Environmental Issues in Interlinking of rivers in India

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Environmental Issues in Interlinking of Rivers in India

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ABSTRACT
Rainfall over the Indian Sub-Continent is a gamble of monsoon. The spatial and temporal variations in the rainfall over India has led to detonation of water ‘surplus’ and water ‘scarce’ basins in the country. The project for interlinking the rivers in India aims at transferring water from water ‘surplus’ to the water scarce basin. The paper questions the prevailing reductionist concept of ‘surplus’ flow in some river basins irrespective of its diverse ecological needs and of its diversion to water scarce region. In the background of this debate, the paper touches on the fact that though the interlinking proposal has been made to reduce the water scarcity in the rain scarce areas of western and southern parts of India, the choice of this gigantic project as the appropriate mechanism to accomplish that goal is questioned. Enquiring further into the logic behind the proposal that has formidable cost involved, the author is of opinion that the above observations, it identifies the need for a transparent techno-economic and environmental feasibility study and comparison with other options, before the interlinking project is given final approval. With the diverse parameters viz; environmental refugees, water pollution, forest hacking, water logging and salination and sedimentation, paper arrives at following conclusion that, linking of rivers in India is based on supply side hydrology and encourages the inefficient uses of water in agricultural and in other uses, rather than opting for supply augmenting approach government should take care of demand management approach to increase the efficiency of water use. Emphasis should be made on watershed management, river basin planning, dry farming and other grass root initiatives by people’s participation. Paper recommends a strong urge for Environment Impact Assessment and Social Impact Assessment studies at various stages of river basins across the nation.

KEY WORDS
Water surplus and deficit basins, environmental refugees forest hacking, sedimentation, water logging and salination, water pollution and rain water harvesting.

INTRODUCTION
Water is a prime natural resource, a basic human need and a precious national asset. Planning development and management of water resources need to be governed by national perspective. As per the latest estimate 1993, out of the total precipitation, including snowfall, of around 4000 billion cubic meter (BCM) in the country (India), the availability from surface water and replenishable ground water is put at 1869 billion cubic meter from surface water and 432 billion cubic meter from ground water, can be put to beneficial use. The rapid growth in the demand of freshwater driven by growth in the global population and of the economies, has led to natural resources becoming scarce in many parts of the world. In the global picture, India is...
identified as a country where water scarcity is expected to grow considerably in the coming decades. Erratic and very unpredictable nature of monsoon and spatial and temporal variation in the rainfall over India has led to denotation of water surplus and water scarce river basins in the country. Further, drought conditions resulting from climatic variability causes considerable human suffering in many parts of the country, in the form of security of water for both satisfaction of domestic needs and for crop production. India has made big strides in the field of agriculture and industries during the last 5 decades. Due to these efforts, irrigated area in the country has grown from 21 million hectare in 1950 to about 90 million hectare and the food grain production increased from 50 million tones annually in 1950 to around 200 million tones at present. Thus India has made considerable progress in developing and harnessing its water resources. The future development and management of water resources are going be increasingly difficult since water demands are expected to grow even faster due to improvement in the living standards of the people.

The major constrain in the utilization of water is non-availability of storage facilities since river flows occur as flood flows during the short period of rainy season. With the help of interlinking of rivers and interbasin water transfer projects, about 200-250 BCM can be added to the utilization according to the National Perspective Plan prepared by the Ministry of Water Resources. To meet the growing demand of the basic necessity like food, it will be necessary to increase the area under the irrigation to about 180 mha. Interbasin water transfer based on proven technology has a potential of additional irrigation of up to around 35 mha. Closing of the future demand-supply gap would require tremendous effort for developing the various options, amongst which the interbasin transfer appears very promising in national perspective plan at the cost of other cost effective alternatives. Unfortunately, contrary to the professional expectation, no technical details of the interlinking projects are available in the public domain. Except few lines drawn on the map of the country to indicate the rough location of the dams and the canals, nothing is available to the open professional world to verify the justifiability and efficacy of the official claims of benefits from the project, which are also not substantiated by any data. In this background of the complete non-availability of the technical details of the projects for interlinking of Indian rivers, it is not possible to take any clear position on the technical feasibility or otherwise of the claims made by NWDA. Yet, it is not easy to turn a blind eye to a proposal for such a large investment by the nation, which can also drastically alter the hydrographic picture of the country.

