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Dams, Rivers & People

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Lead Piece

Why Inter-linking of Rivers is neither *necessary*, nor *Desirable*

The Supreme Court order of February 27, 2012, asking the government to "implement" the interlinking of rivers is very disturbing. It is not possible to dismiss it as a comedy or tragedy, even as we recall the famous Karl Marx quote, "History repeats itself, first as tragedy, second as farce."

If ILR is taken up before entire basin wide options are assessed and implemented, it is likely that we may end up finalising a project that will have no water, making the whole construction and costs incurred useless. If all the costs are counted, the local in basin water resources development and use would be more cost-effective, with less social and environment impact, and it is likely to be more sustainable and climate friendly. It would also be more democratic.

Firstly, as a number of legal and constitutional experts have said, the Supreme Court has no mandate to ask the executive as to what projects it should take up. In that sense, whether to implement the Interlinking of Rivers (ILR) and if so in what form is a subject that is entering the domain of the executive and hence is beyond the mandate of the judiciary.

A decade ago, a few days after the bench headed by then Chief Justice Bhupinder Nath Kirpal delivered a similar order on October 31, 2002 (he retired the next day), he was asked at a meeting at the Bangalore Law School about how he could pass such an order when the judiciary does not have the mandate to direct the executive to take up certain projects. Justice Kirpal reportedly said it was only a suggestion, not a direction, but then he was already retired!

Now in the same case, the recent order by Justice Swatantra Kumar also noted that such decisions are in the domain of the executive. In such a situation, the order of Feb 27, 2012 is uncalled for, unfortunate and erroneous.

The Supreme Court order asks the government to implement the interlinking of rivers, when there is no existing scheme to do so. In case of 14 of the 30 schemes, there is no existing feasibility report. The pre-feasibility and feasibility studies that exist are also all outdated, the water use pattern today has far outstripped availability in almost all basins. Including in basins like Ganga, Brahmaputra, Godavari and Mahanadi that the ILR assumes have surplus water. In any case, none of the water balance studies or pre-feasibility studies are in the public domain. The quality of the studies is so bad that National Water Development Agency is afraid to put them out in the public domain. In fact, I recall the then secretary of the Union water resources ministry being so exasperated with the poor quality of NWDA's work that he said in an open meeting about a decade and half ago that NWDA should be closed down. Moreover, for none of the schemes is there a detailed project report or environment clearance or any of the statutory clearances.

How can the apex court ask for implementation of a scheme for which neither a feasibility report nor a DPR exists, and the available studies are not only outdated but they have not passed independent scrutiny?

Some of the ILR (inter-linking of rivers) schemes have international implications, with a possible impact on countries like Bhutan, Nepal and Bangladesh. How can the SC ask for the implementation of a scheme to be taken up beyond the boundaries of the country?

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Each of the 30 schemes of the ILR is supposed to get through several statutory, legal and procedural steps. None of the schemes have gone through any of it. **How can the SC ask for implementation of a scheme where such legal steps are necessary?**

Andhra Pradesh, Maharashtra and Chhattisgarh say there is no surplus in the Godavari basin when ILR studies say they have. Bihar, West Bengal, Uttar Pradesh, Haryana say there is no surplus in the Ganga basin when ILR studies advocate the transfer of water from Ganga to non-Ganga basin areas. So where is the rationale for these ILR schemes?

In each such legal step, the answer could actually be no. Now with the SC order, will the concerned sanctioning authorities be forced to say yes when law seeks their judgement on whether the scheme is viable or acceptable? If they were to say no, will they be prosecuted under contempt of court cases? If not, how can the scheme be implemented?

Will the sanctioning authorities dare to say no when the SC has clearly asked the government to implement the project? Has the SC not invited violation of law? For example, in case of the Ken Betwa link -- the first interlinking project that the SC wants the special committee ordered by it to take up -- the project will submerge 4600 ha of the Panna Tiger Reserve and almost double that amount of forest land. The Union Ministry of Environment and Forests has already said no to the project and former Environment Minister Jairam Ramesh has publicly said that the project is a disastrous proposition. **Now will the Union ministry of environment and forests be forced to reverse its decision? A decision taken under specific law that the ministry is mandated to implement? Wont such a reversal than be illegal under that specific law?**

The SC order also raises another legal issue as pointed out by Shri Ramaswmay Iyer, does the order now debar judicial review of all ILR projects by any court? Won't this be against the fundamental constitutional arrangement?

As mentioned in the same Supreme Court order of Feb 27, 2012, several states have opposed ILR plans. It is also worth noting here that only ten state governments filed responses in the Supreme Court; rest of the states did not even bother to file a response. Three of these states filed affidavits opposing the ILR plan. Three others gave only a conditional nod; the conditions in most cases meant they were not in favour of the ILR plan as it stands.

Among the three others that filed affidavits agreeing to the ILR plan, Rajasthan has not agreed to sign the MOU for the Parbati Kalisindh Chambal link, seven years after the ruling United Progressive Alliance put that link among the top five Prioritised links. Even Gujarat was reluctant to agree to the Damanganga Pinjal project, till Maharashtra did a quid pro quo in agreeing to the Par Tapi Narmada proposal that Gujarat wanted. That agreement is only for a DPR. No state is ready to give water to another state. In India's constitution, water is essentially a state subject. **Can the SC ask states give up their constitutional role and to comply with its order?** That too when almost no state, except Tamil Nadu has accepted ILR project as a whole?

Several states including Kerala, Andhra Pradesh, Assam and Sikkim have already opposed ILR plans. Orissa and Chhattisgarh have said there is no surplus in the Mahanadi basin, despite the fact the NWDA (which has been in existence since 1982 with only job assigned to is to do studies related to ILR)/Union Water Resources Ministry says Mahanadi has surplus water.

Andhra Pradesh, Maharashtra and Chhattisgarh say there is no surplus in the Godavari basin when ILR studies say the basin is water surplus. Bihar, West Bengal, Uttar Pradesh, Haryana say there is no surplus in the Ganga basin when ILR studies advocate the transfer of water from Ganga to non-Ganga basin areas. **So where is the rationale for these ILR schemes?** ILR justifies this concept by saying that some river basins have a surplus and others have a deficit in terms of water availability.

You can arrive at such a conclusion only if you do complete options assessment including rainwater harvesting, watershed development, groundwater recharge, local water systems, optimum use of existing water infrastructure, improving water use efficiency, optimising cropping patterns, optimising cropping methods, demand side measurements, recycling where feasible. Do such assessment of potential and its realization at a basin or sub basin level. But none of the NWDA water balance studies involve such an exercise for a single basin or sub-basin in India. In fact the Union or any of the state ministry of water resources has never done such a study for any basin or sub basin in India.

I, as a member of the ministry of water resources' expert committee on ILR, have been asking for such a study, but I have been told that it does not exist for any basin. This means that we have no basis for arriving at the conclusion that there is a surplus or a deficit in any basin. In that case, there is not even scientific basis to arrive at an acceptable answer to the question if a basin has surplus or deficit water.

Why is the basin wide full options assessment necessary before the ILR plan can be taken up? Can the ILR plan

not be taken up simultaneously while other options listed above are taken up? The government says we are looking at all these options, but let us also take up ILR along with it. What is wrong in that?

Firstly, if you take up ILR before the entire basin wide options are assessed and implemented, it is likely that you may end up finalizing or worse, implementing a project that will have no water, making the whole construction and costs incurred useless. Secondly, if all the costs are counted, the local in basin water resources development and use would be more cost-effective, with less social and environment impacts, and it is likely to be more sustainable and climate friendly.

The equation that flood means surplus and drought means deficit shows hydro-logical ignorance. There are states like Orissa, Bihar, Andhra Pradesh, Gujarat, Maharashtra and even Tamil Nadu that face drought and floods in different parts of the river basin or year. This is even true for Assam. It holds true for surplus basins like Ganga, Brahmaputra, Godavari and Mahanadi and so-called deficit basins like Betwa, Chambal, Krishna, Narmada or Cauvery.

It would also be more democratic to first exhaust the potential of options listed above. Doing ILR before exhausting the in-basin options assessment and their realisation would thus be most unscientific, illogical and against the interests of the people of the basin.

In fact, no democratic exercise has been taken up in any basin to even find out the views of the people, starting from gram sabha onwards, as should have been done even before proposing the inter basin transfer of water.

When I, as a member of the Union Water Resources Ministry's Expert Committee on Inter-linking of Rivers, suggested to the Ministry and NWDA to consult the gram sabhas in the Ken and Betwa basins about need, possibility, optimality, desirability of taking up Ken Betwa river link proposal, they just point blank refused to do it.

They said water is a state subject and the centre cannot undertake such an exercise, only state governments can do it, even though they were doing all the work related to the inter-linking of the two rivers of the states.

Then I suggested: why don't you write to the state government to take up such an exercise? But they didn't do that either. This shows many things, but most importantly, it shows the lack of faith our water resources establishment has in the democratic process and the people. In the context of ILR, this shows that they have actually no sound case to claim that a basin has surplus water or deficit water.

In the specific context of the Ken Betwa link, it may be useful to know that the collectors of Panna and Damoh districts wrote to the Planning Commission and others to say that the only reason the Ken basin is seen to have a surplus is because very little of the potential of local water systems and irrigation has been developed in the backward upstream areas. If that potential were to be realised, there would be no surplus in Ken basin. This is another evidence to show that there is no scientific foundation to the claim that the Ken Betwa river link is justifiable. In fact we have shown how NWDA has manipulated the assumptions to show that Ken basin has surplus and Betwa basin has deficit. If same assumptions were to be applied for both basins, the surplus of Ken would simply disappear.

In fact, the equation that flood means surplus and drought means deficit shows hydro-logical ignorance. There are states like Orissa, Bihar, Andhra Pradesh, Gujarat, Maharashtra and even Tamil Nadu that face drought or floods in different parts of the year. This is even true for Assam. It holds true for surplus basins like Ganga, Brahmaputra, Godavari and Mahanadi and so-called deficit basins like Betwa, Chambal, Krishna, Narmada, Tapi or Cauvery.

There will be numerous environmental impacts of ILR including submergence of land and forests, destruction of rivers, aquatic and terrestrial biodiversity, downstream impacts, destruction of fisheries, salinity ingress, pollution concentration, destruction of groundwater recharge and increased methane emission from reservoirs, among others. Unfortunately there is no comprehensive assessment of all such possible impacts even for a single link in any credible way. Cumulative impacts will be greater than the addition of the parts in case of many of the serious impacts.

According to a paper I wrote in 2007, "This paper estimates that based on available information, the ILR will require at least 7.66 lakh hectares land and will displace at least 14.8 lakh people. In addition, ILR will need at least 20 lakh hectares of land for the canal network. ILR will also need at least 1.04 lakh hectares of forest land as per available official information." (www.sandrp.in/riverlinking/DRR_paper_0107.pdf)

Today, when land is scarce and at a premium, to even consider a project that requires large swathes of land and that displaces millions of people, and whose feasibility, viability, optimality or desirability is doubtful, is not going to be acceptable for the populations that would be affected.

The National Council of Applied Economic Research paper that the SC order quotes clearly says that NCAER has not done any environment impact assessment or

social impact assessment or options assessment or assessed if the ILR is the best options available or if it is even feasible option. It assumes ILR is feasible and will happen and then estimates what will be the economics, without even knowing what the social, environment or opportunity costs are.

Pertinently, the SC order quotes NCAER study saying that Bhakra dam created an irrigation of 6.8 million ha in Punjab and Haryana. This is completely wrong. Even as per Bhakra dam objectives set at the outset, it was to achieve an irrigation of 1.15 million ha irrigation in Punjab and Haryana, one sixth of the figure quoted in SC order. In actuality Bhakra never achieved even that figure!

Clearly, the NCAER study and the SC order that depends on the study uses grossly inaccurate figures. Here it may be noted that use of such grossly inaccurate figures seem to be plaguing most of those who support the ILR.

For example, the strategic writer Brahma Chellaney is so wrong in some basic facts, so he writes in a recent article: "India, however, is downriver to China and gets almost one-third of all its yearly water supplies from Tibet". But that is totally wrong. Even as far as Brahmaputra is concerned (Chellaney talks about the whole of India, not just Brahmaputra), India gets hardly a sixth of the water from Siang or Tsangpo that China, it is feared, will divert.

In fact if the water resources establishment is interested in water security in deficit or closed basins like Krishna, than it should stop the completely, wasteful diversion of about 3.4 billion cubic meters of water every year out of water deficit Krishna basin to the water surplus west flowing rivers. This is almost criminal, and no attempt is being done to reverse this, when it is technically feasible do that. That quantity of water is sufficient for 3 to 4 mega cities like Delhi each year!

It is true that we need to store our rains to make it available after the rains. But for that, we have many storage options. We first need to use groundwater aquifers that have become and are becoming empty, we need to use local storage options, we need to desilt local water systems on regular basis say through MGNREGA and we need to ensure optimal use of existing large storages. We are not doing any of these.

Actually India's water lifeline is **groundwater.** Over 38-39 million hectares of our irrigation, out of total net irrigated area of 62 million hectares, comes from groundwater. 85-90 percent of rural drinking water, around 55 percent of urban and industrial water supply comes from groundwater.

With each passing day our dependence on this is increasing with more and more proportion of our water coming from this source. And whether we like it or not, such dependence is only going to increase. But our current use of groundwater is not sustainable. We need to make groundwater sustainability the focus of our water policy, plans and practices if we want our water lifeline to sustain. We are not taking any credible steps in that direction.

Our water resources establishment refuses to acknowledge the central position of groundwater for our drinking water and irrigation security. They continue to spend 70-75 percent of water sector budget on big dams (as is the case for the ongoing 11th Five Year Plan), the large dams actually reduce groundwater recharge due to destruction of downstream river and also other contingent loss of forests, wetlands and local water systems. ILR will actually destroy ground water recharging systems on a massive scale directly and indirectly, it will make our water lifeline even more precarious.

In last 20 years, since 1991-92 when our net irrigated area from M&M (Major and Medium) irrigation projects reached a peak of 17.79 million hectare, it has never again reached that figures, as per govt figures. The NWDA director general suggested to me that some states are not reporting correct figures. Fact is that the states are happy to exaggerate their achievements, but even if we were to correct for some under reporting, it still does not change the picture in any material way. In this period we have spent over Rs 200 000 crore on big irrigation projects, but not adding any area to net irrigation!

The net area irrigated by M&M projects have actually reduced by 1.5 million hectare. ILR is nothing but and extension of the M&M agenda. And we continue to pour money in that ineffective black hole. Union Finance Minister, in his budget speech for 2012-13 (the first year of 12th Plan) in March 2012 increased the allocation for the Accelerated Irrigation Benefits Programme by 13% to over Rs 14000 crores. There is clearly no hope at least now of any course correction in 12th Plan.

The biggest issue is that we have better options available, we are not using them, we are refusing to take them up with any seriousness, only lip service is being paid to such options and we are going for unnecessary, unviable, undesirable, wasteful and destructive projects like ILR.

It would be in interest of everyone that the Supreme Court reviews and cancels this order and instead asks the government to go for democratic, participatory, transparent and accountable water resources management. This is indeed necessary to ensure water, food, livelihood, energy and environment security of the people and the nation.

Himanshu Thakkar

(This was earlier published at: www.rediff.com/news)

THE SUPREME COURT'S JUDGMENT ON THE RIVER-LINKING PROJECT:

PLEASE PUT THE ORDER ON HOLD AND RECONSIDER

We, the signatories to this statement, wish to record our utmost concern at the Hon'ble Supreme Court's judgment of 27 February 2012 on the Inter-Linking of Rivers Project (ILR), on the following grounds:

(1) The judgment gives categorical directions to the Executive Government on a matter which is clearly in the executive domain, namely the implementation of a particular project.

(2) It gives the direction to implement the 'project', i.e., the grand design as a whole, at a time when none of the thirty projects that constitute that grand design has gone through the processes of examination, evaluation and approval and received final sanction. In fact, even the earlier stage of project formulation has not been completed in most cases; only three of the thirty projects have reached the Detailed Project Stage, and even these are not final.

(3) By declaring the project to be in the national interest it not only anticipates the result of the examination that is yet to take place, but also makes it extremely difficult for the various governmental agencies and Ministries to undertake a rigorous and objective examination.

(4) Its reference to "the unanimous view of all experts" that the project is "in the national interest" is patently untrue, because there is a substantial body of expert opinion that is highly critical of the project. Such a serious error would not have occurred if there had been consultations with scholars of various disciplines who have given thought to the matter.

(5) It fails to take note of, or treats lightly, the strong dissent on the part of several State Governments.

