

# **INTER-BASIN WATER TRANSFER FOR AUGMENTATION OF WATER RESOURCES IN INDIA - A REVIEW OF NEEDS, PLANS, STATUS AND PROSPECTS**

by

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## **INTRODUCTION**

Assessment of freshwater resource of a country is based on aggregation of rainfall and runoff figures for each of its drainage river basin. This natural resource is required for various uses by its people, irrespective of where they live. They may be living in dense urban clusters or sparsely habitated rural areas - within a river basin or across it where water is in short supply. Often, the place of human habitat is due to a historical accident. But, making the required water available in needed quantity, of certain quality, at the place of their residence or work, and at needed time is the duty of the society and is possible if the water resource is developed and managed in an integrated and sustainable manner: equitably, economically and efficiently. The process is broadly termed as Integrated Water Resources Development and Management which includes both within basin and inter-basin water transfer. Although the inter-basin water transfer has been adopted in India since long, it was formalized and elaborated in 1987 and revised it in 2002, through the National Water Policy. An action plan for implementation of the National Water Policy is since under way.

India annually receives adequate rainfall, mostly concentrated in a short Monsoon period with a large variability in space and time. It therefore runs-offs through the country's vast river systems causing floods and / or droughts, unless captured in storages. River flow otherwise is inadequate for meeting uniform needs for abstraction and use. Storage reservoirs can be constructed in hilly areas where population density and society's needs often are low as compared to available flow, but they enable release and transfer of water to areas where the needs are high – within and outside the river basin boundaries.

## **WATER RESOURCES AVAILABILITY, VARIABILITY AND NEEDS**

The annual average precipitation in India is 1170 mm, a little more than the world average of about 1110 mm. It however tremendously varies spatially and temporally. At the same time, the rainfall intensity in India is quite high, as painfully evidenced by the 2005 monsoon deluge in Mumbai, Bangalore or Chennai. At places, it rains for 200 days

a year; at some for 10 days. The precipitation yearly brings about 4000 billion cubic metres (BCM) of water to India. Because of high rates of evaporation, out of this, only about 1900 BCM of water, comprising both surface and ground waters, is considered as annual renewable resource. Due to further geographic limitations, about 1300 BCM of water only can be used. Although the average annual water availability in the country is adequate, it is skewed. India's population grew in the last 50 years from about 0.4 billion to 1.0 billion and is likely to stabilize at about 1.5 B in 2060. Amongst river basins, annual water availability per capita is highest at about 18,400 cum in Brahmaputra which is a least developed vast basin to 300 cum in Sabarmati basin, which is highly developed but relatively a much smaller basin, already depending upon inter-basin water transfer from Mahi and Narmada rivers. The water availability per capita within basins such as Sabarmati will fall further with population growth, increasing its dependence on inter-basin water transfer more than ever before.

India's present yearly Water Balance in BCM is as follows.

- Precipitation is 4000 BCM, inflow 400, total is 4400. Evapotranspiration is 2200, infiltration 300. Available water is about 1900. Developable potential is around 1130 BCM.
- Developed potential for withdrawal is 650 BCM. Still available is 480 which can be extended through inter-basin water transfer by another 28% upto 300 BCM.
- Use for Irrigation is about 83%. That for domestic purposes and industry is about 4% each, for energy it is about 2%, and for other sectors it is about 7%.

The possible use scenarios by different sectors with following assumptions are indicated in Table 1 for years 2010, 2025 and 2050.

- All intra-basin development is completed by 2025.
- Surface water use efficiency goes up from 40 to 60 %, groundwater from 70 to 75%.
- Net area under irrigation goes up from 53 Million Hectares (Mha) to about 80 Mha. Cropping intensity goes up from 140 to 150% for intra-basin development, and further to 155% with inter-basin water transfer (net irrigated area going up to 90 Mha).
- The productivity of irrigated land increases from 2.5 to 4.0 T/ha, for rain-fed from 0.8 to 1.5 T/ha. Gross irrigation potential rises from 90 to 140 Mha.