As a result, in the present paper we have analyzed the governments National Perspective Plan in the light of environmental issues involved in the linking of rivers in India. The objective of paper is to examine the environmental issues that can take place if river linking is going to be implemented in the future.

Looking at the experience of other countries (developed and developing), it is clear that the adverse impacts of the inter basin water in less in developed countries in comparison to the developing nations and adverse effects outnumbered benefits. This is not simply because of there advance technology but because of holistic approach towards the water resources management as along with the transfer of water they have also applied rainwater harvesting, drip and sprinkler irrigation methods and dry farming. While in countries like India much emphasis has been given on the supply augmentation.

**ISSUES IN INTERLINKING OF RIVERS**

This section deals especially with environmental issues involved in the inter-linking of rivers in India but other issues which include economic, social, political and geopolitical issues. Prominent environmental issues are as follows: Impact on the channel flow, ecological and hydrological usages of water, biodiversity, delta and flood cushions i.e. marshes, evaporation losses, issue of floods and drought, water logging and salination, forest hacking, environmental refugees, water pollution and issues of glacial retreat and its impact on stream flow. But it's very difficult to discuss all these aforementioned issues in this paper so our basic thrust will be on the issues like pollution and forest hacking and environmental refugees. In subsequent sections we will look at these one by one.
Environmental Refugees / Internally Displaced People

The term “environmental refugees” now is widely used within both environmental and the humanitarian aid/disaster relief communities. There are refugees from floods, toxic spills and dump sites, desertification, hydroelectric projects, strip mining, radon and other radiation exposure, severe logging, soil erosion, agricultural land abuse, disease epidemics, defoliation, land mines, and other unwitting or international human activities. Dams cause permanent changes in the land use patterns and in the habitats of people those who are living in the area nearby the site of dams. This is also known as “displacement due to development”.

Dams and other developmental activities such as construction of canals and roads, rails are examples of the human induced environmental disasters. When humans modify an environment in attempts to control it, there are many ramifications not only for the inhabitants, but also for the immediate surroundings and the environment at large, as the decision to link the rivers is also an effort to modify the environment at large.

The Indian government has been a major dam builder in the past four decades. This development has displaced between 20 and 50 million people (Judge 1997). Many of the displaced people were not consulted or properly compensated, and most of these refugees are also indigenous and tribal groups. For example, in the state of Orissa, indigenous people constituted 98% of the people displaced by the Balimela Hydro Project, and 96% of those displaced by the Upper Kolar Dam (Judge 1997). Also, due to the land specifications necessary to construct dams, the displaced people generally were hill or river inhabitants, but were moved to plains, deserts, or mountains—less desirable, less productive lands.

The problem with the construction of dams is not only the loss of the land, but also the manner in which the displaced are treated. The abuses extend far beyond not consulting and misinforming these groups. The issues of environmental refugees should be taken care of in process of linking of rivers. Calculations, based on a study of 213 dams, show that the average submergence per dam was 8748 ha and the average displacement per hectare (based on data of 83 dams) was 1.51 per hectare. Extrapolating from these, the total figure of displacement comes to 5,66,81878 or 56.6 million. Perhaps even this is an exaggeration, but what it does establish is that those displaced by large dams number not in the hundreds or the thousands but in million.

Further, data available for 34 dams shows that tribals formed 47 per cent of those displaced, despite the fact that their national share of population is only a little over eight percent. The main rational behind the linking the rivers is to bring development in the country but development for whom. Due to this task millions of people are going to be displaced and that too without proper rehabilitation and compensation (past experience proves this fact). The most of displaced people are indigenous and tribal, and at the same time are at the bottom of power structure.

