

## Lead Piece



GOVT OF INDIA'S CENTRAL WATER COMMISSION

## An Agent of Sub Optimal Development

**Govt can easily develop the procedures to ensure that projects that have not been approved by either CWC or the Planning Commission do not get statutory clearances. Instead, central agencies work more like agents for sub-optimal development & demand more powers.**

In a shocking revelation, an official Govt of India document accepts that an astounding 300 major & medium irrigation project costing Rs 122 060 crores, comprising 63 % of the M & M irrigation projects under implementation in the country, have been going on without clearances from the Central Water Commission, the Planning Commission, the Public Investment Board and the Cabinet Committee on Economic Affairs.

The Dec '06 Report of the Working Group on Water Resources for the 11<sup>th</sup> Five Year Plan, chaired by Secretary, Union Ministry of Water Resources Gauri Chatterji reveals that of the 477 major & medium irrigation projects that will spill over into the 11<sup>th</sup> Plan (which was to begin on April 1, '07, but is pending approval of the National Development Council), "around 63% of the 477 projects are unapproved; it is desirable to emphasize the concerned State Govts to take up needful steps for their early clearance." The 477 projects include 166 major, 222 medium and 89 ERM (Extension, Renovation, Modernisation) projects. Rs 41,128 crores have already been spent on these unapproved projects until March 2007. These projects are supposed to create irrigation potential of 79.47 lakh ha.

What should happen when a project, especially one where huge expenditure is involved, begins without the necessary approvals? The report does not call for penalties; instead it argues that once the necessary clearance is obtained, "Central Assistance/ Funding can be provided for their early implementation." Implicit in this statement is the fact that central agencies rarely disapprove a project - another serious comment on the decay in the functioning of the central water agencies. Polavaram dam on Godavari River and a dam on the Palar River, both in Andhra Pradesh and the building of Hansi Butana Bhakra Mainline Link Canal by Haryana are examples of recent times where the project work has been going on without the approvals from the CWC.

**Significance** The CWC, as per the latest available annual report of that organisation, is "an attached premier technical organisation of the Ministry of Water

Resources" and is "responsible for overall planning and development of river basins, national perspective plan for water resources development in accordance with the National Water Policy, techno-economic appraisal of Water Resources Projects and assistance to the States in the formulation and implementation of projects, monitoring, management, design, research". This important role, however, is diluted by the fact that the current approval process at the Centre for such projects is procedural, and not statutory. The 11th Plan document states, "The complex process of investment approval of Planning Commission preceded by techno-economic clearance after examination by Central Agencies is a procedural requirement for obtaining the plan finance and not a statutory requirement. As a result, an unmanageable number of unapproved projects have been taken up by the States for implementation."

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But that does not mean that the central agencies have no power to influence the states not to take up sub-optimal projects. On the contrary, even without the powers of statutory approval, the CWC has tremendous implicit powers over all states, as it also has a crucial role to play in sanctioning and monitoring the central funding for water projects all over the country. Similarly, the environment clearance for such projects is a mandatory requirement under the Environment Protection Act and a representative of the CWC sits on

the expert committee appraising river valley projects. Similarly, where forests and wildlife impacts are involved, separate clearances on these issues are also mandatory requirements. The Centre can easily develop the procedures needed to ensure that projects that have not been approved by either CWC or the Planning Commission do not get the statutory clearances.

But instead of using such powers, the central agencies work more like the agents and catalysts for such sub-optimal development. The states are happy to take up projects wherever they want to, without the Centre's approval. They know that once the project is *fait accompli*, they can always get the central approval then, as it is unlikely to be denied once the project has begun. Some other well known problems in the functioning of the CWC include: lack of credible post facto evaluations of the projects, failure of the agency in its flood forecasting and flood management issues, failure of the institute to either assess the impact of global warming on India's water sector or assess the global warming impact of India's large dams, failure of the agency to correctly assess the siltation of India's reservoirs and take some effective action to reduce the siltation. These are important issues considering the unique position of the Central Water Commission.

A central agency like CWC is bound to fail considering the huge task given to it. Particularly in absence of similar institutes at state level and further downstream. But absence of such institutions, and absence of a culture of scientific enquiry and accountability mechanisms can be counted among the failures of CWC.

What this means is that water resources development is going on in an unplanned way, which also means that this is certainly suboptimal development. Overdevelopment of river basins is one of the direct implications of this phenomena leading to wasteful

expenditure of public resources on inappropriate projects. With 83% of the geographical area of India comprising of interstate river basins, such unilateral projects by states would have interstate implications. These thus become seeds of conflicts.

A second, even more disturbing recommendation is this: with the central agencies having already failed in their the CWC be given even wider powers - to give statutory approvals in addition to the procedural ones it is now authorised to give. "It would, therefore, be appropriate to

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include investment clearance for interstate irrigation projects under Item-20 as Item-20(B) (in concurrent list of subjects in India's constitution) to give constitutional backing for

Central clearance. Appraisal should necessarily be made mandatory to bring all water projects under the process of TAC/investment clearance, possibly through legislative measures in order to put hold on mushroom growth of unapproved projects, being carried through plan to plan, causing thin spreading of resources and inordinate delay in completion of projects."

Does an agency that has failed so miserably in using its existing powers to ensure proper water resources development, deserve to be given more powers? An objective answer would be a clear, big NO.

**Reason for hope?** However, the report isn't all bad news for the governance and administration of water. The document makes another recommendation in this regard, which is certainly welcome, "Secondly at present, detailed documentation regarding examination of alternative options to optimally meet the overall objectives and aspirations in the light of basin plan is not given in the Feasibility Report/DPR. A detailed chapter analyzing the available options, even not involving large

dams, should preferably be included in the DPR of future project proposals." One hopes against hopes that the centre will use all its powers to ensure this happens. And to make it a reality, the central agencies can use the existing powers at their

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One hopes the centre will use all its powers to ensure this happens. And to make it a reality, the central agencies can use the existing powers at their command.

**Himanshu Thakkar (An edited version of this article was carried at: <http://www.indiatogether.org/2007/may/env-watercwc.htm>)**

## High Water Storage in Reservoirs before the monsoon Warning for repetition of 2006 flood disasters?

Even as the nation awaits the arrival of monsoon (parts of India already drenched), a number of large water reservoirs in the country have significant water storages, which go upto 87% of their storage capacities. As per the Central Water Commission records updated on June 16, 2007, of the 76 large reservoirs monitored by CWC, 41 reservoirs had water filled upto more than 20% of its capacity, when ideally, the storage level should be 10% or less. In case of 20 reservoirs, the water level was over a third of the reservoir storage capacity. This situation could help create floods in the monsoon.

Existence of so much water stored just before the monsoon is difficult to justify in most cases. Particularly when such storages are seen in drought prone areas like Vidarbha (Maharashtra), Gujarat and Rajasthan and also flood prone basins like the Mahanadi.

**Vidarbha** For example, reservoirs like Upper Painganga (44% of its 964 Million Cubic Meters capacity reservoir full on June 16), Kamthi Khairi (88%), Upper Wardha (33%) and Arunawati (28%), are all in drought prone Vidarbha region, where one of the reasons cited for farmer suicides is lack of adequate irrigation facilities. The Prime Minister's much celebrated Vidarbha package is mostly constituted of additional resources of large irrigation projects in this region. What is the justification for storing so much water before the monsoon in such drought prone areas?

**Gujarat** Similarly in Gujarat's drought prone north Gujarat region, Kadana dam (54%) & Panam dam (38%) on Mahi River and Dharoi dam (38% full) & Jakham dam (in Rajasthan, 23%) on Sabarmati River had such high water storages. Ukai dam on Tapi River in South Gujarat, that brought unprecedented floods in Surat and other downstream areas last year, had 29% water storage at the end of May '07, though the level had been brought down to 18% by June 15. Here it may be recalled that Ukai, Sabarmati and Mahi Rivers brought disastrous floods in Gujarat last year.

**One of the main justifications behind creating more storage capacities is that they are required to store water available in monsoon, so that the stored water is available in non monsoon months. If the stored water is not used in non-monsoon months, than it raises question mark over the justification of creating storage capacity.**

**The Planning Commission report (Dec '06) of the 11<sup>th</sup> Plan working group on Agriculture (P 25) noted in this context, "There are apprehensions that recent floods in central & western India were due to improper planning, coordination & management of water releases from reservoirs."**

**Rajasthan** In neighbouring Rajasthan, in Chambal basin, Gandhi Sagar had 35% and Rana Pratap Sagar 87% storage capacity full as reported by CWC on June 16. The Chambal basin also experienced floods in 2006 and such high storages before monsoon could increase the risk of repetition of such floods this year.

**Mahanadi** In the flood prone Mahanadi, the Gangrel Dam (41%) and Hansdeo Bango (27%), both in Chhattisgarh and Hirakud dam (42%) in Orissa had unjustifiably high water storage in these big reservoirs. This is bound to increase the possibilities of high flood damages in this basin in 2007 monsoon.

**Large Dams and the 2006 floods** Significantly, the storage levels are

significantly high in the river basins like Tapi, Mahi, Sabarmati, Chambal, Krishna and Godavari. These basins faced disastrous flood damages in 2006, mostly even before half the monsoon season was over. In case of most of the flood damages in these basins in 2006, the sudden release of high magnitude water flows was one of the most important reasons for the flood damages and better management of reservoir storages could have lead to avoidance of many of these floods. [For details about 2006 situation, see SANDRP Press Releases in July and August 2006 at: [www.sandrp.in/floods](http://www.sandrp.in/floods).] Many of the reservoirs in these basins had significantly high water storage level before the 2006 monsoon, a similar

situation now prevails in 2007. No action has yet been taken against those responsible for the wrong reservoir operation in 2006, which brought catastrophic floods.

