

INDIA'S TRYST WITH
THE BIG IRRIGATION PROJECTS

**The waves of subsidy for the islands of
prosperity;
neglect of the majority, the weak, the
environment and the future**

May 2010

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Shocking story of performance of large irrigation projects

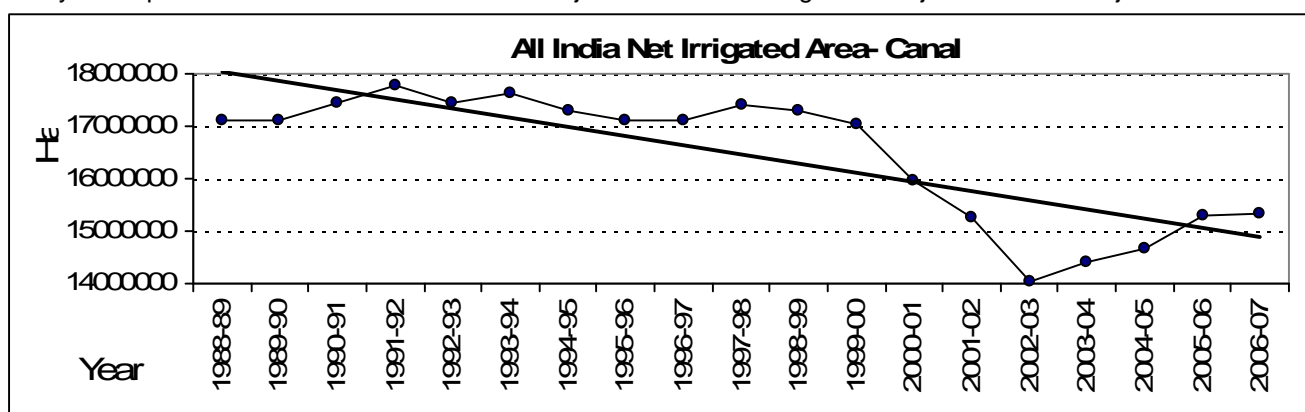
No addition to Canal Irrigated areas for 15 years

The Dam Domination of India's Water Resources Development

- There were 346 large dams in 1950: There are over 5000 now, over 95% of them are irrigation projects.
- 66-80% of water sector budget goes for big projects – also in the 11th Five Year plan (2007-12)
- This is to the exclusion of Rainfed farmers, local water systems, groundwater recharging, repair and maintenance of created infrastructure
- New ways are being attempted to push big projects, some recent instances include: Accelerated Irrigation Benefits Programme (AIBP) started in Oct 1996, Interlinking of River (ILR) that got prominence in 2002, advocacy to increase storage capacities (pushed by the World Bank), climate change (National Water Mission under India's National Action Plan on Climate Change advocates for big storages), Hydropower (questionable claims of hydropower being clean, green, cheap, renewable), National projects (started in 2006-7) & the Use of China bogey
- However, no questions asked about actual performance of big irrigation projects.

We at SANDRP tried to assess the performance of big irrigation projects of India based on official figures, the analysis is presented below.

Recent Performance In fifteen years from 1991-92 to 2006-07 (the latest year for which figures are available), there is been absolutely no addition to net irrigated areas by canals from Major and Medium Irrigation Projects as per official data from the Union Ministry of Agriculture, based on actual field data from states. From April 1991 to March 2007, the country has spent over Rs 142 000 crores on Major and Medium Irrigation Projects with the objective of increasing



canal irrigated areas.

Two years back (see cover story in Sept-Oct '07 issue of *Dams, Rivers & People*: http://www.sandrp.in/drp/Sept_Oct2007.pdf) we showed that this was the story for twelve years ending in March '04. Since then we have received information (under the Right to Information Act, also available on the official website: http://www.dacnet.nic.in/eands/LUS_1999_2004.htm, the URL is correct) from the Union Ministry of Agriculture, which shows that the trend essentially remains the same, as can be seen from the graph above. The official data shows that this whole expenditure of over Rs 142 000 crore has not led to addition of a single ha in the net irrigated area by canals in the country for the whole of this fifteen year period. In fact the areas irrigated by such projects have reduced by a massive 2.44 million ha during this period.

This should be cause of some very serious concerns and the Ministry of Water Resources (MWR), the states and the Planning Commission will have to answer some difficult questions. But the MWR, Planning Commission and all the other official agencies have not realized the folly of continued investment of majority of our water resources investments for the big irrigation projects. About two thirds of all five year plan budget under water resources development continues to be used for M&M irrigation projects, including during the ongoing eleventh five year plan.

