stream of the Mandakini river that had been dry for decades. When the river returned to its old course following the deluge, these constructions were washed away".

Lastly, Valdiya said roads have been built over the debris of previous landslides because it's costlier to build paths higher up on the hills where the rock is firmer. "Sadly, **the department geologists are often no more than rubber stamps**, okaying everything the engineers say. Independent geologists are never consulted," he said. "Scientific engineering has very low priority in the state," he lamented. Unfortunately, the state pays with human lives and huge property losses because authorities do not pay attention to basic scientific principles.[8] Prof Valdiya repeated many of these warnings when he spoke at Gandhi Peace Foundation onn July 20, 2013 at a meeting orgnised by Uttarakhand People's Forum, where Himanshu Thakkar of SANDRP was also invited to speak on impact of hydropower projects in Uttarakhand floods.

Reports from Comptroller and Auditor General (CAG), India ignored: 2009 CAG Report

CAG performed an audit of Hydel Projects in Uttarakhand and concluded that:

- "Audit scrutiny of project records revealed that no speciûc measures had been planned/ designed in any project to cope with the risk of ûash ûoods The adverse consequences of such ûoods are acute as they can not only damage the project structures but can cause loss of live in low-lying down stream areas. Civil construction in projects is required to factor in this natural threat. Also the bigger the project, the greater should be the efûcacy of the preventive measures."
- "Given the current policy of the State Government of pursuing hydro-power projects indiscriminately, the potential cumulative effect of multiple run-of-river power projects can turn out to be environmentally damaging."
- "Negligence of environmental concerns was obvious as the muck generated from excavation and construction activities was being openly dumped into the rivers contributing to increase in the turbidity of water. The projects seemed oblivious of the gross negligence of environmental concerns."
- "The plantation activity was highly deûcient, as 38 per cent of projects reported hardly any plantation; posing severe hazards both for natural ecology and stabilization of hill slopes".
- "Audit analysis revealed that, negligence in applying appropriate construction norms and structuring the project without appropriate technical counter measures may expose projects to enhanced seismic vulnerability".

"In conclusion, the above also shows inadequate construction practices being followed by project developers who failed to cater for such eventualities which are common place in the region. Additionally, it also highlights the ineffective monitoring by the GoU and the nodal agency as a result of which the slapdash approach of the project authorities towards project execution has gone on unchecked".[9]

CAG report on Uttarakhand Hydro power projects in **2011** again repeats many of these warnings, but none of them were heeded.

8 http://timesofindia.indiatimes.com/india/Geologist-explains-why-Uttarakhand-tragedy-was-man-made/articleshow/20780742.cms

2013 CAG Report on Disaster Management in Uttarakhand In April 2013, a CAG report said that Uttarakhand State Disaster Management Authority, (SDMA) which was formed in Oct 2007, has never met till date. Nor has it mandatory "rules, regulations, polices or guidelines", first step for the authority to have functional existence.

Doppler Radar not installed Several equipment like Doppler Radars, which were approved by Government of India as well as Indian Meteorological Department were not installed by the State Government. This was because of lack of coordination between National Disaster Management Authority, India Meteorological Department and Uttarakhand government.[10]

> CAG on Uttarakhand Hydro: "Audit scrutiny of project records revealed that no speciûc measures had been planned/ designed in any project to cope with the risk of ûash ûoods. The adverse consequences of such ûoods are acute as they can not only damage the project structures but can cause loss of live in low-lying down stream areas. Civil construction in projects is required to factor in this natural threat. Also the bigger the project, the greater should be the efûcacy of the preventive measures."

WII recommendations ignored The report of the Wildflife Institute of India in 2011 recommended that at least 24 hydropower proejcts in Bhagirathi-Alaknanda basin should be dropped, but MoEF, Uttarakhand government, Expert Appraisal committee of MoEF have all been ignoring this recommendation.

Expert committee on Uttarakhand glaciers As noted earlier in this issue, the Expert Committee on Glaciers formed by the Uttarakhand government in their report in Dec 2006 made a number of short and long term suggestions including monitoring of the glaciers, formation of five study groups and action plan. Unfortunately, none of these recommendations were implemented.

Recommendation of National Mission for Sustaining the Himalayan Ecosystem This report of this mission document[11] under India's National Action Plan on Climate Change was supposed to take a number of measures that would have helped reduce the damages signficantly in current disaster. For example under "Enhanced implementation of guidelines for Priority Action" it listed: "A comprehensive inventory of key pilgrimage sites in each State would be drawn up, which would include analyses of the ecological capacity of each site, based on its location and fragility." The document noted the recommendation of the Chief Ministers' conclave in Oct 2009 that recommended among other recommendations, "the need for evolving methods for comprehensive impacts of projects at a basin-level". However, no action was taken on any of these recommendations even as over half of the the NAPCC's implemention period (2009-2017) is over.

