

Dams, Rivers & People

Working for water resources development as if democracy, people and environment matter

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Two years of Uttarakhand Flood Disaster of June 2013:

Why is state & centre gambling with the Himalayas, the Ganga & lives of millions?

Its two years since Uttarakhand faced its worst ever flood disaster during **June 15-17, 2013**. We remember such tragedies to ensure that we learn the necessary lessons. So that in future such tragedies are not repeated or their dimensions are reduced. One of the enduring debates since that the Uttarakhand tragedy has been about the role of existing and under construction hydropower projects in increasing the proportions of the disaster.

A lot of water has flown down the Ganga in these two years, so let us revisit the important milestones of

- The existing and under construction hydropower projects had indeed increased the proportion of the disaster.
- Out of the 24 HEPs in Upper Ganga basin, about which the 2012 Wildlife Institute of India (WII) report had recommended to be dropped, 23 projects should be dropped and even the 24th project should go ahead only after significant modifications.
- "... the EB recommends that terrain above the MCT³ in general and above the winter snow line in particular (~2200-2500 m)

Within two months of the disaster, a bench led by Justice Radhakrishnan gave an order on Aug 13, 2013, asking the Union Ministry of Environment, Forests & Climate Change to appoint an independent panel to assess the role played by existing and under construction hydropower projects in the disaster.

that debate. Within two months of the disaster, a bench led by Justice Radhakrishnan gave an order on **Aug 13, 2013**¹, asking the Union Ministry of Environment, Forests & Climate Change (MoEF&CC) to appoint an independent panel to assess the role played by existing and under construction hydropower projects in the disaster.

The Expert Body (EB) led by Ravi Chopra Committee so formed in **Oct 2013** gave its report in **April 2014**. The EB report said², to recapture only briefly:

should be kept free from the hydropower intervention in Uttarakhand." This zone is fragile in nature due to unpredictable glacial and paraglacial activities.

- The EB recommended a large number of other actions and studies, but we are not going into the details here.

In **May 2014**, the MoEF asked the Supreme Court for another committee to look into the recommendations of the EB, which, the SC bench, still headed by Justice Radhakrishnan, rejected.

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Justice Radhakrishnan retired from the Supreme Court on May 14, 2014 and Justice Dipak Misra have headed the bench in this matter thereafter.

In **June 2014**, while remembering the one year of tragedy, we published an article⁴ showing pictures of numerous damaged hydropower projects, possibly for the first time.

As *Business Standard* reported⁵, in **August 2014** hearing, the court's focus shifted. It asked the government to present a report on each specific project, "so that the report can be appreciated from proper perspective". This was divorced from the cumulative impacts perspective that was necessary.

In **Oct 2014**⁶, the Supreme Court asked MoEF to hold discussions with developers of three (three more projects were added latter on, making the total of six HEPs, a subset of the 24 HEPs that WII had recommended to be dropped in 2012) to assess what changes they are ready to bring in the projects in view of the disaster, need for longitudinal connectivity and in view of the earlier WII and EB recommendations. It turned out that the developers were not ready to bring any significant changes.

So on **Dec 5, 2014**, the MoEF filed a landmark affidavit in the Supreme Court. Some of the noteworthy things said this affidavit:

- "...large & small hydro power projects on the Ganga & her tributaries all over the Himalayas are a threat to the aviral dhara of the Ganga. The absence of this is leading to a serious threat to the biodiversity of the Himalayan ecology."

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- "The (IMD) analysis also mentioned that anthropogenic activities has also led to massive over-exploitation of the local environment, thereby loosening the top soil and making the region susceptible to landslides and flash floods."
- It quoted the Supreme Court order of Aug 13, 2013: "The cumulative impact of the various projects in place and which are under construction on the river basins have not been properly examined or assessed,

which requires a detailed technical and scientific study."

- MoEF was very clear in rejecting the CEA (Central Electricity Authority) and CWC (Central Water Commission) report submitted. This minority report expressed dissent with the EB report. The MoEF affidavit stated that these institutes "promotes the hydro power projects as their adopted policy, it is found

that this report mainly concerns the potential realization of hydro power generation and does not deal in the concerns of environmental degradation, as raised by Hon'ble Supreme Court and assigned by MoEF via its TORs. *Prima-Facie*, this 2 member report is basi-

cally technical and hydro projects centric and have not carried out any significant and specific study regarding environmental degradation post the disaster in the Ganga-Himalayan basin."

- MoEF's endorsement of EB report was unambiguous: "MoEF&CC therefore, finds merit in main 11 members expert body (EB) report in context of the compliance of directions by Hon'ble court".
- Nailing the propaganda that Tehri saved downstream towns, the MoEF affidavit quoted EB report to show the disaster Tehri created in Sept 2010: "In September

2010, to retain flood inflows in the face of water levels rising beyond the permitted FRL the dam authorities had to seek the permission of the Supreme Court. It led to inundation of the upstream town of Chinyalisaur and later a draw down fresh landslide zones were created around the reservoir rim."

- "The findings of EB report reveal that the damages during the 2013 disaster were more concentrated/ aggravated in the immediate upstream or around or mainly on the downstream of existing and under construction barrages of hydro power projects."
- **Phata Byung HEP** "Thus it can be said that the Phata-Byung HEP aggravated the damage caused by the floods."
- **Singoli Bhatwari HEP** "Bank erosion downstream

of the barrage could have been due to the project construction... Both these processes cause bank erosion and flooding. Geomorphic evidence of this process was visible in the relatively wider segment of the Mandakini valley below the Singoli-Bhatwari HEP and downstream of the power house area.”

• **Vishnuprayag HEP** “The Vishnuprayag barrage

obstructed a very high intensity debris flow brought by the Khiron Ganga, a tributary of the Alaknanda just upstream of the Vishnuprayag HEP. It caused extensive destruction of public and private property... According to EB, the Vishnuprayag HEP is a classic example of how human structures can alter river morphology during unusual weather events. It is constructed in a paraglacial zone.”

- **Srinagar HEP** “EB reported that local eye witnesses and the project authorities seemed to agree that the flow downstream reduced till about 4 am on June 17th when the highest level of the reservoir was reached. But thereafter the gates were opened further and the water level was reduced on June 17th at 9 am. This led to a high flow and the flushing of downstream muck. The high flood caused morphological changes to the river, extending several kilometers downstream of the dam. The river carved out a new course to the right immediately below the dam and kept attacking the concave bank against the HNB University area scouring 100 m of the bank. Deposition of fine sediment upto 7 to 8 m height occurred in Srinagar urban area. The local ITI, the SSB training campus and housing colonies downstream – all along the left bank of the river — were submerged one to two stories deep in silt... Hence, a significant contribution from muck eroded from muck disposal sites of the Srinagar Hydro project was confirmed... Whereas the events of 1894 and 1970 impacted the entire Alaknanda valley, the damage due to the June 2013 flood in the Alaknanda valley was focused at two locations, i.e., around the

MoEF affidavit of Dec 5, 2014 went on to submit that the Expert Body plus some four additional members need to be given fresh task of doing remaining studies for a year before any decisions can be taken about the HEPs across the Uttarakhand.

The 4 member committee headed by Vinod Tare submitted a report on Feb 12, 2015 that concluded: “... committee is of the view that the six projects may not be taken up as they have potential of causing significant impacts on the bio-diversity, riverine system, wildlife and other fragile eco-systems in the areas where these projects are located due to altered hydrological parameters. As such entire process of according clearances to these projects warrants review.”

Vishnuprayag HEP at Lambagar and downstream of Srinagar barrage till Bagwan.”⁷

- MOEF conclusion on role of HEPs in disaster: “It was commonly observed that all HEP (existing and under-construction) in the disaster affected areas have been significantly impacted and the maximum damage sites, in the disaster affected areas, were located either just upstream, or around or immediate downstream of these HEPs, it is pertinent to conclude that there has been a direct and an indirect impact of the HEPs in the aggravation of the floods of 2013.”
- MoEF conclusion about the 24 HEPs: “That as per the directions of Hon’ble court, MoEF&CC also heard the project authorities and representatives of civil society on the meetings held on 15th, 27th, 29th Oct and 20th Nov 2014 and found that the project wise approach is not feasible and that carrying capacity study, strategic environmental assessment (SEA) and cumulative impact assessment (CIA) must be carried out before any decision could be taken. In view of... the exercise done by MoEF&CC during the meetings on the directions of Hon’ble court, MoEF&CC has not found any reason to reconsider any of these projects individually.” Which basically means they recommend cancellation of these 24 HEPs.
- “MoEF&CC feels that the following studies need to be carried out before proceeding with the under-construction and existing projects.”

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Uttarakhand govt

writes to PM This affidavit immediately made the hydropower lobby restive and they pressed Uttarakhand Chief Minister Harish Rawat to write a letter to the Prime Minister⁸ “in protest against the alleged unreasonable stance of the Union Ministry of Environment and Forest regarding the hydroelectric projects of the state”, alleging “that unfortunately the state was being

subjected to an unfair and unjust treatment by the Union Ministry of Environment and Forests without applying any scientific and rational approach to the issue of hydroelectric development.” The letter “requested the Prime Minister to intervene in the matter and direct the MoEF” appropriately. The letter was carried in media on Dec 16, 2014, the date of the next SC hearing.

At the hearing on **December 16 2014**, the apex court seemed to have completely disregarded this landmark affidavit of the MoEF and directed, “the cases of six projects⁹ of NTPC, NHPC, THDC, GMR and two projects of Super Hydro shall be considered in a cluster... The ministry of environment and forests shall see the date on which the licence have been granted, regard being had to the law prevalent at that time. If there be any deficiencies, that shall be pointed out to them and their responses called for.”

So on **Dec 30, 2014**, MoEF issued an order constituting a 4 member committee including Prof Vinod Tare (IIT Consortium), Dr V B Mathur (WII), Brajesh Sikka (scientist in the environment ministry) and Dalel Singh, a representative of Union Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR for short).

The committee, after its last meeting on **Feb 4, 2015** submitted a report on **Feb 12, 2015** that concluded: “Considering the existing available reports on the subject and after interaction with the developers as well as interveners as per the order of MoEF, committee is of the view that the six projects may not be taken up as they have potential of causing significant impacts on the bio-diversity, riverine system, wildlife and other fragile ecosystems in the areas where these projects are located due to altered hydrological parameters. As such entire process of according clearances to these projects warrants review.”

When Mr Bishwanath Sinha misled the Supreme Court in his affidavit In an affidavit dated **Feb 16, 2015**, Bishwanath Sinha, Joint Secretary in MoEF, told the Supreme Court of India that the MoEF appointed a

four member committee following SC orders of Dec 16, 2014, which submitted its report on Feb 12, 2015. However, very strangely, Mr Bishwanath Sinha did not submit the report of the committee. Nor did Mr. Bishwanath

Sinha, Joint Secretary in MoEF, submit the conclusion of the 4 member committee that “committee is of the view that the six projects may not be taken up” and that “As such entire process of according clearances to these projects warrants review.”

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In stead, misleading the highest judicial court of the country, Mr. Bishwanath Sinha told the apex court, “That it is submitted that the Committee has observed that whatever was mandated in the procedural and substantive requirement of the law for environmental clearance, forest clearance and consent to establish, these projects have not been found to be deficient in such respect except for wildlife clearances which have not been accorded so far.” This was clear attempt at misleading the highest judicial body in India by a Joint Secretary in MoEF. It is true that the affidavit filed by Mr Bishwanath Sinha may have been approved by his higher ups including the minister, but that does not take away the fact that Mr Sinha agreed to mislead the Supreme Court of India in a sworn affidavit.

However, even when it became clear that the MoEF official had knowingly misled the apex court, no action was taken against him either by the court or by the government. This possibly emboldened the officials and they continue to misled the court and violate their own affidavits as we will subsequently see.

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As *Business Standard* reported¹⁰, by Feb 17, 2015, at the Supreme Court hearing, the matter now focused on the suffering due to banned projects; the focus was shifted away from the Uttarakhand tragedy & its implications.

And the SC is indeed misled Using the totally misleading affidavit of

Feb 16, 2015, on **Feb 17, 2015**, the Union Govt advocate suggested that the six projects be allowed to start work!

As media reported¹¹, “Attorney General Mukul Rohatgi said the Ministry of Environment and Forest has given

a clean chit to six projects - one each of NTPC, NHPC, THDC and GMR and two of Super Hydro. The Supreme Court on Tuesday sought the views of environmentalists on a plea by the Centre for partial lifting of the ban and allowing six projects to come up, given the acute power shortage in the state.”

The Attorney General told the Supreme court, and the court recorded, that the Union government believed the six projects are worthy of clearance: “Mr. Mukul Rohatgi, learned Attorney General for the Union of India, has submitted that in pursuance of the aforesaid order, the affidavit is ready and he has instructions to state that the six projects mentioned in the afore quoted order, are worthy of clearance.”. A signed affidavit to this tune was shared with some litigants but not formally submitted to the court. That affidavit (different that the one quoted above) was read out and but never submitted in writing!

However, vigilant media¹² exposed the MoEF attempt to mislead the Supreme Court. *Business Standard* report showed:

“Government did not disclose warnings in the expert committee report against permitting the projects in their current shape; instead, gave opposite picture... the ministry did not tell the court the experts, in the report to the ministry, had also warned these dams could have a huge impact on the people, ecology and safety of the region, and should not be permitted at all on the basis of old clearances. They warned that even the Badrinath shrine could be at threat, added by the lack of safeguards in one of the six projects. The cherry-picked reading of the committee report to the Supreme Court comes out giving the impression the experts gave a clean chit to the six dams in question and the court can give the go-ahead. The truth is just the opposite. The experts, in reality, have warned the projects received their clearances long before the Uttarakhand tragedy of 2013, in which thousands were killed.”

Very strangely, on **Feb 23, 2015**, the Union Environment Minister even defended the MoEF stand in the

Supreme Court¹³. This showed that the misleading affidavit of Bishwanath Sinha was filed with full knowledge of everyone in the ministry, including the minister. The minister’s defense that the MoEF had responded as per SC queries is not correct, as *Business Standard* reported since the court had also asked the government to

carry out a cluster (or cumulative) impact of the six projects to assess their impact afresh. The MoEF had failed to provide the main conclusion of the report and instead cherry picked parts of the report to push hydro-power projects. This is exactly how a hydro-power lobby works, not how an environment

ministry is supposed to work.

Voices from Uttarakhand The Uttarakhand state government pleaded for the hydropower companies¹⁴. The Uttarakhand Power officials were very happy with the MoEF U-turn in SC¹⁵. “The Central government’s stand is welcome. The fears of locals here are baseless. We will be engaging international experts to monitor the projects and give regular feedback on impact assessment”.