(6) The following is a succinct statement of the case against the project:

(i) Instead of starting from the identification of the needs of water-scarce areas and finding area-specific answers, the project starts by looking at a map of India, decides *a priori* that the rivers of India can and should be linked, and then proceeds to consider the modalities of doing so. This is a reckless and major redesigning of the geography of the country.

(ii) The related ideas of a 'national water grid' or the 'networking of rivers' give evidence of profoundly wrong thinking about rivers. Rivers are not pipelines.

(iii) The grand design consisting of 30 projects involving upwards of 80 dams is bound to have major environmental/ecological consequences, which might even be disastrous in some cases. Each dam will also mean the displacement of people to varying extents, and may cause injustice and hardship.

(iv) The Project is at variance with the growing recognition that it is necessary to move away from the long-standing engineering tradition of a supply-side response to a projected or imagined demand, and towards restraining the growth of competitive unsustainable demand for water in all uses.

(v) Assuming that some augmentation of supply is necessary, the project fails to consider alternative possibilities, of which there are several very good examples.

(vi) The idea of transferring flood waters to arid or drought-prone areas is flawed because (a) there will be hardly any flood-moderation; and (b) this project will be of no use at all to the drylands and uplands of the country.

(vii) The idea of transferring water from surplus to deficit basins is equally flawed because the very notions of 'surplus' and 'deficit' are highly problematic. The idea of a 'surplus' river ignores the multiple purposes that it serves as it flows and joins the sea, and that of a 'deficit' river is based on 'demands' on its waters derived from wasteful uses of water.

(viii) Careful, economical, conflict-free and sustainable intra-basin management should come first, and bringing water from elsewhere should be the last recourse.

(ix) The project holds the potential of generating new conflicts between basins.

(x) There are international dimensions to this project. Both Nepal and Bangladesh have expressed serious apprehensions that need to be taken into account.

Having regard to the points made above, we, the undersigned, would earnestly and respectfully urge the Hon'ble Supreme Court to put the judgment on hold and undertake a careful reconsideration of the entire matter. We would also respectfully suggest a study of the available literature on the subject, and consultations with several distinguished critics of the project.

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NO MINISTER, *PUNE DOESN'T NEED A NEW DAM, IT NEEDS PROPER WATER MANAGEMENT*

Pune, a growing metro from W Maharashtra represents the opportunities and challenges. It receives ample water, but is demanding more. There is a growing, painful competition between the urban centre and downstream towns, villages and agricultural area. In 2011, Pune area did not receive a good retreating monsoon. This and other factors have led to an acute water scarcity in the city. Just a week after the Municipal Elections got over in early March 2012, Pune is facing a sudden 50% cut in its supply. Now a number of purely supply-oriented options are being put forth as solutions.

Pune city gets its water from the Khadakwasla projects, a system of four dams: Panshet, Warasgaon, recently built Temghar and Pune's oldest dam, Khadakwasala on the river Mutha, a tributary of River Bhima. The combined live storage capacity of these four dams is 831 million cubic meters (MCM). From the Khadakwasla Dam, water is released for irrigation and downstream areas through the left bank and the right bank canals. Currently, closed pipeline brings about 80% of the water from the Khadakwasala dam, whereas approximately 20% is lifted from the canal by the Pune Municipal Corporation (PMC). All these dams are situated in the Western Ghat mountains, towards the west of Pune, about 20-50 kms away from the city. Pune is supposed to get 325.6 MCM water from these dams (actually gets more than 410.6 MCM) and to return treated water back to the canal after treatment (which it does not). See the table on next page for details on dams, the details as per the CWC National Register of large dams, 2009.

Deputy Chief Minister and erstwhile state Water Resources Minister Ajit Pawar has made a statement suggesting that PMC should build a new dam for city, on the lines of Mumbai (Lokmat Pune Edition, Front page Headline, 090312). By saying so he is echoing the thoughts of exclusively supply management approach which is prevalent in the Water Resources Dept as well as PMC.

Before coming to any such conclusion about need for a new dam, the Water Resources Dept needs to make a public statement about allocation of water from Khadakwasala, Warasgaon, Panshet & Temghar dams and Khadakwasala canals to various sectors, including Private Townships like Lavasa, Nanded City, Pune City, Industrial Area and Water Users Associations. This data should be analysed for equity and water use efficiency.

PMC should come out with a White Paper (not a two-page note in the Environment Status Report) about:

- Precise monthly need of the city and usage, with details of sectors, population & water use for each ward
- Current per capita w supply in various areas, sectors
- Projection of future need
- The amount of polluted waste water that PMC treats, with figures for each STP along with the input and output quality and quantity, design parameters and month wise figures of returns to the specific canal network & the river
- Full list of functioning bulk water meters and their month-wise readings
- Water audit that shows the sources, use, losses, sewage outputs and quality and quantity of treated and untreated sewage and where it is released

The White paper should also include the status of implementation of all options including the following.

Present Water sources within the city Pune sits amidst some excellent traditional water sources. The two Katraj tanks built across Ambil Rivulet, which supplied water to old Pune still harvest huge quantities of water. Volume of the Katraj lake alone is more than 3 MCM. So does the Pashan tank on Ramnadi, which supplied water to the Pashan area and University. The catchment area of this tank is over 40 sq kms Utilising such water sources within & around the city can help Pune's water security.

Watershed development work to be carried out on the hills surrounding Pune along with afforestation and reforestation. This will stop run off and increase ground water recharge. Pune city has a large number of wells which are now closed. These can be put back in use for conjunctive water use where appropriate.

Rainwater Harvesting How much water is being currently harvested (and/or recharged) in the city? Mapping aquifers is a critical step to planning rain water harvesting, which can be more effective if implemented through a comprehensive area based approach. Though the PMC has made RWH mandatory for new buildings, there is no monitoring to check if the system is in place and functioning. These systems need to be monitored.

For a phased program, initially rainwater harvesting should be made mandatory for even existing big buildings and complexes like government offices, shopping malls, movie theatres, industries, colleges and schools as well as open parks and water bodies under the PMC. The owners/ managers of these building should be given a deadline of 1-2 years to achieve functioning RWH systems, with publicly declared information how they do that and consequences to follow for those who do not achieve this in stipulated time and manner. The system should be monitored for its efficiency and steps should be taken against defaulters. Pune receives more than 700 mm rainfall annually. This means that a building with a roof area of 2000 sq feet has a runoff of 130000 litres annually. Considering 100000 litres of water is actually harvested, this can suffice water use of two people for an entire year (at around 135 lpcd).

This is to indicate the potential of RWH, which is currently unexplored in Pune. According to GSDA report, groundwater levels in the city have dropped by over 8.75 m. Recharging groundwater using the existing 5000 borewells & 400 open wells can help.

Name of the Dam	River	Design Purpose	Ht above lowest foundation (m)	Year Completed	Gross Storage Capacity (MCM)	Live Storage (MCM)
Panshet (Tanaji Sagar)	Ambi	Irrigation/water supply	63.56	1972	303	294
Warasgaon (Veer Baji Pasalkar)	Mose	Irrigation/Hydro power	63.40	1976	374	275
Temghar	Mutha	Irrigation	42.5	2000	107.9	101
Khadakwasla	**Mutha**	**Irrigation/W supply**	**32.9**	**1880**	**86**	**56**

Waste Water Treatment and reuse Pune produces over 744 Million litres/ day sewage of which less than 30% is treated. The 7 Sewage treatment plants (STP) run at less than 50% of their designed capacity in addition to huge quantity of sewage which flows in the river directly. Pollution caused by Pune is wreaking havoc with the riverine ecosystem and downstream areas of Indapur, Daund towns and settlements around Ujani Dam and as far as Solapur. Fish kills are common in the river and the reservoir. MPCB River Water Quality Status Report from 2007-09 lists 30 stations with 'very bad' Water Quality Indices out of which **a staggering 16** are from Pune and Pimpri Chinchwad Municipal Corporations!

Pune has been spending huge amounts on setting up STPs. The General Body meeting on 29th Feb 2012 said that Rs 51 crores has been kept aside from the current Annual Budget for 10 more STPs. But why do we not see any results? Why are there no credible external audit of the efficiency and functioning of these sewage treatment plants? Why are there no transparent, accountable, participatory governance mechanisms for each STP?

Losses It has been estimated that wastages and leakages in Pune's water supply system are over 40%. Answering a question in General Body Meeting of PMC in Sept 2011, the PMC Water Supply Dept had agreed that it does not have the figures of water wastage and leakage and no projects have been undertaken regarding this for past 4.5 years. Pune did not have functioning bulk water meters then and it was nearly impossible to comprehend where losses came from. Pune urgently needs to adopt metering system and follow example of towns like Amravati where the city with Maharashtra Jeevan Pradhikaran overhauled its ageing water system and set up District Metering Areas (DMA), each with 500-2500 connections per DMA and a bulk water meter at the entrance of each DMA. This can be done without any privatisation or huge loans from the World Bank, as is being proposed for Pune.

Demand Side Management Pune needs to assess the water consumption by various sectors and sections and see where it is possible to reduce the unwarranted, wasteful use. Those who use higher than minimum quantity needs like Water Parks, swimming pools, etc., should be made to pay at higher rates for the water they consume. Hotels, Malls, multi storey offices, and such other users can also be asked to put in their own STPs to recycle maximum possible quantity of water in a time bound manner. Here we can learn from Mumbai, which provides only 90 lpcd water and has asked the citizens to reuse their wastewater in case more in needed. This has also helped in setting up small STPs by apartment complexes and offices in Mumbai.

River Encroachment and Concretisation Under the guise of River improvement and river restoration project, streams and river sections are being channelised and put in pipes, severely affecting groundwater recharge and flood absorption, besides killing the stream and river section biologically and socially. Instead of exclusively focussing on such investment-intensive river destruction options, Pune needs to work on river and stream restoration through citizen's participation urgently.

Democratic Water Governance Accountable water governance where the citizens are participant and aware of the investments and projects, can monitor progress and participate in the functioning of departments is a necessity for efficient water use in Pune.

The respected Deputy Chief Minister quoted the example of Mumbai and how it is building dams in surrounding areas. **What he forgot to mention was that these dams will be coming up at a huge societal and ecological costs, profiting only the contractors and babus.** More than 30000 tribals will be displaced for these dams which will submerge more than 14000 hectares of rich Western Ghat Forests and villages. Work on many of these dams is going on ILLEGALLY, without any environmental or other statutory clearances in place. In fact work on one of the Dams, Kalu has been stayed by the Bombay High Court recently because it does not have the requisite permissions and also because the ecological and social impacts are very high, but have not even been assessed.

Keeping all these factors in mind, it is entirely unjustified for a city like Pune, which has not worked seriously on any of the options for reducing and reusing its water, to simply ask for a new dam. This new dam will be built at a great cost to a vulnerable society and ecosystem. Pune does not deserve this at least till all options listed above are assessed and exhausted.

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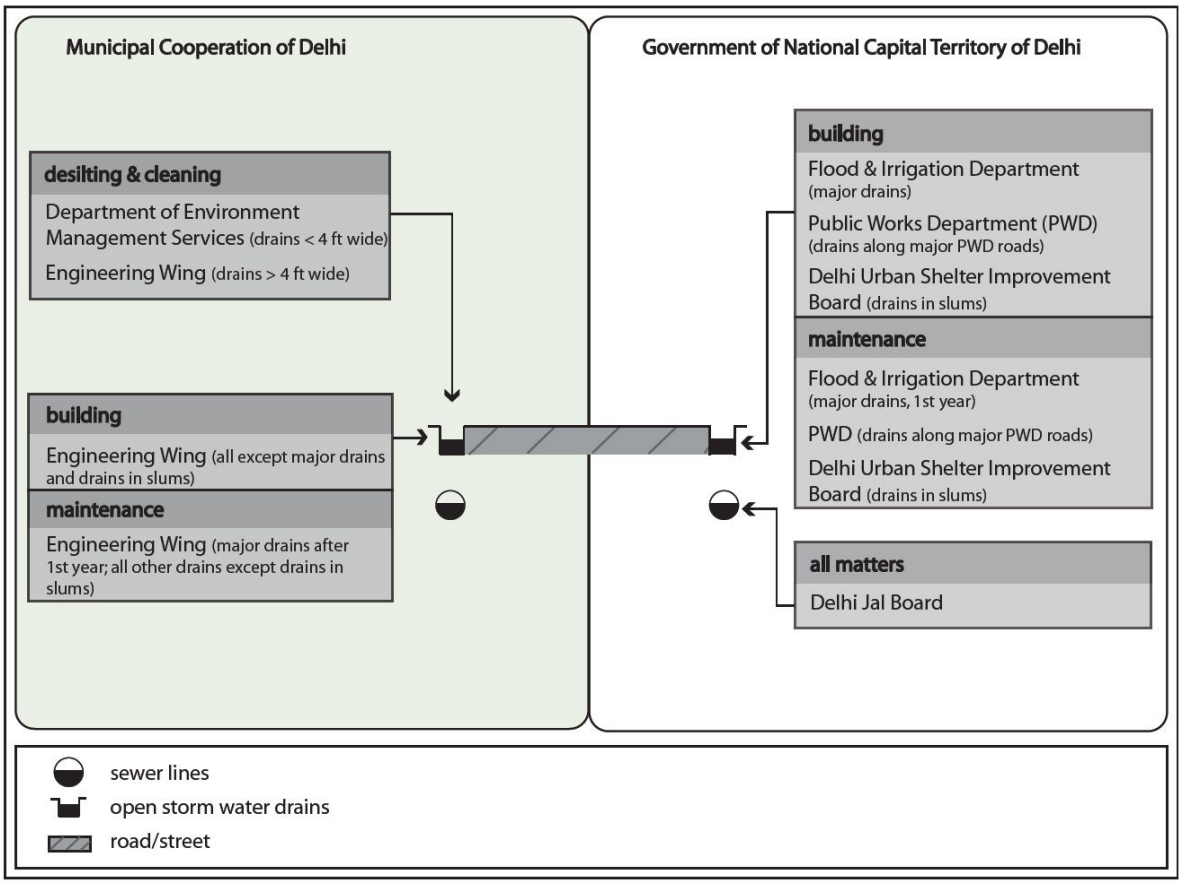
Fragmented governance, divided cities:

The need for an integrated view on urban waste water*: A Case Study of Delhi*

Anna Zimmer (anlouve@googlemail.com)

It is a well-known fact that the Yamuna River, and especially its Delhi stretch, resembles more a "sewage channel" than actually a river. Especially outside the Monsoon season, one can hardly talk about "water quality" in the capital, as in this period of the year, the full volume of Yamuna water is diverted north of the city for water supply to its residents; the urban part of the "river" is then made up exclusively of drain water, i.e. sewage. Figures are highly disputed, but it is estimated that at least 1,789 million litre out of the 3,267 million litre of waste water that Delhi generates are discharged into the Yamuna every day untreated through the 19 major drains of Delhi (CPCB 2004: 2). It is therefore not surprising that the Delhi stretch is declared biologically dead, and levels of dissolved oxygen are near zero once the river enters the city (CSE 2007: 89). Also, coliform bacteria counts are several millions above the permissible levels for bathing standard (ibid.: 90; see also GoI Ministry of Environment & Forest 2009: 46).



While this is unfortunately no news, this article wants to discuss the approach taken to tackle this issue so far and argues that no sustainable and just solutions are likely to come up until an integrated view including political & social reasons behind river pollution is achieved.

It is striking in the debate that such an integrated view that connects the politics of fresh and waste water, vulnerable populations and rivers is vastly lacking. In the official narrative, river pollution is explained almost exclusively by population growth and migration in combination with lack of funds. In Delhi's Ministry of Urban Development, for example, an anonymous interview partner stated: "There is one root cause for the environmental problem: No politician is willing to touch the population issues. The day politicians will start saying no more than two kids [the problem will be solved]" (interview, 27/10/2009). Somewhere down the line, so goes the promise, there will be enough money, migration will be under control, and even the last couple will have opted for the small family model – and then problems will be solved on their own. River pollution is thus isolated from its wider political context: **policy-makers seem to believe that the status of our rivers can be addressed (or redressed) without addressing the question of governance and the highly unequal living conditions in our cities.** However, to solve the pollution issue, it is high time to understand the connection between our ecology and our social and political urban landscape better.

A first point to raise is the governance set-up. When studying – as one example amongst many – Delhi's urban waste water cycle, it turns out that each fragment of the mosaic is handled by a different agency. The Central Pollution Control Board monitors the water quality and pollution levels of major rivers, such as the Yamuna.