Consistent advocacy and protests related to impacts of dams on hydrology, communities ignored Numerous organisations, notably the Matu Jan Sangathan, Himal Prakruti, Ganga Avhan, SANDRP, People's Science Institute, individuals like Prof G D Agarwal, Bharat Jhunjhunwala, have been raising questions about the impact of unbridled hydel power development in Uttarakhand. Their concerns have gone largely unaddressed and ignored.

Bigger than Uttarakhand disaster? It is amazing to see this consistency of Uttarakhand in ignoring all these warnings and recommendations. There is of course no hope for any accountability here. What is even more disturbing is the fact that over a month after the disaster, there is not even a begining of thinking of an course correction in terms of rethinking what was happening before the disaster including the hydropower projects. There is no movement in this direction on the part of Uttarakhand government, central government or even media. This means we are happy with the risk of more such disasters, but refuse to learn anything from this disaster. This may turn out to be bigger disaster than the one Uttarakhand just saw.

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9 http://www.cag.gov.in/html/cag_reports/uttranchal/rep_2009/pa_cont.htm

10 http://www.indiatogether.org/2013/jun/gov-disaster.htm

11 Available as draft document: http://www.dst.gov.in/scientific-programme/NMSHE_June_2010.pdf, accessed on July 24, 2013

NEWS

NTPC's Lata Tapovan faces protests Villagers have not allowed work on the barrage site for several months now and capex for the project fell short by Rs 49 crore during 2012-13. (Business Standard 240513)

Uttarakhand Floods disaster: Lessons for Himalayan states

Many in the media and outside are calling the current Uttarakhand floods disaster of huge but as yet unknown proportions as Himalayan Tsunami. By that very name, we connect the combined fate of all Himalayan states and the inherent lessons which all Himalayan states need to learn from this tragedy.

Similarities between Uttarakhand and Himalayan states like Arunachal Pradesh In fact one article[1] has already been written drawing some parallels, predicting what Uttarakhand experiences today[2], Sikkim may tomorrow and Arunachal day after. In fact, Himachal Pradesh and Jammu & Kashmir are ahead of North East in this queue.

Himachal Pradesh, Sikkim and Jammu & Kashmir have gone too far down that road, but still can wake up and review their development plans and policies and possibly reduce the disaster potential in the respective states. Similarly Arunachal Pradesh has signed over 150 MOUs for big hydropower projects, each of them will entail big dam, long and huge tunnels, blasting, mining, muck generation & disposal, roads, townships, influx of people, transmission lines and so on, without any credible assessment in place. These projects are being pushed under one pretext or another, including the China bogey. For Uttarakhand and all Himalayan states there is still time to learn all the lessons that the Uttarakhand experience offers. This is also applicable to neighboring Himalayan countries like Nepal, Bhutan, Pakistan and Tibet. Indeed there are a lot of similarities between the situations in Himalayan states:

- All Himalayan hill states are fragile, part of new mountain that is prone to high intensity rainfall events, including cloud bursts. In fact the average rainfall in Arunachal Pradesh is much higher than that in Uttarakhand.
- All Himalayan states are also prone to flash floods and landslides.
- All Himalayan states are home to very large number of rapidly flowing silt laden rivers that can turn into ravaging, eroding, forces of destruction if they are not treated carefully. Again Arunachal Pradesh has much large number of major rivers than Uttarakhand. Arunachal's Rivers are also known to carry more silt than Uttarakhand Rivers.
- All Himalayan states are in seismically active area in zone IV and V, with tectonic activities that can lead to impact on land, rivers, landslides, increasing the disaster potential. This also means that geology of these states has numerous fault lines and all development activities have to be done keeping these fault lines in mind.
- All Himalayan states have very high proportion of area under forests, which is necessary for the sustained existence of the local environment, rivers, people and biodiversity. Livelihood and water security of people in these states majorly depends on these natural resources.
- All Himalayan states are prone to climate change impacts in major way, Himalayas have already seen increase in temperature that are 2-3 times higher than the average global temperature rise of 0.9° C. These climate change impacts include greater frequency of high intensity rainfall, including cloud bursts that can also increase the potential of landslides, flashfloods and glacier lake outburst floods.