The people of Uttarakhand, however, were very unhappy. In a noteworthy report¹⁶ *The Times of India* quoted Sushila Bhandari from Mandakini River Valley in Uttarakhand where the Kedarnath shrine is located and which suffered the maximum damage and deaths: “They want to make the state *urja pradesh* (land of electricity) but we know it will make it a *murda pradesh* (land of death).”

For Rudraprayag resident, Savitri, it was like losing her “mother.” “The river and springs near it are like our mother. Because of the projects, the springs and streams in our villages have dried up. We can’t bathe, we can’t even cremate the dead by water bodies like we used to. I am sure if

Ganga upstream is treated so badly, all of you downstream will face disasters too” she says. Both Sushila and Savitri were in Delhi in Mid Feb 2015 to attend the Supreme Court hearing.

Meeta Khilnani, an earth scientist at IIT Roorkee, who has been studying the area for years now observes¹⁷, “The carrying capacity of Himalayan rivers is immensely re-

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duced by extensive muck dumping and various anthropogenic activities. The HEPS in Uttarakhand have been given clearances without any study of the carrying capacity. We have already overburdened the vulnerable Ganga-Himalayan basin. It's important that we acknowledge and act according to the various scientific reports that have already concluded how projects are impacting the region. Hydropower projects have destroyed river and its ecological system in fragile Himalayas in Uttarakhand... the topography has changed so much after the disaster of 2013, that the previous clearances cannot apply. Such unresearched haphazard activities can become a stimulus for yet another disaster in the future".

"The issue is not whether these six projects are valid or not. But it is about allowing hydropower projects altogether when committees and expert bodies have repeatedly pointed that these projects are causing extensive damage to the river ecosystem," said Mallika Bhanot of *Ganga Ahvaan*, a non-profit organization, who is also intervener in the SC petition on behalf of Matri Sadan.

In February 2015, NDTV *Khabar* published an amazing video story¹⁸ explaining how we have failed to understand the nature of Himalayan Rivers.

What explains the U-turn of MoEF? So what had happened between the MoEF affidavit dated Dec 5, 2015 (filed by Director B B Barman) and Bishwanath Sinha affidavit for MoEF dated Feb 16, 2015, that the MoEF not only totally changed its position, took a U turn, but also was ready to mislead even the Supreme Court? That was possibly explained by a meeting taken by the Prime Minister's office in Mid January.

Prime Minister's office lobbies for hydro projects So in a strange twist of circumstances, the Prime Ministers' office intervened on **January 15, 2015** and as per media reports, literally asked the MoEF to rescind its stand. *Business Standard*¹⁹ reported on March 12, 2015 that it reviewed the minutes of the meeting chaired by Principle Secretary in the PMO:

"The minutes read, "Though some hydro-electric projects were conceived and planned, they were facing several difficulties, leading to stalling of the development process of Uttarakhand."

And, "Environment ministry may finalise the norms — e-flow, inter-dam distance, quality, etc — based on such (existing) scientific studies by February 15, 2015. Once finalised, no retrospective changes should be allowed at subsequent stages (of clearances)."

The minutes also talk of the 24 new projects (including the six specific ones the Supreme Court inquired) that the environment

ministry's earlier expert committee had already recommended to be scrapped. The minutes indicate a willingness to accommodate these as well.

They read, "The findings and recommendations of various studies conducted by the ministry of environment and ministry of water resources through reputed and capable

institutions on aspects of carrying capacity, cumulative impact assessment, biodiversity impacts, water quality, etc, need to be examined. These studies and the clearances already granted to these hydroelectric power projects may be duly factored."

The meeting was attended by senior officials from the cabinet secretariat, the PMO, the environment, water resources, transport and power ministries, member of the Central Electricity Authority and the chief secretary and officials of Uttarakhand, as well as the Uttarakhand Jal Vidyut Nigam."

The BS report concluded that "**the meeting in the PMO triggered the change in the government's stance to favour the dams**".

The Economic Times reported²⁰: "However, at a meeting called by the PMO in mid-January, it was agreed to tell the court about the "critical need" for the projects for green power and the livelihoods of local people. The meeting was attended by officials from the ministries of power, environment, water resources, defence, road transport and Uttarakhand government... The action

points agreed to in the January meeting require the environment ministry to "factor in" the clearances that had been granted to 24 specific projects while taking a view on the future course of action."

Before the SC hearing on **March 12, 2015**, *The*

*Economic Times*²¹ again highlighted how the MoEF affidavit of Feb 16, 2015 had misled the Supreme Court: "Experts points out that there is nothing stopping the government from submitting the Tare Committee's recommendation to the apex court along with the submission answering the specific question put it by the courts."

Indian Express reported²² on March 12, 2015: "Not satisfied with the oral submission, the (Supreme) court

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asked the ministry (MoEF) to submit the “ready” affidavit in four days. Until Wednesday (March 11, 2015), the ministry had not submitted any.

There was no affidavit even till **April 13, 2015**. As Business Standard reported²³ the government came with a novel alibi before the SC: “the Attorney General told the Supreme Court on April 13 that there is an inter-ministerial conflict on the issue, and the highest authority - the prime minister - is out of office. He asked the court for two weeks’ time for him to come back with the Union government’s position after the PM returns from foreign visit.”

MoEF affidavit of May 11, 2015 In an affidavit dated **May 11, 2015**, S K Srivastava, a director in MoEF submitted to the Supreme Court: “That it is submitted that this Ministry vide its affidavit dated 5.12.2014 outlining the future approach has prayed before this Hon’ble Court which inter alia includes: (i) Cumulative impact assessment and carrying capacity study of these rivers to suggest the optimal number of HEPs indicating locations, designs and capacity to be allowed in a sustainable manner. The study would consider the 2013 tragedy, geological and tectonic stability, river fragmentation, possible damage caused by the existing HEPs, effect of tunneling and blasting vis a vis sinking of water springs, frequent cloudburst in the upper reaches of Ganga. (ii) The proposed study as suggested above would be carried out by already constituted Expert Body (EB) with wider representation with a seismologist, a social scientist, a climatologist and a glaciologist.”

About the six projects and Tare Committee report, the MoEF affidavit of May 11, 2015 continues to mislead the apex court, not saying that the Tare Committee has said these projects should not go ahead, except when it says: “The committee has further observed that the clearances have to be viewed for any deficiency as per the latest knowledge of environmental and ecological protection methods, and the process of according environmental clearance, war-

rants review. However, MoEF&CC submits that while the process of grant of environmental clearance has to be in accordance with the law, regulations and procedures prevailing at the time of consideration of application for clearances, sometimes additional measures other than those considered and stipulated at the time of giving environmental clearances may be required to be

taken in some cases in larger public interest, considering the impact on the biodiversity, riverine system, wildlife and other fragile eco systems in the area where such projects are located due to altered hydrological parameters and the need for Ganga Rejuvenation as warranted. A decision has been taken that the report dated 12.2.2015 will also be examined by an expert body in detail in order that the government takes a final view.”

This request for a new Expert Body should have been struck down since so far four separate reports²⁴, all initiated on orders of the Supreme Court, have already said that the 24 projects or the subset thereof should not go ahead and the MoEF should have been asked to follow the recommendations of these four reports. Even in the affidavit of May 11, 2015, no reason is given why the 4 member report dated 12.2.2015 on 6 HEPs is not to be followed and another EB is asked for. In fact in case of none of the four reports has the MoEF at any stage said why those reports should not be followed.

Secondly it is noteworthy that the affidavit mentions the existing EB plus four experts for future work & has no reference to any other EB, clearly indicating that the work will be given to the existing EB with some 4 additional specialist members. It is also noteworthy that the affidavit does not refer to the MoEF affidavit of Feb 16, 2015, though it refers to the earlier MoEF affidavit and orders of SC since Dec 2014.

Just before the Supreme Court hearing in the afternoon of May 12, 2015, Delhi, as most of North India and Nepal had experienced shaking earth due to the second mas-

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sive earthquake, this time of magnitude 7.3 on Richter scale. It came close on heels of the April 25 earthquake of magnitude 7.8 on Richter scale²⁵. The quake and the Himalayan vulnerability to seismic activity were mentioned in the Supreme Court hearing²⁶ and it is hoped the Court would have taken note of the same.

At the **May 12, 2015** hearing, Sanjay Parikh, who was representing the people of the Kedarnath Valley, stressed on the need to treat the recurring high-intensity earthquakes in Nepal seriously. Highlighting that the hydropower projects were being planned in a fragile zone, Parikh urged it was the responsibility of all concerned to consider the threat posed by ramping up the number of hydropower projects in the region in light of the recent earthquakes in Nepal. "Each of us should be concerned with the Himalayan ecology. Today also there was an earthquake," he said. Parikh has questioned the efficacy of a fresh review, especially as the environment ministry's four-member committee headed by Vinod Tare of IIT Kanpur had recommended against allowing the six projects.

The 4 member Vinod Tare Committee report, ordered by the Supreme Court, was coming before the Supreme Court for the first time on May 12, 2015. The MoEF had already misguided the Supreme Court about this report through affidavit of Feb 16, 2015. And yet apparently, there was no discussion of the report or the misleading MoEF affidavit in the Supreme Court on May 12, 2015 and the MoEF's unjustified and baseless demand for yet another committee was agreed to by the apex Court on that date, without any discussion on merits or demerits of the MoEF demand.

Ravi Chopra said²⁷, "Our committee made it clear in its report that all 24 hydro-power projects are harmful for the environment. It said 23 projects should never be permitted to operate. After that, developers of six of the 24 projects, who had

sought some clearances for their power projects before the June floods, moved the SC and the Vinod Tare committee was formed. Now, it seems both MoEF and judiciary are subverting the

24 projects by focusing only on six, in an attempt to permit all the remaining 18, with the one verdict that relates to these six."

However, the apex Court order of May 12, 2015 suggested that MoEF can go ahead with the steps suggested in its affidavit: "Regard being had to the totality and the facts and circum-

stances of the case, as advised at present, we are inclined to adjourn the matter to 29th July, 2015, to enable the Union of India to file an affidavit with regard to the progress made, so that the proponents of the six projects and other persons who are waiting, that is, twenty-four in number, be aware of the situation... We are sure that the Union of India will be able to proceed with the matter, as undertaken in the affidavit filed today."

So on May 12, 2015, everyone left the Court, assuming that MoEF is going to ask a new committee comprising members of the original EB plus four specialists to look into the entire Ganga basin in Uttarakhand (in essence entire Uttarakhand since all of Uttarakhand is in Ganga Basin) in the context of the disaster, WII report, EB report, MoEF affidavit of 05.12.14 and Tare Committee report. But there was surprise in store for everyone!

MoEF order of June 3, 2015, violating Supreme Court affidavit

The MoEF surreptitiously, without any consultations and in violation of its own affidavit in the Supreme Court of India, set up an entirely new Expert Body through an order dated June 3, 2015²⁸. The order itself, apparently became public only around June 13, 2015. The constitution of this

committee is serious flawed²⁹:

- It is in violation of the MoEF affidavit of May 11, 2015, which said that it intends to give this task to

At the May 12, 2015 hearing, Sanjay Parikh, who was representing the people of the Kedarnath Valley, stressed on the need to treat the recurring high-intensity earthquakes in Nepal seriously. Highlighting that the hydropower projects were being planned in a fragile zone, Parikh urged it was the responsibility of all concerned to consider the threat posed by ramping up the number of hydropower projects in the region in light of the recent earthquakes in Nepal.

Ravi Chopra said, "Our committee made it clear in its report that all 24 hydro-power projects are harmful for the environment. It said 23 projects should never be permitted to operate. After that, developers of six of the 24 projects, who had sought some clearances for their power projects before the June floods, moved the SC and the Vinod Tare committee was formed. Now, it seems both MoEF and judiciary are subverting the 24 projects by focusing only on six, in an attempt to permit all the remaining 18, with the one verdict that relates to these six."

the existing EB when it said in para 2: "The proposed study as suggested above would be carried out by already constituted Expert Body (EB) with wider representation with a seismologist, a social scientist, a climatologist and a glaciologist."

BP Das is inappropriate to head the committee

The new 12 member committee is chaired by Dr B P Das, who has neither the required expertise nor the required independent track record. The MoEF order of June 3 2015 says by way of his credentials: "Civil Engineering and Hydrology Expert". But we need for this committee head to be an environmental expert, not a civil engineering and hydrology expert. He as a member and vice chair of the Expert Appraisal Committee (EAC) on river valley projects since April 2007 to at least June 2013. During this committee had zero rejection rate³⁰. He even served under chairmanship of Mr P Abraham during this period who was ultimately removed for this conflict of interest when we wrote to Jairam Ramesh as the new Environment Minister in mid 2009. Many of the projects that this new committee will now review has been cleared when he was a member of the EAC, so there is a conflict of interest involved here, since he would clearly not like to go against the projects that he has cleared as EAC member. His pro hydro and pro dam bias is also apparent in his article in *The Hindu* dated Aug 31, 2013³¹, where he said: "The devastating landslips were caused by the undercutting of fragile hillsides for highways rather than by dams, which actually helped mitigate the floods." It is clear that Dr B P Das has neither the credentials nor required track record to be chairing this committee.

Ravi Chopra said³², "The environment ministry has handpicked technocrats and administrators for the new EB. It seems clear the objective is to get the nod for the HEPs. BP Dass, vice-chairman from my committee, who has been appointed in this EB, has been consultant with hydro-power companies. He has served state government committees that have approved such projects in the past. Prem Barakoti, another member, is a politician."

The new 12 member committee is chaired by Dr B P Das, who has neither the required expertise nor the required independent track record. The MoEF order of June 3 2015 says by way of his credentials: "Civil Engineering and Hydrology Expert". But we need for this committee head to be an environmental expert, not a civil engineering and hydrology expert. He as a member and vice chair of the Expert Appraisal Committee (EAC) on river valley projects since April 2007 to at least June 2013. During this committee had zero rejection rate.

This kind of committee full of members who are either biased or have poor track record is clearly unacceptable and hopefully will also not pass the legal test.

Mallika Bhanot said, "The already constituted EB led by Ravi Chopra studied the impact of the HEPs after the June (2013) flash flood disaster. They witnessed the disastrous effects of these HEPs from close quarters. After two years of the disaster, how can the new committee hope to do that? (understand the 2013 flood disaster). This new committee has also not been mandated to consult the Chopra committee. No expert from the Wildlife Institute of India (WII) or any other independent expert, scientist or environmentalist from a non-government body has been taken into this EB. And a causal draft without any clear terms of reference has been woven in this new

affidavit. All this indicates a conspiracy by the Centre to build HEPs on the Ganga."