The Delhi Pollution Control Committee monitors the water quality of the Yamuna in Delhi, as well as certain drains, groundwater bodies, and ponds in the city; it also supervises Common Effluent Treatment Plants and treatment plants of hospitals among other responsibilities. Concerning waste water collection and treatment facilities, in Delhi alone no less than eight, and probably even more, government agencies at both state and municipal level are responsible for various tasks. The major agencies and their respective responsibilities are depicted in the figure on the previous page; besides, DDA builds drainage infrastructure in its colonies, and DSIIDC is responsible for drain construction, too.

When studying Delhi's urban wastewater cycle, each fragment of the mosaic is handled by a different agency. No less than eight, and probably even more, govt agencies at both state & municipal level are responsible for various tasks. As a result of this institutional (& mental) fragmentation, there is no state actor which is officially assigned the responsibility of sewage that does *not* flow in the sewer lines – i.e. wastewater in or from unconnected areas.

As can be seen above, the sewer system, and thus sewerage, ought to be dealt with in all matters by Delhi Jal Board. **Yet, in practice, the sewer system covers only between largely a half and two third of Delhi's population** (different data is given on this, NIUA 2005: 115, GoI Ministry of Environment & Forest & GNCTD Planning Department 2001: 43). Where sewer lines do not exist, the storm water drainage system is used for evacuation of human waste (black water) and (so-called grey) waters from kitchen sinks, clothes washing and bathrooms.

This system is inherently flawed: The open drains have a slope of 1/150 200 inch (~0.6%), as opposed to slopes that are five to ten times steeper (3 6%) in sewers, because they have been constructed exclusively for storm water drainage, as Delhi Jal Board points out. With lower slope (and thus slower flow) any solid material such as faeces and garbage is much more likely to deposit in the open drains, creating blockages and subsequent overflow.

But officially at least state actors are in denial: storm water drains are not acknowledged as integral part of Delhi's sewerage story. This shows for example in the letter of the Conservancy and Sanitation Engineering Department (predecessor of the Department of Environment Management Services) in the appendix to the Delhi Master Plan 2021: here the department holds that its responsibility consists exclusively in the "disposal of storm water drainage" (DDA 2006: A 36).

Yet, because the internal storm water drains of residential areas are used for the evacuation of municipal waste water, the absurd situation arises that the Department of Environment Management Services ends up handling large parts of Delhi's sewage without the pertaining mandate to do so. As a result of this institutional (and mental) fragmentation, therefore, there is no state actor which is officially assigned the responsibility of sewage that does *not* flow in the sewer lines – i.e. all waste water in or from unconnected areas.

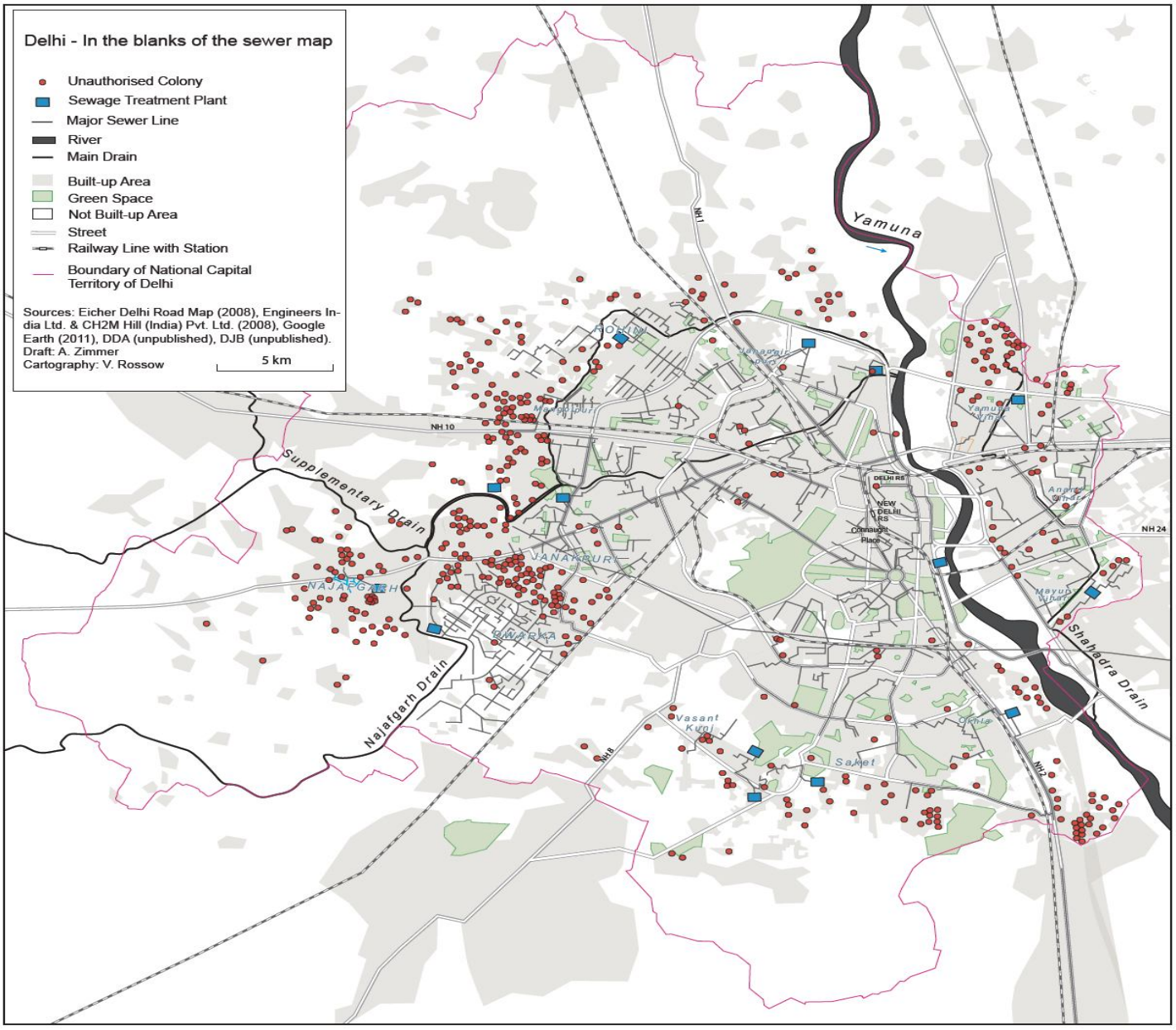
Chasing the dream of a completely sewered capital, vast amounts of money are currently being poured into the construction of ever more sewer lines, new treatment plants, and the covering up of drains (maybe hoping that out of sight, the problem might be out of citizens' minds?). In 2011, it was expected that phase III of the Yamuna Action Plan will be approved soon. Under this phase, Rs 1,656 crore of Japanese loans would be spent with a focus on expanding Delhi's sewer system in order to tackle pollution (The Hindu 2011).

Moreover, the National Ganga River Basin Authority was founded in 2009 to revive river 'clean-up' initiatives. While the Government of India invests 556 million USD, the World Bank has granted financial support of 1 billion USD to this project on May 31, 2011 (making it a total amount of 8,262 crore Rupees).

Plans are (among other goals) to vastly expand the sewer systems and number of sewage treatment plants in the basin (World Bank 2011). Most recently, Delhi Jal Board announced extending the sewer network, renovating pumping stations, rehabilitating sewer mains and increasing the capacity of the several Sewage Treatment Plants at a cost of more than Rs 552.5 crore, partly financed through JNNURM (The Hindu 2012).

Yet, at the same time, DJB announces projects such as the interceptor sewer to come up. **This project shows very clearly the second main concern regarding how waste water is framed in current urban governance: the disassociation of ecological concern and social (and environmental) justice.**

The interceptor sewers are to be built along Delhi's three main drains – Najafgarh drain, Supplementary drain and Shahadra drain – and are meant to capture the sewage from areas without sewer system before it enters the main arteries that would transport it straight into the Yamuna: a classical end-of-pipe approach. At an estimated cost of Rs 2,455 crore, this is another mammoth project in the 'clean-up' mode with the objective of an "effective abatement of pollution in the River Yamuna and improve(…)[ment of] water quality" (Engineers India Ltd. & CH2M Hill (India) Pvt Ltdl 2008: 1).



Yet, this project is not very likely to be successful even in terms of enhancing the quality of water in the Yamuna as it leaves out crucial factors such as the waste water quantity added to the drains due to extensive groundwater use, the malfunctioning of existing sewage treatment plants , the lack of fresh water flow in the Yamuna outside of the monsoon, and the fact that pollution levels are actually higher than assumed in the Detailed Project Report (CSE 2009: 16-19).

More seriously still, addressing exclusively the aspect of river pollution, residents of unconnected areas are left out of the project equation, and are literally left to dwell in the sewage that overflows from their open drains: As the sewage is to be trapped at the outlet of internal drains into the major drains, this means that in the best of cases, the ecological status of these drains (and subsequently the Yamuna) will enhance. In the residential areas, in contrast, nothing will change: sewage will continue to flow (or stagnate) in storm water drains, exposing residents to its pollutants almost on a daily basis. Although designated by Jairam Ramesh, then Minister of Environment, as "interim measure" (The Times of India 2011), the high investments in these drains and the even higher investments that would be needed for covering the whole city with sewers makes the supposed temporary character of the project very unlikely.

Moreover, the political leverage of the populations concerned is not the best: *The map above shows how the lack of sewer connection concerns to such a very significant degree residents of unauthorised colonies*. Slums, too, fall almost exclusively in the category of

unconnected residential areas (although this would not be visible at the scale of this map as smaller slum pockets are inserted in otherwise connected colonies). It is therefore mainly the 'informal Delhi' that suffers from the current waste water governance.

In such unconnected areas, inhabitants face regular overflow of sewage onto streets, and partly into houses. The situation worsens significantly during the monsoon months when overall city drainage systems touch (or overstretch) their limits. Next to practical problems of daily life, this presents a major health hazard.

It is therefore mainly the 'informal Delhi' that suffers from the current waste water governance. In such unconnected areas, inhabitants face regular overflow of sewage onto streets, and partly into houses. The situation worsens significantly during the monsoon months when overall city drainage systems touch (or overstretch) their limits.

It is therefore not surprising that 7.5% of all deaths in India are attributable to deficiencies in safety of water, sanitation or hygiene (Prüss-Üstrün et al. 2008: 38). By far the highest number of these deaths is due to diarrhoea and its consequences.[1] Expressed in disability adjusted life years, water, sanitation and hygiene related diseases are even responsible for an estimated 9.4% of all years lost in the country (ibid: 39). In terms of financial costs, it is calculated that India looses 2.4 trillion Rupees or an equivalent of 6.4% of its GDP due to inadequate sanitation in urban as well as rural areas (WSP 2010).

As a consequence of more frequent exposure to waste water, public health problems are identified especially amongst the residents of urban informal settlements (UNDP 2006: 48 51). This does obviously not concern the capital alone: in a study on Chennai, slum residents for example have been found to bear catastrophic economic costs of disease burden, with up to 22% of monthly incomes lost due to direct or indirect costs of ill health (Sakdapolrak 2010: 317). In Delhi, slum inhabitants have also recorded higher morbidity than other urbanites (Singh 2009: 207 & 212).

Apart from health risks, residents of these areas struggle with the insult to their dignity and social wellbeing that constantly overflowing or blocked drains mean to them. Research in an unauthorised colony and a slum cluster in Delhi revealed how inhabitants suffer from living in what they perceive to be a "fourth class" colony (interview with Naseem Begum[2], 13/11/2009), or to have to live like "insects" (interview with Meena, 17/09/2009) – being ridiculed by visiting relatives from smaller towns and villages, feeling discriminated against in comparison to residents of adjacent authorised colonies, and facing an overwhelming sense of neglect vis-à-vis government agencies and politicians that remember them only in times of elections.

In the best of cases, complaints to the political representative or the local administration lead to short-term solutions when scavengers are sent to clear blocked drains. Yet, this strategy mostly works if people get together in a group – something especially daily wage labourers find difficult to do as time directly translates into (meagre) incomes. And even then, complaints are no guarantee for relief, and the response often takes too long. Seeking relief from government agencies unsuccessfully, residents then spend a significant amount of time cleaning drains manually as well as money in trying to prevent overflow through other means.

But these means are difficult to agree upon amongst neighbours. Several households cover the drains parts in front of their house, but thus make cleaning more difficult. Some residents put a grid in the open drain where their plot starts, trying to prevent garbage to settle in front of their house, but thus create even more blockages for those who live 'upstream'. Others would like to hire private scavengers but find their neighbours are not ready to contribute money for this. Again other households suffer more because their houses have become very low with raising levels of concrete to repair internal lanes.

They are frequently left to clean the drains of the whole street if they want to avoid overflowing sewage to enter their ground floors, because better-off families who could rebuild their houses do not feel concerned any more. One of the consequences of insufficient public scavenging services therefore is that communities have to deal with numerous conflicts among neighbours. **Life in unconnected areas is therefore even tenser than it already is due to difficult economic situations.**

Next to time and money invested in these small scale and temporary solutions, inhabitants of unauthorised colonies – usually better educated and connected than those in slum areas – have tried to seek better service provision through court cases. But this avenue is not easily accessible: in the investigated colony, cases have for example been dropped as the petitioners were not able to attend all the court dates. Nevertheless, more scavengers have been allocated to the area – because

[1] India thus is positioned 104th amongst 152 WHO member states for which data are available.
[2] Names have been changed for sake of anonymity.

the municipal administration got scared, according to residents' impression.

The documented stories of neglect and ongoing struggle are appalling and loudly call for change. Yet, it is high time not for more crores and lakhs of rupees, or more engineering solutions – it is high time to frame river pollution differently.

Therefore, it is imperative to create forums where different actors, from inhabitants to local politicians, NGOs to administrators, can come together to assemble the elusive and fragmented story of our dying rivers.

An integrated appreciation on waste water, as we have seen, needs to achieve both: a comprehensive view of the urban water cycle, and a deep understanding of (and commitment to) the social and political dimension of this water cycle.

Continuing to leave storm water drains out of the sewerage equation will lead to continuously underestimating waste water quantities, and the dimension of the problem we are trying to address. Equally, turning a blind eye to the fact that more than half of Delhi's citizens simply cannot afford living in areas which are connected to the sewer lines will not allow to clean the Yamuna, or any other river for that matter.

It is just too likely that even after a new round of augmenting the sewer network, large areas will remain undeserved and keep relying on internal storm water drains. Instead of chasing the ever-escaping goal of a fully sewered city and spending lakhs of crores in order to do so, therefore, **policy makers would be well advised to work towards options of waste water treatment that are cheaper, localised, and less prone to technical problems.**

It should allow for incremental infrastructural improvement such as effective collection and treatment of sludge from pit latrines, and envisage using existing drains for example as spaces for biological waste water treatment. Ultimately, however, in order to handle urban waste water in an integrated manner, the need is for ways of including citizens' experiences, knowledge and concerns in the governance of river pollution and the urban water cycle.

Only if the informal and unconnected Delhi gets a voice will the urban waste water problem show in all its dimensions. Therefore, it is imperative to create forums where different actors, from inhabitants to local politicians, NGOs to administrators, can come together to assemble the elusive and fragmented story of our dying rivers.

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Managing Embankments to Manage Disasters

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Status of Flood Control in the Country Central Water Commission reports that the average affected area within the country due to floods is 75.5 lakh hectares (almost the area of Assam or Jharkhand) and on an average a population of 3.29 crores (more than that of Kerala) is hit by floods every year. The average area where the crop is lost every year is 35.4 lakh hectares and 12.18 lakh houses are washed away in the floods every year (rendering a population more than that of Bangalore homeless). Cattle loss is estimated to be around 95,000 annually and the human lives lost amount to 1589, on an average.

There are, inherent problems with embankments in dealing with floods and it is essential to understand that when a heavily silt laden river is embanked; the sediment gets trapped within the embankments, pushes the bed level successively upwards necessitating the raising of the embankments also. There is a practical limit to which the embankments can be raised and maintained. The river water seeps through these embankments and cause water logging in the countryside.

These losses have occurred despite building nearly 34,000 kilometers of embankments along the rivers, 39,000 kilometers of drainage channels, raising and protecting 4716 villages above flood level, protecting 2358 towns and building 58 raised platforms at a cost of Rs 17,237.48 crores during 1952-2006. Only 182.22 lakh hectares of land is reported to have been protected till 2006 according to the CWC Reports while the flood prone area of the country is reported to be 400 lakh hectares. **This means that more than half the flood prone area of the country is yet to be protected.**

The country had 5280 kilometers length of embankments in 1947 which got increased to nearly 6,000 kilometers in 1954 according to the Report of Rashtriya Barh Ayog (1980). Some 28,000 kilometers length of embankments were added during the plan period till 2006 and this has singly been a major intervention by the state as far as flood control is concerned and needs to be examined.