The current storage position of reservoirs in these river basins seems to suggest that

events of 2006 could be repeated this year if adequate prior precaution is not taken. International weather forecasts have already suggested that the western & southern India (where most of these reservoirs with high water storage are situated) are likely to have above average monsoon with some intense bouts of rain. If these forecasts come true, then the high water level in

these reservoirs could help increase the possibility of destructive floods in the river basins mentioned above.

**Non Optimum use of resources** Such high water storages behind the dams before the monsoon and floods signifies an inefficient, non optimum use of the resource created at huge cost. One of the main justifications behind creating more storage capacities is that they are required to store water available in monsoon, so that the stored water is available in non monsoon months. But, if the stored water is not used in non-monsoon months, than it raises question mark over the justification of creating storage capacity. Moreover, the capacity already occupied before the monsoon is no longer available to store water from the next monsoon and this also could create additional flood hazard.

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This also means that the storage space created at such huge investment of resources is not being put to use. This also means that there is little justification in the blind advocacy for more storage capacities through large dams, as put forward by the World Bank, the Water Resources Ministry and the Planning Commission.

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planning, coordination & management of water releases from reservoirs."

India urgently needs a transparent, accountable reservoir policy and reservoir operation rules with legal force. Failure of such measures could prove very costly for the people and the economy.

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### Two New Publications on Floods

#### **BEFORE THE DELUGE: Coping with floods in a changing climate**

The International Rivers Network (IRN) has come out with a new report title above as part of its annual report series. Some of the key flood management elements in the changing climate, as highlighted in the report include: Slow the flood, improve emergency procedures, move out of the harm's way, protect the vulnerable buildings and assets and improve dam management. The report also includes a chapter on Indian experience, titled, "A Dam made disaster: How Large Dams and Embankments Have worsened India's floods".

The report shows that traditional flood control policies such as building dams and embankments (levees) may actually be making floods more severe particularly in the context of global warming. The report not only critiques traditional flood control policies, but also offers less dangerous and less ecologically damaging alternatives. This vision of flood management involves reducing flood risks by working with rivers rather than straightening, constraining and concreting them. A new approach to flood management is all the more important in an era of global warming when climate patterns are changing and storms are becoming more frequent and deadly. The old assumptions about how to deal with floods are looking increasingly untenable.

The full report can be downloaded from: [www.irn.org/](http://www.irn.org/). A few copies of the report are available with SANDRP, those interested in getting a copy of the same may contact us.

#### **Story of Kosi River (Hindi)**

Dinesh Kumar Mishra is possibly the foremost expert on floods issues in Bihar and even India. He has been studying the rivers, floods and embankments of North Bihar for over two decades now, as part of *Barh Mukti Abhiyan*. Peoples Science Institute, Dehra Dun has published (Nov 2006) the book in Hindi by Mishra, focusing on the story of Kosi River, titled *Kosi Nadi ki Kahani: Dui Patan ke bich main*.

This 190 page book full of maps and illustrations covers the complex issue of floods with all its historical context, in a very readable way, in a characteristic style of Mishra ji. Kosi was the first river of Bihar where embankments as flood control measure were taken up soon after the 1954 floods. As Mishra ji says, the embankment have completed destroyed the drainage patten of the river basin and in many areas, the floods that were limited to monsoon have now become a permanent feature. The book also shows how the flood control benefits of proposed large dam on Kosi in Nepal is doubtful.

For copies (suggested contribution: Rs 200/-), write to Mishra ji ([dineshkmishra@rediffmail.com](mailto:dineshkmishra@rediffmail.com)) or PSI ([psiddoon@gmail.com](mailto:psiddoon@gmail.com)). The book will soon be published in English.

## Global Warming emissions from Large Dams

### Highest contribution from Indian Large Dams

#### *Myth of large hydro being clean stands shattered*

Latest scientific estimates show that Large dams in India are responsible for about a fifth of the India's total global warming impact. The estimates also reveal that Indian dams are the largest global warming contributors compared to all other nations. This shatters the myth that large hydro projects are clean sources of energy. The estimates by Prof Ivan Lima and colleagues from Brazil's National Institute for Space Research (INPE) were recently published in a peer-reviewed scientific journal.

As per Intergovernmental Panel on Climate Change (IPCC), there are six global warming gases, of which large dams could be sources of three: methane, carbon dioxide and nitrous oxide. Methane emission from human activities is known to contribute 23% to global warming.

#### **Methane emission from Indian Large Dams**

This study estimates that total methane emissions from India's large dams could be 33.5 million tonnes (MT) per annum, including emissions from reservoirs (1.1 MT), spillways (13.2 MT) and turbines of hydropower dams (19.2 MT). Total generation of methane from India's reservoirs could be 45.8 MT. The difference between the figures of methane generation and emission is due to the oxidation of methane as it rises from the bottom of a reservoir to its surface.

The study had to make a number of assumptions in arriving at these estimates, as no measurements of the methane concentration or emission have been made for reservoirs in India. (Most measurements of methane emission from reservoirs have been done in Canada, Brazil and French Guyana.) Secondly, the data about the release of water from turbines and spillways of India's dams were not adequate; hence the estimates involved some further assumptions.

**For over a decade now large dams have been known to be emitters of greenhouse gases like methane, carbon dioxide and nitrous oxide. The "fuel" for these gases is the rotting of the vegetation and soils flooded by reservoirs, and of the organic matter that flow into and also grow under the reservoirs. Methane is produced at the bottom of the reservoirs in the anaerobic conditions prevailing there**

**When methane-rich deep water is released at the turbines and spillways (generally from below the surface of the reservoirs), the pressure acting upon the gas suddenly drops and most of the dissolved methane is released directly into the atmosphere. This degassing process is similar to the fizzing of a newly opened bottle of Soda or cold drink. Researchers from INPE estimate that 95% of dam methane emissions are from spillways, turbines and downstream**

The study estimates that emission of methane from all the reservoirs of the world could be 120 MT per annum. This means that of the total global emissions of methane due to all human activities, contribution from large dams alone could be 24%. This study does not include the emission of nitrous oxide and carbon dioxide from large dams. If all these are included, the global warming impact of large reservoirs would go up further.

By these estimates, the methane emission from India's dams could be 27.86 % of the methane emission from all the large dams of the world, which is more than the share of any other country of the world. Patrick McCully, Director of the International Rivers Network says, "Climate policy-makers have largely overlooked the importance of dam-generated methane. The IPCC urgently needs to address this issue."

These latest round of studies should further help shatter the myth that power from large hydropower projects is clean. Indian hydropower projects are already known for their serious social and environmental impacts on the communities and environment. The fact that these projects also emit global warming gases in such significant proportion should further destroy the myth.

Looking at the available figures for dams in India, total emission of methane from Indian dams may be somewhat over estimated. Even if we assume that methane emission from Indian dams is about half of what Prof Lima et al have estimated, it is still likely to be around 17 MT per annum. Even this more conservative figure means that India's dams emit about 425 CO<sub>2</sub> equivalent MT (considering that Global Warming

Potential (GWP) over 100 years of a T of methane is equivalent to GWP of 25 T of CO<sub>2</sub>, as per the latest estimates of IPCC). This, when compared to India's official emission of 1889 CO<sub>2</sub>e MT in year 2000 (which

does not include emission from large dams), the contribution of methane emission from large dams is 18.7% of the total CO<sub>2</sub> emission from India.

Pradipto Ghosh, till recently secretary, Ministry of Environment and Forests, Govt of India, responded by saying that in India the practice of removing the vegetation from the reservoir before submergence makes this irrelevant. This argument is clearly quite baseless, since it is not even practical to achieve complete or near complete removal of all organic matter before filling the reservoirs. Secondly, this is not even being attempted. For example, in case of both Sardar Sarovar and Indira Sagar dams, standing forests were submerged when reservoirs were filled. Moreover, the submerging forests is not the only source of methane, the organic matter flowing into the reservoirs and also growing within the reservoirs are also big sources of methane.

**Dibang Hydropower Project** To understand the significance of the issue, let us take the example of the proposed 3000 MW Dibang hydropower project in Arunachal Pradesh. The Environment Impact Assessment of the project on Dibang River does not include the green house gas emission potential of the project. The green house gas emission (particularly the emission of highly potent methane) from the project is likely to be very high. This is so considering that the project is in tropical climate, that the turbines of the project will be extracting water from 25 to 80 m (depending on the water level being at MDDL and FRL) below the surface of the water; and that the spillways of the dam would be extracting water from a depth of 45 to 90 meters below the surface. In addition, there will be emission of methane from the reservoir surface and downstream of the river also.

Estimated methane emission from Dibang HEP (based on inadequate hydrology information given in the EIA), even assuming conservative figures, would be 3.3 MT per annum, which is equal to emission of 250 g CO<sub>2</sub> equivalent per unit power generated. To put this in perspective, according to the Central Electricity Authority, some of India's gas based thermal power stations emitted 430 g CO<sub>2</sub> equivalent per unit of power generated. While the estimated emission from Dibang is

less than the emission from such projects, it is still significant that it emits at least 58.1% of the emission from such projects.