Net Irrigated Area by source, All India, 1990-2006 (Ha)

	Canals	Tube Wells	Other Wells	Total GW	Tanks	Other Sources	Total
1990-91	17453000	14257000	10437000	24694000	2944000	2932000	48023000
1991-92	17791000	15168000	10869000	26037000	2991000	3048000	49867000
1992-93	17457000	15814000	10569000	26383000	2854000	3599000	50293000

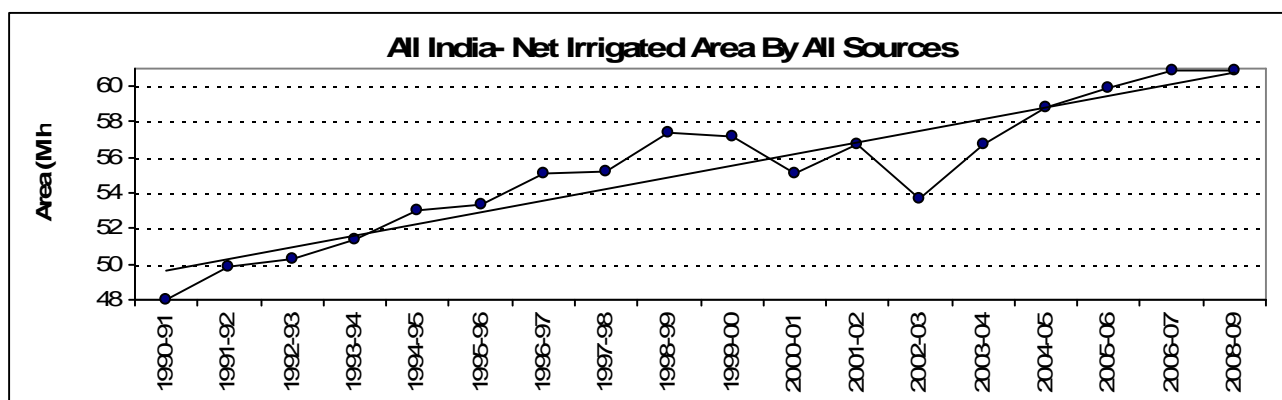
1993-94	17636000	16375000	10685000	27060000	2828000	3816000	51340000
1994-95	17280000	17190000	11722000	28912000	3276000	3533000	53001000
1995-96	17120000	17894000	11803000	29697000	3118000	3467000	53402000
1996-97	17109000	19338000	12457000	31795000	2821000	3388000	55113000
1997-98	17397000	19680000	12431000	32111000	2597000	3106000	55211000
1998-99	17311000	21394000	12606000	34000000	2795000	3329000	57435000
1999-00	17045000	22053000	12593000	34646000	2540000	2912000	57143000
2000-01	15965000	22569000	11260000	33829000	2455000	2885000	55134000
2001-02	15266000	23241000	11731000	34972000	2191000	4359000	56788000
2002-03 (p)	14042000	23479000	10660000	34139000	1804000	3667000	53652000
2003-04 (p)	14413000	24514000	11612000	36126000	1914000	4292000	56745000
2004-05 (p)	14649000	23063000	11834000	34897000	1725000	7546000	58817000
2005-06 (p)	15284000	23419000	11648000	35067000	2080000	7447000	59878000
2006-07 (p)	15351000	24056000	11853000	35909000	2044000	7554000	60858000