Controversial Technology of Embankments Building embankments along the rivers has been a major intervention by societies and the states to protect the countryside. These are essentially mud walls of trapezoidal section designed to prevent the river water from entering habitations on the countryside of the embankments and this has probably, been the most ancient method of dealing with the floods. The countryside is deprived of the nutritious silt that it could have got if the river was allowed to flow freely. The embankments prevent the flow of the tributaries from getting in to the main river and sluice gates have to be constructed to allow the tributary water to flow into the main river.

These sluice gates cannot be opened during the rainy season because there is a possibility of the main river water entering into the tributary and flooding newer areas hitherto unknown to flooding. The tributaries, on their own, may start flowing parallel to the main river outside, again flooding new areas. It can be suggested then to embank the tributaries also and in that case the rainwater between the embankments of the main river and the tributary may get trapped. The only route for this water to escape is through evaporation or seeping into the ground. Or else, it may have to be pumped into either of the streams. Should any of the embankments breach, then the people residing between the two embankments will meet their watery grave.

No embankment can be guaranteed against breaching, not even in the USA or China. The cost of relief & rehabilitation would offset all the benefits that have accrued over the years in case of one single breach. It was for these reasons that the British, having failed to tame the Damodar River, never repeated the mistake till they ruled India.

The debate whether embankments increase the floods or decrease them, is yet to be resolved amongst the engineers. The engineers escape any debate by saying that every river has its own special characteristics and should be dealt with separately. They also take advantage of approving or rejecting any embanking scheme depending upon the social or political pressure brought on them. The arguments for or against the embankments are, apparently, technically so sound that nobody can point his finger towards them. **The fact is that the benefit of this inconclusive debate goes to the politicians who take the decision on embanking the river & engineers play only a subservient role.**

The British Government found it uneconomical to check floods by embanking rivers; their engineers spoke the same language. The Government after independence of India wanted the rivers to be tamed at any cost, the engineers of the regime spoke the same languages as convincing scientific arguments were available to both.

People Are Also Divided There are many strong views about the Embankments. Some of these are:

1. Those living within the embankments want that the embankments should be demolished immediately and they see no debate over the issue. They even try to breach the embankments during the flood season.
2. Those living close to the embankments in the countryside remain confused whether they want the embankment or not. Water logging, loss of fertility of soil, threat of a breach during rainy season, mass destruction of life and property after a breach makes them talk against the embankments. Fact remains that nobody wants to face a breaching embankment and despite all the opposition to embankments, they patrol the structure during the rainy season so that no damage is done to it. It often leads to conflicts between embankment busters and the saviors.
3. There are a sizable number of people who see the flood problem as that of drainage and want more and more passage through all the structures like embankments, canals, railway lines, and roads that impede flow of water. This would automatically solve the flood problem, they feel. The state too appreciates and advocates this in all its reports but never works in that direction.
4. Those living far away from an embankment where floodwater never reaches after a breach, generally, favor the embankments on the plea that it might be doing some good to the people out there. They, in fact, have no opinion because it never concerns them. Unfortunate part of the entire game is that such people outnumber those who have some opinion, for or against, the embankments. **Most of the decisions about embankments are taken by those who are not affected by them.**
5. There are people who feel that the embankments are here to stay and the state will go all out to continue with their construction and rebuild them in case of a breach and there is no people's power that can thwart the efforts of the state.

There was time in 1950s when the embankment victims fought a pitched battle against the state when Kosi embankments were being built. There is no leadership available now that can mobilize people to oppose such constructions. Hence the approach should be made to live with the embankments. The problem here is that one day in future, it will not be possible to push the river back within the embankments after the breach, before plugging the breach. The rising bed level of the river within the embankments will prevent that. That day, the new course of the river will have to be embanked trapping more and more people within them. This is what happened with the Hwang Ho in China.

Unfortunately, embankments are the only convenient upland available and most people living within the embankments spend nearly four months on the embankments. Unmindful of the fact that these living on the embankments are the victims of flooding, erosion, or water logging, the government tries to evict the people from the embankments which the dwellers find impossible as there is no other place to go and that often leads to conflicts in which the flood victims have a history of always losing.

6. The government suggests that the real solution to the flood problem for the middle Gangetic plains lay in construction of dams in Nepal. The response of the other side is cool to this problem but it helps the government and the engineers to pass the buck of their miseries to somewhere else.

Without going into the merits of different versions of opinions about this technology of embanking and assuming that the embankments are there to stay and that the government will always plug the breaches (it calls flood fighting as one of its sacred duties) and, as a corollary, force some people to live within the embankments and some facing the fury of the river in case of a breach, **how does one deal with the situation?** Here are some suggestions:

Situation – 1 Recognize that there are people living permanently within the embankments

The country has, at the moment, about 34,000 kilometers length of embankments that run parallel to the rivers. A sizable number of population lives within embankments as, unlike oustees of dams, they were not given any land anywhere and were supposed to live in rehabilitation plots in the protected countryside and cultivate their land that was located within the embankments.

It is reminded here that there are 414 villages (380 villages of India and 34 of Nepal) located within the embankments of the Kosi with a population of nearly 1.2 million. Within the two embankments of the Mahananda in Bihar, there are 66 villages, the Kamla has agricultural lands of 104 villages within its embankments and the Bagmati has entrapped 95 villages within the embankments. The details about the Gandak and the Burhi Gandak are not available.

Most of the displaced people chose to stay back in their old villages as living in the rehabilitation site and managing agriculture at a distance of three to five kilometers was not a viable proposition.

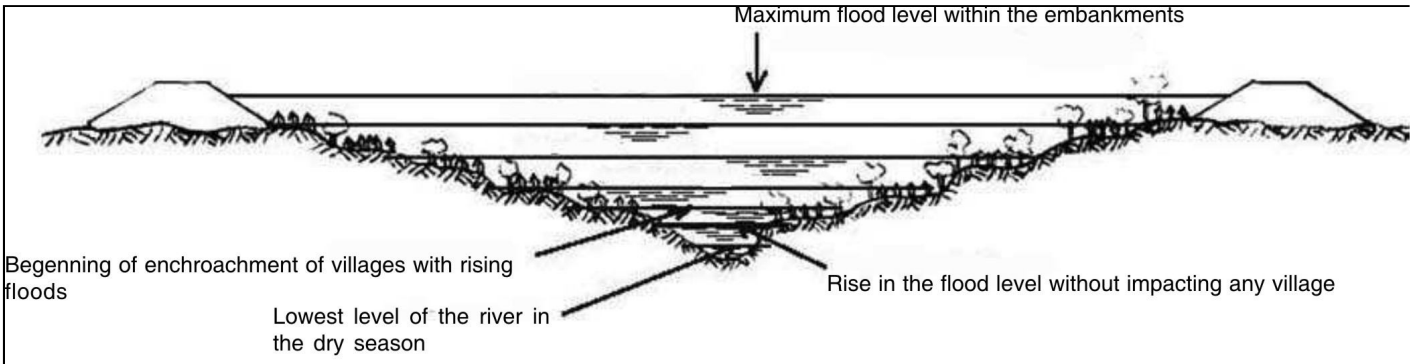


Fig. 1 : Sequence of flooding of the villages with rising flood level in the river.

Most of the rehabilitation plots got water logged later for the reasons stated above and that also forced people to move to their respective old villages. Of late, the state government has started making disaster shelters for the flood victims but there is no order in that and most of the citing of locations is done under the influence of local political heavy weights. Here is what could be done for providing shelter to the people trapped within the embankments.

Find the sequence of inundation within the embankments in case the embankment is intact Referring to Fig. 1, we can visualize the location of villages within the embankments. Water Resources Department of the state and the Central Water Commission keep a running record of the flood levels of the rivers and the discharge passing through the embankments. If we know the gauge level of the river within the embankments at any place, it is possible to predict whether a village is going to get inundated or not or whether the people living there have to be moved to a safer place. These 'safer places' can be decided in advance and if a flood shelter is to be built, one can plan its location and capacity that it will have to accommodate the population and live stock. Once a decision is made on the numbers, one can easily assess the number of boats needed to move the victims, quantity of food and fodder that will be needed, arrangements of drinking water, medicines, and sanitation could be planned accordingly. One can also plan the retreat of the people and cattle as the villages start emerging out of water.

This exercise should be repeated for every two to three kilometers length of the embankment and all the plans made to suit the local needs.

Situation 2: Life within the embankments coming to a standstill in case of a breach A breach in the river embankment does not change the situation upstream of it as the flood continues there as usual but on the downstream side within the embankments, the floodwater disappears very fast below the spot where the breach has taken place and within few hours, only a very nominal water remains in the river there. This means that the boats will get stuck wherever they are, the material supply, if any, will get terminated at that point and so will be the movement of people. One will have to wade through mud and silt and the cattle are also put to the same inconvenience. **This is a situation worse than inundation where all sorts of movements come to an end.**

Referring to Fig. 1, we can visualize the location of villages within the embankments. Water Resources Department of the state and the Central Water Commission keep a running record of the flood levels of the rivers and the discharge passing through the embankments. If we know the gauge level of the river within the embankments at any place, it is possible to predict whether a village is going to get inundated or not or whether the people living there have to be moved to a safer place.

The establishment often takes a stand that these people were given rehabilitation & that they are living in a place that they are not supposed to. Sometimes, the local administration refuses even to give relief to these unfortunate victims. (This had happened in Saharsa in 1986 and 1995-96.) There is no ready answer to this problem and the matter needs to be debated thoroughly. **Those living within the embankments of the Kosi after the breach at Kusaha in 2008 suffered the same fate with no one to look after them and no one ever questioning where the flood water of the Kosi would have gone if the breach had not taken place?** With dried river, they failed to get whatever Rabi crop they used to get in a normal year.

Situation 3: There is a breach in the embankment & the river mauls the people living in the protected

countryside In case there is a breach in the river embankment, the water will gush through the settlements in the protected countryside depending up on the levels of the land.

The surges that emerge out of the breached embankment invariably sweep through neighboring villages as it is they who bear the brunt first. It takes time for the water to fill all the depressions and reach the end point which again, in most cases, is the river that it had left earlier. That is the normal occurrence.

If the river water finds a favorable slope, it might enter another river and add to its flow causing inundation and breaches there. Sometimes, there is a reverse breach in the embankment because of water logging in the countryside and in that case the stagnated water from the countryside will gush into the riverside of the embankment and may cause similar damages if there is a village close by within the embankments.

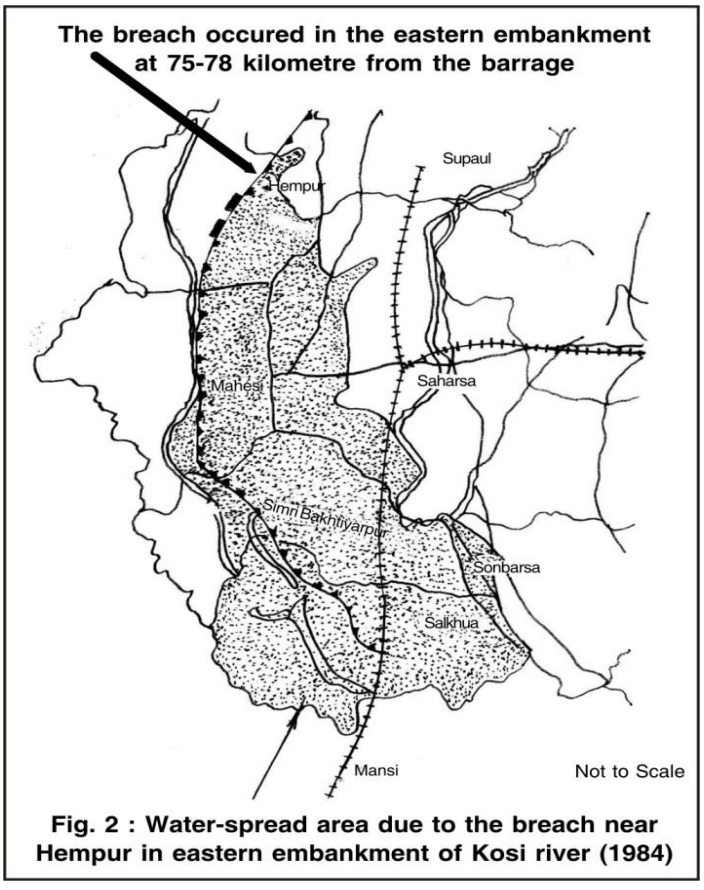


Fig. 2 : Water-spread area due to the breach near Hempur in eastern embankment of Kosi river (1984)

Such a situation had actually occurred in case of the Bahuarawa breach of the eastern Kosi embankment in 1980 and the 1984 breach of the Kosi eastern embankment at Belwara sluice in Saharsa, as the floodwater tried to re-enter the river in lower areas.

These are different settings once a breach occurs. But, let us analyze the normal situation in case of a breach in the embankment when the river water comes out into the protected countryside as shown in Fig.-2.

Disaster Management Departments of the flood prone states should have the necessary skilled human resources to plan disaster management with the help of MIS that will be really effective and streamlined if the suggested process is followed. There is vast scope of building up on this suggestion and what all has been said should not be taken as final view because there are many more variables that will have to be looked into.

The inundation in the countryside will depend on the flood level of the river, discharge passing through the embankments and the levels of the countryside. It should be possible to assess the water spread area and the depth of inundation in the countryside and the time taken for it to reach various locations if the contour maps of reasonable accuracy are available.

Inundation maps of earlier breaches in the embankment and the time taken to reach various points would be very useful in making such calculations. Assessment of time taken for the water to reach a particular point is very crucial in planning safety operations. This will also help in planning evacuation, the man power and equipments / machinery needed to move human beings and their belongings to safer place.

This exercise will also reveal what will be the safe place for a particular discharge and a particular gauge reading. It should be remembered that breaches in the embankments are a common phenomenon and if we can assess the extent, depth and sequence of inundation; it should be possible to locate the flood shelters.

This exercise should also be repeated for, say, every third kilometers length of the embankment so that the travel distance and travel time of the people to move to safer places is short and manageable.

Conclusion Disaster Management Departments of the flood prone states should have the necessary skilled human resources to plan disaster management with the help of MIS that will be really effective and streamlined if the suggested process is followed. There is vast scope of building up on this suggestion and what all has been said should not be taken as final view because there are many more variables that will have to be looked into.

Let a beginning be made somewhere.

Dinesh Kumar Mishra (Convenor-Barh Mukti Abhiyan)

DAMS

Silt eating into storage capacity of Karnataka's dams Accumulation of silt in major reservoirs over the years has started to severely affect water storage in Karnataka. Hydrological surveys reveal that seven reservoirs, including Tungabhadra and Almatti, have accumulated silt that has reduced the storage capacity of these dams by a staggering 1390 MCM (Million Cubic Meters).

Tungabhadra dam has been the worst hit from the accumulation of silt. According to hydrological survey conducted by the Water Resources Development Organisation, the loss in storage capacity of Tungabhadra dam (constructed in 1953) is 793 MCM, Narayanapura dam, constructed in 1982, has already accumulated silt that has resulted in loss of storage capacity by 283 MCM, reducing the original dam capacity by 27 per cent. Significantly high rate of siltation has been witnessed during recent years. In Tungabhadra, the loss of capacity between 2004 and 2008 is 24.66 MCM/year which is twice the assumed rate of siltation (12.1 MCM/year). Loss of forest cover in catchment area, erosion due to mining, industrialisation and urbanisation and no catchment area treatment have resulted in the siltation rate increasing over the years.

Capacity loss due to siltation (MCM)

Reservoir name	Original capacity	Present capacity	Loss of storage	% loss	Rate of siltation per year
Tungabhadra	3737.5	2944.7	792.8	21	15.57
Malprabha	1245.8	1160.9	84.9	6	7.84
Bhadra	2010.3	1953.7	56.6	3	1.44
KR Sagar	1387.4	1359.1	28.3	2	0.51
Narayanapura	1075.9	792.8	283.1	27	11.50
Almatti	3482.6	3341.1	141.5	4	11.55
Hipaargi	99.1	96.3	2.8	4	0.40
Total	13038.6	11648.6	1390	-	-

The government-appointed 'Task Force for Quality Assurance in Public Construction' has now come forward with a proposal to desilt the reservoirs on a long-term basis. The silt removed can be used by farmers as it is rich in soil nutrients and fertile for agriculture. The Task Force has proposed to take up Doopadal, downstream of Hidakal dam, as pilot project. According to the task Force members, Doopadal reservoir has 85 per cent silt accumulation.