Lessons from Uttarakhand tragedy Some of the lessons that Uttarakhand and other Himalayan states can draw from the current tragedy include:

- Put in place system of early warning, forecasting and dissemination for all kinds of disasters, particularly those related to rainfall and landslides. It is technologically feasible to predict even cloud bursts at least 3 hours in advance. A Doppler radar system was sanctioned for Uttarakhand since 2008 which would have enabled this forecasting, but due to lack of coordination between NDMA, IMD and Uttarakhand government, this was not installed. However, communities and local governments have to be at the centre of all such warning and forecasting systems.
- Put in place a clearly defined monitoring system in place which will give prompt reports of actual rainfall events even as the they start so that people and administration in the downstream and can be alerted. This was absent in Uttarakhand.
- Protection and conservation of rivers, riverbeds and flood plains, including aquatic biodiversity. Do not allow encroachment of riverbeds and floodplains.
- Prepare clearly defined space for rivers, have river regulation zone in place and remove all illegal encroachments in river beds and flood plains in a time bound manner urgently through legislative, followed by executive action.

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12 http://www.indiaspend.com/investigations/after-uttarakhand-will-arunachal-sikkim-be-next-54548

13 For detailed blog on Uttarakhand disaster, see: http://sandrp.wordpress.com/2013/06/21/uttarakhand-deluge-how-human-actions-and-neglect-converted-a-natural-phenomenon-into-a-massive-disaster/

- Do not allow unsustainable mining of riverbeds.
- Do not allow blasting for any development activity. (Uttarakhand Disaster Management & Mitigation Centre made this specific recommendation after the Rudraprayag disaster of Sept 2012 that lead to death of 69 people) As such, blasting leads to increase in landslides.
- Protection of catchments including forests, wetlands and local water bodies that can play the role of cushion during high rainfall events.
- Ensure credible environmental and social impact assessment of all activities including all dams and all hydropower projects of above 1 MW capacity, all major roads, such assessments should also include how the projects can increase the disaster potential of the area, how they will affect the adaptation capacity of the local people in the context of climate change, how the projects themselves would be affected in changing climate, among other aspects. Currently, we do not have credible environmental and social impact assessment for *any* project.
- Ensure credible environmental compliance mechanism in place for each project in which local people have a key role. Today we have NO credible environmental compliance in place.
- No projects should be cleared until and unless there is credible cumulative impact assessment for all projects in any river basin and sub basin, which includes carrying capacity study. None of this was done in Uttarakhand and none is in place in any river basin of any Himalayan state.
- A review of under construction and under planning projects should be taken up urgently and projects need to be halted, awaiting such a review. The review should include various environment and river governance policies.
- Certain rivers and certain high risk zones should be declared as no project areas in each basin.
- In any case, there should be at least 5 kms of free flowing river between any two projects. At least 50% of river flows in lean season and at least 30% of river flows in monsoon should be released on daily changing basis as environmental flows as recommended by IMG recently. This should be applicable for all projects, including existing and under construction projects.
- All states, including those in North East must have an active state disaster management authority in place that will have key role in all development decisions. The disaster management authority should be integrated from village/ ward level upwards as action taken at local level typically has the greatest impact.
- Implement the National Mission on Sustainable Himalayan Ecosystem in a participatory, transparent, accountable and time bound manner.

While rainfall and cloud bursts are natural phenomena, the disaster potential of such events directly depends on what we have done on ground over the years. Uttarakhand, by allowing indiscriminate building of roads, buildings and hydropower projects without basic assessments and participatory decision making processes, has increased the disaster potential of high intensity rainfall manifold. While some in the media are erroneously (as Tsunami is a natural phenomena, current Uttarakhand disaster is not) calling this as Himalayan Tsunami, many people of Uttarakhand are seeing it as a trailer of such Tsunami. If Himalayan states do not wake up, much bigger tragedy may await the region.

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NEWS

Geological problems at 520 MW Tapovan Vishnugad HEP Fear of infinite delays loom for NTPC at its Rs. 2,978 crore 4X130 MW Tapovan Vishnugad HEP due to the geographical surprises. Project has been affected due to the flash floods in river Dhauliganga in August 2012 which had caused serious damages in Cofferdam, the approach road to chormi adit. Restoration work for the same is still in progress. The river diversion that was affected for the project in December 2012 by flash flood, has proved costly. HRT excavation from intake adit was adversely affected since March 19, 2013 due to cavity formation. Earlier too, the unfavourable geological conditions in the form of heavy water ingress due to fault and geological failures had been a major hurdle in the the HRT tunnel. NTPC has expressed its concerns over non-achievement of milestones by BHEL for reasons of geological problems of power house service bay area. Tapovan Vishnugad HEP on the River Dhauliganga in Chamoli district of Uttarakhand is located near Joshimath on Rishikesh-Badrinath Road and involves construction of a barrage at Tapovan, 15 km from Joshimath on Joshimath-Malari Road. (Energylineindia.com 300513)

Lessons from Uttarakhand disaster for selection of River Valley Expert Committee: Select Independent persons with clean track record; don't select any of the current members

On June 29, 2013, over 50 individuals and organisations from 15 states all over India have written a letter to the minister and secretary in Union Ministry of Environment and forests about their concerns when the MoEF selects members of the new Expert Appraisal Committee for River Valley Projects. The signatories include Prashant Bhushan, Akhil Gogoi, Ramaswamy Iyer, EAS Sarma, Vandana Shiva, Prof M K Prasad, Bittu Sehgal, Dunu Roy, Manoj Mishra, Vimal Bhai, Madhu Bhaduri, Amit Bhaduri, Rohan D'Souza, Ravindranath, Prof Vijay Paranpye, Shripad Dharmadhikary and Mansi Asher. At least eight organisations/ persons from the disaster affected states of Uttarakhand and Himachal Pradesh have endorsed the letter.