(p): Provisional

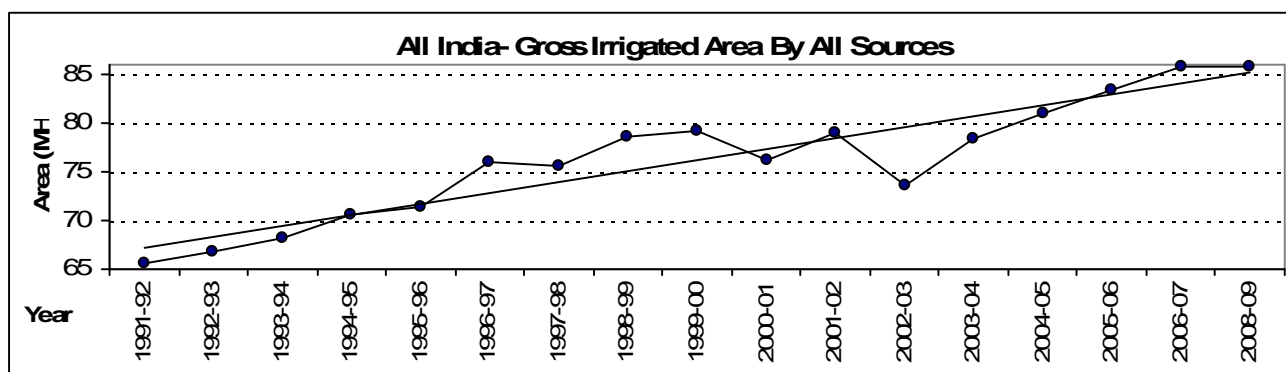
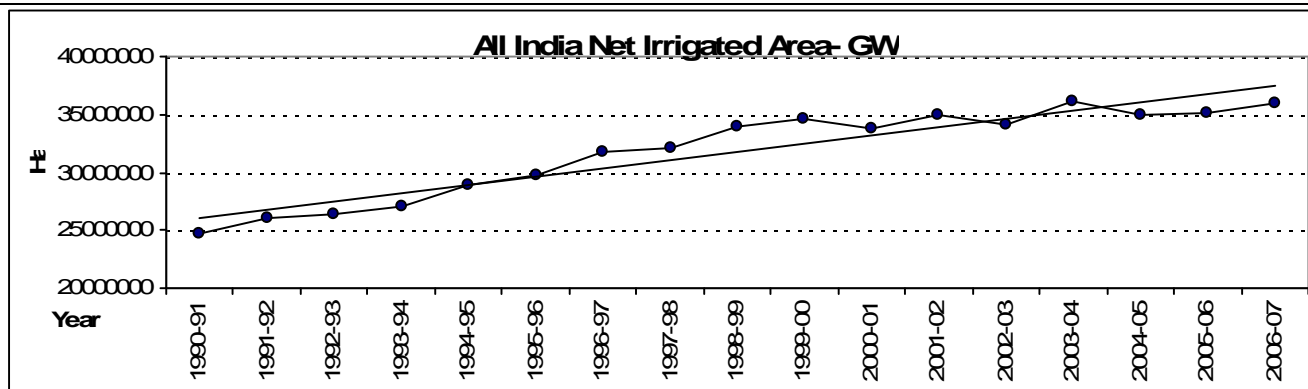
Source: Land Use Statistics at a Glance 1997-98 to 2006-07. Directorate of Economics & Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, November 2008 Page: 36.

In this period, the MWR has been claiming (e.g. in the working group report on water resources for the 11th Plan and additional information thereafter) that the country has created additional irrigation potential of 10.5 million ha and utilisation of irrigation potential of additional 7.82 million ha, but the official data from the ground show how false these claims are. The MWR has been using such claims to push more allocations for investment in M&M irrigation projects. The MWR has proposed, for example, that in the 11th plan, an allocation of Rs 165900 crores should be done for the ongoing M & M Irrigation Projects. The available facts show that this is likely to be a total waste of public money.

The net irrigated area by canals all over the country was 17.79 million ha in 1991-92. In all the years thereafter, till 2006-07, the latest year for which the data is available, the net irrigated area by canals has not only been lower than 17.79 m ha, but has been more or less consistently falling, as can be seen from the trend line in the graph above. The detailed figures of net irrigated area by source for the period 1990-91 to 2006-07 is given in the table above. It is clear from the above table that the Net Irrigated Area by all sources increased from 48.02 m ha in 1990-91 to 60.86 m ha by 2006-07, plotted on the graph below.



Similarly Gross Irrigated area (if two irrigated crops are taken in year on a give area, that area is counted twice in estimation of gross irrigated area, but once in estimation of net irrigated area) for total from all sources has been increasing during the period as seen in the graph above. This increase in all India net and gross irrigated areas have been possible due to the increase in groundwater irrigated area from 24.69 m ha in 1990-91 to 35.91 m ha in 2006-07, see the graph below. In fact the increase in groundwater irrigated area has helped the MWR suppress the reality of non performance of the big dams.



In majority of the years during 1991-2009, the rainfall has been normal or above normal, see the table below. So it cannot be claimed that this trend is due to low rainfall.