Other members The committee has at least four central government and one state government official. The four central government officials include one each from CEA, CWC, both are known to be lobbying for hydro projects and their earlier report has been rejected by the MoEF affidavit of 05.12.14. The two MoEF officials, include Mr Bishwanath Sinha who filed misleading affidavit in Supreme Court and Mr Barman who till recently has been member secretary of the EAC and again has poor track record in terms of taking any independent position. In addition, the NGO representative listed on the committee, Mr Prem Barakoti is a known RSS person³³, he is not from any NGO that has been working on issues related to hydropower projects and their impacts. RSS is known to be part of the parivar of ruling coalition at centre and with the PMO having clearly shown their lobbying efforts for hydropower projects, this RSS member is not likely to take any independent stand. Of the rest, the expert member on biodiversity should have been from WII since they have the necessary expertise and independent track record. ICFRE, whose representative has been included as biodiversity expert, on the contrary has poor track record. For example, their EIA of Renuka Dam has been so poor that the NGT has stayed the project considering the incompleteness, inconsistencies in the EIA, among other reasons.

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This kind of committee full of members who are either biased or have poor track record is clearly unacceptable and hopefully will also not pass the legal test.

Terms of Reference The committee has been given two sets of TORs: one for all the projects across the Uttarakhand (since whole of Uttarakhand is in Ganga Basin) and another specific to six projects which were rejected by Tare Committee, in addition to earlier three reports. The first TOR is not complete in many respects, for example the MoEF affidavits in SC has repeated said that ecological integrity of the Ganga basin has to be sustained in the context of government priority of rejuvenation of Ganga, but there is nothing about that in the TOR.

Secondly the MoEF has repeatedly talked about the socio-cultural issues, but the TOR does not mention them, only socio-economic issues are mentioned.

Thirdly, longitudinal connectivity issue is not mentioned for the whole of Ganga basin.

Fourthly, why should the committee not follow the recommendations of the MoWR-MoEF report³⁴ on E-flows assessment? Why do the TOR not include that the committee work in the context of earlier reports? Why is the TOR referring to the 1000 cusecs flow that is basically for the Har ki Paudi at Haridwar and not for the river? Why the committee is also not asked to look at the existing and under construction projects, as the MoEF affidavit of 05.12.14 had suggested?

As far as the TORs for the six projects are concerned, the MoEF affidavit had clearly stated that the EB+4 will look at them in the context of the Tare committee report, but the TORs do not mention that, but assumes that these projects can go ahead the committee is only to submit recommendations for mitigation, safety and so on. This is clearly doctored, manipulated TORs that is also in violation of the MoEF affidavit in the Supreme Court.

In Conclusion The MoEF officials seem to have been emboldened by lack of consequences of misleading Su-

preme Court and others earlier and have again constituted a new committee and given them TORs in violation of its own affidavits. We hope the apex court will take due note of this. In any case such a committee will have no credibility.

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Committee report has been allowed to deteriorate into murky affairs with all the somersaults, misleading affidavits and violation of what is said on oath. It shows complete lack of any concern for the future of the Himalayas, the Ganga and the people of Uttarakhand and beyond. What happened in Uttarakhand two years back in June 2013 was certainly an unprecedented disaster.

However, the Aug 13, 2013 order of Supreme Court created a possibility that we could learn much from this disaster and such lessons could help, in addition to Uttarakhand, also the rest of the Himalayas that are also facing similar vulnerabilities & challenges and similar mindless onslaught of hydropower projects and other infrastructure. But recent events described above seem to have completely destroyed any such hopes.

The theme song of the government and others seems to be (with apologies to lyricist Indeevar who wrote the famous song for 1970 film SAFAR):

**Jo hydro ko ho
pasand wohi baat
karenge,
Tum din ko agar raat
kaho raat kahenge...**

The only hope is that the judiciary will see through the machinations of the MoEF and reject this new committee and in stead ask the MoEF to follow the recommendations of the earlier reports.

Himanshu Thakkar
(ht.sandrp@gmail.com), SANDRP

- ¹ For details, see: <https://sandrp.wordpress.com/2013/08/14/uttarakhand-flood-disaster-supreme-courts-directions-on-uttarakhand-hydropower-projects/> SANDRP had sent a letter to MoEF about a month before this order, see: <http://sandrp.wordpress.com/2013/07/20/uttarakhand-disaster-moef-should-suspect-clearances-to-hydropower-projects-and-institute-enquiry-in-the-role-of-heps/>
- ² For details see: <https://sandrp.wordpress.com/2014/04/29/report-of-expert-committee-on-uttarakhand-flood-disaster-role-of-heps-welcome-recommendations/>
- ³ Main Central Thrust
- ⁴ <https://sandrp.wordpress.com/2014/06/16/uttarakhand-flood-disaster-of-june-2013-lest-we-forget-the-experience-and-its-lessons/>
- ⁵ http://www.business-standard.com/article/economy-policy/uttarakhand-dams-six-new-projects-await-apex-court-review-115021700055_1.html
- ⁶ During this period IIT Consortium submitted a problematic report, for details see: <https://sandrp.wordpress.com/2014/11/01/why-is-the-iit-consortium-acting-like-a-hydropower-lobby/>
- ⁷ For the latest on Srinagar project, see: <https://sandrp.wordpress.com/2015/05/25/why-the-srinagar-hydro-electric-project-continues-to-remain-a-threat-2/> and <https://sandrp.wordpress.com/2015/06/12/Jhuxj&tyfo|qr&ifj;kst/>
- ⁸ <http://www.tribuneindia.com/news/uttarakhand/harish-rawat-complains-to-modi-on-hydroelectric-projects/18489.html>
- ⁹ These six projects are: 171 MW Lata Tapovan project of NTPC, 195 MW Kotlibel - IA of NHPC, 108 MW Jhelum Tamak of THDC, 300 MW of Alaknanda of GMR, 4 MW Khirao Ganga and 24.3 MW Bhyundar Ganga of Super Hydro Electric Power.
- ¹⁰ http://www.business-standard.com/article/economy-policy/uttarakhand-dams-six-new-projects-await-apex-court-review-115021700055_1.html
- ¹¹ <http://www.dailymail.co.uk/indiahome/indianews/article-2957666/Government-urges-Supreme-Court-lift-ban-Uttarakhand-hydro-plants.html>
- ¹² http://www.business-standard.com/article/current-affairs/sc-kept-in-dark-about-threat-from-six-uttarakhand-dams-115022100042_1.html, this was possibly the most significant news report that exposed how the MoEF tried to mislead the apex Court.
- ¹³ http://www.business-standard.com/article/economy-policy/javadekar-defends-giving-partial-report-on-uttarakhand-dams-to-sc-115022300875_1.html
- ¹⁴ <http://timesofindia.indiatimes.com/india/Hydro-projects-no-reason-for-2013-deluge-Uttarakhand-govt/articleshow/46269709.cms>
- ¹⁵ <http://timesofindia.indiatimes.com/city/dehradun/Ukhand-looks-to-expand-hydropower-generation/articleshow/46291452.cms>
- ¹⁶ <http://timesofindia.indiatimes.com/india/Keep-tunnelling-expect-deluge-Uttarakhand-flood-survivors/articleshow/46268575.cms>
- ¹⁷ See also: <http://www.livemint.com/Politics/hl5Fo2iIFnPuV4nlB3B0eP/SC-to-start-hearing-case-against-hydropower-projects.html>
- ¹⁸ <http://khabar.ndtv.com/video/show/documentary-ndtv-india/what-is-the-mood-of-himalayan-river-357478>, this was published as blog by SANDRP: <https://sandrp.wordpress.com/2015/02/25/fgeky;h&ufn;ksa&ls&f|kyokM+/>
- ¹⁹ http://wap.business-standard.com/article/current-affairs/pmo-meeting-changed-nda-s-stance-to-favour-more-dams-in-uttarakhand-115031100923_1.html
- ²⁰ <http://economictimes.indiatimes.com/industry/energy/power/uttarakhand-hydel-plants-unlikely-to-be-stalled-by-moef/articleshow/46281237.cms>
- ²¹ http://articles.economictimes.indiatimes.com/2015-03-12/news/60047875_1_hydropower-projects-hydro-projects-environment-ministry
- ²² <http://indianexpress.com/article/india/india-others/its-experts-red-flag-six-hydel-projects-govt-says-critical-need/>
- ²³ http://www.business-standard.com/article/economy-policy/govt-in-knots-over-dams-in-uttarakhand-11504160024_1.html
- ²⁴ These include: A. WII report of 2012; B. EB report chaired by Ravi Chopra; C. the report of MoEF submitted to SC through affidavit dated Dec 5, 2014, following examination of the 6 projects through a meeting chaired by additional secretary, MoEF and D. 4 member Tare Committee report.
- ²⁵ For details regarding impacts of Nepal earthquake and its implications for India, see: <https://sandrp.wordpress.com/2015/05/05/nepals-everest-sinking-7-9-earthquake-april-25-2015-himalayan-warning/>
- ²⁶ <http://economictimes.indiatimes.com/industry/energy/power/recent-tremors-raise-concerns-on-feasibility-of-6-hydropower-projects-in-uttarakhand/articleshow/47257823.cms>
- ²⁷ <http://timesofindia.indiatimes.com/city/dehradun/Not-just-6-all-24-hydro-projects-would-be-detrimental/articleshow/47271874.cms>
- ²⁸ <http://www.moef.nic.in/sites/default/files/Order%20of%203rd%20June.pdf>
- ²⁹ http://www.business-standard.com/article/current-affairs/govt-forms-new-expert-panel-to-review-projects-on-ganga-basin-115060401277_1.html, <http://timesofindia.indiatimes.com/city/dehradun/Scientists-see-red-over-new-body-to-study-HEPs/articleshow/47668141.cms>
- ³⁰ http://sandrp.in/env_governance/TOR_and_EC_Clearance_status_all_India_Overview_Feb2013.pdf
- ³¹ <http://www.thehindu.com/opinion/op-ed/down-a-slippery-slope-in-uttarakhand/article5076238.ece>
- ³² <http://timesofindia.indiatimes.com/city/dehradun/Scientists-see-red-over-new-body-to-study-HEPs/articleshow/47668141.cms>
- ³³ See for example: <http://www.organiser.org/Encyc/2013/10/14/Samskars,-not-the-training,-help-fighting-calamities-%E2%80%944Mohan-Bhagwat.aspx>, <http://ndtfdu.blogspot.in/2013/07/rss-in-uttarakhand-helping-army-and.html>
- ³⁴ <https://sandrp.wordpress.com/2015/04/15/mowr-report-on-assessment-of-e-flows-is-welcome-needs-urgent-implementation/>

MoWR E-Flows report is welcome, needs urgent implementation

A three member committee set up by the Union Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR for short) has submitted a report in March 2015, which makes welcome recommendation on “Assessment of Environment Flows”. These recommendations on Environmental Flows (E-Flows) need to be implemented immediately for better health of our rivers. The committee members includes Dr Vinod Tare of Indian Institute of Technology Consortium (IITC), senior officials of Union Ministry of Environment, Forests and Climate Change (MoEF for short, it was represented by Dr Shashi Shekhar, Special Secretary in MoEF)) and MoWR (represented by Dr Amarjeet Singh, Additional Secretary, MoWR).

What is E-flows and E-flows assessment? The committee concludes that “E-flows Assessment (EFA) is an important step in determining the River Health Regime (RHR)... Achieving a specific RHR may warrant (i) certain policy decisions to set boundary conditions for planned actions (e.g. irrigation and hydropower projects that are at planning stage), and/or (ii) reversal of trends in ongoing activities (e.g. hydropower projects and water diversions schemes that are operational). The time line, resource, resource requirements and challenges faced are expected to be different and may have to be based on strategic planning (e.g. Ganga River Basin Management Plan).”

The MoWR committee “recommends adoption of this description of the E-flows”: “E-Flows describe the temporal and spatial variations in quantity and quality of water required for freshwater and estuarine systems to perform their natural ecological functions (including material transport) and supports the spiritual, cultural and livelihood activities that depend on them.” The report emphasises that the E-flows are not only about water

flows: “However, maintenance of the water-sediment balance is also an essential condition. It is desired that E-flows should carry suspended load and bed load in approximately the same proportions as present in virgin flow.”

The 32 page report is not about EFA or RHR only of Ganga River but all rivers of India. The report gives seven examples of EFA, which are all in upper Ganga Basin since the IITC report on GRBMP, just recently submitted was available with the committee. In fact all these seven examples are taken from the “Mission 1: Aviral Dhara” document of the GRMBP 2015 of IITC.

It defines E-flows as: “E-Flows are a regime of flow in a river that mimics the natural pattern of river’s flows... E-Flows refer to the quality, quantity and timing of water flows required to maintain the components, functions, processes, and resilience of aquatic ecosystems that provide goods and services to people.”

The Methodology for assessment MER The committee has come up with recommendations about how to estimate the E-Flows, Minimum Environment Requirement (MER) in Rivers, depending on the decision on River Health Regime. The report strongly recommends the Building Block Method (BBM) for assessment of E-

Flows as “robust and scientifically most suitable”. The methodology suggested by the committee involves identification of keystone species for the river stretch for which E-flows is to be assessed, after defining the river cross section and generating stage-discharge curve. The report defined Keystone species as: “A species that has disproportionately large effect on the

environment relative its abundance.” In case of Upper Ganga basin, the report identifies two keystone species at different locations, namely Snow Trout and Golden Mahseer.

“E-Flows describe the temporal and spatial variations in quantity and quality of water required for freshwater and estuarine systems to perform their natural ecological functions (including material transport) and supports the spiritual, cultural and livelihood activities that depend on them.”

The methodology than asks for assessment of temporal variations in depth of flow required for survival (minimum depth) and natural growth (spawning season depth). It also requires assessment of water required for longitudinal (upstream downstream) connectivity and lateral connectivity with the floodplains for the historically observed number of days during monsoon season.

The methodology than asks for assessment of temporal variations in depth of flow required for survival (minimum depth) and natural growth (spawning season depth). It also requires assessment of water required for longitudinal (upstream downstream) connectivity and lateral connectivity with the floodplains for the historically observed number of days during monsoon season. The flow depths for any given flow will be different at different locations, for example the depths will be greater at pools than that at the riffles. To ensure that the minimum flow depth is available at the entire stretch under assessment, the flow depth is assessed at riffles. This assessment provides Minimum Ecological Requirements (MER).

For Upper Ganga Basin examples, the report assesses that the river requires lateral connectivity for at least 18 days during monsoon. For each of these depths, water flow requirements are assessed at average and at 90% dependable flow regime.

E-flows Hydrograph The report says that “The E-Flows are obtained by mimicking the trend in daily 90% dependable flow using the MEF for non monsoon season as the E-Flows for non-monsoon period.” The higher figure between the flow required for spawning season and the maximum E-flows during non monsoon season is specified as minimum monsoon flow. “The E-Flows for monsoon period are obtained by mimicking the trend in daily 90% dependable flow using the minimum monsoonal flow”, report says, at the same time ensuring that lateral connectivity for the historical average number of monsoon days is assured.