**The Science** For over a decade now Large dams have been known to be emitters of greenhouse gases like methane, carbon dioxide and nitrous oxide. The "fuel" for these gases is the rotting of the vegetation and soils flooded by reservoirs, and of the organic matter (plants, plankton, algae, etc.) that flow into the reservoirs. Methane is produced at the bottom of the reservoirs in the anaerobic conditions prevailing there, over the lifespan of the reservoirs. The gases are released at the reservoir surface, at turbines (of hydropower projects) and spillways, and downstream of the dam.

The actual measurements by Prof Lima et al at some of the Brazil dams reveal that the biggest global warming impact of large dams could be coming from methane emissions from turbines of large hydropower projects and spillways of dams. Methane is produced at the reservoir bottom. As it rises toward the surface part of the methane is oxidized in the water to carbon dioxide, a much less powerful greenhouse gas. But when methane-rich deep water is released at the turbines and spillways (generally from below the surface of the reservoirs), the pressure acting upon the gas due to the water column above it suddenly drops and most of the dissolved methane is released directly into the atmosphere. This degassing is a similar process to the fizzing of a newly opened bottle of Soda or cold drink. Researchers from INPE estimate that 95% of dam methane emissions are from spillways, turbines and downstream.

China and USA have more large dams than India.

However, Indian dams, being

situated in tropical climate, could be such big contributors to global warming. This is because the Methane emissions are one or more orders of magnitude higher in tropical (in areas between 30 degree latitude on both sides of equator) climate (due to higher temperature) than those from reservoirs elsewhere. This is similar to the phenomena of lower generation of gas in winter in biogas plants in India, where too, the degradation of organic matter under anaerobic conditions lead to generation of methane. Some of the large hydropower reservoirs in Brazil (also in tropical

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**Lima and his co-authors propose capturing methane in reservoirs and using it to fuel power plants. Lima says, "If we can generate electricity from the huge amounts of methane produced by existing tropical dams we can avoid the need to build new dams with their associated human and environmental costs."**

climate zone) have been estimated to have a higher global warming impact per kilowatt-hour electricity generated than fossil fuels, including coal, according to the study.

It is true that the calculation of the warming impact of reservoirs should be based upon net emissions, which is additional emissions due to reservoirs, compared to situation without the reservoirs. Net carbon dioxide emissions from

reservoirs may be significantly smaller than gross emissions. However the difference between net and gross methane emissions is not likely to be significant.

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**Indian govt blind to the issue** Even though Indian government has remained silent on this issue, it cannot claim it is ignorant of this problem. Surya P Sethi, principle advisor (energy) of Govt of India's Planning Commission has said that he has been asking the Power ministry to assess the methane emission of India's HEPs for five years. A study by Govt of India's National Environmental Engineering Research Institute on environmental impacts of power

generation noted in its report in Feb '06, "Latest studies have found that the levels of harmful greenhouse gases like methane emitted due to decomposition of vegetation submerged under water can be significant."

However, Indian government has not estimated the emission of global warming gases from dams in India. Govt of India's Central Electricity Authority, in its December 2006 estimation of generation of global warming gases from power sector in India said that the total emission for the year 2004-05 was 462.192 MT,

which includes ZERO emission from hydropower projects. The conservative estimation of methane emission from large dams given above is 92% of that figure.

The proportionate emission of hydropower dams would be around 258 MT CO<sub>2</sub> equivalent (since only some of the dams have hydropower component), which would increase the emission of global warming gases from power sector by a huge 55.82%.

**Surya P Sethi, principle advisor of Govt of India's Planning Commission has said that he has been asking the Power ministry to assess the methane emission of India's hydropower projects for five years. A study by Govt of India's NEERI on environmental impacts of power generation noted in its report in '06 had noted, "the levels of harmful greenhouse gases like methane emitted due to decomposition of vegetation submerged under water can be significant."**

**What needs to be done** Neither Central Water Commission, nor Central Electricity Authority, both premier institutes of Govt of India, have assessed the global warming impact of India's large dams and implications there of. The minimum first step one can expect from the government is to urgently institute a credible independent scientific study of global warming impact of dams in India, in light of findings elsewhere. The study should include actual measurement of methane and other GHG emission from a sample of reservoirs. While making this assessment, it should also be assessed as to what extent methane emitted from

reservoirs and hydropower projects can be recovered for beneficial use, in the process also reducing the global warming impact of the reservoirs. While assessing power and water resources development options, the Green house gas emission potential of dams should be assessed, as part of the cost benefit analysis and as part of EIA.

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The IPCC should initiate an independent study to assess the GHG potential of reservoirs in different parts of the world, including India. Emission of CO<sub>2</sub> from reservoirs is already part of the mandatory reporting formats of IPCC. Reporting of methane emissions is suggested, but not mandated. The IPCC should make reporting of emission of methane from large dams mandatory.

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## Over One Crore Acres submerged by Large Dams in India

### Area equal to 30 Delhis or whole of Haryana submerged by Large dams

While there has been a lot of debate about the impacts of large dams (LD) in India, a well researched figure on the area submerged by the reservoirs created by large dams was not available. Here a LD is defined, following International Commission on Large Dams, as one with a height of more than 15 meters from its deepest foundation. A dam of 10-15 m height is also included if it fulfils one of the additional conditions, which include the length of the wall being more than 500 meters, reservoir capacity being more than a million cubic meters, maximum flood discharge capacity being over 2000 cubic meters per second, among others. Most estimates were based on a few hundred reservoirs at the most. Now based on information about 3148 reservoirs from Govt of India's Central Water Commission, we can estimate that the 4528 large dams already constructed in India could have submerged at least 4.426 million ha or 44262 sq km. This is equal to 1.094 crore acres.

In the table below we have given the state wise figures of number of large dams, no of large dams for which CWC information on reservoir area is available, total reservoir area of state from CWC figures, reservoir area per LD for the respective state and total possible reservoir area from the state, based on extrapolation of CWC figures for all the large dams of the state.

Broadly, the land taken for the reservoirs fall under four categories: forest land, riverbed land (& other wasteland), private land (agriculture, home stead) and common property non forest land (panchayat land, grazing land, etc).

**Table: State wise information on Reservoir Area of Large Dams in India**

State	No of LD	No of LD for which Reservoir Area is available	Res. area of state (total available data) (10 <sup>3</sup> m <sup>2</sup> )	Res. area/ LD from CWC data (Average)(10 <sup>3</sup> m <sup>2</sup> )	Possible total reservoir Submergence Area of state (10 <sup>3</sup> m <sup>2</sup> )
	A	B	C	D (C / B)	E (D x A)
Andaman & Nicobar	1	1	1840	1840	1840
Andhra Pradesh	185	135	4134351.65	30624.83	5665593.55
Arunachal Pradesh	1	0	-	-	8857.95
Assam	3	2	22370	11185	33555
Bihar	29	23	199238	8662.52	251213.08
Chhattisgarh	255	236	1567309.04	6641.14	1693490.7
Goa	7	7	50897.04	7271.01	50897.04
Gujarat	567	38	482699.58	12702.62	7202385.54
Himachal Pradesh	6	6	442002	73667	442002
Jammu & Kashmir	10	2	18725	9362.5	93625
Jharkhand	76	56	909578	16242.46	1234426.96
Karnataka	231	224	3904133.22	17429.16	4026135.96
Kerala	56	46	497997.2	10826.03	606257.68
Madhya Pradesh	803	696	4299158.37	6176.95	4960090.85
Maharashtra	1651	1237	3352602	2710.27	4474655.77
Manipur	5	1	51800	51800	259000
Meghalaya	6	2	10777	5388.5	58597.74
Orissa	159	136	2318698.74	17049.25	2710830.75
Punjab	12	11	106014.54	9637.69	115652.23
Rajasthan	188	145	2771707.71	19115.23	3593663.24
Sikkim	1	0	-	-	8857.95
Tamil Nadu	100	77	613186.3	7963.46	796346
Tripura	1	1	51669.2	51669.2	51669.2
Uttara Khand	17	11	347416	31583.27	536915.59
Uttar Pradesh	130	52	1575722.2	30302.35	3939305.5
West Bengal	28	3	154927	51642.33	1445985.24
<b>TOTAL</b>	<b>4528</b>	<b>3148</b>	<b>27884819.79</b>	<b>8857.95</b>	<b>44261850.52</b>

Notes: 1. The figures for 3145 reservoirs from CWC's National Register of Large Dams, 2002.

2. The submergence area of Gumti Dam of Tripura and Umiam & Kyrdemkulai dams in Meghalaya were taken from the respective CWC studies on siltation of the reservoirs, obtained under the Right to Information Act.

3. For the rest of the reservoirs for which CWC information on reservoir area was not available, it was assumed that such reservoirs would have average of the reservoir area of the respective states, for which CWC information is available. For a couple of states for which CWC has not provided reservoir area of any dam, we have gone by the national average for reservoir area data available from CWC. This is not likely to create big impact on overall figures as only dams are involved, one from each state.