Other measures that the task force has recommended include Construction of barrages across rivers and making water user charges mandatory. Making more barrages across rivers will not address the root cause of siltation, but bring in more problems. Significantly, Almatti, Naraynapur and Tungabhadra were the same dams that overflowed, leading to flash floods in 2009 in Karnataka and Andhra Pradesh. The sedimentation has affected the crop growing pattern in many of the downstream areas. The staple diet of North Karnataka is jowar (sorghum). The reduction in storage capacity of the dam has also hampered supply of water for irrigation, impacting the crop.

Siltation has been actually eating away into our extremely expensive storage capacity built at huge social, environmental and economic costs. A detailed report on siltation of reservoirs by SANDRP can be found at: http://sandrp.in/dams/reservoir_siltation_in_india0906.PDF. The analysis in 2006 concluded that we are we are losing about 1.95 BCM of our Large Storage capacity annually to siltation. In economic terms, this means we are losing reservoir capacity worth Rs 5.53 crores daily! Please note these are 2006 figures.

According to a 2004 study commissioned by the Centre for Wildlife Studies and Ashoka Trust for Research in Ecology and Environment and conducted by hydrologist Dr Jagdish Krishnaswamy and conservation biologist Dr Ullas Karanth of Wildlife Conservation Society, at least 53 to 67 per cent of the total silt load entering the Bhadra reservoir in Karnataka from the Kudremukh mining area of the Kudremukh Iron Ore Corporation Limited. This causes serious damage to the river basin and the wildlife in the area. During the 2002 monsoon alone, over 68,000 tons of sediment load was estimated at Neelibeedu, downstream of the KIOCL mining area at Malleswara. This included a single day when heavy rainfall led to over 19,900 tons of sediment being discharged into Neelibedu," the report records. (Deccan Herald 08012004, India Today 280112, Deccan Herald 290112)

Conservation Reserve to be formed at Jawai Bandh Rajasthan will soon accord the bio-diversity rich Jawai Bandh forests in Pali district the status of a conservation reserve. The rich forests and the water bodies along the **Jawai dam** in Sumerpur tehsil have a large presence of crocodiles. The wildlife census in 2011 had put their number at 288. The standing committee of the Rajasthan Board for Wildlife under the chairpersonship of Minister for Environment & Forests Bina Kak, cleared the new conservation reserve under Section 36 of the amended Wildlife Protection Act, 1972. The reserve is fifth in the category in the State. The conservation reserves, a concept introduced in the Act through the amendments, replaces the "closed area" concept.

Located in the south-western transition zone of the Aravallis on the Jawai River and the Luni river basin, and in close proximity of Kumbalgarh sanctuary, the Jawai dam was built in 1957 for drinking water. Considered to be an ideal location for sighting crocodiles, the area also has a large presence of turtles, fishes and aquatic birds. The Jawai Bandh terrain was declared a closed area in 1983 and after the 2002 amendments it ceased to exist in that category. Ms. Kak said the creation of the conservation reserve would promote eco-tourism and help preserve crocodiles, aquatic life in the dam and the leopard and wolf population in the forest. (The Hindu 090212)

DAMS FOR MUMBAI AND SURROUNDING AREAS

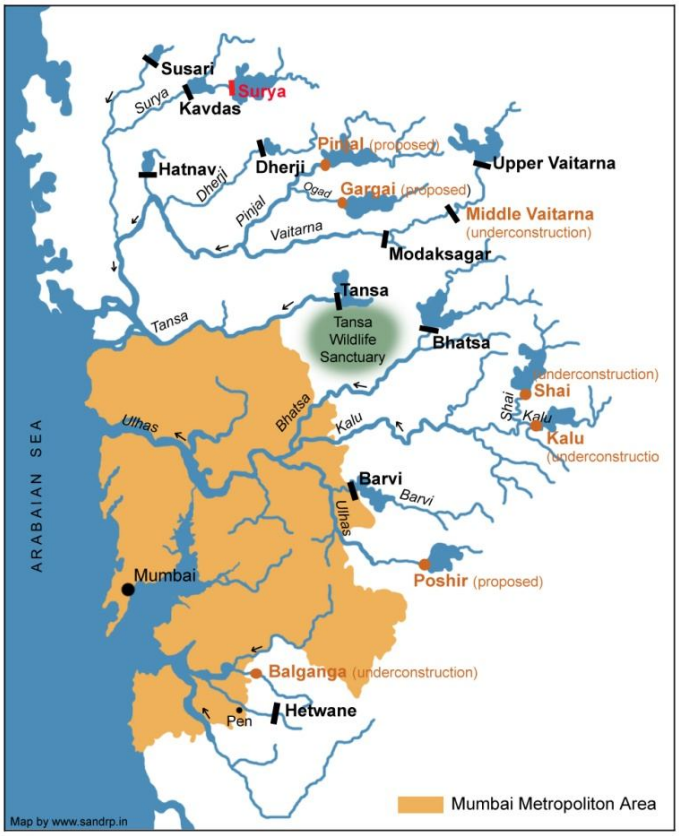
High Court Stays work on Kalu Dam

In a significant decision and a major respite to local communities and ecosystems, the Bombay high court has stayed the construction of Kalu Dam in Murbad block of Thane District. Main reason stated is absence of permissions that the state government is supposed to get from the Union Ministry of Environment and Forest (MoEF). The stay would continue for three months until the ministry decides on the proposal seeking permission.

"The private construction company appointed by the state government cannot undertake any activity unless further permission is given by the court," said the division bench of Justice DD Sinha and Justice VK Tahilramani.

The bench directed the MoEF to decide on the state government's proposal, seeking permission for development on forest land within three months. The Forest Advisory Committee of MoEF has two months to submit its recommendations based on the report submitted by the Chief Conservator of Forest (Central) in the ministry for consideration. Thereafter, the central government has to take a decision on it within a month. **In an affidavit, the state government admitted that work on Kalu dam in Murbad began in October 2010 without permission from the Centre and MoEF.**

The MoEF had carried out a site inspection in January 2012 and the report submitted by the CCF, Shri. J.K. Tewari, said the construction should be **stayed** as the state govt had not got the necessary permissions. The report has also severely criticised the functioning of the state machinery, stating that it **"had no respect for law of the land and getting permission from MoEF was taken for granted."**



He also noted that Social Impact Analysis has not been conducted till date, which is required as per provisions of National Rehabilitation Policy 2007. The report also touched on broader issues of large number of dams planned for Mumbai and surrounding areas in the eco-sensitive Western Ghats. "A large number of dams have already been constructed in the Mumbai Metropolitan Region and reservoirs have been proposed in almost all the remaining important water courses. So far no EIA, EMP has been conducted in this regard. Therefore, it is essential that the **regional EIA for cumulative impact of all existing resources is conducted for MMR**, and for any new project, EIA is conducted for incremental pollution issues. Considering the richness of wildlife, a detailed study of flora & fauna should be urgently conducted & an informed appropriate decision taken." (See the accompanying map depicting the large number of dams in the region, most of them are for the Urban & industrial water supply for Mumbai & surrounding areas.)

Shramik Mukti Sangathana & SANDRP in their representation to Shri J.K Tewari before his site visit had also highlighted these issues. Forest Diversion for Kalu has not yet been discussed at the Forest Advisory Committee meeting of the MoEF. It is hoped that the **FAC will not give clearance to the project, but demand a comprehensive Cumulative Impact Assessment study of all dams being planned and constructed and specific EIA and SIA for Kalu Dam.** It is also hoped that FAC will recommend punishment of all those that allowed construction on the project without the necessary clearances. (Personal communications with Shramkin Mukti Sangathana, DNA 260212, DNA 020312)

Villagers agitating against Shai dam arrested 21 persons, agitating against the proposed Shai dam in Thane district's Sahapur taluka were arrested on March 16, '12. The villagers were annoyed as the govt has still not resolved the issue of rehabilitation of the affected people from over 52 villages of Sahapur & Murbad talukas. Also, there is no environment clearance. The authorities were rushing without resolving important issues. The MMRDA has started constructing dams on Shai (Thane) and Poshir (Raigad) rivers. The Shai dam with a capacity of 940 MLD would cost Rs 1620 crore (2009 estimate), to be completed by 2016. It aims to provide water to Thane, Bhiwandi, Ulhasnagar, Kalyan-Dombivli, Ambernath & Badlapur. Poshir is to provide water to municipal councils of Karjat, Khopoli & Matheran, with a capacity of 720 MLD. (PTI 170312)

Save Ganga Campaign

Members of the NGRBA resign; fast leads to NGRBA meeting on April 17

The 80 year old Prof G.D Agarwal or Swami Gyan Swarup Sanand, as he is called after his sanyas, has been fasting for Ganga since 14 January 2012. From the 9th February he has been taking only water and has, since March 9th, forsaken water too. There has been as yet, no credible response from the UPA government to Prof Agarwal. He was taken to hospital, first in Varanasi and than in Delhi.

In a very striking event of this fast, on 8th Feb, 2012, on their way from Prayag to Haridwar for the second phase of the fast, Swami Gyan Swarup Anand & Swami Avimukteshwaranand went to submit a Memorandum to Lok Sabha Speaker. They had given her ample notice of their visit. The Lok Sabha Speaker Mrs Meira Kumar not only refused to meet them personally, she also reportedly did not send an officer to receive the Memorandum. Disappointed, the two Swamis pasted a handwritten protest note on the police barricade with the request that it be sent to Meira Kumar. At this, police officer yelled at them and tried tearing the note down right in front of them. Shocked at such rudeness the two Sanyasis stood on dharna for 11 long hours almost till midnight. They made a simple request: Let the Speaker receive their Memorandum and note of protest. But the Speaker did not meet them. The incidence highlights the callousness of the UPA Govt towards its citizens & rivers.

Following the government's extremely non-serious attitude towards the National Ganga River Basin Authority, three eminent members, namely Mr Rajendra Singh, Mr Ravi Chopra and Dr RH Siddiqui have announced their joint decision to resign from the body. They charged the Centre with gross negligence towards worsening state of the river. Rajendra Singh, said the government was not serious towards Ganga as evident by it's attitude towards the movement undertaken by Swami Gyan Swarup Sanand. This indifference is also clear if we see how it handled the fast by Swami Nigamanand. We see it as our moral responsibility to resign as members of the NGRBA.

"The government has neither political will nor any executable plan. During the three years since NGRBA was formed, it met only twice. Even the allocation of members' responsibility was not done, reflecting a non-serious attitude" said Singh. He also questioned the seriousness of the Chief Ministers of Uttarakhand, Uttar Pradesh, Bihar, W Bengal and Jharkhand, who are members of NGRBA, towards the issue.

In a letter to Prime Minister on Nov 20, 2011, seven members of the Authority unanimously wrote to the PM for allocation of responsibilities. He asked for a meeting on Feb 16, 2012. It was, however, postponed due to Assembly elections. The members asked the Environment Minister that a meeting of the Authority be convened at Haridwar on March 5, 2012. But there has been no response from the Government.

The government's callousness is also glaring from the fact that the final notification for declaration of 135 km of upper Bhagirathi region as eco-sensitive region is still awaited.

Echoing similar views, Mr Siddiqui said Prime Minister Manmohan Singh's declaration of Ganga as National River is nothing but an exercise in tokenism. Some reports suggested that Mr Rajendra Singh had accepted to withdraw his resignation with certain conditions, but final position on this is still unclear. (Press Releases from Ganga Mahasabha, media reports)

Prof GD Agarwal's immediate Demands:

- All hydel projects upstream of Panchaprayag on Alaknanda, Nandakini, Mandakini be scrapped. The govt must ensure that no such projects are undertaken on the National River (Ganga and its tributaries) that disrupt the flow of water.
- At least 100 cumecs water must flow from Prayag to Narora. During festivals, this should be 200 cumecs.
- The govt should stop sanction of loans for developmental work in the name of Ganga. Work should be stopped and issues should be analyzed.
- Industries that pollute the river should be removed from current location and only allowed beyond a distance of 50 kms.
- Ganga should be officially declared a National River and a strong law must be passed in parliament to ensure efficient management.

CLIMATE CHANGE & WATER SECTOR

Emissions from Hydro dams underestimated A study by Global Forest Watch concludes that Canadian government may be underestimating greenhouse gas emissions from hydro developments by a factor of 20. The report states that while hydropower projects releases less carbon than power generated by fossil fuels, emerging research suggests the difference is not as great as previously thought.

The federal govt, using procedures recommended by the Intergovernmental Panel on Climate Change, has reported that such emissions total 0.5 Million Tonnes (MT) of carbon dioxide a year. But research on hydro developments suggests that the real total is anywhere between **7 and 13 MT** carbon dioxide. Part of the reason for the difference is that the govt estimate assumes that reservoirs stop emitting carbon from submerged plants

after about a decade. However, **new research indicates that there is no cutoff in emissions after 10 years. The actual net emissions extend way beyond the 10 years.** (The Huffington Post 180112)

Groundwater a shock absorber in changing climate

Training on *Stakeholders Consultation on Climate Change Platform* was organised by the Tamil Nadu Agricultural University (TNAU) in association with Indian Council of Agricultural Research on Jan 23-24, 2012. Director, Directorate of Water Management (DWM), Bhubaneshwar said that the biggest challenge is **strengthening of ground water** resource, which can act as a shock absorber for the effects of climate change. He said that DWM emphasizes on the water harvesting potential, development of models to assess ground water recharge, and to enhance water productivity as a response to climate change challenges.

P Murugesa Boopathi, vice-chancellor, TNAU said the University is advocating **SRI (System of Rice Intensification) for rice cultivation which enables reduction of methane (one of the greenhouse gases) emissions by following alternate wetting and drying method of irrigation**.

Groundwater buffer depleted In a study for the World Water Forum held in March 2012, UN agencies have called for a radical rethink of policies to manage competing claims on available water. According to UNESCO, "Freshwater is not being used sustainably." The demand from agriculture, which uses around 70 % of freshwater used globally, is likely to rise by at least 19 % by 2050 as the world's population swells by 2 billion to 9 billion. A "silent revolution" has taken place underground, the report warns, as the amount of water sucked from below the surface has tripled in the past 50 years, removing a buffer against drought. These impacts will be exacerbated by climate change. "Climate change will drastically affect food production in S Asia & South Africa between now and 2030" it says.

Climate Change to stress groundwater Scientists have said that climate change may bring unsustainable demands on the world's groundwater. As precipitation becomes less frequent due to climate change, lake and reservoir levels will drop & people will increasingly turn to groundwater. Groundwater supplies nearly half of all drinking water worldwide but recharges at a much slower rate than surface water sources & in many cases is non-renewable. "It is clear that groundwater will play a critical role in society's adaption to climate change," said San Francisco State University geo-science Professor Jason Gurdak, who co-led a U.N.-sponsored group of scientists urging policymakers to increase regulations & conservation measures on nonrenewable groundwater. The group is recommending closely monitoring or limiting groundwater pumping as well as seeking cooperation from communities to consume less. (Times of India 250112, UPI.com 060312, Huffington Post 110312)

Impact on Wheat yields According to a study published in *Nature Climate Change*, more intense heat waves due to global warming could diminish wheat yields through premature ageing. Wheat is harvested on more than 220 m ha, making it the most widely grown crop on Earth. In some nations, the grain accounts for up to 50 % of calorie intake and 20 % of protein nutrition. In 2010, drought and wildfires in wheat-exporting Russia pushed world prices of the grain to two-year highs, underscoring the vulnerability of global supplies to weather and climate-related disruptions.

Fluctuations in wheat yields in India have also been attributed by farmers to temperature changes, most recently a heat wave in 2010 was blamed for stunting plant productivity. Three researchers of Stanford University sifted through nine years of satellite data for the Indo-Ganges Plains in N India & then used statistical methods to isolate the effects of extreme heat on wheat. They found that a 2 C increase above long-term averages shortened the growing season by a critical nine days, reducing total yield by up to 20 %. (The Dawn 300112)

Britain's rivers are drying up According to UK Environment Agency, unless emergency measures are adopted, some of Britain's waterways could be reduced to trickles over the next few decades. In some cases, the agency warns, river levels in summer could drop by 80%. Rivers in the north-west of England, such as the Derwent in Cumbria, are also at risk, including in Southern Britain. The implications for wildlife, housing, business and tourism are extremely serious, adds the study.

The study *The Case for Change: Current and Future Availability* is the 2nd river report prepared by the agency of the likely impact of climate change. In its analysis, the report identifies the twin dangers of climate change and increased population as threats to the water supply. The former is expected to bring warmer and drier summer weather, particularly to the south-east of England, leading to the drying up of rivers and reservoirs. The increased population will produce a jump in demand for water. This could have a devastating impact on ecology.