Year	Monsoon Rainfall
1991	91 %
1992	93 %
1993	101 %
1994	110 %
1995	100 %
1996	103 %
1997	102 %
1998	106 %
1999	96 %
2000	92 %
2001	92 %
2002	81 %
2003	102 %
2004	87 %
2005	99 %
2006	99 %
2007	105 %
2008	98 %
2009	77 %

Some qualifications for the data:

- The data in this analysis is from Ministry of Agriculture, generally considered more reliable source of data for irrigation areas.
- The Ministry of Water Resources, on the other hand, has no data of actual irrigation, only notional claims about irrigation potential created and irrigation potential utilised. In this period analysed, the MWR has been claiming (e.g. in the working group report on water resources for the 11th Plan and additional information thereafter) that the country has created additional irrigation potential of 10.5 m ha and achieved utilisation of irrigation potential of additional 7.82 m ha. We see no evidence of that achievement in the Ministry of Agriculture data.
- The gross irrigation area by sources and by states is not available on consistent basis to make analysis using that data possible.
- There are some problems with even MOA data. E.g. they also under report irrigation by groundwater.
- There are some experts like Tushar Shah and Dr Himanshu Kulkarni who say that there is very little land that is purely rainfed, most such land get some groundwater irrigation. In any case the proportion of 60% of NCA (Net Cultivable Area) or about 80 M HA (million Ha) of net cultivable area being rainfed seems an exaggeration. However, we need more reliable data to arrive at more realistic figures for this.

The Reasons Some of the reasons for this situation include: Siltation of reservoirs and canals, lack of regular and proper repair and maintenance of the irrigation infrastructure, inadequate allocation of resources for repair and maintenance, water intensive crops in the head reaches, non building of the canals, over development (beyond the carrying capacity) of projects in a basin, water logging & salinisation, diversion of water for non irrigation uses, increasing exploitation of groundwater. A reason cited by some: increased rainwater harvesting. In some cases, the additional area added by new projects is not reflected in the figures as the area irrigated by older projects (due to above reasons) is reducing. Indeed the World Bank's 2005 report *India's Water Economy: Bracing for a Turbulent Future* showed that annual financial requirement for maintenance of India's irrigation infrastructure (which is largest in the world) is Rs 17000 crores, but less than 10% of that amount is available and most of it does not result in physical maintenance of the infrastructure. In some over developed basins, the new projects are like zero sum games, since they would be taking away water from some of the downstream areas. Optimistic hydrological projections, which are almost universal in big irrigation projects, would mean that in any case there won't have sufficient water in the basin to provide the projected benefits.

The Implications of no increase in irrigation area These findings have grave implications. Firstly, they very clearly imply that the thousands of crores the country is spending each year on big irrigation projects is not leading to any additional net irrigated area. Secondly, the real increase in irrigated area is all coming from groundwater irrigation and groundwater is the lifeline of irrigated agriculture. Lastly, this raises many accountability issues: Who are responsible for deciding on these wrong priorities and what consequences will follow? This trend indicates that in stead of spending money on new major and medium (M&M) irrigation projects, the country would benefit more (at lesser costs and impacts) if we spend money on proper repair and maintenance of the existing infrastructure, taking measures to reduce siltation of reservoirs and at the same time concentrating rainwater harvesting, groundwater recharge, regulation, demand side management, water efficient cropping methods like the System of Rice Intensification and on rainfed areas. On groundwater front, we need to make preservation of existing groundwater recharge systems and augmentation of the same our top priority.

PERFORMANCE OF STORAGE CAPACITY CREATED There are several ways of assessing the performance of the big reservoir capacity India has created for irrigation. We have seen no attempt by the official agencies in this direction even as they hanker for more storage capacities through big projects. Until we start doing such assessments in a credible we cannot even know how they are performing, nor can we start analyzing if that performance can be improved. We have tried this from a couple of parameters.

Idle Reservoir Capacity during 1994-2009 The Central Water Commission, the apex technical organization of government of India in water sector, publishes weekly updates of the storage levels in some selected big water dams of India, the number of projects thus monitored currently stand at 81 with total live storage capacity of 151.77 Billion Cubic Meters (BCM). The number of such monitored reservoirs has been going up over the years, as can be seen from the figures given here for the period 1994 to 2009. The table given as to how much of the reservoir capacity was filled up before the monsoon and how much remained idle or empty at the end of the filling period in various years. We can see that even in years when monsoon rainfall has been above 100% of normal, a significant part of the reservoir capacity remains idle. This shows the level of underperformance or idle investment. This is because the basic justification forwarded for creating such reservoir capacities is that this will enable storage of monsoon rainfall and

make it available for the post monsoon months. But if a significant part of the capacities remain empty at the end of the monsoon year after year, it shows that the intended benefit has not been achieved.