**Limitations** This estimation of land used by the LD projects suffer from a number of limitations. Here it should be noted that impact of the reservoirs of large dams go beyond the submergence area at Full Reservoir Level (FRL), as the Maximum Water Level (MWL) of many of the reservoirs goes beyond the FRL. In addition, there is also the backwater impact in the monsoon, which affects additional area in the upstream even at levels higher than FRL or MWL. These additional submergence areas are not included in this estimation. Moreover, the LD projects needs land for a number of purposes like for colonies, roads, canals, transmission lines, protection work, etc. The above estimation of land requirement does not include any of these. It is not possible to include all that data, since such data is not readily available for any single dam, leave aside all the dams of India. Fourthly, the list of dams in the CWC National Register of Large dams is not complete. It does not include, for example, a number of large dams which has only hydro power component (e.g. Chamera I, Chamera II and Chamera III projects in Himachal Pradesh). There are a large number of such projects, which if included; the amount of land even for reservoir area would go up. However, the number of such projects is not likely to be more than 1-2 % of the number of large dams in National Register.

**Glaring Errors** While making these estimates, we found that the CWC data given in its 2002 *National Register of Large Dams* had some glaring errors. This was particularly so in case of large dams of Uttar Pradesh. For example, the reservoir area of Naugarh dam, completed in 1966, is given in 2002 CWC National Register as an unlikely figure of 233160 ha. When we cross checked with CWC's 1990 National Register of Large Dams, we found that the figure for reservoir area of this dam was given as 2331.6 ha. We found similar discrepancies for other dams of UP in the 2002 National Register. Hence for such projects, we have taken the figures in the 1990 National Register. We have cross checked the figures of 1990 National Register with the figures of some of the UP LD given in "Large Dams in India", published in Oct 1987 by Central Board of Irrigation and Power.

**Significance** To give an idea as to how big this figure is, this total submergence area of large dams in India (4.426 million ha) is equal to 30 cities of the size of Delhi. This area is larger than the area of whole of Kerala state (38863 sq km) or whole of Haryana (44212 sq km) state. It is significant to note here that as per the report of the Government of India working group on Water Resources for the 11<sup>th</sup> Five Year Plan, by the end of 10<sup>th</sup> Five year plan it is expected that 34.42 m ha would be irrigated through major and medium irrigation projects. The submergence area of 4.426 m ha suggests that to achieve the irrigation from big dams, at least 13% of the projected irrigated area could go under submergence.

Himanshu Thakkar and Bipin Chandra Chaturvedi

NEW PUBLICATION FROM SANDRP & IRN

## Dams, Rivers & Rights

**Action Guide for communities affected by dams – in Hindi and English**

SANDRP has just published in Hindi, "*Dams, Rivers & Rights*" an action guide for communities experiencing adverse impacts of dams. The action guide was earlier published by the International Rivers Network in English, "to empower communities threatened by new dams and to share ideas from the growing international dam movement. It is hoped the guide provides information and tools to help communities to decide how to respond to a proposed or existing dam, how to protect rights and demand a voice in the decisions. Over the years, movements have also been proposing better or rather real options for fulfilling justified water and energy needs of the society.

The Hindi edition is not a literal translation of the English edition. We have tried to change the examples, text and figures, to contextualize the guide for Indian/ South Asian audience. Some additional text and material has also been added, where appropriate.

Please write to SANDRP ([ht.sandrp@gmail.com](mailto:ht.sandrp@gmail.com)) or IRN ([info@irn.org](mailto:info@irn.org)) to get copies of the guide. Soft copies of the English and Hindi edition are also available on IRN ([www.irn.org](http://www.irn.org)) and SANDRP ([www.sandrp.in](http://www.sandrp.in)) websites respectively. The suggested contribution for the 44 page Hindi edition is Rs 30/-.

**Maharashtra Water Regulator:****Can there be some place for the people, please?**

*This article, when circulated among the participants of the Gomukh meeting, created a live debate, which included detailed responses from the member secretary of MWRRA. However, the responses only reinforced the points raised in this article. If anyone is interested in getting copies of that debate over email, pl write to [ht.sandrp@gmail.com](mailto:ht.sandrp@gmail.com)*

This sounds weird, but is true. The Maharashtra Water Resources Regulatory Authority Act (MWRRAA) of 2005, a pioneering act of its kind, has no role for the people outside the bureaucracy and the ministers. This shocking revelation was reinforced at a recent meeting organised by the Gomukh and Arghyam in Pune, where the chairman and the secretary of the Authority also spoke. The Act is now being amended, the MWRRA secretary, Suresh Sodal informed the participants, to bring into the Act's ambit the groundwater development and management issues and also to expand the tariff fixing role of the Authority. This may be a good opportunity to bring in other amendments to give people of the state some worthwhile role in the functioning of the authority and the water sector. The assurance by the officials of the authority that people will have an opportunity to express their views (and the officials will decide what to do with them) is clearly inadequate, to put it mildly.

Interestingly, the objective of the MWRRAA, as stated in the act is, "to regulate water resources within the State of Maharashtra, facilitate and ensure judicious, equitable and sustainable management, allocation and utilisation of water resources". Maharashtra is the first state in India to come out with such an act, but it is clear that the union government would like such acts to be passed by all the states. Particularly when the World Bank wants this as part of the Water Sector Reforms. Arunachal Pradesh has already passed such an act and Gujarat has drafted one over two years ago.

Significantly, the MWRRAA was published in Gazette on May 4, 2005 and the World Bank funded US \$ 325

million Maharashtra Water Sector Improvement Project was cleared on May 26, 2005. The Project Appraisal Document of the WB loan is candid about its role in making such act a reality. In fact, as the Bank document declared, one of the key legal conditions of the loan was to, "establish MWRRA by no later than Dec 31, '05 and make it operational by Sept 30, '06." Ajit Nimbalkar, Chairman of the authority accepted the crucial role of the Bank in making the MWRRAA possible.

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**Broadly, the act consolidates the hold of the government in planning and decision making in water sector. For a sector that is characterized by non transparent, unaccountable, non participatory, top down and big dam centric approach, the act facilitates further weakening of the already weak accountability of the politicians of their actions in this sector.**

Broadly, the act consolidates the hold of the government in planning and decision making in water sector. For a sector that is characterized by non transparent, unaccountable, non participatory, top down and big dam centric approach, the act facilitates weakening of the accountability of the politicians of their actions in water sector. This cannot be good for democracy. Bringing sweeping changes in the water sector, the Act also empowers the authority to allocate and change entitlements of water for various categories (e.g. agriculture, domestic, industrial, etc) and users of water. Sodal also revealed that the concept of

entitlement for various categories of use and within each category is being introduced in 6 pilot irrigation projects.

Moreover, for the first time in India, the act also empowers the authority to create mechanisms for trading of water entitlements. This again cannot be good for the poor and weaker sections of the population. In a trade between the prosperous and the poor, it is well known who would win and who will suffer.

This mix of non transparency, lack of accountability and lack of representation of people from crucial water sectors outside the government, with this concept of

trading of entitlements, so that the water goes to the highest valued users, could be very dangerous for access of the poor and weaker sections to the water they need for life and livelihood. For example, it could mean that since industries and urban users are considered higher valued users in the World Bank parlance, the needs of the rural, agriculture and poor sectors within a region and weaker regions within the state would get lower priority or even no priority while entitlements are considered and traded. There can be several other serious implications.

**Moreover, for the first time in India, the act also empowers the authority to create mechanisms for trading of water entitlements. This again cannot be good for the poor and weaker sections of the population. In a trade between the prosperous and the poor, it is well known who would win and who will suffer.**

Such sweeping powers and sweeping changes in the water sector, without even a wide and informed consultation across the state is neither warranted, nor justified. It seems to be a case of the World Bank agenda being uncritically accepted by the state govt. Here it may be added that the bill was brought before the legislative assembly in the last hours of the last of the session on April 13, '05. There was not even an opportunity to read the bill, leave aside debate it and it was passed by voice vote, as one of the legislators said.

Most atrociously, a reading of the act shows that the act has no significant role for anyone outside the government.

Looking at the constitution of the Authority (all three members are current or former bureaucrats and five special invitees are officials from government agencies), the River Basin Agencies, the State Water Board, the State Water Council, the Selection Committee (for selecting the Chairperson who "shall be a person who is or who was of the rank of Chief Secretary or equivalent thereto"), there is no place for anyone outside the government in any of these. This cannot be an acceptable situation. Mr Suresh Sodal wrote about this, "My own view is also that only an ex-chief secretary level officer with more than 35 years of administrative experience in public affairs behind him can best fulfill this quasi judicial function in this particular sector at the current time." Why should head of a quasi judicial body be headed by a bureaucrat with 35 years of experience? This possibly exposes the govt mindset on this issue.

The two members of the Authority (besides the Chairperson) are supposed to be experts in engineering

and economics. When over 80% of water use is in Agriculture (on which 65-70% of people depend), and when every action in the water sector has such profound impact on environment, there is no place in the act for having members from Agriculture, Environment and Social sectors. The first thing the government needs to

do is to add experts from these three areas as full members and they should come from outside the government and should not be former bureaucrats.

While in theory it may be true that the two full time members need not be current or former

bureaucrats, in practice, as it clear from the current situation, they are likely to be current or former bureaucrats. The Govt could have easily given signal by

selecting non bureaucrats, particularly in the inaugural team. The fact that govt chose not to do so, says a lot. When MWRRA was challenged to make public the names of all those who were considered for the post of full time members, they refused to do so.

The mindset of the govt thinking on the authority again got exposed when Sodal, member secretary, wrote in his response to us, while discussing planning process, "It has to be appreciated however,

that in the ultimate analysis project design is a technical function and the final say has to rest with the engineers concerned." The trouble is the question of project design comes only when a decision about a project has been taken, but the planning and decision making process for such projects has to be and can be participatory, which the govt is not prepared to accept.