"Fish species such as Atlantic salmon and brown trout, which need cold water to thrive, may struggle to survive. Plants and animals may decline in some parts of England and Wales." Significant changes will have to be introduced to halt the lavish amounts of water that are used, and often wasted. (The Guardian 220112)

Climate impacts in Indian Sundarbans more severe The impacts of climate change on Indian part of Sundarbans have worsened because of official apathy and complete lack of development planning. Sundarbans, one of the most biodiversity-rich habitats in the world, is getting severely pummeled by changing climate. But now its becoming apparent that situation has worsened in the Indian part of Sunderbans because of

official apathy and mismanagement. This conclusion has come from a recent report by CSE *"Living with Changing Climate: Impact, Vulnerability and Adaptation Challenges in Indian Sunderbans".*

According to the report, Sea surface temperature (SST) in the Sundarbans is increasing at the rate of 0.5°C per decade; globally, the rate is 0.06°C per decade. Higher SST is leading to sea level rise and adverse impact on the fish stocks. Sea level is rising in this region at a rate higher than the global average. In the past 25 years, sea level has risen at a rate of 8 mm/year – more than double the global average. This is leading to land loss as well as increasing soil salinity. The Indian part of Sundarbans has been losing land at 5.5 sq km/year over the past 10 years. The frequency of severe cyclones in the region has increased by 26 per cent over the past century.

These natural calamities and changes are playing havoc with the people's lives, but the 'development deficit' in the region is worsening the situation. Sundarbans has remained largely neglected and isolated over the years, and 'development' has passed it by - finds the report. "Socio-economic pressures are changing the environment in the Sundarbans. This has resulted in multiplied impact on lives and livelihood of people and other biological phenomenon," says Mojaffar Ahmed, President, Bangladesh Paribesh Andolon.

The region is experiencing rapid increase in population. On the other hand, it is witnessing extreme mismanagement of its fragile and limited land resources, leading to lower agricultural productivity and growing disenchantment of the rural poor. A rising sea level has been eroding and eating away the land, while sea water ingress has been leading to high salinity, laying waste vast tracts of land. Development planning in Indian Sundarbans has never included climate change or its impacts within its purview – and this is quite evident in the way everything from electrification to land management is being done here. The report and the meeting that followed called for a new plan for the Sundarbans, in which development policy would include climate change and its impacts and regional cooperation with Bangladesh as "Climate change does not respect political boundaries. So, regional eco-solidarity should be the utmost priority for Sundarbans". (CSE 180112)

New study of the effects of climate change on India's water According to a study by International Water Management Institute (IWMI), the Indian Institute of Technology Delhi (IIT-D) & Norwegian Institute for Agriculture and Environment, Bioforsk, improved integrated water management practices could increase agricultural production, protect natural systems and improve regional food security. The study, *Water and Climate Change: an integrated approach to adaptation challenges* is based on a 3-year project, funded by the Bioforsk and implemented by IIT-D and IWMI.

According to IWMI, the book draws on research over several years in the Godavari River Basin which covers large areas of Andhra Pradesh, Maharashtra, Orissa, Chhattisgarh and Pondicherry, parts of Karnataka & Madhya Pradesh. The survey identifies challenges to maintaining adequate supplies in the next few decades, but argues that these can be overcome with an integrated, multi-sectoral approach that takes into account water use from farm to river basin level. According to the editors, more investment and further policy reform will be needed if India is to remain food secure whilst protecting the natural systems on which agriculture relies.

"We are convinced that India can rise to the water supply challenges that climate change will bring," says IWMI's Dr. K Palanisami, a co-editor of the book. "However, it is critical that we adopt a multi-level approach to the problem of climate change and water management. We need to look at issues at farm level right up to the whole river basin if we are to successfully deal with the challenges. It is vital that we involve people at all levels and that we look at social & environmental concerns. We believe, in India, this is one of the first studies using a multi-scale integrated approach."

The book makes some key recommendations including the development of "low regret" (low risk, simple & practical) policies, improving & sharing water databases, plus better dissemination, capacity building & awareness. (http://www.iwmi.cgiar.org/News_Room/Archives/Water_and_Climate_Change_Book/index.aspx 01022012 For more information contact: gosain@iitd.ac.in)

Streams need trees to withstand climate change More than twenty years of biological monitoring have confirmed the importance of vegetation for protecting freshwater streams and rivers against the ravages of drought and climate change. Researchers from Monash University and the Environment Protection Authority Australia studied the effects of drought on fragile freshwater ecosystems for 11 years. **The research showed streams with extensive surrounding vegetation, whether natural or re-planted, were healthier, both in terms of water quality and biodiversity. These sites were much more robust in the face of drought than sparsely vegetated areas.**

Dr Ross Thompson, of the Australian Centre for Biodiversity at Monash University, said the results provided clues as to how waterways and surrounding areas would respond to climate change. (Monash University PR 100212) The protected riparian stretches along streams and rivers already have a number of documented benefits ranging from water treatment to flood moderation. Such research from climate change view gives us another reason to advocate for a strong River Zone Regulation to protect riparian areas and floodplains along streams and rivers.

Encroaching deserts threaten Yarlung Tsangpo

According to a Chinese geological study, rising temperatures, reduced rainfall and excessive number of grazing animals are worsening desertification and drying up grasslands in the Yarlung Tsangpo River (which becomes Siang, a major tributary of Brahmaputra, after entering India). According to them, "In the upper reaches of Tibet people move due to desertification and their traditional occupation of herding hasn't changed. This has deteriorated the quality of the grassland that they used to herd on and increased the possibility of strong winds that turn to sandstorms".

Herders who previously lived by the river have been forced to move several kms away by the growth of sand dunes. They must now graze their herds at altitudes 5,500 m (18,000 ft), close to the snow line. Several villages are now surrounded by dunes up to **40 m in height and 100 m wide**. Wetlands between the dunes are deteriorating rapidly, and residents are considering relocating farther away from the river. Along the upper reaches of the Yarlung Tsangpo, where the river is known as the Maquan, the connected dunes already extend for **100 km and are 10 km at their widest.**

The scientists noted that evaporation is intensifying due to global warming and that rainfall has become less predictable. Glacial melting is also making the traditional hydro-geological pattern fragile and less predictable. They said that river is an important water source for all three countries through which it flows, but especially for Bangladesh, where it passes through heavily populated areas.

The group recommended restrictions on industrial development and mining in the region, and said that any **hydropower development should include detailed evaluations of environmental impacts, especially in terms of geology and biodiversity.** What the region needs, said one of the scientists Yang, is an **integrated river basin plan agreed on by all countries affected by the river system – China, India and Bangladesh. Such a plan, among other things, would need to look at how to control hazards associated with the river, at hydropower plans, at water flow and at demand for water in each country**. (Alternet 220212)

CDM HYDRO PROJECTS

"Ban CDM credits for large hydro" CDM Experts Payal Parekh and Barbara Haya in their recent report *Hydropower in the CDM: Examining Additionality and Criteria for Sustainability* conclude:

o Large hydropower should be excluded from the CDM in all countries because it is common practice, unlikely to be additional and additionality testing is inaccurate.

o Small hydropower projects should only be allowed under the CDM where they are not already being built or are being built at much slower rates than they would with carbon credits, and in countries in which the govts are less able to financially support the technology.

o The common practice assessment should be strengthened; At present, by allowing the boundaries of the assessment to be defined narrowly, and "essentially distinct" to be defined broadly, practically any project can be shown to not be common practice

As to the **sustainability criteria** of the EU member states, the authors state major problems are:

o Inherent conflicts of interest in WCD compliance evaluations. The WCD requires that projects be appraised by auditors that are institutionally and financially independent from the project developers. The EU guidelines require that the project developer hire and pay a Designated Operational Entity (DOE) to conduct the assessment. An inherent conflict of interest exists when those performing or verifying project assessments are hired directly by those with vested interests in the projects going forward.

o Weak guidelines for and evaluation of stakeholder involvement. The WCD emphasizes that throughout project planning and implementation project-affected people must have the opportunity to actively participate in the decision-making process. But the EU guidelines do not require mutual agreement of key issues such as compensation packages with all recognized adversely affected people; they had merely to be planned 'in consultation' with affected people.

o Only large hydropower projects must comply with WCD guidelines. Categorizing hydropower by size is somewhat arbitrary, as there are no clear relationships between installed capacity and general properties of hydropower or impacts. Furthermore smaller projects are subjected to fewer regulations and scrutiny in India and China, which represent over 70% of all small hydropower projects in the CDM pipeline and is likely to be the case for other countries as well. Authors recommend that all hydropower projects, large and small, should be required to meet WCD criteria. See the report at: http://www.climate-consulting.org/app/download/5601316164/Haya+Parekh-2011-Hydropower+in+the+CDM.pdf?t=1330342668

Nearly all the conclusions of the authors hold true for Indian CDM hydro Projects, like Alain Duhangan and the 412 MW Rampur project on Satluj in Himachal Pradesh, both funded by the World Bank. Despite the local community and civil society organisations providing number of evidences against additionality, sustainability and non compliance with the WCD criteria of the project to the UNFCCC as well as the Swedish funder Swedish Energy Agency, the project has been registered as a CDM project. The Spanish consultancy Agency AENOR that did the WCD compliance study for the Rampur project never visited the site, nor consult any documents except the documents submitted by the developer and the World Bank. (see: http://sandrp.in/hydropower/Scam_UNFCCC_registers_Rampur_hydro.pdf)

HYDRO PROJECTS IN NORTH EAST INDIA

Union Environment Minister has no time for the indigenous people of Arunachal Pradesh

In early March 2012, a 16 member delegation of indigenous people from the interiors of the far off Lohit basin in Arunachal Pradesh travelled all the way to Delhi to meet the Union Environment Minister and express their concerns about the proposal of large number of big hydro projects in the basin. They waited for 48 hours, the minister had no time for them. They ultimately left without meeting her, but after sending the following letter dated March 15, 2012 to her. To the best of our information, the minister has not yet found time to respond to them.

From: People's Forum for Project Affected Families, Anjaw, Arunachal Pradesh

To: Ms Jayanti Natarajan, Union Minister of State for Environment and Forests (Independent Charge), Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi 110003

Subject: Mega Hydro projects in Lohit Basin in Arunachal Pradesh

Respected Minister,

We learn that the Government of India, including your ministry and Go AP, is considering construction of at least six mega hydropower projects on the main stem of Lohit River i.e. DEMWE-I 1750 MW, DEMWE-II 1250 MW, HUTONG-II 1250 MW, KALAI-II 1200 MW and KALAI-I 1250 MW alone, in addition to several more on the tributaries of the Lohit River. Firstly we should add that this basin is situated in a unique geo-climatic situation that is full of thick natural forests and biodiversity, seismically active zone-V, erosion prone, landslide prone, flood prone area with a river that carried heavy silt load and that is close to China border, the tribal dominated population of our area has already faced the adverse consequences of Chinese aggression. Lastly, this is happening at a time when climate change is hovering as a big threat on everyone, but particularly on people who are directly dependent on natural resources like the forest, the biodiversity, the river and the mountains. Even precautionary principle requires that taking up any big project in such a region, all studies are done comprehensively and in credible way. This has clearly not happened.

1. Even more we the tribal and indigenous people of Lohit valley are randomly settled at the basins of the river Lohit since our inception and practicing jhum cultivation and existing with fragile ecology, the valley population constitutes the 75% population of the entire district and 05 administrative circles are also located in the basin. With coming up of such kind of mega HEP, the whole of the population, administrative blocks and major habitation of the district would be permanently damage and seriously affected. Even if the GOAP comes up with R & R policy there is no such kind of fertile Terrains, plateaus, and land alternately available for establishment of settlement areas for the homeless and landless poor people.

2. However, there has been absolutely no decision making process involving the people of this valley, in a free, prior and informed way before deciding to take up these projects. Even if one of these projects were to come up in Lohit Valley, it would create sufficient permanent adverse impacts on society, culture, people, forests, river, biodiversity, their livelihoods, and environment. But the governments of India and Arunachal Pradesh have decided to go ahead with these projects, signed, MOUs and the committees like the Expert Appraisal Committee of your ministry have already decided that all these projects can be taken up. Even a committee chaired by you have decided to give a go ahead to the massive 1750 MW Demwe Lower Hydropower Project, the fist of these projects. The Arunachal Pradesh government has already taken up front money from the developers who signed the MOUs. Can this be accepted in any society that calls itself humane and democratic? We do not find this acceptable. This is also not legally tenable considering that these are sixth schedule area, considering the implications of Panchayat Extension to Schedule Areas Act, Forest Rights Act and such other legal provisions.

3. It is not that we lack electricity or that these projects are being planned for electricity (for us). We all belong to Anjaw district that is already self sufficient in electricity (see for ex: http://timesofindia.indiatimes.com/city/guwahati/Anjaw-shines-in-hydro-power-sector/articleshow/11333208.cms). This has been possible through hydro projects of capacity less than 1 MW. There is a huge potential of such sub-MW capacity projects possible to be constructed in the tributaries of Lohit basin like TIDDING, DALAI, DAV, HALAIPANI, CHOWO, LATI, KATHANG, KULUNG, KLANGDI, SARTI, WARTI, CHOMU,DONG, KHARWTI, MUSHAI PANI and many more tributaries exist in the basin, which has neither been assessed, nor realised. If we can realise this potential through a participatory process, we believe we will have sufficient power for whole of the valley and the state and more to export to the North East Region and may be beyond. This must be done first and till that is done no big hydro projects should be taken up.

4. As far as the projects proposed on main stem of the Lohit river are concerned, the participatory process that is mentioned in para 2 above can be taken forward only if there is a comprehensive assessment of impacts of the projects across the basin. This has not been done. The Lohit basin study done by the WAPCOS cannot qualify for such a study. It has not looked at, for example the social impacts of the projects at all. Nor has it done any options assessment, nor has it done cumulative impact assessment since the impact assessment of the individual projects is still to be done. How can cumulative impact assessment be done without impact assessment of individual projects? Most importantly, no study of

WAPCOS would be acceptable to the people of the Lohit Valley and other social and environment conscious people for two main reasons. Firstly, WAPCOS is an organisation under the Union Water Resources Ministry, and Union Water Resources Ministry is basically a pro dam lobby. WAPCOS also does other pro dam studies like the feasibility reports and Detailed Project Reports for Big dams, such studies are done in favour of Big dams and an organisation that is doing such business cannot be entrusted to do an environment or cumulative impact assessment study. Secondly, WAPCOS also has had very poor track record and has done very poor quality EIA and CIA reports. Hence, in future, we will not accept any reports done by such organisations. Once a credible basin study, including options assessment is done, full such study should be made available to each gram sabha of the Lohit Valley, and a credible process of decision making should start from there. Before that none of the big hydro on the main stem of Lohit river should be taken up. The same conditions should apply for any big hydro projects on tributaries of Lohit River.

5. Here we would like to bring to your attention that ours is a completely tribal area with total tribal population of about 16500 according to population census 2011. In such a small place when such mega projects are taken up, it will not only destroy our society, culture, villages, forests and river, but also the onslaught of thousands of out side populations will create huge political, religious, social and cultural problems for our tiny population.

5A. The impact assessments of religious holy sites like NIMKEY and TAILUNG popularly known as PARSURAM KUND is not yet done for its preservation and maintenance as this two holy sites falls under parameter of submergence due to HEP lower DEMWE.

6. The construction of Mega HEP at the sensitive zone of Indo-China border areas of Arunachal Pradesh would also pose serious threat to the national security as witness in the late year 1962 when Chinese aggressed our country up to the plains of Lohit and even today the Chinese counterpart controversially claims Arunachal Pradesh as integral part of china. Secondly, mega projects would inevitably invite in fluxion of thousands of migrant labours and employees which would tremendously effect to the intelligence concerned to the national security.

7. As said earlier the Lohit valley is vigorously rich in flora and fauna and has fragile ecological system of water, forest and wildlife. The main wildlife and endanger species like mishmi takin(*Bodorcas taxicoalr*), Goat antelope, musk deer (*muschus chrysogester*), Bear (black and brown), Capelangur (a Himalayan monkey species, Hornbill, Spotted Leopard, Hollock gibbon, Flying bat, wild boars, wild dogs and many others. The impact study of such endangered species and their perseverance is surprisingly sidelined.

8. We would urge that till the process described in para 3 and 4 is completed, no work on any of the big hydro projects should be taken up in Lohit basin. The ongoing survey work should also be stopped on proposed projects upstream of Lower Demwe project.