The letter says, "In this context, we would like to suggest that the ministry must follow some basic criteria while selecting the chair and members for the new committee. Firstly, the ministry must ensure that all the members of the new committee have credible track record on environmental and related social issues related to the River Valley Projects. This cannot be said to be the case of some members of the outgoing committee. In addition to sociologists, ecologists, hydrologists, the committee needs to have representation from tribal groups, members with proven work on services of the river as against hydrology, experts in climatology and disaster management. The committee also needs gender balance. Secondly, all the members of the new committee must have a track record of unimpeachable integrity and professional independence, of taking position independent of government and developers. Thirdly, there should be no issues of conflict of interest for any of the members or their affiliated organisations with respect to the projects and sector they are dealing with."

"The members of the EAC should be accountable for their actions. There should be a code of conduct for EAC members, and they should give an undertaking to the MoEF that they will adhere to it. The Code should include items such as a requirement for the members to read the EIA Reports and send it written comments before each meeting on what they consider are the significant issues, declaring conflict of interests, not taking on consultancy, etc."

"In this regard, we would urge you not to select any of the members of the current EAC. This is because, firstly, the current EAC has had almost zero rejection rate for the projects they considered, as can be seen from the detailed analysis done by SANDRP (see: http://sandrp.in/env_governance/TOR_and_EC_Clearance_status_all_India_Overview_Feb2013.pdf and http://sandrp.in/env_governance/EAC_meetings_Decisions_All_India_Apr_2007_to_Dec_2012.pdf) for the six year period ending in Dec 2012, during part of which many of the current EAC were members." (See for details: http://sandrp.wordpress.com/2013/06/29/lessons-from-uttarakhand-disaster-for-selection-of-river-valley-projects-expert-committee/)

NEWS Uttarakhand faces new danger ahead: riverbed levels have gone up Following the June 2013 flood disaster in Uttarakhand, the river bed levels throughout Uttarakhand have gone up. This is because of lot of the boulders and muck brought by the river from the glaciers, landslides and riverbank erosion and also the muck illegally dumped by the hydropower projects have been deposited along the rivers and river bed level has gone up substantially at most places. This is bound to pose new threats as this means the carrying capacity of the rivers would have gone down and the surrounding areas would face floods more frequently, even at lower flow rates. Uttarakhand government and Union Ministry of Environment and Forests needs to urgently assess the implications of this situation.

THDC finds it difficult to pay royalty for mining materials THDC's discontentment over large mining royalty charges on its Tehri and Koteshwar HEPs has found sympathy with the High Court. Ruling in favour of THDC, the High Court has permitted THDC to furnish the royalty amount of Rs. 170.02 crore and Rs. 28.29 crore respectively for Tehri and Koteshwar by breaking it up into bank guarantee and simple bonds. THDC will be furnishing bank guarantee amounting to Rs 34.40 crore and Rs 3.09 crore towards royalty for Tehri stage 1 and Koteshwar HEP respectively. The bond component would be Rs. 135.62 crore and Rs. 25.2 crore respectively. Earlier, THDC had been slapped Rs 170.2 crore and Rs 28.29 crore toward royalty for materials extracted during the construction of Tehri and Koteshwar projects respectively. THDC had then lamented that the arbitrarily calculated royalty. It had knocked the high court doors on April 17, 2013, demanding an amendment to such provisions. (Energylineindia.com 230513)

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16. Hydropower Generation Performance in Beas River Basin (http://sandrp.wordpress.com/2013/06/22/hydropower-generation-performance-in-beas-river-basin/)
17. Hydropower Generation Performance in Chenab River Basin

(http://sandrp.wordpress.com/2013/06/21/hydropower-generation-performance-in-chenab-river-basin/)

JAMMU AND KASHMIR

18. PM kick starts 850 MW Ratle Project in J&K without full Impact Assessment: Invitation to another disaster in Chenab basin? (http://sandrp.wordpress.com/2013/07/01/pm-kick-starts-850-mw-ratle-project-in-jk-without-full-impact-assessment-invitation-to-another-disaster-in-chenab-basin/)

The blog-site also contains articles on Uttarakhand Disaster with images, which have been included in this issue of *Dams, Rivers and People*.

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