Thus it seems this has been a missed opportunity to bring some fundamental changes in the character of India's water sector. The minimum one can expect is to suspend the act till there is a wide and informed debate on the Act, its rules and regulations (currently under the consideration of the state government) and implication there of. Moreover, the reforms should be bottom up, if they are to respect the democratic norms of India's constitution.

**SANDRP (A version of this article was published in MINT newspaper on May 9, 2007, see [www.livemint.com](http://www.livemint.com))**

## Comments on ADB Energy Strategy 2007

The Asian Development Bank is developing a new Energy Strategy to guide ADB's future involvement in this sector. Comments on this draft strategy (see: [www.adb.org](http://www.adb.org)) can be sent to ADB at [energystrategy@adb.org](mailto:energystrategy@adb.org) by July 27, 2007.

These preliminary comments on the DRAFT ADB Energy Strategy were submitted to ADB at Delhi consultation on June 18, 2007.

**Consultations** The way current consultations are held, it does not carry much credibility, since the ADB management that formulated the draft policy also decides what to do with the comments, suggestions. If the process is to have some credibility, it should be conducted by credible independent panel that reviews the issues raised and ADB response and also says to what extent ADB response was

adequate. Of course the selection of such a panel has to be credible so that the experience of the water policy review panel is not repeated, where the panel said what ADB anyway wanted!!!

**General Comments on the Strategy** The Energy Strategy (ES) makes many politically correct statements, including on energy efficiency, renewable energy, low carbon projects, etc, but has little by way of specific targets. Such general statements, which were there in 1995 policy and 2000 review, do not mean much as long as there are no targets and actions.

**ES will increase global warming** The strategy gives a picture that it is concerned about global warming, but the energy strategy would only increase it!

### ADB funding for Large

**Hydro** The claims in para 54 (and also para 37) that large hydro is renewable, clean, reliable and flexible are all highly questionable. The claim of it being efficient is vague at best. It is certainly not renewable since the

reservoir silt up, among other reasons. It is certainly not clean as reservoirs at least in tropical countries emit substantial amounts of methane, in many cases higher than those from combined cycle gas based power projects. It is not reliable in the age of global warming when glaciers are melting and when monsoon is getting more unpredictable. It has no flexibility if you are talking about run of the river projects.

**The claims that large hydro is renewable, clean, reliable and flexible are all highly questionable. The claim of it being efficient is vague at best. It is certainly not renewable since the reservoir silt up, among other reasons. It is certainly not clean as reservoirs at least in tropical countries emit substantial amounts of methane, in many cases higher than those from combined cycle gas based power projects. Besides, such projects have substantial social and environmental impacts. It is not reliable in the age of global warming when glaciers are melting and when monsoon is getting more unpredictable. It has no flexibility if you are talking about run of the river projects.**

documents, incomplete survey work for the EIAs, flawed public hearings, attempts not to take responsibility for the full projects, by attempting to fund only the transmission component, no comprehensive options assessment, no basin wide cumulative impact assessment, among others.

**Under the circumstances, ADB's intentions of funding large hydro (Para 77) is unacceptable.**

**Sustainable Energy** If ADB really believes in this than it needs specific targets about GHG emissions of its energy portfolio. The first step would be to measure the total emission of its energy portfolio and country wise energy portfolio in 2007 as soon as possible. Here is a suggested target: the emission potential of

ADB energy portfolio should reduce by 20% from current level in five years and by 20 % in each 5 years cycle.

**Violations in Uttaranchal** ADB's ongoing Uttaranchal Power project (including four small hydropower projects, which are also submitted for CDM credits) in India and the planned funding of the three Kotli Bhel large hydropower projects in Uttaranchal have already seen violations in terms of non consultation of affected people, not

conducting comprehensive EIA for the individual projects, flawed information in the EIA and project design

**Energy Efficiency** The ES accepts (Para 35), “Energy Efficiency is the most cost effective source of reducing energy gap, carbon emissions, and reliance on expensive hydrocarbon imports. Studies have shown that adoption of proper and effective energy conservation measures can reduce energy demand by 20%”.

This is a huge potential which has largely remained untapped even though the ADB 1995 policy also talked about it, there is little significant progress. In countries like India the potential from EE is larger, with 20% potential only in the Demand Side management. In addition there is a very huge scope in improving supply side generation, in reducing T&D losses, in peak demand management, in better maintenance of existing infrastructure and so on. The least one can expect from ADB is to have a clearly defined targets, say 33% of ADB’s power sector funding will be for EE projects.

**Renewable Energy** Renewables (Solar, Wind, biomass and hydro less than 10 MW provided they follow WCD guidelines) have huge potential (para 73 says it can be 5-10 times current share and increase to 10-20% of total electricity supply, but that is a conservative estimates. Even a die hard main streamer say that US can generate 20% of its power supply from wind energy alone. Putting devils aside, the fact is the potential is much larger than what ADB has projected.), but ADB has done little for it in its energy portfolio. ADB needs clearly defined targets, including say 33% of ADB’s power sector funding will be for RE projects.

**Reducing Consumption** There is no word in the Energy Scenario that one of the option is to find ways to reduce our current energy consumption. Here are a couple of quick suggestions how this is possible.

- **System of Rice Intensification** If this new method of rice cultivation is used extensively, it can reduce the water demand for rice cultivation by upto 50%, seed requirement by upto 90%, eliminate the chemicals required and yet increase the yields by upto 50% or even more. If similar methods are tried for other crops, the total energy consumption in agriculture can come down significantly.

**It is clear that ADB equates governance reform in power sector with privatisation, but this is clearly a fundamentally flawed proposition. There are many ways in which power sector needs reforms to achieve greater transparency, accountability, participation, equity, sustainability and efficiency. Privatisation is not necessary to achieve any of these**

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- **Organic Farming** Similarly, organic farming can reduce the energy demand in agriculture and related areas significantly.

**Energy for All** Amazingly, this is one of the shortest sections of the ES and the content is even shorter in substance.

This clearly shows ADB’s lack of seriousness on this issue and ADB only wants to use the lack of access to what it calls modern forms of energy to push for more generation capacities, without meaning to ensure that the unreached are reached. The fact is that you do not necessarily need to add to generation capacities if you want to reach the unreached. There are so many examples where communities staying near the huge generation capacities do not have access to the electricity generated. Moreover, ADB’s blind advocacy for privatisation of power sector actually is in contradiction with the Energy for all goal as private sector has no interest in rural electrification or ensuring that everyone gets power. This is also evident from the experience of power sector reforms in Orissa in Eastern India. If there is any seriousness in reaching the unreached, than the least ADB can do it to have time bound targets in the strategy and specific allocations for this. Say at least 20% of the power sector portfolio should be for ensuring that those who do not have access to electricity get it, in say next ten years.

**Governance reforms = Privatisation?** It is clear that ADB equates governance reform in power sector with privatisation (see Para 65 and 89), but this is clearly a fundamentally flawed proposition. There are many ways in which power sector needs reforms to achieve greater transparency, accountability, participation, equity, sustainability and efficiency. Privatisation is not

necessary to achieve any of these and in a basically monopoly sector like the power sector, there is little benefit in privatisation. Experience shows that privatisation helps little in achieving these objectives. But ADB’s ES is very short on honest exercise of learning from the past experiences, and this needs to be built into the ES. In any case, there is no need for privatisation of power sector and equation of reforms with privatisation is unacceptable.

**SANDRP ([www.sandrp.in](http://www.sandrp.in))**

## SRI SUCCESS STORY IN TRIPURA

The state of Tripura shares a border with Bangladesh on three sides and is the smallest of the North Eastern states. In April 2007 some of us visited two (West and South) of the four districts and had extensive discussions with farmers, field-level agriculture department officials, the Director of Agriculture and the Minister of Agriculture.

Two striking features of SRI (System of Rice Intensification) in Tripura is the scale of operations with large stretches of contiguous SRI plots of 30-50 ha and the strong policy and field support of the Department of Agriculture. Though a small state (10,491 sq km) with a cropped area of 280 000

ha, the achievement with regard to SRI is considerable and provides hope and lessons to offer for the rest of the country. An estimated 14,000 ha of rice in 2006-07 is under SRI that is nearly 8% of the total land area under paddy. The plan objective for 2007-08 is 30,000 ha. States such as Tamil Nadu and Andhra Pradesh might have greater area under SRI; SRI's share of their total rice production is much lower.

The achievement of Tripura has been due to the work of a dynamic agricultural officer, Baharul Mazumder, who was responsible for introducing SRI and systematically working towards overcoming its technical hitches before arguing the case with his peers and creating a positive environment for SRI. Tripura has been able to provide institutional support to its farmers in enabling them making the transition. It is the combination of the social entrepreneurial skills of Baharul and the policy support of the state government that is responsible for this transition. The Tripura story

is remarkable for the achievement has been without any outside financial support either from the centre or any donor agencies though they would indeed like to support the successful initiative.

The story of SRI in Tripura dates back to 1999 when Baharul Mazumder first heard of SRI from people in Calcutta. On his return to Tripura Baharul decided to try out SRI based on the information he had. He first tried out single seedling and young age seedlings (10 days, 15 days, 20 days). His initial attempts to speak to farmers and agricultural officers were met with great

skepticism. He then decided to try things out by himself in an area where he had worked, East Charakbai / Baikhora in South Tripura district. Dr Norman Uphoff at Cornell when contacted, gave Baharul a lot of information and asked him to get in touch with Dr Alapati Satyanarayana who was doing SRI work in Andhra Pradesh.