Issue of Forest Hacking

The impoundment in the reservoir area leads to the loss of forested tracts. In the WCD report an attempt is made to gather together all available information and, by extrapolation, get some understanding of the magnitude of the impacts. Accordingly, the amount of forests submerged by large dams, between 1980 and 2000, works out to be between 9.1 million hectares and 4.5 million hectares (based on the Central Water Commission data) and this, when we are already well below the stipulated 33 per cent forest cover (19 percentage of country is covered by forests). A study by the CWC (Central Water Commission), of 54 projects, showed a per-dam submergence of 24,555 ha. Upper reaches of valleys are store house of biodiversity and are contributing to our most of flora and fauna. But due to the construction of dams and link canals these ecologically most hostile areas are in danger. Why are we planning to go for such a project that can ruin or alter drastically our natural vegetation and while on the other hand we know that we are running out of ecological balance in terms of forest cover.

Issue of Sedimentation

Another issue that should be addressed in the process of linking of rivers the rate of sedimentation in reservoir on a longer term basis, it is a matter of serious concern that the life span and benefits of several
irrigation projects has significantly reduced due to rapid rate of sedimentation. Similarly, the data provided by the Central Power and Irrigation Board of the Government of India for 19 dams shows that in all except one of these dams (Machhund), the rate of sedimentation of the reservoir is higher than anticipated. This has serious repercussions on the life, safety and the economic viability of the dam. The excess rate of sedimentation ranges from 115 per cent in Kangsabati to 809 per cent in Maithon, with 10 of the 19 having an actual rate that is over 200 per cent of the anticipated rate. What the supporters of linking of rivers and construction of big dams do not realise is that Bhakra Dam's life has been shortened by massive sedimentation. The engineers will deny this but the fact is that Bhakra has only another 15 to 20 years of productive life. The first report of the Central Water Commission states that the rate of sedimentation on an average for big dams is 500 percent more than what is initially estimated by the engineers.

Table 1: Rate of Sedimentation in Selected Reservoirs

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Annual Rate of Siltation (In acre feet) expected</th>
<th>Observed (In acre feet)</th>
<th>% of Estimated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhakra</td>
<td>23000</td>
<td>33475</td>
<td>146</td>
</tr>
<tr>
<td>Maithen</td>
<td>684</td>
<td>5980</td>
<td>874</td>
</tr>
<tr>
<td>Panchet</td>
<td>1982</td>
<td>9533</td>
<td>481</td>
</tr>
<tr>
<td>Ramganga</td>
<td>1089</td>
<td>4366</td>
<td>401</td>
</tr>
<tr>
<td>Tungabhadra</td>
<td>9796</td>
<td>41058</td>
<td>419</td>
</tr>
<tr>
<td>Mayurakshi</td>
<td>538</td>
<td>2000</td>
<td>372</td>
</tr>
<tr>
<td>Ukai</td>
<td>7448</td>
<td>21758</td>
<td>292</td>
</tr>
<tr>
<td>Nizamsagar</td>
<td>520</td>
<td>8725</td>
<td>1678</td>
</tr>
</tbody>
</table>

(Source: The Irrigation Commission, 1972)

After looking at the data pertaining to the rate of sedimentation in the different dams of country it's very clear that the actual rates are very high in comparison to the estimated rates. These rates vary from 146 percent in case of Bhakra to 1678 percentage in case of Nizamsagar. This leads into reduction in the lifespan of dams. These rates are high because of poor management of river basin as a unit of planning. Due to this the capacity of dam storage, generation of hydro-electrical power, flood control capacity tends to decline up to a great extent.

Water Logging And Salination

The sustainability of any developmental project vitally hinges on its ability to maintain the essential ecological factors. From the point of view of enhancing the agricultural production, water-logging in the command and salinization of soils are two most significant out-growths of perennial irrigation. The impounding of such large amounts of water and the existence of permanent water-logging in the command has brought with it malaria in its most dreadful forms. Government estimates about water-logging in the command vary widely from document to document and sometimes in the same document though showing widely varying figures, these documents reveal an alarming state of affairs as water-logging has surged in Kakrapar command from a mere 0.5 percent of the Gross Cultivated Area (GCA), prior to irrigation, to nearly 39 percent after the command. One of the reasons for this is change in cropping pattern and due to this the crops which require more water has replaced the less water intensive crops.