- Flow regime inferior than the MER would render the river in **Degraded** state. Most rivers in India (except possibly those in North East and some Himalayan tributaries in upper reaches) are already degraded since we are not maintaining even minimum flows.
- Flow regime that is better than MER but below the E-Flows will make the river **Impacted**.
- Flow regime higher than E-Flows but below 90% dependable flow will make the river **slightly impacted**.
- Flow regime better than E-Flows but below the average flows will mean river is in **Near Pristine** health.
- If flow regime matches the average flows in the river, than it is considered in **Pristine** Condition.

The above description of River Health status is only with respect to hydrological quantities, we need similar classification for river water quality, geomorphology and biology, but the MoWR committee does not go into these definitions. MoWR should possibly ask the same committee to take this remaining task too.

The committee has stated that the river needs to have Environment flows higher than the MER to allow the rivers to continue to perform its basic functions. It says on page 9, while starting to assess the e flows requirements at seven sites along the Upper Ganga by way of illustration, that “E flows at the sites selected consider the ecological and geo-morphological requirements, which in turn, ensure the minimum ecosystem goods and services of the river (including the cultural, spiritual and livelihood requirements that depend on these).”

Site	MER in Wet period as % of AVF	MER in Dry period as % of AVF	E-flows in wet period as % of AVF	E-flows in dry period as % of AVF
Ranari, Dharasu/ Bhagirathi	32.59	32.96	46.13	53.12
U/s of Devprayag/ Bhagirathi	29.00	20.48	37.96	29.04
D/s of Rudraprayag/ Alaknanda	31.71	19.3	46.19	38.16
D/s of Devprayag/ Ganga	43.21	29.98	61.47	59.00
U/s of Rishikesh/ Ganga	53.00	30.23	67.29	50.23
At Rishikesh/ Ganga	55.83	31.72	70.55	52.55
D/s of Pashulok Barrage, Rishikesh/Ganga	27.99	30.99	37.43	58.42

Note: AVF: Average Virgin Flow

River Health Regime The report divides the rivers into five health regimes: Pristine, Near Pristine, Slightly Impacted, Impacted and Degraded. Here is how it defines these regimes.

The committee goes on to recommend that the rivers must have E-flows and not just MER, which is welcome. It can be seen from the table above that at most sites (only exception is site no 7), the dry season E-flows as %

of AVF is lower than wet season E-flows. However, the river is in greater stress in dry season, and possibly would need greater % of AVF releases in this season. Secondly, the whole assessment given here is basically for keystone species and it is assumed that the requirements for keystone species will be also take care of all the other social, cultural, ecological needs of the river. That assumption may not always hold good and there should be an assessment if the E-flows for keystone species will satisfy these other river requirements. Lastly, it should be noted that the WII report recommends greater depths for adult and juvenile species of snow trout and golden mahseer than what is assumed by IITC¹. It should be noted that WII is the credible, specialist agency on these matters and hence recommendation of the WII in this regard should be followed.

However, leaving aside these qualifications, the MoWR report is most welcome and needs urgent adoption and implementation.

E-flows is not a luxury but a necessity for the people and society The MoWR committee says, "The objective of E-flows is to recognise the physical limit beyond which a water resource suffers irreversible damage to its ecosystem functions, and systematically balance the multiple water needs of society in a transparent and informed manner. E-flows are one of the central elements in water resources planning and management for sustainable development." That element has been completely absent from India's water resources planning and management, and earlier we bring that element into the decision making and implementation, better it will be for everyone.

The implementation of these E-flows recommendations are neither impractical nor will the implementation have disruptive impact on our water needs and uses. There are many reasons for this, the biggest one is that since agriculture is our biggest user of water and since groundwater is the lifeline of agriculture water requirement, groundwater recharge and sustainable use should be our biggest priority. Secondly, there are methods like System of Rice Intensification and Sustainable Sugar Initiative that can reduce our agriculture water requirement hugely, similar is the case for appropriate crop-

ping pattern. It should be noted that 97% of our big dams are built for irrigation, but these are neither socially and environmentally acceptable, nor are they any longer effective. In that situation, underground aquifers provide much better water storage option.

As far as Urban and Industrial water use is concerned, in the interest of the cleaner rivers, it is even more im-

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portant that there is treatment and recycle to the maximum possible extent of effluents from these sources, nearest to the source of such effluents. Lastly, if we take up rainwater harvesting more seriously, the demands on rivers would automatically reduce. To implement these set of

steps, we will need much greater social and political will, it is the lack of will that is the biggest impediment in the path of better future for our rivers.

Such E-flow assessment exercise has NOT be done for any of the dam or hydropower project anywhere in India or in Ganga basin or in Uttarakhand as part of the decision making process for hydropower projects, dams and irrigation projects.

This is also true for the Uttarakhand hydro projects under consideration in the Supreme Court now. Hence all the projects must go through this exercise as recommended by this report. Without such assessment and implementation, there is no possibility for the river to continue to play its minimum functions and also there is no possibility of Ganga Rejuvenation about which the current government has been making promises from day one. The Supreme Court should direct that the projects follow these recommendations to achieve e flows recommended in this report. We hope the government, including the Ministry of Environment and Forests and also the Ministry of Water Resources, who are part of this report, will make their submissions to the court on these lines. The conflict between the two ministries that the Attorney General hinted in the Supreme Court on April 13, 2015 seems to be misleading considering this joint report from two ministries.

However, this report has much greater significance beyond the Supreme Court case, beyond the Uttarakhand and Ganga Basin. It has significance for all the rivers of India and the government needs to start implementing the recommendations immediately.

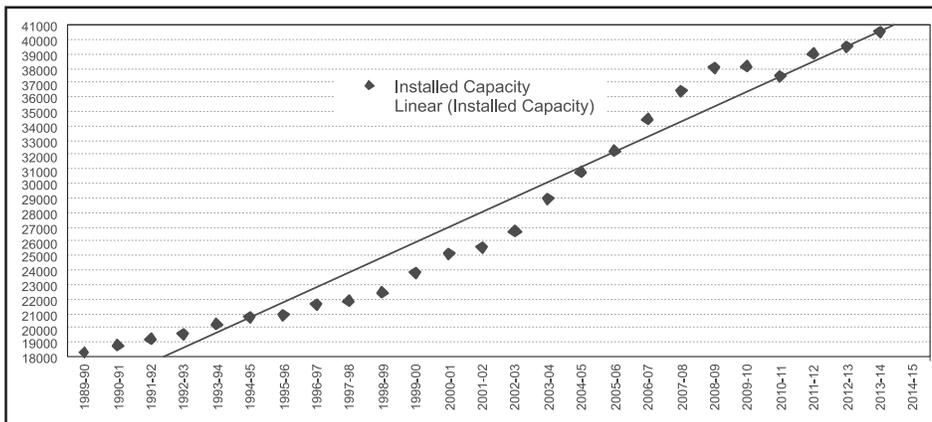
Himanshu Thakkar

¹ Adult and Juvenile Mahseer need depths higher than 0.75 meters (Adults: depths greater than one meter, Juveniles: shallow, ranging 0.75- 1.5 mts), see Table 7.6 of WII report.

Diminishing Returns from Large Hydropower projects

As per the latest power generation figures released by the Central Electricity Authority¹ the hydropower generation during the Financial Year 2014-15 was 4.25% lower than the previous year's generation even though the installed capacity has gone up. Average power generation per MW of hydro capacity in India in 2014-15 was over 20% less than what our average generation was in 1993-94. More worryingly, the hydropower generated per MW installed capacity continues its downward slide, the downward slide has been going on for now over two decades.

SANDRP has been doing performance appraisal of large hydropower projects of India for some years. In the graph given below we have plotted the Million Units (MU, one unit is equal of one kilowatt hour of power) power generated per Mega Watt (MW) installed capacity of all operating hydropower projects in India. We have done this based on the official data from Central Electricity Authority for total annual power generated by all existing operating large hydropower projects of India and total installed capacity of such projects, for each of the last 20 years from 1993-94. The total installed capacity of large (installed capacity over 25 MW) hydro projects in India as on March 31, 2015 is 40885 MW.



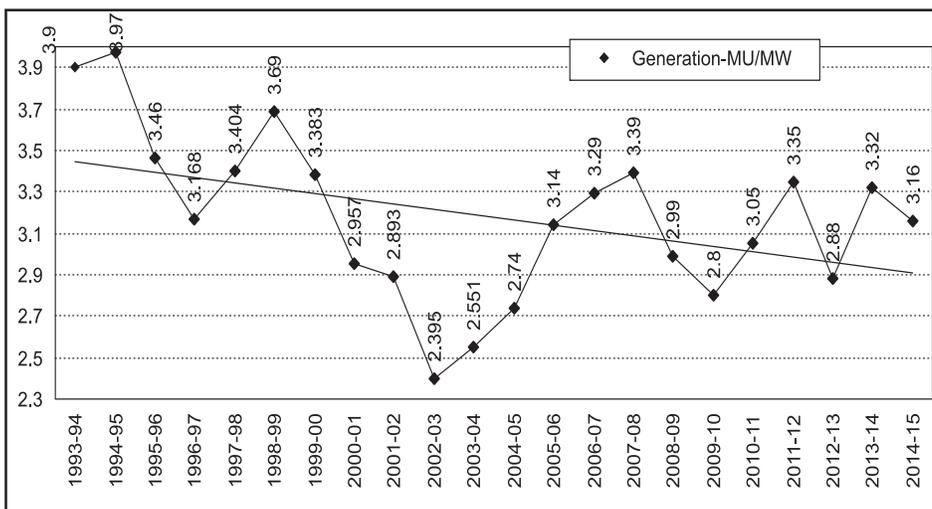
The graph also shows the trend line of power generation of Big Hydro-power projects for the last 20 years, it is clear the trend-line shows diminishing generation from existing hydro power projects of India.

- It shows that per MW generation in 2014-15 has dropped by over 20% from the generation figure for 1993-94. This should be a matter of serious concern, but the CEA, Power

The governments and power sector establishment in India have been pushing Large Hydro projects as if they are good in themselves. See the graph below that shows the rapid increase in installed capacity of large hydro projects in India². A huge additional capacity of hydro capacity is under construction and various stages of approval and planning.

Ministry or none of the other bodies are doing such an analysis. Such an analysis can also help us try and understand why this is happening and what needs to be done to arrest or reverse this trend.

The falling generation cannot be attributed to lower monsoon rainfall, since rainfall has been average or above average in most of the years under consideration.



We can see from these monsoon rainfall figures from India Meteorological Department³ that in 14 of the 22 years the rainfall was above or near normal (above 98% of normal), so one cannot say that the diminishing generation is due to below normal monsoon.

89% projects are underperforming A separate analysis showed that 89% of the projects generate at below the design or promised generation level at 90% dependability. Each large hydro project is given techno economic clearance by CEA based on a promise at appraisal stage that the project will generate certain amount of power in 90% of

the years. However, there has been no attempt at credible performance appraisal of hydropower projects in India.

When we compared that figure with the actual generation figure for the last 29 years for each of

Monsoon Rainfall

Year	Monsoon Rainfall
1993	101 %
1994	110 %
1995	100 %
1996	103 %
1997	102 %
1998	106 %
1999	96 %
2000	92 %
2001	92 %
2002	81 %
2003	102 %
2004	87 %
2005	99 %
2006	99 %
2007	106 %
2008	98 %
2009	78 %
2010	102 %
2011	102 %
2012	93 %
2013	106 %
2014	88 %

the operating projects, we found that 89% have been under-performing. And among the under performing projects, 50% were generating below the 50% of the promised power generation. And yet no questions are asked, no accountability fixed, in fact such an analysis is not even done by the official agencies. This means, for example that a lot of the projects that are being set up now are UNVIABLE projects or that the installed capacities are way above optimum levels.

The reasons There are many reasons why the generation per MW is dipping: unviable projects, unviable installed capacities, over-optimistic hydrological assumptions, over development (development beyond the carrying capacity of the basin), catchment degradation, high rates of sedimentation, inadequate Repair & Maintenance, Run of River projects (this phrase is a misnomer, these projects do not generate power from the run of the

river but through a dam and a tunnel), changing monsoon patterns due to climate change, etc.

Here it should be added that the destruction of forests, rivers, fisheries, biodiversity and submergence of lands for hydropower projects is also making the impact of climate related disasters worse for the people and also for the hydropower projects, as could be seen during the June 2013 Uttarakhand disaster. All this needs to be part of our impact assessment and decision making process.

No one is assessing peaking power from hydro projects One of the USPs (Unique Selling Propositions) of hydropower projects is that it can provide peak hour power, which coal based or nuclear power projects cannot provide. However, we do not have the necessary data to analyse what % of hydropower generation is providing peaking power. What is surprising however is that there is no agency in India that is doing such an analysis. Without such an analysis it is not possible to even start understanding and optimizing the peak hour power generation from hydro projects. Needless to add, such an analysis should also involve assessing the impacts of peaking power generation. Depending on site specific conditions, the currently under-utilised peaking power potential of existing hydropower projects can be substantially better utilised before going for new peaking projects. The question is if we are neither monitoring nor trying to optimize peaking power generation, is there a case for pushing more hydro in the name of peaking power demands?

What about existing large dams? Lastly, it should be added that less than 3% of India's large dams have hydropower component, most of these 97% large dams without hydropower component are irrigation projects. However, in these projects, the social, environmental and economic costs have already been paid. We need to at least assess the possibility of adding hydro component to some of these projects. But such an assessment is not happening at all. United States of America, whom we look up for many things, have been doing exactly that, assessing the possibility of adding hydro component at existing dams rather going for new hydro projects.

What all this means is that before we go for more large hydro, we have a lot of options. We hope the questions raised in this analysis leads to changes in some of the directions indicated here.

Himanshu Thakkar

(ht.sandrp@gmail.com), SANDRP, April 2015

¹ CEA is a Union Power Ministry's premier technical body, see: http://cea.nic.in/monthly_gen.html

² The slight dip in installed capacity in 2010-11 is because in the capacity monitored by the Central Electricity Authority, the CEA that year excluded some of the small hydro projects (capacity below 25 MW) that were included in its monitoring matrix earlier.

³ http://www.imd.gov.in/section/nhac/dynamic/Monsoon_frame.htm

Nepal Earthquake: A Himalayan warning

The massive Nepal earthquake of 7.8 intensity (Richter scale) on April 25, 2015 with epicenter 77 km north-west of Kathmandu in Nepal is a major noteworthy event in the Himalayas that also has warnings for what is in store for future. The earthquake left a major trail of destruction affecting over 20 districts of Nepal, of which 8 million live in 11 severely affected districts. Besides, it affected areas of India (Bihar, UP, W Bengal, Sikkim, Assam), Bangladesh, Tibet. The earthquake has now been given the official name of Gorkha Earthquake.