This analysis needs to be done storage wise and river basin wise for all large storages. We could not do it as we could not get the required information.

Sr No	Year (Annual monsoon rainfall)	No of reservoirs monitored	Monitored capacity (BCM)	Capacity filled up (BCM)	BCM Idle Capacity	% Idle Capacity
1	1994 (110%)	63	125.14	112.63	12.51	10
2	1995 (100%)	63	125.14	98.44	26.7	21.34
3	1996 (103%)	63	125.14	89.53	35.61	28.46
4	1997 (102%)	68	129.4	101.2	28.2	21.18
5	1998 (105%)	70	130.6	106.1	24.5	18.76
6	1999 (96%)	70	130.6	97.6	33.0	25.27
7	2000 (92%)	70	130.6	82.66	47.94	36.71
8	2001 (91%)	70	130.6	87.49	43.11	33.01
9	2002 (81%)	70	130.6	69.25	61.35	47.09
10	2003 (105%)	71	131.28	78.76	52.52	40.01
11	2004 (87%)	71	131.28	85.1	46.18	35.18
12	2005 (99%)	76	133.021	109.695	23.326	17.54
13	2006 (99%)	76	133.021	120.451	12.430	9.34
14	2007 (105%)	81	151.77	124.150	27.62	18.20
15	2008 (98%)	81	151.77	114.262	37.508	24.71
16	2009 (77%)	81	151.77	90.48	61.29	40.38

Implications for Idle Reservoir Capacity

- On an average, each year about 35.86 BCM (equivalent of 6 Sardar Sarovar Projects) of storage capacity out of only the monitored storage capacity is not filled up for the last 16 years.
- That means that on an average an investment of Rs 34886 crores has remained idle in each of the last 16 years.
- This happens when in 10 of the 16 years the rainfall was almost average or above. (See the figures in brackets in col. 2.)
- Should we not be trying to understand why this is happening? How we can make the existing storage capacity play the useful role it is supposed to, in stead of pushing for more storages?

High water storage in Reservoirs before the monsoon Another way to assess the performance of big storages is to see how much water has remained in the live storage capacity BEFORE the onset of monsoon. This is important because this means that to that extent the stored water has not been used in the previous year. This thus reflects non optimal use of the stored water. This has further implications for the following year. Firstly, because the live storage space that has remained filled from the water from the previous year will not be available for storing water in the current year, so that much monsoon runoff cannot be stored this year. Secondly, this would mean that the live storage space would get filled up faster in the following year, most likely before the end of the monsoon, which an mean that the reservoir would have to release water during the monsoon, which could created flood disaster in the downstream areas, as has happened in case of number of dams. Thus such water storages before the monsoon reflects non optimal use of the storage space created at huge investment. This is not to advocate emptying of the reservoirs before the monsoon, but to ensure optimal use of the storages created at huge expenses. Some water could be kept in the storages as an insurance agsint failure of monsoon. However, this has be based on cleared defined transparent norms. Secondly, the option of using the water from below the live storage level could also be explored in such eventuality. In case, storage of water beyond 5-10% of live storage capacity before the monsoon in case of very large reservoirs and more than 10-15% in others cannot be considered prudent in most cases. The trouble is, such analysis is not even done to see where we stand and where there is room for improvement and where wrong decisions have been made, who are responsible for such wrong decisions and what actions are taken in such cases.