In IGNP, government estimates of water logged areas are at 2 percent in stage 1st (Urmul 1991b); while another report (WAPCOS 1989) puts it at 33.7 percent. Moreover, the 'potentially sensitive' areas (with ground-water level at less than 6 meters from the surface) occupy 199980 hectares, roughly 38 percent of the command area of stage 1. The rising water table, whose rate of annual rise in the IGNP is almost 1.01 meters, could very seriously aggravate the situation. In stage 2nd, of the 2.8 lakh hectares surveyed by the Command Area Development Agency (CADA), about 33.8 percent was found to have a hard pan up to 10 meters in
Environmental Resources and Sustainability

depth. With the average rate of increase in the water table in stage 2nd being 1.25, meter per year, large parts of the command area could witness a severe crisis from water-logging (Urmul 1991b). Associated with the problem of prolonged water-logging in the command in the obvious fall-out-soil salinity, which is of permanent nature. It leads to decline in yields and finally complete abandonment of cultivation in the saline areas. Though data on soil salinity is not available, there is a notable and definite increase in it as was pointed out by many farmers whose lands have been affected by it.

Issue of River Pollution

India consumes about 86311 tones(t) of technical-grade insecticides annually to cover one million hectare of its land. Most Indian rivers pass through agricultural areas that use pesticides. This makes leaching from agricultural fields the most non-point – unspecified, and therefore, not measurable accurately-sources of pollution to the aquatic environment. Environmentalist have said that most of India’s rivers, the main source of water and sacred for the majority of the population, are already dead, because millions of industrial effluents and domestic flow into them daily. These aforesaid statements can be proved empirically with the data on the state of health of rivers in India. Here paper takes the case study of largest river of nation; Ganga.

Table 2: Water Quality Status of River Ganga.

<table>
<thead>
<tr>
<th>State</th>
<th>Location</th>
<th>Desired</th>
<th>Existing</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>U. P.</td>
<td>Rishikesh U/S</td>
<td>A</td>
<td>B</td>
<td>T. Coliform</td>
</tr>
<tr>
<td></td>
<td>Haridwar D/S</td>
<td>B</td>
<td>C</td>
<td>T. Coliform</td>
</tr>
<tr>
<td></td>
<td>Ganga at Garhmukteshwar</td>
<td>B</td>
<td>C*</td>
<td>T. Coliform</td>
</tr>
<tr>
<td></td>
<td>Narora (Bulandsahar)</td>
<td>B</td>
<td>C*</td>
<td>T. Coliform</td>
</tr>
<tr>
<td></td>
<td>Kannauj U/S (Rajghat)</td>
<td>B</td>
<td>D</td>
<td>BOD</td>
</tr>
<tr>
<td></td>
<td>Bithoor (Kanpur)</td>
<td>B</td>
<td>C*</td>
<td>T. Coliform</td>
</tr>
<tr>
<td></td>
<td>Kanpur U/S (Ranighat)</td>
<td>B</td>
<td>C*</td>
<td>T. Coliform</td>
</tr>
<tr>
<td></td>
<td>Dalmau (Rai Barseilly)</td>
<td>B</td>
<td>D</td>
<td>T. Coliform</td>
</tr>
<tr>
<td></td>
<td>Allahabad D/S (Saagam)</td>
<td>B</td>
<td>E</td>
<td>pH, T. Coliform, Free Ammonia</td>
</tr>
<tr>
<td></td>
<td>Varanasi D/S (Malviya Bridge)</td>
<td>B</td>
<td>E</td>
<td>pH, DO, BOD</td>
</tr>
<tr>
<td></td>
<td>Trighat (Ghaizpur)</td>
<td>B</td>
<td>D</td>
<td>BOD</td>
</tr>
<tr>
<td>Bihar</td>
<td>Buxar</td>
<td>B</td>
<td>D</td>
<td>T.Caliform</td>
</tr>
<tr>
<td></td>
<td>Khurji, Patna U/S</td>
<td>B</td>
<td>D</td>
<td>T.Caliform</td>
</tr>
<tr>
<td></td>
<td>Patna D/S (Ganga Bridge)</td>
<td>B</td>
<td>D</td>
<td>T.Caliform</td>
</tr>
<tr>
<td></td>
<td>Rajmahal</td>
<td>B</td>
<td>D</td>
<td>T.Caliform</td>
</tr>
</tbody>
</table>