The intensity of this earthquake is generally comparable with the 2005 earthquake in Kashmir which killed over 86,000 in Pakistan and India. This is the largest earthquake in Nepal since the Bihar-Nepal earthquake of 1934. The 1934 earthquake was 8.3 magnitude and centered near Mount Everest, when more than 10,000 people were killed.

India Meteorology Department¹, provides a list of 85 aftershocks till May 4, 2015 after the earthquake of April 25, 2015. The aftershocks include a major earthquake of 7.3 magnitude on Richter scale on May 12, 2015 with epicenter 68 km west of the town of Namche Bazaar, close to Mount Everest². It created a lot of additional damage. The latest event this long episode happened on May 26, 2015 when a landslide blocked the Kali-Gandaki river, destroying 26 houses and creating flood panic in the downstream area. The full dimensions of the calamity are still unfolding.

Impacts in Nepal

- According to Nepal Government³, 8670 people have died, 21433 are injured, 1355 government buildings are totally destroyed and 3396 government buildings are partially affected. 501783 private buildings are destroyed and 271391 are damaged. Total affected population is 2 649 4504. The figures continue to rise.
- *Kathmandu valley a meter up at the cost of Mount Everest!* According to scientists from the European Space Agency⁴, post earthquake, the Kathmandu Valley area of about 120 km by 50 km has risen by up

to a meter. The Mount Everest has sunk by one inch and areas north have settled below their original height probably because the land below loosened up, as built up strain was released. That possibly triggered the base camp avalanche that killed 22 people. However, it has subsequently been found that the Mount Everest may not have shrunk in size, but has been shifted by about an inch.

- *The Hindu* reported⁵ that the Kathmandu valley is more vulnerable to damage as underneath the valley

A peculiarity of this Nepal Earthquake is that almost all the aftershocks and most of the damage has been caused in areas to the EAST of the epicenter of the earthquake, very little to the west. I have been wondering how can this be explained and asking a number of persons, but have yet to find a satisfactory reply.

is a 300 m deep layer of black clay, the remnants of a prehistoric lake, which amplifies the damage caused by severe earthquakes.

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damage has been caused in areas to the EAST of the epicenter of the earthquake, very little to the west. I have been wondering how can this be explained and asking a number of persons, but have yet to find a satisfactory reply. As noted by David Petley in blog⁶ on April 26, 2015⁷, "In the case of the Nepal Earthquake the rupture appears to have propagated mostly towards the east of the epicentre, not to the west. So the epicentre itself is at the west end of the earthquake affected zone. This is clear from the [USGS shakemap](#)."

Noteworthy positives The earthquake response has thrown up some positives too. The effort of the common people in the immediate impact zone has been praiseworthy at many places. The prompt response of Indian government, including air-force, NDRF and others has been acknowledged by the Nepal government. Indian state governments have also been providing useful help to the affected people and others.

Indian and international media has been trying their best to give a true picture of the situation.

THE QUAKE EXPOSED MANY FAILURES In the aftermath of the earthquake, a number of failures of India's response system were exposed.

- **Dysfunctional NDMA** The National Disaster Management Authority has been dysfunctional for many

months, since all the members (except one) of the NDMA resigned in June 2014 after Modi government took over. It was only in January 2015 that three of the eight new members were appointed. In the meantime, the annual drill of the disaster management this year was cancelled.⁸ This does not sound great about India's premier disaster management institute. A former member of the NDMA and senior official of NDRF confirmed this situation to this author.

- Quake Monitoring Network in Coma:** *The Hindustan Times* reported,⁹ "The country's network of "ground-motion" detectors, the backbone of quake monitoring, has not been working for nearly eight months now due to a bureaucratic bottlenecks, putting millions of lives at risk." Ground or strong-motion detectors — also called accelerographs — are critical as they serve as the basis for India's earthquake early-warning system, but they were found to be lying idle in the aftermath of the Nepal earthquake. India's network of 300 strong-motion sensors, installed at critical points across 14 states, cover high-risk seismic zones V and IV as well as some heavily populated cities in zone III. These imported devices, which measure movement generated during a quake and also help identify areas that could be vulnerable, cost Rs 10 crore to install and about Rs 1 crore a year to maintain. In Sept 2014, the government moved the project out of IIT-Roorkee after it decided to carve out a separate seismological organisation from the India Meteorological Department. Funding was cut off in September 2014, without an alternative arrangement in place. When this author asked very senior official of government of India about this, he confirmed that yes, there has been problem in transition to Geological Society of India.

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The Indian Express reported that Nepal has a network of 300-400 GPS instruments spread over the entire fault line, while India does not have more than 25-30 that are permanently deployed. These instruments help monitor the tectonic movements. A top earthquake expert, Roger Bilham of Colorado University (US) said that Nepal in fact is better prepared than India to withstand strong earthquakes since it has started taking remedial measures several years back.

- India has fewer GPS stations than Nepal** *The Indian Express* reported¹⁰ that Nepal has a network of 300-400 GPS instruments spread over the entire fault line, while India does not have more than 25-30 that are permanently deployed. These instruments help monitor the tectonic movements. A top earthquake expert, Roger Bilham of Colorado University (US) said that Nepal in fact is better prepared than India to withstand strong earthquakes since it has started taking remedial measures several years back.

- Lack of actionable landslide maps during disaster** While our government and various agencies talk about this prowess of Remote Sensing images providing information, what was required in the immediate aftermath of the earthquake was quick information from this source about the possible sights where earthquake had led to landslides so that rescue and relief action can be taken up. This was particularly important when communication and transport was completely disrupted in the remote areas. However, we did not see any useful actionable inputs in this regard from India's (or for that matter from other countries) remote sensing agencies when it was necessary and useful in the immediate days following the earthquake.
- No Post Disaster reporting** One of the key ways to learn lessons for future from disasters is to have comprehensive reporting about what happened at the disaster and who played what role. Unfortunately we have no such comprehensive report about even the Uttarakhand disaster of June 2013 that killed between 6500 and 30 000 people as per different estimates. NDRF director General and a former member of NDMA who were with me at a Lok Sabha TV discussion after the April 25 earthquake agreed we need such reports.

DAMAGED HYDROPOWER PROJECTS Experts have been warning of the danger against building large dams in the seismically unstable Himalayas, where the collapse of large infrastructure can magnify devastation in mountains. Such role of the projects in Uttarakhand flood disaster in June 2013 was confirmed by the Expert Body (chaired by Dr Ravi Chopra) appointed by the Union Ministry of Environment and Forests (MoEF) following the Supreme Court order of Aug 2013 and also as per the affidavit of the MoEF in the Supreme Court in December 2014.

Deaths, damages at Rasuwagadi HEP The huge earthquake caused serious damage to the 111 MW Rasuwagadhi Hydropower station¹¹, which the company¹² started to build two years ago 67 kilometers west of the quake's epicenter in Rasuwa district of Central Development Region. The China Three Gorges Company & media reported that two Chinese & four Nepalese workers were killed in the quake and several were seriously injured. On April 28, a child and 24 other people were airlifted by helicopter to nearby Jilung County in China's Tibet Autonomous Region, according to the quake relief headquarters in Jilung. The dam itself has suffered serious damages. The Rasuwagadhi Dam was being built on the upper Trishuli River in a very remote corner of Nepal near the Tibetan border. The dam's reservoir is to stretch back 25 km, holding back 1500 million cubic metres of water. Writer Michael Buckley asks in his article in *The Ecologist*: "Rasuwagadhi Dam was described as severely damaged by the quake. And that brings up a nightmare scenario. What if that dam were up and running, with a huge reservoir sitting behind it? ... It would be a Fukushima moment - earthquake followed by tsunami."

Workers stuck at Upper Tamakoshi HEP In a news report¹³ that appeared eight days after the earthquake, Ganesh Neupane, chief of the environment division of the Upper Tamakoshi Hydropower Company Limited¹⁴, said some 200 Chinese technicians and engineers as well as 70 Nepalese workers are stranded in the powerhouse station at the hydropower project site after a massive landslide caused by the earthquake blocked the 11-kilometer-long Lamabagar-Gongar stretch of the road connecting the region. The 456 MW Project of Nepal Electricity Authority is located at Lamabagar VDC, Dolakha District, Janakpur Zone, Central Development Region.

The workers are stuck but safe at the Upper Tamakoshi hydropower project in Lamabagar Area in Dolakha district, where reports suggest that more than 90 per cent

of houses in rural areas have been destroyed. The stranded workers are from China's Sinohydro Corporation Limited, the contractor of civil construction work for the Upper Tamakoshi Hydropower Company Limited in charge of the project.

Kulekhani Dam Our colleague Ratan Bhandari reported on May 4, 2015 that Nepal's

only storage dam, the Kulekhani Reservoir dam has cracked by the earthquake. According to Nagarik daily (Nepali)¹⁵ the water level in the 114 m high Kulekhani dam is being reduced by three meters. Nepal Electricity Authority is doing micro study of the dam. According to the senior officer of NEA, the dam is cracked in various part from north to south.

Other affected hydro projects As per latest news in Nepal media¹⁶, the earthquake of April 25 and series of aftershocks have damaged around 14 hydropower plants across the country, resulting to loss of 150 MW of electricity, see the details below. The total capacity of the 16 projects listed below comes to 280.1 MW. Some of the projects are in operation, in case of some others, full information is not available.

The condition of two more existing hydropower stations is not known, said Nepal authorities. *Hydroworld*, an industry trade magazine, reported that the 144-megawatt Kaligandaki hydroelectric power station and 22.1-megawatt Chilime hydropower plant "may have been affected according to news reports from the area."¹⁷ Kaligandaki on the Gandaki River is about 187 miles west of Kathmandu near Mirmi in the district of Syangja District. Chilime Project on the Bhotekoshi river is in the district of Rasuwa, which is 83 miles north of Kathmandu. In Aug 2014¹⁸, Nepal's deadliest landslide in a decade caused destruction that knocked out 10% of its power generation capacity.

LANDSLIDES On the day of the earthquake on April 25, 2015, *Earthquake Without Frontiers* warned¹⁹ about the possibility of landslides compounding the dangers from the earthquake: "The M_w 7.9 Nepal earthquake on 25 April 2015 appears to have occurred on a shallowly north-dipping thrust fault beneath the Himalayas of central Nepal. The steep topography and high relief in the area of the epicentre, and the high intensity of shak-

Hydropower Projects of Independent Power Producers damaged by the earthquake

Project	Capacity, MW	Status
Upper Bhotekoshi	45	Penstock burst due to rock fall from nearby cliff; power house & generators submerged due to penstock burst; rock slide continues, no access to project; pylons washed by landslide in August 2014.
Sunkoshi Khola	2.5	PH wall has fallen inside PH room, landslide at penstock alignment and landslide at headwork areas, no access to project
Indrawati III	7.5	Significant damage; in operation
Chaku Khola	3	Not in operation; details not known
Baramchi Khola	4.2	Penstock pipe burst; no access to power plant but in operation
Middle Chaku	1.8	Not in operation, no details, no access
Sipring Khola	9.65	Ext joint burst, landslide at penstock alignment, not in operation
Ankhu Khola I	8.4	Substation, PH fully damaged by landslide; 11 poles damaged; not in operation
Mailung Khola	5	Significant damage in headworks, penstock pipe & PH; not in operation, no access
Bhairab Kunda	3	Tunnel leakage, penstock burst; switchyard & Tr lines damaged; PH safe; not in op

Total: 90.05 MW

Hydropower Nepal Electricity Authority damaged by the earthquake

Project	Capacity, MW	Status
Trishuli	24	Cracks in the crest in the balancing pond; colony damaged; Not in operation
Devighat	14	A cascade project with Trishuli; cannot operate until Trishuli resumes
Sunkoshi	10.05	Severe multiple leakages in a stretch of 200 m of the 3 km canal; repair of damages due to Aug 2014 landslide incomplete; again damaged, staff staying in tents; not in operation
Kulekhani	60	Cracks in the crest of the dams, but in operation ; the cracks are above the current water level; it might create problem when the water level goes up during monsoon
Chilime	22	Damage in Tr line
Upper Trishuli 3A (under construction)	60	Severe damage in the construction works after landslides from both sides not only killed four employees but also buried heavy equipment; damage in the audit tunnels and a suspension bridge; 3 km access road washed away by landslides

Total: 190.05 MW

Grand Total: 280.1 MW

ing that was felt, mean that thousands of landslides are likely to have been triggered by the earthquake. Based on past experience of earthquakes in steep mountainous terrain, like the 2005 Kashmir and 2008 Wenchuan earthquakes, some of these landslides will be large enough to create temporary dams across rivers in the area. The lakes created by these dams are particularly hazardous because they can drain without warning, usually within a few days of filling up, due to collapse of the

unstable dam material.” Mapping the landslides will require satellite imagery taken after the earthquake, but unfortunately there are not sufficient inputs available in this respect, including from India’s National Remote Sensing Centre, which can be useful in time for rescue and emergency relief action.

In absence of remote sensing images, EWF has prepared susceptibility maps, (The first map was produced by Dr Tom Robinson of the University of Canterbury, New

Zealand): “Susceptibility in these models is determined by the intensity of the shaking (derived from the USGS ShakeMap estimates, http://earthquake.usgs.gov/earthquakes/eventpage/us20002926#impact_shakemap), the steepness of the topography, the position of a given location on a hillside (because shaking tends to be greater at the tops of ridges than in neighbouring valleys), and the aspect (the direction in which the hillside faces).” The model gives some ominous indications: “The map shows that high landslide susceptibility values – and thus the greatest chance of landsliding – occur in the high Himalayas to the north of the epicentre and Kathmandu. This includes the major river valleys of central Nepal, including the Kali Gandaki, Marsyandi, and Trisuli Rivers, as well as parts of the Sun Kosi River catchment. These areas also have high relief between valley floors and ridge crests, meaning that landslides there are potentially large enough to block the valleys.” David Petley wrote in his first blog²⁰ on this event on the day of the earthquake: “Kathmandu in particular is vulnerable, with poor quality buildings and soils that are prone to liquefaction,”

The EWF also provides some explanation for the major damages in Kathmandu valley: “Kathmandu itself seems to have experienced much greater intensities of VIII or IX – probably because seismic waves were amplified by the soft sediment fill within the valley.”

Narrating the possibilities of landslides post earthquake, Petley writes, “The most seriously affected area from the earthquake is mountainous and remote, but there are substantial numbers of people living in the valleys and on the hillsides... This is highly

landslide-prone territory, and the impact of the earthquake in these regions is going to be dreadful. Some effort is already being made to analyse the likely landslide effects, although at this stage such efforts are tentative... the analysis is really interesting and helpful. It shows that to the north of Kathmandu, the very remote areas are likely to have been severely affected by landslides – but as yet there is no information from up there of course. And interestingly the hills to the south of Kathmandu are also badly impacted by landslides triggered by the Nepal earthquake – indeed the landslide picture might be as bad there as to the north. This is significant for two reasons – first, there are lots of people living in this area; and second, the roads that link Kathmandu to the outside world have to cross these hills... The monsoon is going to be a real problem this year.”