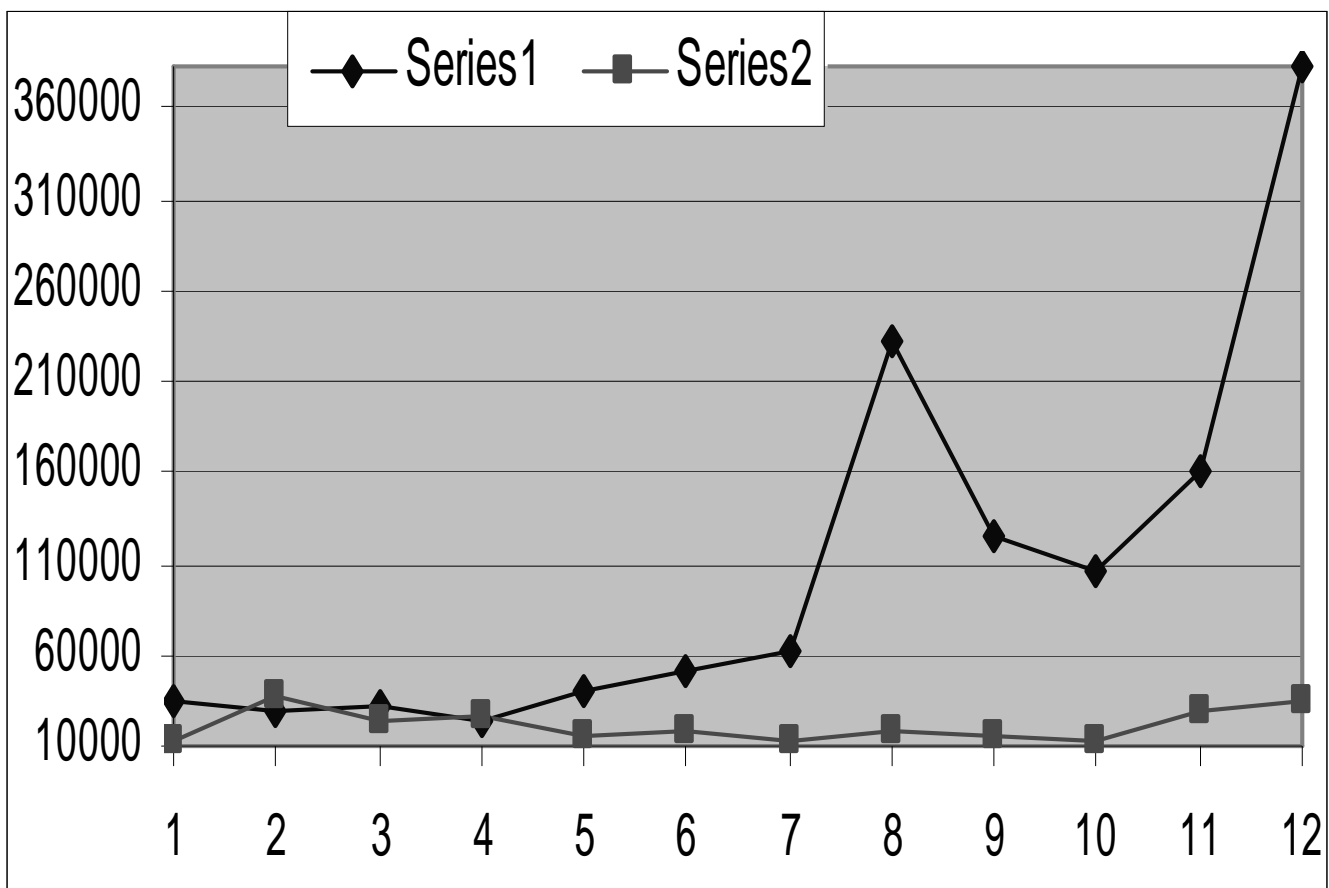
Some of the recent instances where we found such stored water before the monsoon in India include:

- Economic Surveys say that 31.12, 29.495 and 17.5 BCM of live storage capacity remained filled before monsoons in 2007, 2008 & 2009 respectively, out of the CWC monitored capacity of 151.77 BCM (Average for last 11 years: 20.92 BCM).
- Instances of high Reservoir water storage before 2009 monsoon: **Mahanadi**: Hasdeo Bango: 40%, Gangrel: 35% of live capacity; **Krishna**: Srisailam: 1.173 BCM, Nagarjun Sagar: 0.812, Koyna: 1.142 BCM in live capacity; **Tapi**: Ukai: 1.323 BCM; **Mahi**: Kadana: 48%; **Damanganga**: 61%
- Instances of high Reservoir water storage before 2005/6 monsoon: Nagarjunsagar 47%; Naryanpur 44%; Dharoi 42.6%; Kadana 40.7%; Jayakwadi 28.33%; Mahi Bajaj Sagar 28.2%; Koyna 25.%; Tawa 22.6%; Panam 19.4%; Srisailam 17%.

Water Storages are silting up fast

- As per the report of National Commission for Integrated Water Resources Development (Govt of India, Sept 1999), about 1.4 BCM of existing storage capacity is getting silted up every year.
- At today's rates creation of 1.4 BCM storage capacity would cost Rs 1448 crores.
- Our calculations, based on CWC reports of siltation for 27 dams, show the loss is at 1.95 BCM per year.
- That means that on an average, each day we are losing Rs 4 crores worth of storage capacity through siltation.
- And there is little serious attempt to stop this.
- The required Catchment Area Treatment for even Bhakra was not done. Story for other projects is same or worse.