Baharul received valuable inputs from Uphoff and Satyanarayana. By 2002 SRI was being practiced by 22 farmers in first time use. Rice in Tripura is grown in three seasons – Aush, Aman (winter) and Boro (summer). Apart from these many parts of Tripura follow shifting agriculture or Jhum.

To achieve Tripura's main goal of food self sufficiency by 2010 SRI emerged as an alternative based on Baharul's initial experiments in South Tripura. In a review meeting in 2002, the then Commissioner of Agriculture, Dr GSG Iyengar, was asking the Department officials as to what were the new things that were happening in their area. When the Deputy Director of Agriculture mentioned about SRI being practiced, the Commissioner who has an agricultural doctorate, closed the meeting and expressed interest in visiting the rice field. Later in the evening, he spoke to Baharul and commended him for the effort and discussions for scaling-up began. Demonstration plots of SRI were planned in 400 places across the state in 2004, up from 88 in 2003.

The Chief Minister instructed every village pradhan or panchayat head to visit the demonstration plot and explore how it could be taken up in their village. The active involvement of the Agriculture Department officials at all levels and the village-level functionaries of

the Panchayat Department in 2005-06 ensured that a plan was in place for 2006-07 for 16,000 ha under SRI.

Our field visit coincided with the Boro season crop. Many parts of the state were short of water and even though there were extensive lift irrigation schemes, the rivulets had dried up in many places creating dry field conditions. On the night of our arrival on 22<sup>nd</sup> April there were heavy showers which were a big relief to farmers and they were active in their fields when we visited them.

**Though a small state (10,491 sq km) with a cropped area of 280 000 ha, the achievement with regard to SRI is considerable and provides hope and lessons to offer for the rest of the country. An estimated 14,000 ha of rice in 2006-07 is under SRI that is nearly 8% of the total land area under paddy. The plan objective for 2007-08 is 30,000 ha.**

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Our first halt was in the village Dudhpatil in E Nuagaon, Jirania block. It was our first sight of contiguous SRI plots as far as we could see. On Baharul's advise the field boundaries were demarcated using colored flags that were yellow in color (pink and blue were used in other areas) with SRI written on them.

The village was using breeder seed of the Satabdi variety and farmers expressed satisfaction with SRI. Farmers involved in breeder seeds multiplication are often the first adaptors of SRI. These farmers are used to treating seed with greater care and success in their fields often acts as

motivation for other farmers in the region. We interviewed Karanjit Choudhury who tried SRI in 2.2 ha. Karanjit had done transplantation in a week with staggering and used 14 labourers during transplantation. He heard about SRI first through a panchayat meeting and had received training from the Agriculture Department. He also saw the demonstration plot. To him SRI would increase yield and reduce cost of cultivation. His average productivity was 4.5 to 5 T per ha, and he expected SRI yields to be closer to 7.2 to 7.5 T per ha. The agricultural officer estimated an even higher yield.

We also spoke to a sharecropper Prabhat Baishnab who tried out SRI in 0.8 acres own and 0.5 acres sharecropping. He felt SRI involved less fertilizer and inputs. He heard about SRI through local Village Agricultural Officer and had also seen other plots of relatives in S Tripura district and then he decided to have SRI in all his 1.3 acres. He has tried short duration paddy and medium duration in his plot. We asked him about water management and weeding problems and if he thought anything was necessary to improve agriculture in the region. He was wondering if there could be some equipment that could undertake the transplantation. He was more worried that labourers were sometimes planting too deep or too shallow. A transplanter might solve the problem.

We enquired about how was it that 44 farmers had agreed to take on SRI in the village. They mentioned the existence of an informal group of farmers already involved in managing water through the lift irrigation scheme, support from the department, and the visit to the demonstration plot. Dinesh Debnath was the first farmer to take up SRI in 2005. We learned about a government incentive for SRI that amounted to a total of

Rs 4500 per ha. Of this, most was in-kind and Rs 500 in cash -- Rs 400 was for procuring organic matter for composting and Rs 100 for nursery management. The department supplied azotobacter and recommended doses of fertiliser and pesticide if required. The discussions later revealed that democratic

decentralization through the Panchayati Raj system was an important factor in the success of SRI. These officials were the best motivators for the farmers.

Our next halt was E. Havaibari in Teliamura block. The lift irrigation system in the village had gone out of order here, and

there was a dry spell. Timely rains and the SRI system saved their crop. We had a good chance to look at the implements here, and there was some discussion on the weeders being used. These weeders were brought in several years back with a view to popularize the line planting system of the Japanese. The designs were given to local welders who replicated them. The weeders are supplied by the Department and do not form part of the subsidy package of Rs 4500 per ha.

Farmers' plot sizes in Havaibari were a bit lower with nearly 70 farmers practicing SRI in 35 ha. We had interactions with Dwijendra Das in Havaibari, a farmer who took to SRI and is now practicing it in two ha. Birendra Sarcar, another farmer, mentioned that he expected 5.5 T per ha yield, up from the current 2.8 T.

At N. Krishnapur we saw profuse tillering in the fields and had discussions on the methods used by the Agriculture Department to take forward SRI.

Bharat Sircar's plot had vigorous tillering, and he

counted 87 tillers from one plant in his field. He cultivated SRI in 0.5 ha and expects about 4.8 T yield. We tried engaging with farmers on questions of their perceptions on yields, water requirements, etc. and what could be done to improve SRI? This was more to encourage critical thinking among the farmers, and in few places we did get some ideas. We noticed that many farmers were trying out SRI with local varieties. We rushed back to Tripura for an appointment with the Director of Agriculture. Our brief conversation with Amar Das, Director of Agriculture, was more in the nature of exchanging our immediate impressions about SRI.

When we expressed our amazement at the extent of the operation, he seemed pleased and even tried requesting the Minister to see if we could meet him briefly.

**The slogan used in Tripura went something like this 'Beej kam, saar kam, jal kam, aushadh kam, kharcha kam, phalan bishi, aay bishi'. The slogan is similar to the main theme of 'more from less' in SRI and indicates lesser inputs in seed, fertiliser, pesticides, water and costs, with increased output and incomes.**

**Most SRI areas had a simple board that indicated the by-line 'Sri Paddothithe Dhaan Chaas' in Bengali -- or 'Better cultivation through SRI'. These posters had a farmer in the background doing weeding operation.**

The Minister was kind enough to agree to meet us the following day. Mr. Das mentioned that if we were so excited about West Tripura, we would probably be doubly excited after visiting South Tripura the next day.

**South Tripura** We started early and went to S. Bagma and Matabadhi block in South Tripura district. SRI was being practiced in 42 ha with 128 farmers. Irrigation for 30 ha was by lift irrigation and 12 ha by deep tubewell. They have been having a dry spell due to decreased inflow into the river Gumti for the past month. The rains of the previous two days led to a flurry of activity on the field with farmers busy with the weeding operations.

**There is a govt incentive for SRI that amounts to a total of Rs 4500 per ha. Of this, most is in-kind and Rs 500 in cash -- Rs 400 for procuring organic matter for composting and Rs 100 for nursery management. The democratic decentralization through the Panchayati Raj system was an important factor in the success of SRI.**

We had discussions on the weeders with the Agriculture Department officials. The subsidy on weeders is 75%, and they currently cost Rs 625 with Rs 156 contributed by the farmers. We examined the weeders quite closely and found that modifications are being tried out with wooden and steel frames. However, servicing of the weeders is likely to become a major issue, and it appears that there is a lot of scope for design intervention.

We had an idea of the spread effect of SRI. Many farmers have taken to SRI even without the package scheme and hope to benefit from the package in the coming financial year. This led to discussions on what if the government withdraws the package; farmers were confident that they could manage in a few years by themselves. They also mentioned that they would have perhaps lost the crop due to the dry spell but for SRI.

Our next halt was Barobhaia, a small (by Tripura standards) extent of 7 ha of SRI plot. We met Santosh Pal, who had tried out SRI in 1.6 acres. He counted 36 tillers in the middle and 40 in the end (edge effect).

Santosh was a third-time SRI farmer who had tried out SRI in last Boro, this Aman (Kharif), and now this Boro as well. His first exposure to SRI was through the demonstration plot a kilometer away in 2005.

At our next halt, we also met with Babul Dutta, a farmer who tried out the Bangladeshi variety in E Kaphilong. Babul had got this variety from his relatives in

Bangladesh, and the variety is quite popular across the border and even in Tripura. Later we saw the border fenced with thick barbed wire and reflected on the implications of the divides in these border areas. BR 29 has not been recommended by the Agriculture Department as no trials have been done. In fact, we learned that insurance companies have been instructed to not entertain any claims on BR 29.

However, farmers had their own knowledge that spread across the border. It would be really interesting if some agency could sponsor an SRI exchange between Bangladeshi and Tripura farmers. With similar agro ecological conditions but

different institutional structures, such a facilitated exchange can lead to interesting knowledge flows.