Although the projections are optimistic, making water available accordingly involves hard work and harder decisions, in particular for building storages which facilitate water transfers – both intra and inter basin. Really philosophically both are not different. What is important is cost-effectiveness of one or the other option. And of course, as simply put, mere availability through development

**Table 1. Sector-wise water requirement in BCM and percentage, 2010-2050**

Sector \ Year	Present		2010		2025		2050	
		%		%		%	G*	%
Irrigation	524	83	550	77	590	73	770	68
Domestic	30	4	43	6	59	7	1.4	
Industry	30	4	37	5	67	7	100	9
Power	9	2	18	3	32	4	3.3	
Navigation	0		7	1	10	1	81	7
Ecology	0		5	1	10	1	2.7	
Evap / losses	36	7	42	7	50	7	68	6
-----	-----	-----	-----	-----	-----	-----	7.5	
-----	629	100	-		-		15	1
Total			702	100	898	100	20	2
							76	7
							2.1	
							-----	
							-	
							1130	100
							1.8	

\*Note: Figures in column G denote proportion of growth from present to 2050.

A surplus region within a basin sometimes is located near a deficit part of the same or of an adjoining basin. Transfer of water between such areas, across higher ground was therefore effected in past, basically for drought-proofing through irrigation or to serve drinking water needs. It was possible due to structures for impounding / diverting waters, raising elevation of water surface and allowing gravity flow. Some times, tunnelling and pumping was resorted. As storages always absorb floods and reduce downstream peak flow, they enable better flood management while ameliorating drought. Hydropower generation at the foot of the dam, at canal sluices or at falls along canals was also adopted wherever possible. Isolated inter-basin water transfer schemes have been successfully implemented in the country at least during the last two centuries, although amongst about 27 countries of the world, earliest record dates back to almost a millennium as in China.

In India, past schemes account for transfer of almost 58 BCM of water through canal links, whereas the world as a whole (including USA, Russia, China, Canada, Germany, France, Spain, Czech Republic, Turkey, Egypt, Iran, Mozambique, Sudan, South Africa, Pakistan, Morocco, Malaysia, Thailand, Japan and others) accounts for about 500 BCM of transfer. Another almost 600 BCM transfer is under planning. In Himalayan basins, about 12 schemes presently account for water transfer of about 39 BCM. They include: Ghagra-Sarayu, Ghagra-Sharada, Indus sub-basin links, SYL, Ganga-Yamuna etc. In peninsula, about 17 schemes comprising: Kurnool-Cudappa, Periyar-Vaigai, Koyna-Vashisti, Mahi-Sabarmati, Narmada-Sabarmati, Harnav, NagarjunaSagar, Sileru-Kolab, and others transfer annually about 17 BCM. All of them have removed the natural imbalance and brought bounty to the people.

To augment freshwater availability in India, comprehensive planning was initiated more than 50 years ago. Although formal comprehensive planning for inter-basin water transfer was initiated in 1980 with a National Perspective Plan, two independent inter-basin water transfer proposals amongst several others were considered earlier. Dr. K. L. Rao's proposal (1972) envisaged a 2640 km long Ganga – Cauvery link as its main component for irrigating an area of 4 Mha, involving pumping over a head of 550 m. Captain Dastur's proposal (1977) envisaged two canals. One, a 4200 km long 'Himalayan Canal' at the foot of the Himalaya. Two, a 9300 km long 'Garland Canal' covering the central and southern India. The two canals envisaged interconnection by pipelines at two points (Delhi and Patna). The proposals were examined and found very expensive and or technically infeasible. The National Perspective Plan was conceived to basically reduce the regional imbalance in water availability. The broad approach comprised: leaving undisturbed existing agreements between states; meeting reasonable needs of basin states for foreseeable future; transferring water essentially by gravity, restricting lifts to 120 m. The National Perspective Plan comprised two components viz. Himalayan Rivers Development and Peninsular Rivers Development and envisaged 35 Mha of additional irrigation besides generation of 34000 MW of hydro-power, flood control, mitigation of drought, navigation, domestic and industrial water supply, fishery, recreational facilities, salinity and pollution control.