09. In future, kindly ensure that there is participatory process at gram sabha level before work on Environment Impact Assessment or Cumulative Impact assessment is started and also full copies of these studies are available to all gram sabhas in language and manner that people there can understand. We would also request you to change the EIA notification to ensure that even projects of capacity greater than 5 MW also required EIA, Environment Management Plan, Environment Clearance and Public hearings. Moreover, the practice of taking up front premium should be stopped and declared illegal.

10. Kindly also note that even if some hydropower projects were to be considered in Lohit River Basin or in any other River basin in Arunachal Pradesh for electricity needs beyond Arunachal Pradesh, a credible democratic process involved all concerned in the state and downstream states should be taken up before any such project is even considered. Not doing such a process will only invite social unrest, like the one being witnessed in Assam now.

So many of us have taken great pains to come to Delhi all the way from one of the remotest corners of India. We had no option but to do that since our lives and future our societies are at stake. We hope you will take these issues seriously enough. We will await your detailed responses on each of these points.

By Shri Behenso Pul, Chairman, Peoples Forum For Project Affected Family. Educated Colony, Lohit District Tezu, A.P. on behalf of 16 member delegation from the Lohit basin in Arunachal Pradesh

<u>Copies submitted for kind information and necessary action</u>:

1. His Excellency the Governor of ArP, Itanagar.
2. The Hon'ble Chief Minister of ArP, Itangar.
3. The Hon'ble Minister, Tribal Affairs, Govt of India Shashtri Bhawan (New Delhi).
4. The Hon'ble Minister Rural Development, Govt of India, New Delhi.
5. The Hon'ble Minister DONER, Govt of India, N Delhi.
6. The Hon'ble Minister Environment & Forest Govt. of Arunachal Pradesh, Itanagar.
7. The Member of Parliament Rajya Sabha, New Delhi
8. The Hon'ble Member of Parliament 2-East Parliamentary Constituency, New Delhi.
9. The Hon'ble MLA 45-Hayuliang Constituency, Itanagar.
10. The Principal Chief Conservator of Forest, Govt. of ArP.
11. The Deputy Commissioner, Anjaw & Lohit District, Govt of ArP

Protesters vow to stop Lower Subansiri NHPC's 2000-MW Lower Subansiri hydro-electric project is likely to face more resistance, with hundreds of anti-dam activists resolving on the 24th February 2012 to launch a total blockade of all construction materials for the project. The agitators took the pledge in the presence of Narmada Bachao Andolan leader Medha Patkar. Patkar, addressing an anti-dam public rally in Lakhimpur district's Chawldhuwaghat, said the "relentless" people's movement against the Lower Subansiri project has become an all-India struggle against large dams. "I salute your persistent agitation against large dams to save the Subansiri River. It is not only your movement. It is an all-India movement. The people of the Narmada and Brahmaputra valleys are united in the struggle against large dams." During the rally, Krishak Mukti Sangram Samiti general secretary Akhil Gogoi announced that the next phase of the stir would tougher one. (Times of India 240212)

Indigenous people not consulted In a significant observation, the United Nations' Human Right Council has said indigenous communities in Assam were not consulted before starting construction of large dams. The latest report compiled by Margaret Sekaggya, special rapporteur on the situation of human rights defenders, said when people of indigenous communities stand against large dams on the ground of human rights and environmental consequences, the authorities brand them as "anti-government" activists. The report was made following the special rapporteur's visit from January 10 to 21 in India to assess the current situation of human rights defenders in the country.

"In Assam, people who criticized the construction of mega-dams were branded anti-government activists. This is the same rhetoric used under the Armed Forces (Special Powers) Act. Defenders live in constant fear," the report stated. This report will be placed before the Human Rights Council in Geneva. (Times of India 170212)

'NHPC hiding facts' Noted consultant engineer J N Khataniar alleged that the National Hydroelectric Power Corporation (NHPC) has been hiding facts on the Lower Subansiri Hydroelectric Power Project (LSHEP) as far as the structure of the dam is concerned. Khataniar also asserted that the expertise of the NHPC in constructing hydel power projects in the seismically sensitive and geologically fragile zones is doubtful. The NHPC had built the 60-MW Kurichu Hydroelectric Power Project in Bhutan, which created havoc in the three Assam districts of Barpeta, Chirang and Bongaigaon in 2004, he said.

He said the argument of the NHPC that number of mega dams have been constructed and are operational in geological conditions similar to those of the LSHEP and they are taller than the LSHEP dam, is baseless. The projects— Bhakra (226 m high), Ranjit Sagar (160 m), Kaligarh (125 m) and Mangala (116 m) — named by the NHPC in this connection, **are rock-fill dams and are multipurpose projects.** But the LSHEP has been provided with a concrete gravity dam and it is a monotype project with the provision of generating power.

In the case of the LSHEP, the NHPC has ignored the recommendations for construction of rock-fill dam. The experts further suggested construction of an underground power house considering the geological condition of the site after extensive investigations and studies carried out together with the Geological Survey of India and the Central Water Commission. But the NHPC has ignored all these suggestions, Khataniar said. He also called for re-investigation and re-designing of all the proposed and under-construction hydel projects in the NE region by maintaining transparency at all levels. (Assam Tribune 190212)

Opposition to Tashiding hydro in Sikkim Villagers in Yuksam and Tashiding are voicing their protest against the upcoming 97 MW Tashiding Hydro Electric Project. In a press statement the convener of Platform for Joint Actions, Tseten Tashi Bhutia, said that the Tashiding Project will damage surrounding mountain resources and affect livelihoods of hundred of villages. Environmentalists believe that this run-of-the-river scheme that divert Rathongchu river through mountain tunnels in Tashiding would damage the fragile geology in an area that has already experienced the wrath of severe earthquake on September 18 2011.

Even though the High Powered Committee appointed by the State Govt to examine the issues of Tashiding HEP is yet to submit its report and whereas the Govt has already abandoned two HEPs viz. 99 MW Ting-Ting and 96 MW Lethang HEPs based on State High Power Committee's Report, the developer is hell bent on implementing the Tashiding project. "The Platform for Joint Actions is of a strong view that it will not allow companies, acting as a front for dubious investors and hedge funds, to exploit our holy rivers and mountains just to multiply their riches and our government watch their interests and not of their citizens. (isikkim.com 210212)

Sikkim Cabinet cancels two projects on Rangit Mounting public anger and unrelenting protests by monks have forced the Sikkim govt scrap two hydro power plants under construction on the Rathong Chu, a tributary of the heavily dammed Rangit river, which feeds the mighty Teesta river. The 97 MW Ting Ting project and the 96 MW Lethang project next to the Kanchenjunga reserve in west Sikkim — on a tributary considered holy — were cancelled by the Sikkim Cabinet after sustained pressure from all sides.

However, there is still fear that like in the past, the Pawan Kumar Chamling-led Sikkim Democratic Front govt may try to strike a bargain with private firms. The Cabinet hasn't put the announcement on record, and has not gazetted the notification that officially declares the

scrapping of these projects. That has raised doubts about the intentions behind the move. Says Tashi Bhutia of the Sikkim Bhutia Lepcha Apex Committee, "The govt has done somersaults in the past."

Chamling govt scrapped a project at the same site on the Rathong Chu river in 1997. In 2009, it renamed the project as Lethang and gave the contract to Kalpan Hydro to avoid a public backlash. The National Wildlife Board struck it down in Oct 2010 due to its proximity to the Kanchenjunga National Park. However, the state kept mum, citing lack of communication from the Union Ministry of Environment and Forests. However, in Nov 2011, when the Union home ministry intervened after persistent letters were sent to the PMO about the violation of the Places of Worship (Special Provisions) Act, 1991. The ministry set up a high-powered committee that shook up the administration in Gangtok. The Chamling govt, had little option but to set up a committee headed by the state's Chief Secretary. The result was reluctant scrapping of the two projects (Ting Ting and Lethang), and putting one (Tashiding) under review.

This 'carbon trade gold rush' has resulted in what concerned citizens call a total pilferage of resources. In fact, many of the hydro projects in Sikkim have been fraudulently trying to derive benefits from the United Nations' Clean Development Mechanism. "To have four different dams with four different power developers within a few kilometres of a tributary in west Sikkim defies common sense," avers Dawa Lepcha of the Affected Citizens of Teesta. "In the Rangit Valley, this has resulted in entire mountains being tunnelled by power companies, with each doing the same work and multiplying the damage to the fragile geology and the sensitive ecology."

The Tashiding project is owned by Hyderabad-based Dans Energy, the same firm that won the now-cancelled Ting Ting project. Tension has been rising across Sikkim after seeing the destruction caused during the quake due to indiscriminate tunnelling work undertaken by power developers. Protests have been spontaneous and angry outbursts by locals over what they call "hell-like night-time explosions" at the Tashiding power site. However, the govt is still canvassing for the projects, neglecting peoples' dissatisfaction. Sikkim has been doling out contracts to Andhra Pradesh-based businessmen to dam every single tributary of the Teesta.

The Lethang project is being executed by a Noida-based firm called Kalpan Hydro. But Kalpan Hydro itself is the subsidiary of a carbon trading and consulting firm called Emergent Ventures, whose directors have served time with the Clinton Climate Initiative, known for its market-driven, business-minded approach to containing climate change. **Kalpan Hydro's small and numerous power projects in Sikkim represent carbon offsets for Emergent's clients, which include some of the world's biggest corporations such as Virgin Atlantic, agro behemoth Cargill, Unilever and PepsiCo.**

"There has to be a policy shift. The Sikkim govt needs to think beyond revenue generation. At the end of the day, the world is washing its dirty linen in Sikkim's rivers and polluting the sacred land," says Tashi Thonpa, a Gangtok-based documentary maker. Chamling has avoided a gazette notification on the scrapping of the power projects. What looked like a step forward has ended up looking like a reluctant concession to the people of Sikkim who have borne the brunt of the govt's love for money from for hydro projects. (Tehelka 180212)

Nyamjang Chhu HEP would destroy Zemithang valley *The proposed power project at Zemithang valley could put the black-necked crane at risk*. The 900 MW Nyamjang Chhu hydroelectric project is proposed to come up in the Zemithang valley of Arunachal Pradesh. The project will need 89 ha of forest land, and entail the felling of 9,127 trees. It will also submerge 41 ha of forest land. The Zemithang valley is inhabited by local Monpa Tribe which has shown remarkable pro-activeness, initiative and sensitivity in protecting the regions biodiversity. In association with WWF (World Wide Fund for Nature), they are working on the conservation of the red panda, the Himalayan black bear, the musk deer, and medicinal plants and rare orchids. They have also banned hunting in the valley. "The sighting of black-necked cranes by villagers is a part of their effort to conserve and document the rich biodiversity of the area," said Pijush Dutta, landscape coordinator, WWF-India. Dutta added that the cranes are also central to the tourism activities initiated by the Monpas.

In the Changthang region of Ladakh, where the crane breeds, people live in harmony with the species & regard it as a sacred bird. Sightings are regarded as a sign of good luck. In Hanle & Chushul, residents consider the arrival of the cranes as a sign of coming prosperity. It is indeed unacceptable to see that this community has no role to play in the decision making about their region. Inspiring Community Conservation efforts like these need to be encouraged and replicated and not nipped in the bud like it seems to be happening in Zamithang valley.

The valley is also winter home to the endangered black-necked crane (*Grus nigricollis*) which winters in Zemithang. The Monpa tribe reveres it as the embodiment of the sixth Dalai Lama (late 17th and early 18th century), Tsangyang Gyatso, a Monpa. This year seven of these cranes were seen in the valley. According to WWF, "Till date, the ministry of environment and forests meetings have touched upon recommendations for forest clearance, but the fact that the Zemithang valley is a wintering habitat of the black-necked crane has not been part of the discussions."

Shockingly, the local people are not consulted, but the even the exact location of Nyamjang Chhu project is not being disclosed by the developer Bhilwara Projects, or the Arunachal Pradesh Government. "Even though we are unaware of the exact location of the Nyamjang Chhu project, it is important that MoEF carefully assesses the likely impact on the black-necked crane, and other wildlife habitat, including the newly discovered Arunachal macaque (*Macaca munzala*)."

The valley is tucked away in a remote corner of western Arunachal Pradesh, sandwiched between Bhutan and China. It is home to the Monpas, who number around 3,000. The Nyamjang Chhu project involves the construction of a 11.2 m high concrete dam across the river and an underground power house at an estimated cost of Rs 7228 crore. The black-necked crane, found in India, China and Bhutan, breeds in high-altitude wetlands (elevations 3000-4900 m above sea level). Little was known about it till as late as the 1980s because of its isolated habitat. The crane is a beautiful bird, and tall, standing 135 cm tall when fully grown. (Livemint 080212)

IRRIGATION

Self-help for irrigation in Assam Baksa and Nalbari districts in lower Assam are currently witnessing a revolution that has never been seen in the state before. Driven by the belief that self-help is the best help, the villagers have themselves developed irrigation facilities through diversion of natural streams and canals, thereby transforming their lives by means of creating livelihood opportunities. A local non-government organisation — Gramya Vikash Mancha is working on diversion-based irrigation system in 80 villages from the two districts.

"Because of acute shortage of water, sometimes it was difficult for us to go for a single cropping. But after we started work on this project, we have water to irrigate our land and have even been able to target multi-cropping," said Bangsidhar Das, a farmer of Arampur village. The farmers of the village have successfully diverted a part of water flowing through Diring and Pagladiya rivers to their village by dredging canals and equitably distributed the water among them by constructing concrete bunds.

"They have also trained us in application of the system of rice intensification last year, as a result of which we are reaping good harvests," said a resident. President of Ghamya Vikash Mancha Prithi Bhusan Deka said they had started the project in 2009 in 80 villages spread across five clusters in the two districts to provide irrigation facilities to farmers by regulating the flow of river waters.

Pagladiya, Saulkhowa, Jaha, Barali and Diring are the five clusters. They are also involved in restoration of water bodies, cleaning of canals and wetlands, capacity enhancement of farmers, creation of fisheries and other such livelihood opportunities. (The Telegraph 0503120)

WATER POLLUTION

***Maily* Yamuna even after 18 years of SC Orders** Eighteen years after the Supreme Court took cognizance of pollution in the Yamuna, a bench headed by Chief Justice of India said that it intended to pass orders to ensure that no person, industry or corporation discharged untreated effluent or sewage into the river. "This court is concerned with the pollution being caused to the Yamuna and complete deterioration in the quality of water in the said river, not only in Delhi, but also in the states of Haryana and Uttar Pradesh," the bench, which also included Justice AK Patnaik & Justice S Kumar, said. On July 18, 1994, the court had taken a *suo motto* cognizance of a report titled *And Quiet Flows The Maily Yamuna*, and since then, it has been issuing directions to various govt authorities to take steps to make the river pollution-free.

While making it clear to all parties that it would order no further adjournments in the case, the SC asked the authorities concerned to furnish details of the steps taken by them regarding the control of Yamuna Water Pollution caused by illegal occupants on either side of the river in Haryana, Delhi and UP. It directed the Central Water Pollution Control Board to take samples of the river water from Haryana, Delhi and UP till Agra and submit a report in four weeks. The bench said it wanted to pass orders, which would ensure that "no person, including corporations or other industries, discharge sewage, trade or other effluent directly into the river, without treatment, as per the provisions of the Environment Protection Act".

However, when the matter came up for hearing, the bench was not clear about the background of the case and the directions it needed to issue to various authorities. It directed counsel for all the parties, including govts of Delhi, Uttar Pradesh & Haryana, to file written submissions/ affidavits in six weeks, giving a complete background of the case, number of committees appointed on its orders, sewage treatment plants constructed, consultants engaged & the cost incurred so far by the central & state govts. (The Hindustan Times 280212)

WATER SECTOR

India Tops List of Virtual Water Exporters India has emerged as the top virtual water exporter in the world, with 90 percent of those "exports" in the form of food products, a new global study reveals. India's per capita water consumption is 1.089 million litres per year, only about a third that of the average U.S. consumer, who uses 2.842 million litres. But trade leaves India with a net Virtual water export of 95 billion cubic meters, according to *The Water Footprint of Humanity* study, published in February 2012. The study by Arjen Hoekstra and Mesfin Mekonnen of the Netherlands-based University of Twente, quantified national water footprints from both a production and consumption perspective and analyzed how various products and their export influence water

flow. "The exports bring in foreign currency, which is good, but much of the export flows are not sustainable because the water used for the exports is exploited in an unsustainable way," said Hoekstra.

Large virtual water flows within India were mainly from water-scarce regions of the north-western states of Haryana and Punjab to wetter eastern Indian states such as Bihar. "**The benefits are more with the countries that import these commodities from India than with local communities in India that suffer from the misuse of water,"** Hoekstra said. "From a water point of view, it would make sense to make Bihar more self sufficient so that it doesn't need to import from drier states." India, China and the United States have the largest national water footprints, according to the study.