Langtang: “possibly the greatest single landslide tragedy of the earthquake”: As per David Petley blog on May 2, 2015 and other sources²¹, there may have been two large rock/ice avalanches, one affecting Langtang and the other, a few days later, destroying Ghotabela in the immediate lower level below Langtang. It is feared that some 300 people may have been buried in Langtang landslide in Rasuwa district in Trishuli river valley. According to Mountain Hydrology²², “Langtang village was located below a very steep ridge and above the ridge there is a glacier towards the northwest and large snow field right above the village. There has been a lot of snow fall this year and at the moment of the earthquake there were considerable amounts of snow at higher altitudes. From a preliminary investiga-

On the day of the earthquake on April 25, 2015, Earthquake Without Frontiers warned about the possibility of landslides compounding the dangers from the earthquake: “The M_w 7.9 Nepal earthquake on 25 April 2015 appears to have occurred on a shallowly north-dipping thrust fault beneath the Himalayas of central Nepal. The steep topography and high relief in the area of the epicentre, and the high intensity of shaking that was felt, mean that thousands of landslides are likely to have been triggered by the earthquake. Based on past experience of earthquakes in steep mountainous terrain, like the 2005 Kashmir and 2008 Wenchuan earthquakes, some of these landslides will be large enough to create temporary dams across rivers in the area. The lakes created by these dams are particularly hazardous because they can drain without warning, usually within a few days of filling up, due to collapse of the unstable dam material.”

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tion we think it is most likely that either a snow avalanche from directly north of Langtang village or a debris/ice avalanche from the north-west has caused this disaster.”

Petley wrote: “It is hard to believe that these will be many survivors from this. It appears that this may have been a rock/ice avalanche, but information is still scarce.” In his earlier blog on April 29, 2015²³ on Nepal Earthquake, Petley described this disaster, quoting eye witness account of Robbie Barnett from Austin Lord, posted on the [Modern Tibet Facebook page](#) as: “*the site of the largest single catastrophe, as the entirety of village was completely buried by an avalanche that came from thousands of feet above on the southern slopes of Langtang Lirung and Langtang II. Smaller settlements on the outskirts of Langtang, such as Chyamki, Thangsyap, and Mundu were also buried. It is impossible to determine exactly how many people died there, but the estimate is perhaps over 300 people in total. The handful of survivors, roughly twelve locals and two foreigners, walked down to Ghodatabela below after spending the night of the 25th in a cave – thus there is no one at Langtang itself. This avalanche is perhaps 2-3 kilometers wide... Langtang is probably one of the greatest single tragedies of this earthquake.*”

Ghodatabela According to David Petley blog, not far from the quake’s epicenter, 250 people were feared missing after a mudslide and avalanche on Tuesday, April 28, 2015 at Ghodatabela village. Heavy snow had been falling near the village Ghodatabela, and the ground may have been loosened by the quake.

Tatopani stretch of Arniko Highway Kantipur²⁴ has reported massive landslide along the Tatopani stretch of the Arniko Highway connecting Kathmandu to Tibet caused by Sunday’s aftershock measuring 6.9 on the Richter scale: “It is suspected that scores of people, including some foreigners, visiting Tatopani and around 25 vehicles were buried in landslides triggered by Saturday’s massive earthquake. According to witnesses, scores of people were buried at Miteripul, Chaku, Jhyalebhir, Nayapur,

Daklang Paharo and Jhirpu. “Ten to fifteen people working at caterings and restaurants in Khasa were buried by landslide at Chaku,” said Shyam Shrestha, who witnessed the tragedy. Some buses, private vehicles and motorcycles were also buried in the area.” Sixteen dead-bodies have been recovered so far.

Lapark village, Gorkha district Bill Haneberg said about the possibility of landslide at this village in a comment on David Petley blog on April 28, 2015: “Laparak, a village of about 2000 people located 12 km north of the epicenter, is on a landslide that has been moving episodically during wet periods since it was reactivated in 1999 (<http://eeg.geoscienceworld.org/content/17/1/23.abstract>). Early reports and aerial photos suggest almost complete destruction, but it is unclear if it was a result of shaking, sliding, or some combination of the two.” There is no information about the situation at this village, though.

Other landslides These are just some landslides on which information is available. There are possibilities of many more now and more likely in coming monsoon months. ICIMOD²⁵ has provides some indications & maps of river blocking landslides like: Site of potential landslide blocking a stream in Ward No. 5, Samagaun VDC, Gorkha district of Nepal, Avalanche blocking upper reaches of Budi Gandaki in Ward No. 5 and 8 of Samagaun VDC, Gorkha district, among others. *Indian Express* reported²⁶ that on April 28 afternoon, six persons were killed and 10 injured when a landslide buried a bus between Mungling and Narayanghat.

BIGGER HIMALYAN EARTHQUAKES ARE DUE

Even as the April 25 Earthquake was the biggest to hit the central Himalayan region since 1934, scientists say this was not the big one that they had been fearing would strike the area. “We know there is a huge amount of accumulated strain in this area. It is due for a major earthquake, perhaps a series of earthquakes, bigger than 8 on the Richter scale. That is the kind of energy that is estimated to be accumulated there. This was certainly not one of those earthquakes that is probably imminent. In terms of energy release, I would say this would not have released even four or five per cent of the energy that is estimated to be stored there,” said Harsh K Gupta, former director of the Hyderabad-based National Geophysical Research Institute.

The BIG ONE is still to come Even as the April 25 Earthquake was the biggest to hit the central Himalayan region since 1934, scientists say this was not the big one that they had been fearing would strike the area. In the Himalayan region the Indian plate is known to be pushing north and northwestwards, getting below the Eurasian plate, which is the reason for most earthquakes in the area. “We know there is a huge amount of accumulated strain in this area. It is due for a major earthquake, perhaps a series

of earthquakes, bigger than 8 on the Richter scale. That is the kind of energy that is estimated to be accumulated there. This was certainly not one of those earthquakes that is probably imminent. In terms of energy release, I would say this would not have released even four or five per cent of the energy that is estimated to be stored there,” said Harsh K Gupta, former director of the Hyderabad-based National Geophysical Research Institute and a former member of the National Disaster Management Authority.

Prof Sankar Kumar Nath of IIT Kharagpur said, “This earthquake would only be classified as medium in terms of energy released. The 2500-km stretch from the Hindukush region to the end of Arunachal Pradesh, is capable of generating much bigger earthquakes, even nine on Richter scale. The trouble is that in terms of energy release, which is what causes the damage, it would take 40 to 50 earthquakes of magnitude 7.9 to avoid an earthquake of magnitude 9”. Since they cannot be predicted or prevented, an expert said, the key to avoiding large-scale devastation from earthquakes is, therefore, precaution and planning.²⁷

Let us divide the Himalayans into four segments and try to understand the quake history and see future vulnerabilities²⁸. The whole of the Himalayas is prone to earthquake of 8 or above as is clear from the history, see below.

Western Himalaya In this region broadly from Kashmir to Yamunotri, several major quakes have happened. The 2005 quake of 7.6 magnitude in PoK and India killed 86000 people. Earlier the Kangra earthquake of 1905 (8.0) killed 19000 people. Some geologists believe that this region is prone to much higher magnitude quakes.

West Central Himalaya In this region between Yamunotri to Pokhara, some of the major recent earthquakes have been Uttarakashi (1991 - 6.6) and Chamoli (1999 – 6.8) earthquakes. However, seismologists have been warning that this region can experience a major earthquake of above 8 intensity anytime.

East Central Himalaya In this region between Pokhara and Sikkim, after the 1934 earthquake of 8.3 that killed estimated 10700 people, the April 25 2015 earthquake of 7.9 is of comparable magnitude.

North East India In terms of magnitude, North East Region is vulnerable to highest magnitude earthquake since India’s biggest earthquakes in past have happened

here in Shillong (1897 of 8.7 intensity, the highest recorded in the region) and Arunachal – China Border (1950 – 8.5), both 8.5 or above. The latest earthquake to affect NorthEast India happened in Sikkim in Sept 2011, but that had magnitude 6.9, so it is not likely to have released much of the North East’s underground stress. As Sanjoy Hazarika wrote in *Indian Express*²⁹, every city in the North East India, from Aizwal to Agartala, from

In terms of magnitude, North East Region is vulnerable to highest magnitude earthquake since India’s biggest earthquakes in past have happened here in Shillong (1897 of 8.7 intensity, the highest recorded in the region) and Arunachal – China Border (1950 – 8.5), both 8.5 or above.

Gangtok to Guwahati, from Itanagar to Imphal, from Shillong to Silchar is prone to huge damages in the event of a big quake that is due here. To illustrate, as per an assessment by GeoHazards International of California in Mizoram made public

only in April 2015, in the event of a magnitude 7 quake, the damage would include: collapse of 13000 buildings, 1000 landslides, 25000 fatalities and major damage to utilities and infrastructure. In this region, not only the government doing nothing to address these hazards, they are increasing by imposing massive agenda of large dams and hydropower projects on the region without doing any credible impact assessment or participatory process. He says there is “the conviction among governments and corporates that development means “big”. Thus, huge dams have come up on the Teesta in West Bengal, reducing the roaring river of literature and history to a placid, sickly pond. How safe are these dams in terms of quakes and cloudbursts? Could an independent audit be essayed after the recent disaster in Nepal?” We hope the government will respond to these questions rather than going for more projects.

Dams are unsafe in earthquake prone regions It is clear from above how the hydropower projects were damaged during the earthquake and they in turn can be cause for deaths and damages. Post earthquake, hydro industry website noted³⁰ that the future of Nepal’s hydropower development will inevitably now demand significantly greater attention to structural integrity in the face of seismic events. As Martin Wieland, Chairman of the ICOLD Committee on Seismic Aspects of Dam Design, concluded in his 2012 paper that dams are not inherently safe against earthquakes.

The Zipingpu Dam in Sichuan Province in China has been implicated in the disastrous quake of 2008 that killed over 85,000 people and left millions homeless: the dam was just 4 miles from the epi-centre of the 7.9-magnitude quake. The quake cracked Zipingpu Dam and caused damage to 60 other smaller dams in the region. Dam personnel and military rushed to empty water from

scores of dam reservoirs, causing considerable flooding downstream.³¹

CASCADING DISASTERS Japan is known to have gained expertise in dealing with earthquakes. However, what happened in that country on March 11, 2011³², started with a magnitude 9.0 earthquake, compounded first by Tsunami and then by melting of three nuclear reactions, the after effects of that disaster are still being experienced not only by Japan, but even by the nuclear industry across the world. This was a case of cascading disasters.

India is prone to such cascading disasters in several ways. Nepal experienced some such events after the April 25 earthquake. One instance of this was the landslides that killed large number of people, these landslides were second order disaster after the earthquake. Another such instance would be if a major dam or hydropower project, while still full of water, were to get damaged after the earthquake or a landslide. David Petley and EWF have indicated a third possibility when a landslide post earthquake were to create a dam on river, which would than be a bomb for the downstream areas when it inevitably bursts.

Geologists and environmentalists have said if a Nepal-like earthquake strikes any of the Himalayan states including North East India and Bhutan, there will be a large scale destruction and death owing to compounding of disasters due to hydropower projects. Dr SP Sati from the department of Geology, HNB Garhwal University, Srinagar, said about Uttarakhand hydro³³, "Barring Tehri Dam, which is rock and mud-filled structure, most of the hydropower dams in Uttarakhand are made up of reinforced concrete cement. The ability of these dams to withstand high-intensity tremors is highly questionable. They could collapse and lead to a large scale death and destruction downstream." Tehri dam is also yet to be tested, considering the large number of landslides that have already occurred in its catchments.

Climate Change compounds the problem The possibility of compounding or cascading disasters is further compounded by two additional reasons. First is the climate change. As it was apparent in Uttarakhand flood disaster of June 2013, while the unseasonal rainfall was the primary reason, the Kedarnath shrine and downstream Mandakini & Alaknanda & Ganga River faced bigger floods due to the glacier lake outburst flood. The third compounding factor in that case was the massive silt dumped on the riverbed by the under construction hydro-power projects.

This factor of under construction and operating hydropower projects adding several layers (e.g. deforestation, blasting, tunneling, minding, muck dumping, damming, to name only a few) to the cascade of disasters is something that is not even acknowledged, leave aside assessed or factored in decision making process.

In conclusion It is high time we wake up to these clear dangers staring at us. However, the Union Ministry of Environment & Forests (MoEF) is busy diluting environmental governance in India. Just a day before the April 25 earthquake, the Expert Appraisal Committee on River Valley Projects was sitting to consider the massive 6000 MW Pancheshwar Dam on Mahakali river on

Nepal-Uttarakhand border. SANDRP, MATU, Toxics Alliance, Himal Prakriti, Dr Bharat Jhunjunwala and a number of other groups & individuals have written to the EAC why this project should not be given even first stage (Terms of Reference) clearance. But the way

Indian Prime Minister Mr Narendra Modi and Nepal Government signed the agreement when Indian PM visited Nepal last year, it seems difficult to believe that wiser counsel will prevail. In fact current government is pushing more hydropower projects in Uttarakhand, some like massive Lakhwar Dam on Yamuna without so much as Environment Impact Assessment and public consultations.

It is clear from above how the hydropower projects were damaged during the earthquake and they in turn can be cause for deaths and damages. Post earthquake, hydro industry website noted that the future of Nepal's hydropower development will inevitably now demand significantly greater attention to structural integrity in the face of seismic events. As Martin Wieland, Chairman of the ICOLD Committee on Seismic Aspects of Dam Design, concluded in his 2012 paper that dams are not inherently safe against earthquakes.

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When I had an opportunity to meet a Union Government Secretary & past and current senior officials of the Disaster Management apparatus at the Doordarshan News program to discuss the aftermath of the Earthquake and I raised all these issues, they said yes, there are environment impact assessment that is supposed to

look into such issues! Such faith in these EIAs that are proved to be such unreliable documents is touching! But the stakes here are so high, we need to react much more strongly.