Per Ha cost for Big vs small irrigation projects as per Planning Commission, at constant 1996-97 prices The comparable figures for creating one ha of irrigation through big and small irrigation projects in various plans is given in the figure below at constant 1996-97 prices as per the Planning Commission reports.



It is clear from the above graph that the cost for creating a ha of irrigation through major and medium irrigation projects have been shooting up over the years. The Benefits from the two options may not be strictly comparable, but it gives

an idea about comparative costs and even if all the costs and benefits from such options were to be included in the equation, the option of smaller project would triumph. Unfortunately, the push for big projects in the government scheme of things has remained as high as ever.

Large projects spells as poor performance?

- India has the largest Irrigation Infrastructure in the world but it is performing far below its capacity.
- The then Finance Minister Chidambaram said in his budget speech in Feb 2005, "Water-use efficiency in the Indian agriculture is one of the lowest in the world".
- The mid term appraisal of 9th 5 Year Plan had noted, "With a 10% increase in the present level of water use efficiency, it is estimated, an additional 14 m ha can be brought under irrigation from existing irrigation facilities".
- The 14 m ha of additional irrigation is an agenda for over a decade at current rate of additional irrigation being created.
- Gap between potential created and realised is over 20 m ha and is growing
- Annual R&M requirement is \$ 4 billion or over Rs 17000 crores – a tiny fraction is being provided and the result is poor performance.
- Why is there no serious attempt to make amends in this situation?

Large Dams also contribute to global warming

- Scientific studies published in research journals show that large reservoirs in tropical climate emit significant amounts of methane, which is 21 TIMES more powerful than CO₂ in global warming.
- Methane is emitted from reservoir area, from spillways, from turbines and from downstream rivers.
- Indian large dams, even by conservative estimates, emit 17 million tons methane a year, which is equal to emission of 357 Million T of CO₂.
- This is about 18% of India's TOTAL official emission of 1889 MT in 2000; or almost same as the total power sector emission of India in 2004-05.
- Indian govt does not even measure methane emission from large dams, even though planning commission has been asking for it for the last five years.
- The proposed 3000 MW Dibang HEP in Arunachal Pradesh, for example, even by conservative estimates, would emit at least 3.3 MT CO₂ equivalent methane every year.

The Achievements: Claims Vs the Reality:

- It can be nobody's case that nothing has been achieved.
- However, the impression being crated that big dams has helped achieve India's food security is wrong, a myth. In fact, the government has never assessed the contribution of big dams to India's foodgrains production.
- While net irrigated area has increased to 57 m ha (11th plan working group report), the lands irrigated by large dams stand at 17 m ha at peak, the rest is by groundwater and small systems. This means that only about 12% of net cultivated area of 141 m ha of NCA get benefits from large dams
- India's foodgrains production that was 50 MT in 1950 has reached 216 MT in 2006-07, 233 MT in 2008-09
- However, what is the contribution of large dams? 10-12% as per two independent assessments, both done for the World Commission on Dams (WCD). And this is gross contribution. Net contribution would be much lower.
- In the process, we have precipitated an agrarian crisis and also an ecosystem crisis (dried and polluted rivers, decreasing GW (Ground Water) levels, pollution of GW...)
- **Is that good enough?**

The agrarian crisis and the Large Dams

- Everyone from the Prime Minister, the President, down to the farmers agree that India's agriculture is facing serious crisis. Farmers are committing suicides in thousands every year. Agriculture growth rates are down to 1-2%, yields are stagnating or declining, and canal irrigated areas are decreasing in a number of states
- Everyone also agrees that every farmer would benefit from better water management
- India continues to be blessed with a bountiful monsoon which can be a great resource for every farmer if put to use through local water systems.
- GW is India's lifeline: That lifeline is in serious crisis
- Only way to sustain this lifeline is through local water systems, recharging GW on the one hand and serious regulation of groundwater use on the other.
- But big dam dominated WRD won't allow that to happen
- Unfortunately every crisis is being used to push for more Big dams. So about 70% of the money allocated in PM's Vidarbha package was for BIG irrigation projects. The single largest investment proposed in Rahul

Gandhi's package for Bundelkhand includes the flawed Ken Betwa link project. The climate change crisis is used for push more storage projects.