Here it's very clear that the lifelines of the nation are extremely polluted due to contamination of water. The parameters taken by the Central Pollution Control Board (CPCB) to examine the quality of water are; T. coliform, BOD, pH value, amount of free ammonia, DO etc. According to Data obtained on the basis of aforementioned parameters, the mighty river Ganga is almost dead. The amount of pollution tends to increase as we move downstream, as at Rishikesh where it enters in plains the existing quality of water is of B grade which is more than the desired. In Allahabad and Varanasi the status of water quality is of E grade and not even fit for propagation of wildlife and drinking purpose after the treatment this is because of the industrial effluents and domestic waste. At Allahabad the amount of free ammonia is at critical level along with the T.coliform. The major polluting industry along the Ganges is the leather and tanning industry especially near Kanpur, from which Chromium and other chemicals leak into the river. Another huge source of pollution is that of the nearly 1 billion liters of mostly untreated raw sewage that enters the river every day. Inadequate cremation procedures result in partially burnt or unburnt corpses floating in the river.

After looking at the data one can imagine the state of India’s lifelines. Inspite of the fact that our rivers are almost dead as Yamauna in Delhi (as there in no micro bacterial activity is found in the river), if we are
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opting for the liking of river then we will circulate the heavily polluted water and which is more fatal from view point of hydrology and also ecology as that would leads to the ultimate death of our mighty rivers. At present we can restore our river with the help of programme such as Ganga Action Plan (GAP), treatment of effluents.

Let’s look at the state of our links, means Canal in terms of water quality. we have taken a case of West Yamuna canal at various points because in the process of linking canal would be the integral part of entire task. What will happen with our water quality in those canals?

Table 3: Water Quality Status of Western Yamuna Canal.

<table>
<thead>
<tr>
<th>State</th>
<th>Location</th>
<th>Desired</th>
<th>Existing</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haryana</td>
<td>Wc-1 (y. nagar) 100m D/s After Receiving Ind. &amp; sew. Effi</td>
<td>C</td>
<td>D</td>
<td>BOD</td>
</tr>
<tr>
<td></td>
<td>Wc-4 Delhi Parallel Branch at Panipat</td>
<td>C</td>
<td>D*</td>
<td>BOD</td>
</tr>
<tr>
<td></td>
<td>C-4 Before Into Delhi Branch</td>
<td>C</td>
<td>D*</td>
<td>BOD</td>
</tr>
<tr>
<td></td>
<td>Wc-6 Sirsa Branch</td>
<td>C</td>
<td>D*</td>
<td>BOD</td>
</tr>
<tr>
<td></td>
<td>C-3 Delhi Branch at R.d. 245250</td>
<td>C</td>
<td>C*</td>
<td>BOD</td>
</tr>
<tr>
<td></td>
<td>C-7 Delhi Parallel Branch</td>
<td>C</td>
<td>D*</td>
<td>BOD</td>
</tr>
</tbody>
</table>


After looking the state of quality of water in the W. Yamuna Canal the fact is very clear that the same thing is going to be happening with the link canals. As the existing levels of pollution is high in comparison to the desired one. The water of canal is even not fit for the animals. The main source of pollution in canal is the seepage of fertilizers, pesticides and insecticides from agricultural fields. So what is use of diverting the polluted water in the polluted canals?

ALTERNATIVES OF LINKING THE RIVERS

After looking at the experience of other countries and moreover the examples from our own country one question which encroaching upon our mind is that “why we are opting for such a mammoth project which is nor viable from any angle be it ecological, economic or political?” This linking process is irreversible and will take very long time to complete. At the moment we are having two ways to develop our nation; on the one hand we have very costly ecologically and environmentally collusive options like linking rivers and construction of big dams, while on the other hand we have cost effective, environment friendly and economically viable options like, Rain water harvesting, rooftop harvesting, channel management, flood plan zoning, restoration of river, modern ways of irrigation such as drip and sprinkle irrigation, dry farming etc.