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- ¹ <http://www.imd.gov.in/section/seismo/dynamic/CMONTH.HTM>
- ² <http://www.theguardian.com/world/2015/may/12/nepal-hit-by-second-huge-earthquake>
- ³ <https://twitter.com/NEoCOfficial>, <http://drrportal.gov.np/official> status as on May 29, 2015
- ⁴ <http://www.hindustantimes.com/world-news/kathmandu-raised-by-a-metre-everest-has-sunk-by-an-inch/article1-1343115.aspx>
- ⁵ <http://www.thehindu.com/news/national/hundreds-of-indians-stranded-in-nepal/article7141955.ece>
- ⁶ Introduction from the blog itself: “Dave Petley is the Pro-Vice-Chancellor (Research and Enterprise) at the University of East Anglia in the United Kingdom. His blog provides a commentary on landslide events occurring worldwide, including the landslides themselves, latest research, and conferences and meetings.”
- ⁷ <http://blogs.agu.org/landslideblog/2015/04/26/nepal-earthquake-2/>
- ⁸ <http://indianexpress.com/article/india/india-others/centre-halted-ndma-bid-to-prepare-states-to-deal-with-earthquake/>
- ⁹ <http://www.hindustantimes.com/india-news/nepal-earthquake-india-s-quake-monitoring-network-bureaucratic-bottleneck/article1-1342366.aspx>
- ¹⁰ <http://indianexpress.com/article/india/india-others/expert-talk-nepal-better-prepared-than-india-to-withstand-strong-earthquakes/>
- ¹¹ <http://www.cctv-america.com/2015/05/02/chinese-workers-stranded-at-nepal-hydropower-station-return-home>, <http://www.thethirdpole.net/chinese-dam-workers-stranded-after-nepal-quake>, http://www.theecologist.org/News/news_analysis/2855302/in_nepals_next_big_earthquake_hydropower_dams_threaten_catastrophe.html
- ¹² <http://www.chilime.com.np/rasuwigadhi/>
- ¹³ http://zeenews.india.com/news/south-asia/200-chinese-workers-stuck-in-earthquake-hit-central-nepal_1589319.html
- ¹⁴ <http://www.tamakoshihydro.org.np/>
- ¹⁵ <http://www.nagariknews.com/economy/hydropower/story/37443.html>
- ¹⁶ <http://myrepublica.com/economy/item/20398-earthquake-damages-over-dozen-hydropower-projects.html>
- ¹⁷ <http://www.circleofblue.org/waternews/2015/world/nepal-earthquake-damages-hydropower-dam/>
- ¹⁸ For details see: <https://sandrp.wordpress.com/2014/08/02/massive-landslide-blocks-sunkoshi-river-downstream-nepal-india-under-threat/>
- ¹⁹ <http://ewf.nerc.ac.uk/2015/04/25/nepal-earthquake-likely-areas-of-landsliding/>, interesting to note that the Tata Institute of Social Sciences and Bihar State Disaster Management Authority are the two Indian partners listed on EWF website.
- ²⁰ <http://blogs.agu.org/landslideblog/2015/04/25/earthquake-in-nepal-1/>
- ²¹ <http://blogs.agu.org/landslideblog/2015/05/02/gorkha-earthquake-1/>
- ²² <http://mountainhydrology.org/nepal-quake/langtang-village>
- ²³ <http://blogs.agu.org/landslideblog/2015/04/29/langtang-1/>
- ²⁴ <http://www.ekantipur.com/2015/05/02/national/rescuers-recover-16-bodies-from-tatopani-landslides/404743.html>
- ²⁵ <http://www.icimod.org/?q=10391>
- ²⁶ <http://indianexpress.com/article/india/india-others/amid-exodus-a-landslide-claims-6-lives-in-nepal/>
- ²⁷ <http://indianexpress.com/article/india/india-others/this-one-was-big-but-the-big-one-is-yet-to-come-say-experts/>
- ²⁸ For details about the earthquakes mentioned in this section, see: <http://www.imd.gov.in/section/seismo/static/signif.pdf>
- ²⁹ <http://indianexpress.com/article/opinion/columns/the-assam-type-house/>
- ³⁰ <http://www.hydroworld.com/articles/2015/05/seismic-impact-on-himalyan-hydropower-development.html>
- ³¹ http://www.theecologist.org/News/news_analysis/2855302/in_nepals_next_big_earthquake_hydropower_dams_threaten_catastrophe.html
- ³² http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster
- ³³ <http://www.tribuneindia.com/news/uttarakhand/hydropower-projects-may-spell-doom-in-case-of-earthquake-say-geologists/74571.html>

Maharashtra Groundwater Management Authority: Can it lead by example?

One of the worst drought affected region of the country, Marathwada in Maharashtra, is reportedly drilling as many as 10,000 borewells¹ per month in this drought. In as many as 247 villages of Marathwada, the draft has exceeded recharge to such an extent that the aquifer has literally gone dry. Water in villages is plummeting by 7 meters of the 5 years average.² The density of borewells is so high that in villages near Tasgaon, a 40-50 square kilometer area has more than 210 deep bore wells. Officials from GSDA tell SANDRP of multiple instances where farmers only lose money in the hope of going deeper for groundwater, deeper than 800-900 feet.

Latest list of critical and over-exploited villages in the Maharashtra as per GSDA is alarming: **2331 villages in the state fall in watersheds which are critical or over exploited condition.**³ District-wise distribution of the villages is: 556 villages in Amravati, 137 in Buldana, 55 in Aurangabad (which looks like an underestimate), 14 in Jalna, 126 in Latur, 41 in Osmanabad, 292 in Ahmednagar, 385 in Jalgaon, 274 in Nashik, 172 in Pune, 91 in Sangli, 55 in Satara, and 133 in Solapur.

This groundwater crisis has moved the wheels of an established legislation:

The Groundwater (Management and Development) Act of 2009. Under this Act, the Maharashtra Water Resources Regulatory Authority (MWRRA), functioning as the State Groundwater Authority, has issued a public notice for comments in April 2015 to **“Notify” 76 overexploited and 7 critical watersheds**

in Districts of Ahmednagar, Amravati, Aurangabad, Buldana, Jalgaon, Jalna, Latur, Nashik, Osmanabad, Pune, Nashik, Satara and Solapur, to prohibit sinking wells deeper than 60 meters. SANDRP discussed this with officials in GSDA who confirmed that more than 1100 villages will impacted by this notification. However, no official communication has been sent to the Gram Panchayats about this. Currently, there is no institutional structure in place to enforce or monitor this restriction on pumping or sinking new wells. It is unclear how the notification has been

issued in the absence of any groundwork on the Act itself, whose rules are yet to be formulated. Senior Official from GSDA told SANDRP that appointment of the District Authority in form of Sub Divisional Officer (Prant) is expected to happen in a fortnight. It is difficult to understand how a one-person authority will enforce penal clauses in so many villages, full of a traveling boring mafia.

Time is opportune to analyse the situation in Maharashtra and the Groundwater Act itself which may finally see attempted implementation.

In Marathwada, plummeting groundwater levels has been one of the reasons for farmer suicides. Groundwater Irrigation due to its very nature throws up issues not only of sustainability of the resource, but equity in its distribution. It is one sector where regulation and monitoring gain highest importance but are entirely lacking in reality.

This is despite the fact that Maharashtra has already promulgated the **Groundwater (Management and Development) Act (GMDA)** in 2009, though it was gazetted only in 2013.

Maharashtra has been on the forefront of drafting new (and at times problematic) water laws, mainly pushed by World Bank funded Water Sector Improvement Project (MWSIP). The state promulgated the first Water Resources Regulatory Authority Act (MWRRA Act) in 2005. However, the state's performance in actually implementing any of the existing laws has been dismal to say the least. As put forth by Pradeep Purandare,⁴ even the Maharashtra Irrigation

Act of 1976, a parent act for many related legislations, has not been implemented fully in the past 38 years: the rules of this act have not been formulated till date. Maharashtra Water Resources Regulatory Authority, formed under the MWRRA Act was paralyzed for many years and then did not perform any of its duties assigned to it, as pointed out scathingly by the Hon. Bombay High Court.

Although Maharashtra has India's largest number of large dams, whopping 71% of the irrigated area in the state is irrigated not by large dams and canal, but through ground water. Experts peg this figure closer to 80%. In India, groundwater-irrigated area has increased 500% since 1960 and India is the largest groundwater irrigator nations in the world.

Can Maharashtra Groundwater Act (2009) regulate this sector?

(See SANDRP's Assessment of Groundwater in India here: <http://sandrp.in/groundwater/crisugrdwtr.pdf>)



Dry wells in Beed District, Marathwada Photo: Outlook

The Maharashtra Groundwater (Management and Development) Act 2009 ⁵ Despite its limitations, Maharashtra Groundwater (Management and Development) Act 2009 could be a useful and needed exercise, if amended and implemented in correct way. This is an attempt to broadly introduce the readers to the provisions and to look at spaces in the act which will allow Maharashtra to move forward from the earlier 1993 Groundwater Act, which largely remained unimplemented. This is not a detailed critique of the 2009 Act.

The preamble of the 2009 act states that this act is for “Sustainable, equitable and adequate supply of groundwater through supply and demand management measures to protect public drinking water sources.” The Law calls for a State Groundwater Authority which will have the powers to “notify” a region which is vulnerable to groundwater exploitation under the Act.

The constitution of this State Groundwater Authority is same as the MWRRRA but invitees include director of GSDA, one expert on Groundwater management and one lady representative working on groundwater issues. The institutional mechanisms recom-

mended by the Act include District Authority, District Watershed Water Management Committee, Watershed Water Resources Committee, etc. The State Groundwater Authority has the right to notify any region under this Act and can then completely ban sinking new borewells or pumping water from existing borewells for irrigation. Any use, including deep wells for drinking water will need to be regulated through the hierarchies of the institutions under the Act.

Unlike the 1993 Groundwater (Regulation for Drinking Water purposes) Act of 1993 which dealt exclusively with protecting drinking water sources, the 2009 Act also looks at regulating groundwater abstraction for irrigation, includes strong provisions for artificial recharge and rainwater harvesting, which is a welcome change.

In a notified region, the State Authority will form a Watershed Water Resource Committees which will work out groundwater use plan every year based on water budget and develop a Cropping Pattern suitable for the region. State authority can recommend complete ban on water intensive crops. Local authorities shall impose conditions on Rain water harvesting and any sinking of wells, even in non-notified region. The permission for sinking a well shall be subject to construction of artificial recharge structures. The Watershed Committee also has the right to ban or regulate Sand mining in rivers.

All the responsibility of “community participation” has been thrust upon the WWRC without any clarity. The WWRC will include 11 villages in the notified region and its chairperson will be the Chairperson of the concerned Panchayat Samiti. The logic behind “11 villages” is unclear. Members of the WWRC include one representative each from every Panchayat or Urban Local Body, one representative each

from Water Supply and Sanitation Dept, Water Resources Department, Agriculture Department, Animal Husbandry and Fisheries Department and GSDA, one representative from Water Users Association (WUA) in the notified area, elected member from Panchayat Samiti or Zilla Parishad as ex officio member, NGO representative as invitee, Block Development Officer as the Member Secretary. Women should constitute at least 1/3 rd of the quorum.

The District Authority (DA) will implement the decisions taken by this WWRC and will have the power to inspect wells being dug, or monitor use of existing wells, or rig owners, and check documentation, etc. The DA has the right to declare a Water Scarcity Area and water use will be restricted and regulated in this scarcity hit area for a limited period. Ironically, DA consists only of one official, Tahsildar or above. The entire inspection regime, which is most problematic, has been entrusted with this one officer, which is impractical.

Through this Act, the intuitional mechanisms are empowered to ban sinking, ban pumping in notified or Scarcity hit region, encourage artificial groundwater recharge, disallow water intensive cropping patterns, collect Cess (to be used for groundwater conservation), disconnect electricity connections of those violating orders, inspect wells and operations, inspect pumping water levels, confiscate instruments, etc. The Act has a penal provision of upto Rs 10000 fine for first offence and imprisonment upto 6 months and upto Rs 25,000 fine for habitual violations and also includes companies in its mandate.

Implementation There are some serious issues with the GMDA, most striking of which is constitution of WWRC only for notified area, a hazy and unspecified community participation aspect, and an extremely Panchayat-heavy constitution of the WWRC which can make surfacing of any complaints against violators difficult, as was experienced with the 1993 Groundwater

Despite many issues, looking at the breakneck speed at which aquifers storing water over millions or years are going dry, the groundwater regulation is still a needed and should be implemented urgently.

Unfortunately, after 2 years of its gazetting, the Act is still not being implemented AT ALL on ground.

Act. It also does not include any mandatory public hearing for either the Integrated Watershed plans being made by the District Committee or the watershed/groundwater plans and water budget made by WWRC.

When the I discussed the progress of GMDA with MWRRA Member, I was informed that **even the State Groundwater Authority has not been formed in the true spirit of the act. No special invitees have been decided till date in the State Groundwater Authority. No District Authority has been constituted, neither have the Watershed Water Resource Committees been formed in the absence of notification. There is no time specific plan to achieve this in place either.**

When SANDRP discussed this issue with senior officials at GSDA, they suggested that delegation of Powers under the Act should happen more swiftly and Director, GSDA needs to play a central role in the Groundwater Authority. According to water expert Pradeep Purandare, there is serious lack of homework and vagueness about the implementation of GMDA. The very central issue was not even discussed in the first (and the only) meeting of the State water Board, under the Chairpersonship of the Chief Minister.

While a notice to notify villages under the Act has been published, no work on encouraging groundwater recharge, improving public participation, education and outreach about the Act has been initiated.

Looking at the speed and the scale at which Maharashtra is being bored and drilled, State Groundwater Development Authority (MWRRA) urgently needs to put forth a time-bound program of action as per the GMDA. Maharashtra cannot afford one more largely unimplemented groundwater Act like the 1993 Groundwater Act.

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¹ <http://www.agrowon.com/Agrowon/20150228/4887008757425465194.htm>

² <http://indianexpress.com/article/cities/mumbai/drought-in-marathwada-ground-water-levels-dipping-every-year-focus-shifts-to-conservation/>

³ <http://www.mwrra.org/District%20wise%20MINI%20village%20%20list%2024.4.2015.pdf>

⁴ <https://sandrp.wordpress.com/2015/03/20/lawlessness-in-maharashtras-water-sector/>

⁵ <http://bombayhighcourt.nic.in/libweb/acts/Stateact/2013acts/2013.26.PDFFull> Piece: <https://sandrp.wordpress.com/2015/05/08/maharashtra-groundwater-authority-can-it-save-the-state-from-deep-trouble/>

Maletha; Redefining 'Development'

Placed in middle Himalaya, Maletha is a prosperous village of about 450 households in Tehri district of Uttarakhand. The village is 25 km farther from Devprayag and owns nearly 500 acres of fertile farmland next to Alaknanda River. Once barren, nearly 70% of the total agrarian land is under highly reliable irrigational facility which was created in 16th century by Shri Madho Singh Bhandari. The painstaking efforts have, till today, enabled Maletha meet its food grain need and check out migration.