The National Water Development Agency was set up in 1982 to detail out the National Perspective Plan through: identification of deficit / surplus basins / sub-basins based on water balance studies, determining suitable locations for storages and transferable quantum of water, identifying dams to facilitate capture and transfer through flow or lift canal links, and for preparing feasibility reports for related infrastructure development initially in peninsular basins and later in Himalayan basins. The National Water Development Agency has a three tier set up. At the top, it has the 'Society' chaired by the Union Minister of Water Resources which has 23 members besides 19 State Secretaries. Then, it has a Governing Board of 16 members chaired by the Secretary WR, besides 19 State Secretaries. At the third tier, it had a Multi-Disciplinary Technical Advisory Committee with a Chairman, Central Water Commission, with 34 members including State representatives.

After extensive studies, field investigations and pre-feasibility studies, the National Water Development Agency concluded that about 30 inter-basin water transfer links (14 in Himalayan sector and 16 in peninsular sector) would be feasible to transfer about 150 BCM of water to needy areas. The work of the feasibility reports was already underway by 2002, when Government of India backed by the Supreme Court's observations about expeditious undertaking the inter-basin water transfer in another Public Interest Litigation decided to launch a comprehensive inter-basin water transfer programme. It dramatically changed the rather business as usual scene in the country and enthused people once again for the first time after independence with a national fervour. For each link, broad estimation was done during feasibility stage. For others, broad pro-rata costs were estimated. The broad estimate is based on an overview of pre-feasibility and feasibility



*Note: Curve (3) depicts isolated development of inter-basin water transfer till now and shows projected growth. Curve (5) shows how it could help attain development potential by 2050 with inter-basin water transfer.*

## **THE NATIONAL WATER DEVELOPMENT AGENCY**

**Himalayan Rivers Development.** This component has 14 links, 4 involve lift. It has following groups for transfer of about 107 BCM of water.

GROUP H.1: BGM: Brahmaputra (43 BCM) – Ganga (38 BCM) – Mahanadi (20 BCM).

GROUP H.2: GBN: Within Ganga basin (north) redistribution of about 66 BCM through Kosi – Mechi [KMe], Kosi – Ghagra [KGh], Gandak – Ganga [Ga-G].

GROUP H.3: GBS: Within Ganga basin (south) redistribution of about 8 BCM through Chunar – Sone Barrage [C – SB] and Sone dam – Sone Tributaries [SD – ST].

GROUP H.4: Ganga – Yamuna – Luni – Sabarmati [GYLSb]: through Ghagra – Yamuna [Gh - Y] 4.1 BCM, Sardar – Yamuna [Sa – Y] 14.9 BCM, Yamuna – Luni [Y – L] 5.9 BCM, Luni – Sabarmati [L – Sb] 2.0 BCM.

For the Himalayan Rivers Development, besides utilizing existing, at least 6 new major dams will be required, some of which will be in Bhutan and Nepal involving international projects.

**Peninsular Rivers Development.** This component has 16 links, 3 involve lift and has following groups for transfer of about 43 BCM of water.

GROUP P.1: Mahanadi (Manibhadra)– Godavari (Dowlaiswaram) 6.5 BCM Group 1.a– Krishna – Pennar – Vaigai – Gundar [MGKPVG], involves in all 43 BCM, GROUP P.1 (b) Godavari (Inchampalli low dam) – Krishna (NSP tail pond) 4.4 BCM, GROUP P.1 (c) Godavari (Inchampalli) – Krishna (NSP) a lift of 116 m for 9.8 BCM, GROUP P.1 (d) Godavari (Polawaram) – Krishna (Vijaywada) 3.3 BCM, GROUP P.1 (e) Krishna (Almatti) – Pennar 2.0 BCM, GROUP P.1 (f) Srisailem (Krishna) – Pennar [SSP] 2.1 BCM, GROUP P.1 (g) Krishna (NSP) – Pennar (Somasila) 8.6 BCM, GROUP P.1 (h) Pennar (Somasila) – Cauveri (Grand Anicut) 3.8 BCM, GROUP P.1 (i) Cauveri (Kattalai) – Vaigai – Gundar 2.2 BCM.