Large Dams: Some Broad issues:

- **Large Dams generally tend to be undemocratic:** They do not come out of the framework of planning and decision making process like the one suggested by WCD. If they were to come from such a framework, they would certainly be more acceptable.
- **Large Dams exclude the needs of the poorest and neediest** As they are indicated by aggregation of demands of a large number of people, but they do not address the specific components of those aggregate demands, particularly those of the poorest and the weakest.
- **Large Dams involve tradeoffs** at the expense of the poorest and benefiting relatively better off.
- **Large Dam Developers are unaccountable.** There had been no credible post facto evaluation of performance of the projects as against the demands they were set out to satisfy and as against the benefits they were to deliver. On the other hand they create huge social impacts, which are seldom addressed, thus creating more problems rather than solving existing problems.
- **Large Dams are poor performers** Performance appraisal of India's large projects show: Diminishing generation from large hydro projects, large hydro projects not providing peaking power, large storage capacities remaining unutilised, Stored water remains unutilised, creation of unviable storage capacities, high costs of irrigation from large projects when less expensive options exist & large dams providing hardly 10% of the food grains production, when options could have provided greater output.

Big reservoirs privileged over local water systems? There seems to be an unwritten norm to privilege the big projects over local systems. Some recent examples: Cauvery basin (Karnataka vs TN), Gandhi Sagar (Rajasthan vs MP), Hussain Sagar vs upstream rainwater harvesting. Some IWMI papers and advocates support this? To advocate that the local water systems or rainwater harvesting or groundwater recharge or groundwater use for justifiable needs should be restricted in the upstream so that the downstream reservoirs get filled would be a dangerous proposition.

Why there is a push for big irrigation projects?

- Simple answer is: big money, easy money
- **Big dams means big money, big power**
- In 11th Five year plan, it is proposed that Rs 163 000 crores should be spent on big irrigation projects.
- Big irrigation projects provide huge centralised *power* in the hands of a few.
- It provides opportunity to politicians to *show* visible symbols of "development" to their electorate.
- More involved answer: little accountability, weak regulation (MEF, CERC, SERCs, CAG, CVC, Courts, PI Com, CWC, MWR), externalisation (paid by others) of key costs, no post facto assessments or evaluations, corruption, easy padding of costs, state ready to take up the risks, etc.
- In simpler words: Non existent governance

Some implications of Big dam advocacy:

- **Islands of seeming prosperity, unsustainable practices, farmers in debt trap**
- Waves of investment/subsidy for specific areas:
 - Big irrigation project investment/ repair, renovation, modernisation
 - Fertiliser subsidy (Recurring)
 - Pesticide, seeds subsidy (Recurring)
 - Food procurement system subsidy (Recurring)
 - Downstream infrastructure development
- Neglect of Rainfed farming
- Damage to Soil fertility, environment, equity, future

What can be done for the Rainfed Areas?

- Clearly defined action plan that needs to be pushed over long term
- Sensitisation and advocacy through MPs, MLAs, political parties, media, useful govt contacts
- Incentives for Organic farming
- Incentives for use of organic manure
- Incentives for SRI methods for various crops
- Incentives for in situ moisture conservation methods
- Make farm level water capture the focus of WRD for agriculture

Some hopes for the Rainfed Areas:

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- Report of the World Commission on Dams: The report was a result of an exercise in which majority of commissioners were supporters of large projects. This was the first ever and most transparent, open, inclusive process to assess the development effectiveness of large dams and it came out with a unanimous report in November 2000. The Report offers a framework for decision making process on Large projects and options.
 - Use of MNREGS for farm level water management work for small and marginal farmers (e.g. in Haryana)
 - SRI kind of methods for various crops
 - Climate change imperatives: Need to increase carbon content in soil, smaller carbon footprints of organic farming, local water systems

Impediments in the path of Revitalising Rainfed Areas:

- Political Economy: Dice loaded in favour of big investment projects: they use even threats like climate change to work in their favour
- No Lobby for Rainfed areas
- No persistent, long term effort for policy advocacy
- Strong convincing case for RRA yet to be made?
- Use of well documented success stories not happening

Conclusion Even as the Planning Commission starts the work on the approach paper to the 12th Five year plan, this is a golden opportunity to make radical changes in our water resources development plans. If we miss this opportunity, the combined impacts of the wrong priorities we have pursued so far and the global warming will result in we having neither the water required for the people or the economy, nor the resources to maintain the and sustain the existing benefits, as the 2005 World Bank report concluded.

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