The prosperity and peace of Maletha was breached in February 2014, with setting up of two stone crushers upwards village habitation. By August 2014, three more units landed on the village land turning a picturesque village into a war zone. Fearing worst, on 13 August 2014, villagers launched a movement under the banner of Maletha Sanghrash Samiti (MSS) demanding removal of all stone crushers from the village. When month long peaceful talks fail, villagers then resorted to *dharna* and *gherao* amounting pressure on local administration which in third week of September 2014 on 42nd day of movement ordered closer of the two operational stone crushers darkening the future prospectus of remaining three. Providing relief to crushers units Nainital High Court (NHC) in the first week of December 2014 dismissed the closer order and the units begun ferrying and piling up stones inside their premises.

Intensifying the protest Smt Sita Devi a village woman sat on a fast unto death on 20th January 2015. Tension prevailed in Maletha gram *sabha* when she was forcefully evacuated and administered fluids in Srinagar hospital on 11th day of her fast. The same day, Sameer Raturi convener of Himalaya Bachao Andolan (HBA) started indefinite hunger strike. On 7th February, 2015 the health of Sameer Raturi deteriorated and 72 women courted arrest while marching towards stone crusher units. The news spread like wild fire across hilly terrain generating wider support base from masses. In a damage control mode Chief Minister Sri Harish Rawat ordered closure of three crusher units with immediate effect and promised suspension of the remaining two in coming days. As a result, on 14th day the villagers withdrew the hunger strike decided to continue the movement until all

the stone crushers are removed. Village women despite their awful workload are supporting the movement as a backbone. Observing Govt. inaction over last two months on 25th May, Hamenti Negi sat on fast unto death. Glorifying Maletha villagers' remarkable struggle, it has been honoured with Shaila Devi Paryavaran Puruskar 2014. And finally, in a victory to the movement on 11th day (3rd June) of Hamenti Negi's fast, Commissioner of Garhwal ordered closure of remaining stone crush-

ers.

In conclusion: Model and pattern of development can't be centralised and uniform in naturally diversified regions with distinctive social, ecological, geo-physical and climatic conditions. I asked the people if there has been any environmental and social impact assessment, options assessment or public hearing regarding the proposed railway line and I was shocked to learn that there were none same with respect to stone crushers. Developmental plans must be democratic and participatory. That's what exactly the Maletha's villagers are asking for, to let them have a say in the decisions about projects affecting their life support system. Hence, any model of development has to be fine tuned with natural and cultural heritage and ought to aim at attaining sustainability and self-reliance.

The proposed 128 km long Rishikesh-Karan Prayag railway line costing more than Rs 4000 crore involves construction of 81 tunnels (half of the railway line will be inside tunnel) through fragile and landslide prone Himalaya hills

at the end reducing the road distance only by 25 km. The wounds and marks of devastating June 2013 floods are still alive and evident all along the Alaknanda valley to remind us of how unexpectedly Himalaya can react. It's also surprising how development agencies pretend to pose unaware of role played by

giant infrastructural intervention in amplifying the destruction and damage right from Uttarakhand floods of June 2013, Kashmir floods of Sept 2014 and March 2015 to the Nepal Earthquakes of April-May 2015.

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(Full story: <https://sandrp.wordpress.com/2015/05/12/maletha-redefining-development-to-protect-cultural-and-natural-heritage/>)

Yamuna Augmentation Canal Breach – A man-made disaster

A 75 feet wide breach on right bank of Yamuna Augmentation Canal (AC) has drowned vast agricultural land area falling Alahar, Palewala and Nachron villages in Radaur block of Yamuna Nagar district, Haryana. The breach reportedly occurred about 14 km downstream of Hamida Regulator around 03:00 am on 12th April 2015. Study of handful documents available online

indicate the incident was nothing but a man-made disaster. Here we share more detail on it

What went wrong: - As per villager ID diverts maximum amount of water into AC to meet Small Hydro Projects (SHP) demand and deliberately underplays capacity limit and dilapidated condition of AC. They also reveal that pondage of water by SHPs put immense pressure on weaken canal structure resulting in as breach in upstream areas. Parts of the AC embankment have fallen into canal at many locations and has not been desilted in last 42 years.

A similar incident occurred on 15 November 2011, when right bank of the AC breached at Thaska village just half a km upstream of Khukni SHP causing enormous damage to cropland. Farmers allege that the accident could have been avoided if the relevant department had timely repaired the canal. Exploring further it was learnt that though AC originates and flows through parts of Yamuna Nagar district yet maintenance and repair of the canal falls under Karnal Division jurisdiction. Obviously the farmers are paying heavily for ID's functioning and inaction.

Haryana Electricity

Regulatory Commission (HERC) order:- An order delivered on 28 July 2014 by HERC contributed greatly in exposing factors behind the breach. In 2012, Puri Oil Mill the owner of SHPs approached the HERC alleging that wrong information regarding AC that has led to reoccurring financial losses in SHPs. The company claimed that due to successive silt deposition in the AC upstream had disabled it to achieve the designed Full Supply Level (FSL) resulting in regular loss in power generation.

Countering the charges ID submitted that the company did not construct the designed slopes as per the approved

design. **It also stated that the continuous leakages in the AC led to a breach on 15.12.2011 at 500 m upstream of KSHP within the premises of the company**

due to the use of sub – standard material. ID also submitted that company was well aware that AC is an Irrigation Channel and not a Hydro Channel. Haryana Renewable Energy Development

Agency (HAREDA) also highlighted that AC on which these projects have been set up was in a dilapidated condition. A State Govt. constituted committee of Chief Engineers in its report on 09.09.13 revealed that **de-silting and bank strengthening of the canal was not done at the time of rehabilitation.** It also highlighted that nothing specific has been mentioned in MoU regarding responsibility among concerned parties for regular maintenance of any affected reach of the canal leaving scope for the disputes.

In the past the Haryana Irrigation Department has several failures on its records, including failure construction of Ditch Drain (2009), faulty rehabilitation of Hamida Regulator (2008) and at least two breaches of AC. In July 2010, the Ghaggar floods had also seriously exposed the serious lacunae in construction and maintenance of canals in Haryana.

In conclusion It is clear from the available details of the Yamuna AC breach that a number of man-made factors are responsible for the breach, including the release of unsafe quantum of water into the canal, lack of maintenance of canal both by the ID and the

operator of the Canal based hydropower projects, namely Puri Oils and lack of involvement of the local people in operation and maintenance of the Yamuna Canals. That such incidents have happened more than once in the past, without the concerned department learning necessary lessons increases the worry. It is clear from all this that a credible independent inquiry into the canal breach is required.

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(Full story: <https://sandrp.wordpress.com/2015/04/17/yamuna-augmentation-canal-breach-man-made-disaster/>, Local media persons and online addition contributed greatly)

Blow by Blow, How pollution kills the Yamuna River

Sri Manoj Misra, Yamuna Jiye Abhiyan and Bhim, SANDRP travelled along River Yamuna and tracked various polluting drains from source during 03-05 April 2015 upstream of Delhi.

The unseasonal rain in *Himachal, Uttarakhand* and other northern parts of India, in the months of March-April 2015 has kept Yamuna River flowing gently in dead lean season at different locations in Haryana at the same time, several drains were also seen continuously bringing more and more pollution load to river Yamuna.

Khewara, Sonipat Here the river had shifted to eastern bank post 2014 floods. Ongoing western disturbance spell kept the sky cloudy with gentle wind blows. The pleasant weather brought commuters to a standstill and who could not resist gazing the flowing river from the bridge. With onset of **Rabi** sowing period, demand for irrigation water were lowest, hence there was around 2000 cusec water being released into River Yamuna via **Munak** escapes.

Panipat Children from nearby villages were seen playing and swimming in the river. Relieved fishing community was back in action and so were the riverbed farmers, who had replanted their **Pledge** a traditional floodplain crop. As per our estimation there was around 1000 cusecs of water flow in river at Mawi. Indeed a flowing river was restored lives and livelihoods of dependent communities.

Gumthala, Karnal With fresh discharge of about 3000 cusecs of water the river started swelling. Several curious villagers and cheerful devotees thronged to river bank to see unexpected flow in Yamuna. Soon, vast sandy riverbed underwent water making it difficult to cross the river. Hence, a boatman started ferrying locals across the river which was forsaken in lean season.

Drain no. 6 & 8 Sonipat Drain No. 6 carries voluminous amount industrial and domestic effluent from Sonipat town. Drain No. 8 off-take at Kakroi head and carries raw water to Wazirabad Treatment Plant (WTP). Both drains carrying potable and polluted water run parallel for 10 km (with drain no. 6 lined separately inside drain no. 8). Before departing they intermix well with each other and create health hazards for general public. Drain No. 6 ultimately empties all its pollution

into Yamuna river via supplementary. During visit we found ongoing rain spell had slightly diluted Drain No. 6 pollution and flooded drain no. 8 with water. As a result drain no. 6 submerged inside drain No. 8 as if there were on drain no. 6 which dangerously polluted the potable water.

Drain no. 1 & 2, Panipat Drain No. 1 runs through Panipat town and industrial area collecting sewage as well as industrial pollution, which it dumps into drain no. 2 upstream of **Shimla Gujran** village in Panipat.

Officially, drain no. 1 carries about 75 MLD of treated/untreated waste water. We found that the 35 MLD capacity STP at Panipat was under up-gradation hence was non-operational. Drain no.1 was discharging all untreated pollution

into drain no. 2 as usual, which finally was reaching Yamuna River near **Atta** village, Panipat polluting the river irreversibly.

Dhanura Escape Yamuna Nagar - Dhanaura Escape is located in Yamuna Nagar district and Ditch drains brings huge amount of untreated industrial effluents into it, that in the end drains in Yamuna River in Karnal district. On the day of field visit, it was business as usual at **Dhanaura** Head. **Ditch** Drain laden with industrial pollution was seen falling into **Dhanaura** Escape. Interaction with villagers revealed that they have in the past raised the issue with their elected representatives at village and block levels but nothing has changed.

In conclusion It is clear from this field visit report that while the unseasonal rains this year have given a fresh life to otherwise dry Yamuna, the pollution from urban and industrial effluents goes on unabated under the new

state and central government, both of whom have declared their priority to rejuvenate rivers in general and Ganga Basin (Yamuna is part of Ganga basin) rivers in particular. However, as we can see above, we see no impact of such claims on ground, in fact there is absolutely no change in pollution situation or in treatment of Urban and Industrial effluents.

Bhim Singh Rawat (we4earth@gmail.com)

(For full story, see: <https://sandrp.wordpress.com/2015/04/13/blow-by-blow-how-pollution-kills-the-yamuna-river-a-field-trip-report/>)

New Publication from SANDRP!

Headwater Extinctions – Impacts of hydropower projects on fish and river ecosystems in Upper Ganga and Beas basins

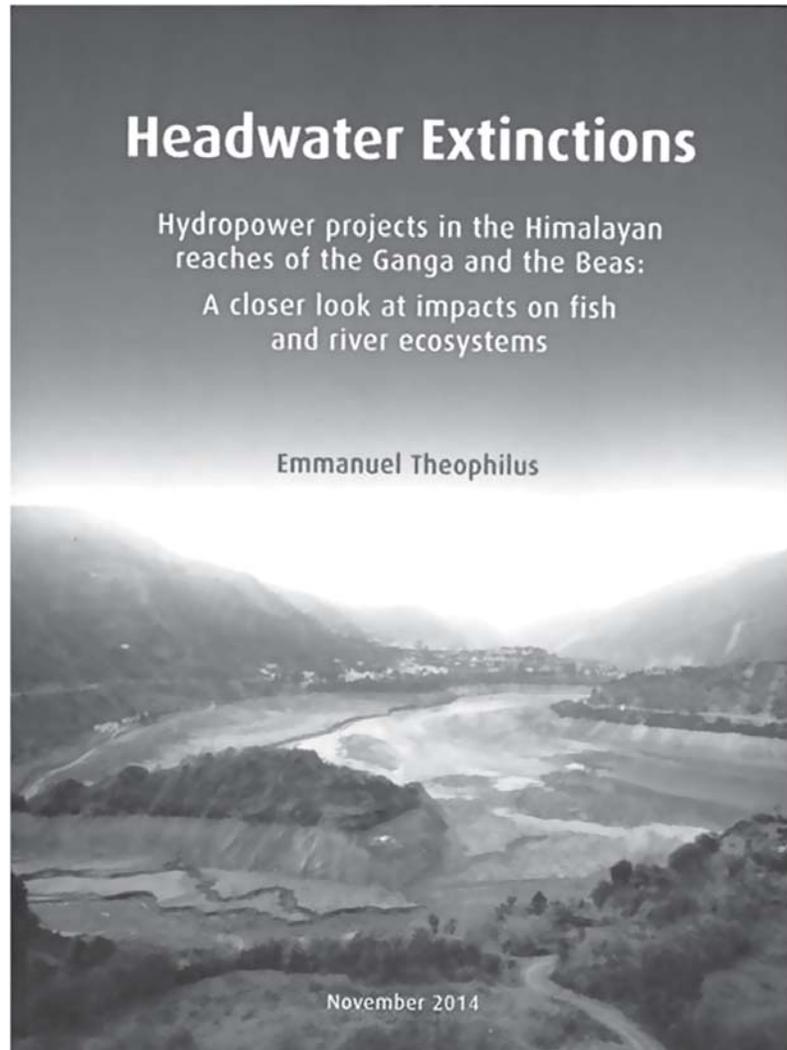
“I can’t help see a few things here, as perhaps you do? Bluntly put, I see slush funds being dangled to a whole range of possible collaborators. The kindest term I can find for them is ‘brokers’.”

SANDRP has just published a new report: “Headwater Extinctions- Hydropower projects in the Himalayan reaches of the Ganga and the Beas: A closer look at impacts on fish and river ecosystems”, authored by Emmanuel Theophilus, which was released at the India Rivers Week held during Nov 24-27, 2014. Headwater Extinctions deals with impacts of hydropower projects in Beas basin in Himachal Pradesh and Alaknanda-Bhagirathi basins in Uttarakhand on river ecosystem and its components, mainly fish. While the harrowing impacts of hydropower projects on local livelihoods and social systems are being realized gradually, we are yet unclear about the extent of impacts of these so-called green projects have on fish and aquatic biodiversity.

The author Emmanuel Theophilus is based in the Dhauliganga Valley and is an avid mountaineer, storyteller, ecologist and our ally. He has extensively travelled the two valleys, talked with locals and has analysed the EIAs and EMPS of the projects. We are very glad to publish the report as a first of the hopefully many steps to be taken to understand and address this important issue.

Dr Prakash Nautiyal, well known freshwater fish expert from HNB Garhwal University, Uttarakhand says about the report: “It is indeed excellent, many more pages can be written on the beautiful portrayal. I am flagging some concerns, in context of the whole issue.” His reflections on the report has been published on SANDRP blog, see: <https://sandrp.wordpress.com/>.

Soft copy of the report is available at: http://sandrp.in/Headwater_extinctions221114.pdf. Please write to us if you need hard copies at ht.sandrp@gmail.com. Suggested contribution is 200 Rs.



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