We proceeded to the Mirza block of the district. Like its famous counterpart in Rajasthan, this town also had its fort and lake. At East Mirza, SRI is being practiced in 30 ha of a total of 150 ha. There are 200 farmers, and 53 ha is covered by the LI scheme. We spoke with Sanjit Mazumdar a three-time SRI farmer who was trying out SRI in 1 ha, having started with 1 acre crop in Boro 2006, with a yield of 50 maunds, Pooja variety (23.5 maunds in 2 acres) and Krishnahamsa (25 maunds in 2.6 acres). When asked about any problems with SRI, they referred to water management being an important issue. They also referred to labour problems during transplantation.

Farmers want to take up SRI in Aush as well but cannot due to lack of water. Sultan Mai was one of the farmers

with the largest landholding that we met. He had 4.32 ha. The discussions at East Mirza were quite animated, with the local farmers' club leader Jiten Mazumdar joining actively in the discussions. Jiten and others mentioned that the awareness of the labourers was the big issue. The fields had plants with 65-75 tillers. Greater spread was not possible in the region due to waterlogged areas.

Our next halt was SRI fields 1 km away from Shamukchura where we met Manoranjan Das. Das had experimented a bit with his SRI fields, trying single seedlings in 1.4 acres, 2 seedlings in 0.2 acre, and 3 seedlings in another 0.2 acre.

Budhi Ram Naotia, a tribal farmer, came over to Das's fields, and we had a brief interaction with him. Much of the success in S Tripura seems to have been with tribal farmers although we did not get an opportunity to visit their fields. Budhi Ram had started SRI with 0.2 acres in Aman last season and got 12 maunds (480 kgs) under rainfed conditions. The tribal farmers do not use weeders and do manual weeding. There are currently 25 farmers in Shamukchura trying out SRI. Naotia is doing it in 1 acre.

Our last halt in farmers' fields was in Laksmipur in Rajnagar block. Farmers were practicing SRI in 30 ha. We spoke to Kumod Debrath, a sharecropper who tried SRI in 1.2 acres. Debrath is a first-time SRI farmer and had heard about SRI from the Panchayat. He has not undergone training. He tried SRI with BR 29 from Bangladesh and had got the seeds from his father-in-law. Transplantation was done between 12-16 days and was spread over four days. When asked about the differences in yields based on the physical look of the fields transplanted differently, Debrath mentioned that during winter, SRI transplantation should be between 15-20 days whereas in summer 8-10 days is enough. There are about 100 farmers operating the 30 ha SRI plot. We counted the grains per panicle in the fields, and they were quite healthy and averaged around 220.

We were to see many more SRI fields at Dimatali, Satpara, etc. but had to rush, hoping to keep the appointment with the Minister of Agriculture.

#### **Policy Support for SRI in**

**Tripura** We met the Agriculture Minister in the evening. He was just reviewing the plan for the year. The Finance Secretary and Commissioner Mr. S. K. Roy were there along with Amar Das, the Director. The Minister Tapan Choudhury first asked us about our impressions of SRI work.

We shared with him some observations on the spread of SRI in the state, the rough calculation on the return on investment that the government was getting through its policy support of Rs 4500 per ha in terms of improved productivity alone, the returns were perhaps three times.

We also shared with him our pleasure at seeing such large areas of contiguous patches under SRI, something unique to Tripura, and the excellent coordination

between the Agriculture Department and the Panchayat officials. We mentioned that the rest of the country has much to learn from Tripura. We also mentioned that many farmers were feeling the need for better water management, and he wondered if it was possible for the communities to have a standby for some of the motors in the LI scheme that were going bad. The Minister mentioned that there is a plan to devolve responsibilities for maintenance to the communities from the coming financial plan and discussions were on with the Water

Resources Department. The Minister was very modest about the achievements and kept referring to Tripura as a small state. He also mentioned that the target for the current year is 30,000 ha, almost double the previous years.

Baharul later mentioned that the investment would also be

increased from 4500 per ha to Rs 5000. S. K. Roy was wondering if more resources could be mobilized to take some of the activities under SRI, and we expressed that it should be possible given the solid work and systems being put in place in Tripura. We also mentioned that apart from financial support there can be other ways of collaboration that included research and documentation. Tripura presents several

sites where detailed water estimates in SRI can be worked out.

Workshops on weeders and markers as well as organic practices in SRI are other issues that can be worked on. Some of the more detailed research experiments on spacing etc. that is currently being done in other places in India can be replicated in Tripura on

farmers' fields with more authentic results.

Baharul Mazumder did share with us some basic information on SRI in Tripura. The state average in Aman (Kharif 2006) under SRI from the 17 agricultural subdivisions works out to 3,519 kg/ha, with the five-year average without SRI ending 2005 working out to be 2,618 Kg/ha, indicating a 34% increase. In several areas where SRI worked without too much water where a conventional crop might have failed. SRI in 2006-07 covered 5,965 ha in Kharif and 8,176 in Boro.

**C. Shambu Prasad (shambu@ximb.ac.in)**

**The state average in Aman (Kharif 2006) under SRI from the 17 agricultural subdivisions works out to 3,519 kg/ha, with the five-year average without SRI ending 2005 working out to be 2,618 Kg/ha, indicating a 34% increase. In several areas where SRI worked without too much water where a conventional crop might have failed.**

**The Tripura Chief Minister Mr Manik Sarkar in his speech at the National Development Council Meeting held in New Delhi on May 29, 2007 said, "Adoption of the System of Rice Intensification technology for paddy cultivation has increased productivity of rice from 2.5 T per ha to about 3.5 T per ha."**

## REMEMBERING A FRIEND, AN INSPIRATION

Sanjay Sangvai 1959-2007

***A tribute to a former Narmada Bachao Andolan colleague, friend and inspiration***

I am still in shock after learning this morning that Sanjay Sangvai, a colleague of many years, is no more. When the sms came today from Shripad Dharmadhikary, I could not believe it. But then there was the flood of messages that came after.

Having worked with Sanjay for many years in the Narmada Bachao Andolan (NBA), I found him to be both a friend and an inspiration. He was a very hard working, dedicated colleague who set an example with his acts, not just his words.



He was also a wordsmith with remarkable command over Marathi, Hindi and English. Before becoming an NBA activist, he taught journalism; he also worked with the Marathi newspaper Sakal. Years after he left the paper, I was amazed to see the kind of respect he commanded when I visited their Mumbai bureau with him in early 1990s. He authored a very readable and yet authoritative book, *The River and Life: People's Struggle in the Narmada Valley*, published by Earthcare Books in 2000. He wrote in the Preface to the book, "paradoxically, the written word becomes history." Those words were important from many points of views, but they also expressed an anguish and an anxiety, for he saw that many times written words, if unchallenged, could give misleading impressions of actual events.

During the NBA years I spent with Sanjay in Baroda and elsewhere, I remember that often he was the last person to go to sleep and the first one to get up.

He was a voracious reader and prolific writer. His needs were the bare minimum (his eyes always lit up at the sight of a cup of tea, of course), you could see his simplicity from the cotton clothes he wore year round. Behind that unassuming exterior was a mind that could understand the complex social, economic and most importantly, political environment in which the struggles he was involved in were played out. Of late, he was also involved in the campaign against the poverty-generating land acquisitions for the Special Economic Zones.

Friends had known for a decade that he was suffering from a serious heart problem. He fought that bravely, but he rarely discussed his problems with anyone. Against the advice of doctors, he continued to travel wherever the struggles he worked on demanded. While this showed his absolute dedication to the cause, it must have taken its toll. In fact he was under treatment at a naturopathy centre in Ernakulam (Kerala) where he died at 7 am on May 29, 2007. It may sound mundane or predictable, but it is indeed true that losses of such a kind are irreparable.

Himanshu Thakkar (June 1, 2007)

### **New Publication from Environment Support Group**

## **GREEN TAPISM**

### **A Response of the Environmental Impact Assessment Notification 2006**

The Environment Support Group, Bangalore, has published this detailed critique of the Ministry of Environment's EIA notification dated September 14, 2006. Authored by Leo Saldhana, Abhayraj Naik, Arpita Joshi and Subramanya Sastry, this 201 page volume is full of detailed case studies and illustrations. As the authors write in the preface, "This review was undertaken acknowledging the widespread concern that the EIA notification was manipulated to suit certain vested interests thus putting to enormous risk the ecological and livelihood security of India. The fact that the Notification is the only legal instrument that explicitly mandates and defines the process for public involvement in environmental decision making, and that this very process was being undermined, compelled us even more to undertake this task."

In recent years, the ministry of environment and forests, govt of India, has been acting even more than ever before as an agent for projects that destroy environment. The track record of the ministry in environmental governance has been abysmal. The publication explains the implications of the latest move by the ministry, which has far reaching implications for environmental governance. Among the case studies, the publication also looks at the environmental implications of the Special Economic Zones Act of Govt of India. The Annexures also includes the EIA notification of 2006 and its comparison with the EIA notification of 1994.

The publication is very useful for anyone interested in environmental issues in India. For copies, you can write to ESG ([esg@esgindia.org](mailto:esg@esgindia.org)) or SANDRP ([ht.sandrp@gmail.com](mailto:ht.sandrp@gmail.com)). The suggested contribution for the publication is Rs 250/-.