The United States is the largest water importer, but this only offsets 75 percent of its water exports, leaving it with one of the largest virtual water trade deficits. Other major net exporters include India, Canada, Australia, Argentina and Brazil. The biggest net importers are North African, Middle Eastern, and European countries, as well as Mexico and Japan. The study provides consumers with information about the water footprints of various products, and hopes the global perspective will be useful to policymakers. "Governments can use our results to explore how they can contribute to reducing the water footprint within their territory or within water-scarce countries from where water-intensive commodities are imported." (ooskanews 290212)

LIVING RIVERS with freshwater flows

Reducing flows of Ganga affect Varanasi Residents, particularly, the boatmen community in Varanasi expressed concern over the rapid decrease in the depth of water of the River Ganges. Over the years the residents have been witnessing a constant dip in the water-level. According to locals, the river has receded substantially from its shores and the depth has decreased. The shrinking river has left huge silt deposits on the banks. According to local boatmen, in the last 12 years the width of the river has considerably decreased and they are finding it increasingly difficult to hold on to their livelihood of boating.

Vinod Sahani, activist of Save Ganges Committee, a non-governmental organisation said the govnt's apathy towards the situation. "(If freshwater flows are not reinstated), the boatmen community will be wiped out. The people of this community, who are around 50,000 in number, make their living by rowing boats, fishing, searching for coins in the river and selling flowers on the riverside. This whole community will be wiped out and the govt will not be able to do anything," he said. Fishermen claimed that forest department's decision against removing the deposited silt from banks to save the turtles has resulted in the huge deposition. The fishermen and boatmen have often questioned the existence of a turtle sanctuary on River Ganges and say that the sanctuary negatively impacts river. However, this is not the entirely correct. The turtle sanctuary is not the only reason responsible for sedimentation, lack of releases from the upstream dams is a very important factor. (NewstrackIndia 010312)

FISH AND FISHERIES

Madhya Pradesh to launch bio-health monitoring of Narmada River Madhya Pradesh is launching a bio-health monitoring, based on benthic invertebrates of the Narmada and its tributaries in MP. The duration of the monitoring would be initially for five years but could be extended further. According to NVDA Vice chairman, objective of the study is to assess the bio-health of Narmada River over a period of time. It will be based on the population frequency of macro invertebrates in the 1077 km long main river in Madhya Pradesh and its 39 tributaries". The abundance, diversity, biomass and species composition of benthic invertebrates are used during the study as indicators of changing environmental conditions. (Times of India 060212)

While any such study us a welcome step, it would have been effective to base the river health study on fish as indicator species. Fish are not only indicators of the rivers' physical and biological health, but also an important livelihood resource. Dams on Narmada have been affecting fish like Mahseer which was initially abundant in Madhya Pradesh, in severely negative ways. Hence, a study on fish, some of which are at the apex of the riverine food chain could throw light on the status and health of river and recommendations can also contribute towards ensuring livelihood security.

Mahseer becomes MPs State fish Mahseer, one of endangered fish species, may find a new home in a water body created by the seepage of Tawa reservoir canal in Hoshangabad district. The fish species was once found in abundance in Narmada River in MP and all across the country. Like all rivers, construction of dams over the Narmada has caused a drop in the fish.

"The construction of dams disturbed the river ecology further disturbing its habitat, several tributaries stopped meeting the river and now Mahseer cannot swim upstream to breed in the river water," said the Director of Fisheries, VK Purohit. He said that Mahseer needs clear crystal water and the water body identified in the Tawa Nagar has all the qualities to have a first breeding centre of Mahsheer in the state.

A team of experts from the Indian Council of Agriculture Research (ICAR) that visited the just-concluded fish festival in MP, surveyed the water body in Tawa Nagar of Hoshangabad for the rehabilitation of Mahseer, the state fish. **After an alarming drop in Mahseer population in the Narmada River four months back, the state**

government in its agriculture cabinet declared Mahseer as its state fish, Purohit said. The Lucknow-based National Bureau Fish Genetic Resource also recommended the state government to make efforts for conservation of the game fish. (Times of India 090212)

The alarming drop in Mahseer and emergence of Hoshangabad as the 'new' home to Mahseer as news reports claim, is indeed a tragedy. Hoshangabad centre and the entire Narmada was extremely rich in Mahseer, with monthly catches of the carp in Hoshagabad alone ranging from 2-3 tonnes (Desai, 2003 *Synopsis on the biological data of Tor Mahseer*, FAO). Dams on the Narmada and its tributaries isolated and lead to destruction of this rich fishing resource, negatively affecting livelihoods of thousands associated with it.

Mahseer is not only an important game and table fish, but has been revered and worshipped by Hindus and protected across the lengths of rivers in the country though community conserved fish sanctuaries. Many such sanctuaries still protect the river as well as the fish in Karnataka, Kerala, Himachal and Uttarakhand.

Madhya Pradesh also reportedly has some Mahseer sanctuaries at Sahastradhra, Mangleshwar and Kapileshwar ghats on the Narmada. Rather than artificially breeding Mahseer fish in some accidental water body formed by canal seepage, it might be more sustainable to restore these riverine stretches, maintain environmental flows and introduce/ conserve Mahseer in its natural habitat. This is also more likely to get overwhelming community support due to sentiments regarding Mahseer. In any case, environmental flows and connectivity of the river Narmada needs to be maintained through structures like Fish passes, ladders and locks to protect the endangered species and livelihoods associated with it and to mitigate the severe negative impacts of existing dams on the river.

Dams on Mekong Tributaries more hazardous Dams on the tributaries of the Mekong River could have a greater negative effect on fish biodiversity and food security than those on the main river, researchers say. Hydropower developments on Mekong tributaries are not subject to the same level of scrutiny as their counterparts on the main river. "Most of the attention has been on proposed dams on the Mekong mainstream, such as the highly controversial Xayaburi dam in Laos," says lead author Guy Ziv, an environmental scientist, Stanford University. "The impact of tributary dams is little studied."

The findings, published in Proceedings of the National Academy of Sciences, "point to a desperate need to reconsider hydropower development in the entire Mekong River basin", says Ame Trandem, the Southeast Asia programme director International Rivers. With a watershed of 800,000 square kms, the Mekong River basin supports the world's largest inland fishery and is home to 65 million people in six countries: China, Myanmar, Laos, Thailand, Vietnam and Cambodia. "Most of the people are poor and get 81% of their protein from subsistence fisheries."

Currently, 11 dams are being planned on the main river, with 41 on the tributaries expected to be completed within the next 4 years. Another 10–37 tributary dams are likely to be built between 2015 and 2030. Using a fish migration model, Ziv and his colleagues found that if all of the proposed dams were constructed, they would reduce fish productivity by 51% and endanger 100 migratory fish species.

They then focused on the 27 tributary dams whose fate is yet to be determined, and found that the losses in fish biodiversity and production would be greater than for the proposed dams on the upper reach of the lower Mekong River. "Individual dams may not make a big difference," says Ziv. "But if you add all 27 dams together, you may get a catastrophic impact." This is not only because of the total area that will be blocked for fish migration, but also because some regions are more important fish passages than others.

The team has created a simple matrix for deciding which dams to build throughout the basin. The tool estimates the loss of fish productivity at different levels of total electricity generation and ranks each dam in terms of its trade-offs. "Dams with better trade-offs can be built first when the energy demand is relatively low," says Ziv. "And you really should avoid building those with the worst trade-offs, such as the Lower Se San 2 Dam."

Researchers say that the study is just a "starting point" and that other aspects of potential impact, such as effects on sediment, agriculture and the displacement of people and communities, must be incorporated into the scheme for comprehensive trade-off analyses. To many, the latest findings call for a change in that policy. It is time for the MRC to take a basin-wide approach to assessing the consequences of dams in the region. (Raw Story.com 050312) This also holds a lesson for reckless cascade construction in India happening in Alaknanda, Bhagirathi, Satluj, Chenab, Ravi, Beas, Lohit, Dibang, Teesta, Bichom, Narmada and Siang, amongst many. Cumulative impact assessment studies do not consider the cumulative negative impact of the dams on fish and fisheries. The above example illustrates that this should be urgently undertaken.

WETLANDS

ESG gets UN *Water for Life* best practice award Environment Support Group (ESG) has been awarded the 2012 UN-Water "Water for Life" Best Practices Award in a ceremony held at the headquarters of the Food and Agriculture Organisation, Rome on 22 March 2012, World Water Day. ESG was given the Category 1 "Best Water Management Practices" Award for its initiative: *Protection of Bangalore Lakes for Posterity – Setting a*

Legal Precedent for Conservation of Lakes as Commons. This multi-year multi-pronged effort based on appropriate interventions involving local governance bodies, under the direction supervision of the Judiciary, is considered by the UN as an "outstanding contribution towards the conservation of water-bodies in Bangalore, India, and its demonstrable and tangible impact on the food and water security of urban, peri-urban and rural communities in the region". (http://www.un.org/waterforlifedecade/)

Narmada waters in Nalsarovar affecting bird population Flamingos and pelicans are keeping away from one of the largest wetlands in Gujarat, the Nalsarovar. Water from Narmada released for irrigation is seeping into the lake, raising its level to four feet, making it difficult for shallow wading migratory birds which prefer shallow waters. Sardar Sarovar Narmada department officials claim that the heavy inflow of water is because of the recent repair work at the gates of the Saurashtra branch canal. However, the forest department officials say that repairs take place on regular basis and Narmada water keeps flowing into the lake.

For the past three years, forest officials were unable to find the reason for the high water level in the lake. This year, the officials tracked down the source of water to the Saurashtra branch canal in Dec when repairs were taking place. "Though none of the branches of Narmada canal reaches here, water released in Bhogavo river overflows into small rivulets which open up in Nalsarovar," said a senior official of the forest department. Deputy conservator of forest said that he had written letters to the collector, irrigation and the SSNNL authorities to stop excess water from flowing into the Nalsarovar. "We have suggested small make-shift ponds to be dug in villages on the periphery to store excess Narmada water."

The official said that the water is released regularly from Narmada and other smaller dams into Bhogavo River for irrigation purposes. However, the excess water flows into Nalsarovar, driving away the migratory birds. The water level in February has been recorded to cross 4.5 feet. (The Times of India 190212) We had reported earlier how the Forest Department had firmly declined SSVNL's offer of diverting Narmada canal waters into Nalsarovar, making it into a perennial lake. It seems this time, they are just burdened with a free gift they would rather not have.

SYSTEM OF RICE INTENSIFICATION

Potential of water saving in SRI A field experiment was conducted in wet and dry seasons of 2006 and 2007 at Hyderabad to study the influence of different methods of crop establishment viz., system of rice intensification (SRI), Eco-SRI (nutrients applied through organic source only) and conventional method on rice productivity, water use efficiency and its productivity. During wet season, grain yield was higher in SRI than conventional method and Eco-SRI by 10.3 and 33.4%, respectively. There was a mean saving of 32% water in SRI as compared to conventional method. Further the amount of water used for 1 kg grain production was higher (3177 lts) for conventional as compared to SRI method (2162 lts). Hence, SRI can become a viable alternative approach to the conventional transplanting having advantage of both in terms of higher yield and water productivity especially in the areas of limited water situations. *(Directorate of Rice Research,* 160312)

NREGA to include SRI The scope of Mahatma Gandhi National Rural Employment Guarantee Act (NREGA) has been expanded to include works related to agriculture, animal husbandry, poultry, drinking water & sanitation, with effect from April 2012. In its initial version, NREGA was limited only to works concerning water & soil conservation, afforestation & land development. It was largely seen as a subsistence dole for the rural people in the lean farm season. Now, it can create productive assets & generate incomes for the poor. Under the new version, small, marginal and SC-ST farmers will be able to employ NREGA workers on their farms for transplantation, weeding, etc. Significantly, farmers will have to grow the SRI variety of rice that gives high yields with low consumption of water.

The additional works — based on the recommendations of a committee chaired by Planning Commission member Mihir Shah — include the construction of cattle sheds, poultry shelters, fish drying yards, etc. According to Shah, "Inclusion of these works will be a major relief to millions of farmers now working under NREGA and will do justice to thousands of crores left unutilised under the scheme every year." (The Hindustan Times 220212)

WORLD WATER

International Rivers presents the Google Earth 3-D tour *Wrong Climate for Damming Rivers*. Refer to IR website for this Info-graphic, which summarizes the key arguments why healthy rivers are critical for adapting to our changing climate. The site also has Climate fact sheet translated in Hindi.

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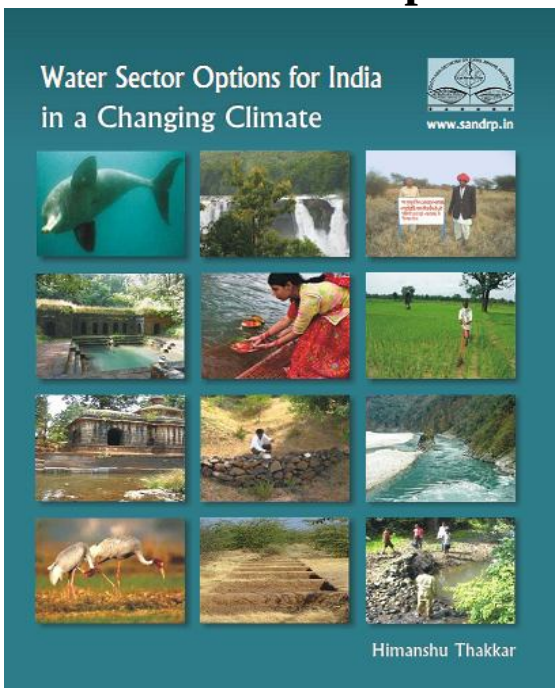
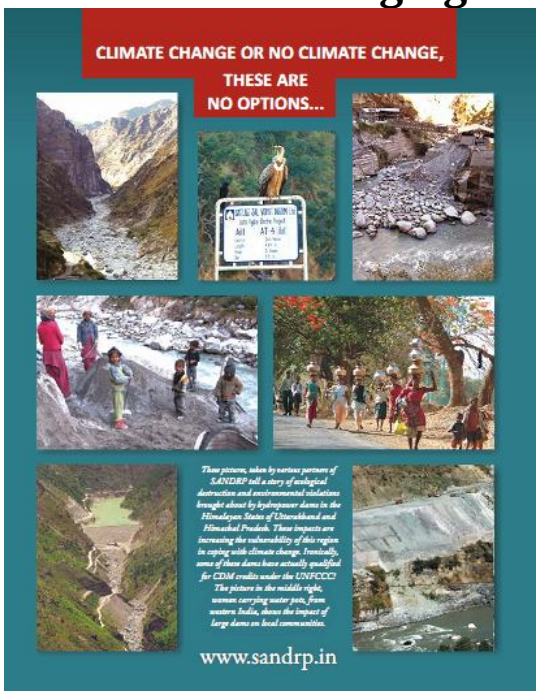
NEW PUBLICATION: **Water Options for India in a Changing Climate**





The report tries to capture the relevant issues for Indian Water Sector in the context of changing climate and highlights the options for coping and mitigating climate change challenges in water sector in India.

"The opportunities provided by climate change are still within reach. *India, with the world's largest water infrastructure also has the biggest performance deficit in terms of what that infrastructure can deliver and what it is delivering now. Groundwater is India's water lifeline and opportunity beckons to make it sustainable. Our foodgrains requirements and demand for water for the same would go up, but there are huge opportunities like increasing soil moisture holding capacity, taking up chauka systems in grazing lands, organic farming, System of Rice Intensification, System of Crop Intensification, rethinking cropping pattern, protecting local water systems, etc. Glaciers are melting, but we have the options of creating large number of local storages and also using underground aquifer storage space. Urban water demands are going up but we also have the slew of hardly explored options including local water harvesting, protection of local water systems, demand side management, achieving proper sewage treatment and recycling, participatory governance, among others."*

(From the SANDRP Press Release, March 21, 2012)

The 93+ix page report is divided in 12 chapters, including on Rainfall, Himalayan Glaciers, Groundwater, Rivers, Floodplains, Wetlands and water bodies, Big Water Infrastructure, Agriculture, Urban water options and Positive local water adaptation and a case study each on **Organic Farming** (by Shripad Dharmadhikary) and **Forest-Agriculture settings in Western Ghats** (by Dr Latha Anantha and S Unnikrishnan).

The soft copy of the report: http://sandrp.in/wtrsect/Water_Sector_Options_India_in_Changing_Climate_0312.pdf
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