All other traditional methods and non-conventional ways of water harvesting are very cheap and can be managed at family level or at community levels. We have a great example of Roman Magasaysey award winner Rajendra Singh popularly known as Paniwale Baba’s success story in the semi arid areas of Rajasthan. We are not telling to go back to Stone Age once again but we can develop our country on such a sustainable basis so that we can minimize the losses and adverse impacts on environment and to our lifelines. Inspite of going for one option we can opt. for multiple ways and a proper blend of both conventional and non-conventional methods. In the western arid Rajasthan there was a splendid tradition of “Bawaris” but due to lack of proper care and maintenance these structures have lost their significance and the problem of drinking water has aggravated in the recent times and by restoring them on traditional basis we can solve the problem of drinking water in the arid and semi-arid areas of country.

The linking of rivers is a part of supply-side hydrology but in recent years, has quite unceremoniously careened off the bend and noisily crashed against the ecological limits. Large Dams, for one, have been particularly singled out for causing catastrophic environmental hazards because of changes in temperature and flow regimes. This alteration of the chemical and bio-physical properties of the river has caused not

1 Bawaris are the traditional water harvesting structures in the Western Rajasthan.
only the loss of estuarine fisheries downstream of the dam but also affected the biodiversity at large, in many instances. The supply-side hydrology has inbuilt inefficiency and promote the wasteful uses of water. Due to all these there is a need for the demand management which gives basic thrust to the increase in the efficiency of water in agriculture and in other uses, in this regard we have very celebrated, successful and sustainable agricultural development model of Israel. The alternatives for the Inter Basin Water Transfer and of Dams are as follows:

- Watershed Management through extensive soil conservation, prevention of forests etc.
- River basin as a unit of planning and catchment improvement through afforestation in the upper reaches of rivers.
- Increase in the efficiency in the agricultural uses by the modern ways of irrigation (such as sprinkle system and drip irrigation) inspite of flood irrigation.
- River restoration1 and protection of flood cushions (marshes and wetlands) which includes the demolition of embankments.
- Ground water recharge with the help of check-dams and groundwater recharge sites.
- Rooftop harvesting in the rural and urban areas, this will solve the double problems of urban waste water in rainy season and also provides the water for domestic uses.
- Flood plan zoning to check the floods and minimize the losses due to catastrophic/flash floods.

Constructions of small and medium dams as these are cost effective and more eco-friendly in contrast to the big dams.

CONCLUSION

At the end of the above review and analysis made on the basis of available literature and data on the linking the rivers in India and data on water quality and availability of water, there appears a great inconsistency in the declared claims of the project and their feasibility. The indicative policy assessment show that the approach based on dams and canals is not the best choice for promoting domestic water security in India. This linking of rivers in India is based on supply side hydrology and encourages the inefficient uses of water in agricultural and in other uses. Inspite of opting for supply augmenting approach to water resources our government should take care of demand management approach which has inbuilt advantage over the supply side hydrology. The efforts should be made to increase the efficiency of water uses. This linking project would help more to the Multi-National Corporations and the construction lobby but not to the marginalized sections of society as tribals and indigenous people.

Here it's very clear that we want development but at what cost and development for whom, here come the question of power structure. Looking in the light of Cauvery dispute and shortage of water in delta area of Tamil Nadu the southern states are running out of drinking water and their voice is in the favour of it but taking care of international treaties and also interstate conflict we have to be very careful in diverting the water from one river basin to other. This linking project would destroy our mighty rivers for ever and we won’t be able to restore their ecosystem. We are opting for such a project that would destroy the riverine ecosystem as well as our economy as the funding would be the biggest problem after the ecological and environmental problems. We have lot more cheaper options to provide water for agricultural, domestic and industrial uses. Before starting the project, studies pertaining to Environment Impact Assessment and Social Impact Assessment should be conducted. Lastly but not the least we are throwing light on, one and foremost issue, issue of global warming and climate and its impact on the glacial retreat as these glaciers are the source of most of perennial rivers.

In the end we would like to quote the Chai Jung, a great Han Engineer. He stated:

"Those who are good at controlling water give it the best opportunity to flow away, those who are good at controlling people give them plenty of chance to talk." 3

3 Quoted in D’Souza, R’s article which appeared in Economic Political Weekly, September 6, 2003
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