**QUICK CAMPAIGN UPDATES**

**Protests, Fast in Sikkim against HEPs** The Affected Citizens of Teesta (ACT), Concerned Lepchas of Sikkim (CLOS) and Sangha of Dzongu are on protest and an indefinite hunger strike since June 20 in Gangtok demanding that all hydel power projects in Dzongu be scrapped and the govt review other projects coming up in North Sikkim and elsewhere in the state. Three young members Tshering Lepcha, Dawa Lepcha and Tenzing Gyatso Lepcha are on indefinite hunger strike. Affected people from the Teesta projects in north Bengal, Darjeeling Hills are joining them in solidarity. Dzongu is a protected area for the Lepchas, the indigenous inhabitants of Sikkim, and is protected under Article 371 (f) of the Constitution. As many as seven hydroelectricity projects are coming up in the Lepcha reserve, including the 495 mw Teesta Stage IV, part of the 1,200 mw Teesta Stage III and the 300 mw Panan hydel project. Dawa Lepcha also blamed the government of flouting environment laws since all the projects are located in the Khangchendzonga bio-sphere reserve and the Khangchendzonga National Park. Last year, the Sikkim govt accorded the Lepchas the status of the most primitive tribe. "On one hand the Lepchas have been declared as primitive tribe and on the other the govt is assisting capitalist companies to bulldoze, plunder and devastate the land that had been protected for over a hundred years. It is a plan to uproot the last bastion of the Lepchas and make them aliens in their own land," an ACT member said. (ACT, <http://weepingsikkim.blogspot.com/>, Telegraph, Voice of America, others, June 2007)

**Massive Public meeting in Guwahati against large HEPs in NE** On June 17-18, over 2000 people gathered in a public meeting in Guwahati University to share their experiences and declare their opposition to the large hydropower projects being planned and taken up in the

North East India. The meeting was organised by Krishak Mukti Sangram Samity and was supported by many movements and civil society organisations from North East India. In addition, Medha Patkar of Narmada Bachao Andolan and representatives of Barh Mukti Abhiyan, Matu Jansangathan and SANDRP also attended the meeting. (SANDRP)

**NBA fast, jal satyagraha** Thousands of displaced men and women affected by Indira Sagar and Omkareshwar projects, two large dams on the river Narmada, held a massive demonstration in the district headquarters of Khandwa on June 4, 2007. Demanding that the State and the Narmada Hydro-Development Corp give them their rights and entitlements immediately, more than twelve thousand oustees held a rally that culminated at the NHDC office where the people held a demonstration and sought answers for their questions from the senior NHDC officials. An indefinite dharna was started and on June 6, five of the oustees and activists of the Narmada Bachao Andolan also began their indefinite fast with a resolve not to leave their struggle till all the affected people get their due rights. The fast and the dharna continues as we go to print. (NBA Press Releases)

**NHPC's Draft R&R policy** National Hydroelectric Power Corporation has come out with its draft resettlement and rehabilitation policy (see: <http://nhpcindia.com/English/Scripts/News.aspx?Vid=62>) and has invited comments for the same, to be submitted (to [vnam176@yahoo.co.in](mailto:vnam176@yahoo.co.in)) by July 14. NHPC's track record on this issue is so poor that if NHPC were to prove its credentials on this issue, it may first address the outstanding issues of its completed and ongoing projects before continuing construction with any project.

**REVEALING QUOTES**

"They (factory owners) somehow want to continue with the discharge of polluting material into the river Yamuna and are leaving no stone unturned to see that pollution of all types continue to the detriment of the children."

**Delhi High Court Judges** (The Hindu 270407)

"The Committee is inclined to believe that (for the hydropower projects) proper assessment of certain foreseeable factors, such as (those relating to) geology & funds, is not done with due seriousness and recommends the ministry to take adequate steps in that direction."

**Parliamentary Committee on Energy** (The Mint 120407)

"There are some credit, irrigation and fertilizer use data which show that the worst is over. We (Agriculture) are growing at 2% now, compared with 1.5% in the nineties. Unless we bungle, we will get 3%, may be 3.5%."

**Prof Yogendra Alagh** (The Mint 180407)

"The feeling is that due to global warming and climatic uncertainties, production of these (agriculture) commodities have become erratic. So, there are going to be repeated problems about their pricing. (It should be considered) whether there should now be a fresh look at their pricing as well as their inventory build up as part of public policy."

**RBI Governor YV Reddy** (The Times of India 260407)

"It is not often that this newspaper finds itself in agreement with Fidel Castro... he has a point... corn based ethanol, the sort produced in America, is neither cheap, nor green. It requires almost as much energy to produce (more, say some studies) as it releases when it is burned."

**Editorial in The Economist** (Financial Express 130407)

**Publications available with SANDRP****PUBLICATIONS IN ENGLISH:**

1. *Large Dams for Hydropower in NorthEast India* SANDRP-Kalpavriksh, June '05, p 228, Rs 150 (indv), Rs 300 (inst)
2. *Tragedy of Commons: The Kerala Experience in River Linking*, River Research Centre-SANDRP, '04, p 146, Rs 120
3. *Unravelling Bhakra*, Shripad Dharmadhikary, Manthan, 2005, pp 372, Rs 150/- (individuals); Rs 300 (institutions)
4. *THE GREATER COMMON GOOD* by Arundhati Roy, Published by India Book Distributors, 1999, pp 76, Rs 80/-
5. *Citizens' Guide to the World Commission on Dams*, By A Imhof, S Wong & P Bosshard, IRN, pp 59, Rs 30/-.
6. *Know Your Power: A Citizen's Primer on the Electricity Sector*, Prayas, Pune, 2004, p 138, Rs 150/-
7. *Green Tapism: A Review of the EIA Notification-'06*, Environment Support Group, Bangalore, 2007, p 201, Rs 250/-
8. *Dam Vs Drinking Water: Exploring the Narmada Judgement*, LC Jain, Parisar (Pune), 2001, p 134, Rs 75/-
9. *Insidious Financial Intrusions in India's North East*, IR & FIPA, April '06, pp 100, Rs 50/-
10. *Tehri Environment and Rehabilitation: Towards Failure and Devastation*, Published by MATU, pp44, Rs 25/-
11. *Conserving Raindrops a Much Better Option than Linking Rivers* by Bharat Dogra, pp 8, Rs 4/-.
12. *The Forest of the Buddha*, By Bulu Imam & Philip Carter, Sanskrit Publishers, Jharkhand, 2005, pp 121, Rs 650/-

**PUBLICATIONS IN HINDI:**

1. *Bandh, Nadi evam Adhikar* Dam Action Guide for Communities, SANDRP, 2007, pp 44, Rs 30/-
2. *Nadi Jod Yozana Ke Mayne, Vastvikta Ke Aaine Mein* (HINDI), SANDRP, 2004, pp 58, Rs 20/-.
3. *Ken-Betwa Nadi Jod : Pyasi Ken Ka Paani Betwa Mein Kyon?* (HINDI), SANDRP, 2004, pp 46, Rs 20/-.
4. *Nadi Nahin Jodnaa, Bund Bund sanjonaa* by Bharat Dogra, pp. 16, Rs 8/-
5. *Bade Bandh, Bharat ka Anubhav*: Hindi, SANDRP, 2001, pp 268, Rs. 100/-.
6. *Vishwa Bandh Ayog per Nagarik Margadarshika* (HINDI), SANDRP, 2002, pp 63, Rs 30/-.
7. *Bharat mein Bade Bandh ka Lekha jokha* (Hindi) summary of WCD India Country Study, Manthan, pp18, Rs 5/-.
8. *Rahiman Paani Bik Raha Saudagar Ke Haath* (Hindi) By S Dharmadhikari, Manthan, pp 55, Rs 10/-.
9. *Bina Jaankari Kaisy Jan Sunvai?*, MATU (Delhi), 2004, p 32, Rs 15/-
10. *Kasbe Ka Paani* By Rehmat/ Mukesh Jat, Published by Manthan, pp 40, Rs 20/-
11. *Sudhar Ya Bazaar: Commodification of Water in MP by IFIs*, Manthan, pp 20, Rs 5/-
12. *Log Banam Faisla: A Reflection on Narmada Judgement* (HINDI), NBA, 2000, pp 72, Rs 10/-

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**YOUR RESPONSES**

**Feasibility of flood forecasting in embankment ridden states** "Dams Rivers & People" issue of Feb-March 2007 contains a report (page 21) that ISRO is developing a disaster forecasting system for floods etc. I welcome the idea but I am not sure whether that will succeed in heavily embanked states like those of Bihar, Eastern Uttar Pradesh, Assam, North Bengal and Coastal Orissa. Disasters in these states are spelt mostly because of the failures of embankments. It is very difficult to tell where a breach would occur in the embankment (unless it is in grossly dilapidated condition) for various technical and non-technical reasons. If any precautionary measure is to be taken, one hopes that the Govt would step in but that rarely happens because of inaccessibility of the area during the peak times of the crisis. The six volume Report of The Second Irrigation Commission of Bihar (1994), does not touch the issue of breaches in the embankments. There is no mention of 1984 breach in the Kosi Embankment which engulfed 196 villages and uprooted half a million people from their homes and hearths and there is also no mention of 1991 breach in the same embankment in Joginia in Nepal that precipitated a major political crisis resulting in the resignation of the State Irrigation Minister. I was fortunate to attend one of the meetings held by Relief & Rehabilitation Dept of Govt of Orissa in 2001. The audience was told that there had been 952 breaches in the embankments till then (25<sup>th</sup> July 2001). Nobody ever that if there are 952 breaches in structures (in fact, just one breach is sufficient to make it totally ineffective), there is something very seriously wrong about the usefulness of such structures and there is a need to review the policy of flood control.

**Dinesh Kumar Mishra, Jamshedpur**

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