GROUP P.2: Within Yamuna South Basin [YSB] in all 1.8 BCM, P.2 (a) Ken – Betwa [KB] 1.1 BCM, P.2 (b) Parvati – Kali Sindh – Chambal [PKSC] 0.7 BCM.

GROUP P.3: Gujarat – Maharashtra [GM] in all 1.6 BCM, P.3 (a) Par – Tapi – Narmada [PTN] 0.7 BCM, P.3 (b) Damanganga – Pinjal [DP] 0.9 BCM.

GROUP P.4: Karnataka [KAR] in all 0.4 BCM, P.4 (a) Bedti – Varda [BV] involves a 124 m lift for about 25 cumecs. 0.2 BCM, P.4 (b) Netravati – Hemavati [NH] involves a 81 m lift for about 7 cumecs. 0.2 BCM.

GROUP P.5: Kerala – Tamilnadu [KT] 0.6 BCM, P.5 (a) Pamba – Achankovil – Vaippar [PAV], 0.6 BCM.

For the Peninsular Rivers Development, besides existing and under-construction dams, 20 new dams are envisaged. Seven of these will be major dams.

### **TASK FORCE FOR THE INTER-BASIN WATER TRANSFER PROGRAMME**

The Government of India in the Ministry of Water Resources under a Resolution, constituted a High Level Task Force for Inter-Linking of Rivers in December 2002, in response to the Supreme Court observations of 31.10. 2002 during the hearing of a Civil Writ Petition 512 of 2002 on another matter.

The observations were made after considering and accepting the affidavit made by Government of India and the advice of the Amicus Curiae about how to undertake and complete the much needed identified river links for inter-basin water transfer to enable facing the myriad problems of the country related with water. The observations included:

- a) assurance of setting up of a Task Force by the Government of India to go into modalities for bringing consensus among states,
- b) expectations of the Supreme Court, from Government of India to draw up a program to complete the links within say 10 years, and
- c) their hope that if a legislation is made under Entry 56, List 1 of the Constitution, need for consent of the states would not arise so as to enable Government of India to undertake the links and complete them.

The Supreme Court also observed that they would periodically review action taken on these observations. Accordingly, the Supreme Court has heard the Counsels of concerned parties 4 times during 2003, about 4 times during 2004 and by now 2 times in 2005 for reviewing the status of action.

The Supreme Court and Government of India adopted the title ‘interlinking of rivers’, ILR for short, to describe in simple terms the inter-basin water transfer programme. The ‘ILR’ nomenclature was a misnomer suggestive of linking of rivers, like roads and railways enabling both ways transfer of waters. The misnomer and the associated overdrive for publicity imparted to the inter-basin water transfer effort, attracted an unnecessary hype causing several uncalled for reactions from misguided elements already opposed to Water Sector.

The mandate of the Task Force was indeed only to prepare a road map for the Government of India to enable undertaking the ILR programme. The terms of reference for the Task Force were the following:

- a) Provide guidance on norms of appraisal, viability, impacts;
- b) Devise mechanisms for achieving consensus amongst States;
- c) Prioritise project components for Detailed Project Report and implementation;
- d) Suggest modalities for funding; and,
- e) Consider international dimensions.

Some over-enthusiastic individuals however carried an impression that the Task Force was mandated to even organize the implementation of the inter-basin water transfer program and hence got themselves and the program into a 'Catch 22' situation.

As per prescribed milestones, the Task Force submitted to the Government of India the 1<sup>st</sup> action plan comprising: an outline of the time schedules for the completion of the feasibility studies, detailed project reports, tentative estimated cost, implementation schedule, concrete benefits and advantages of the project, etc." by the end of April 2003; the 2<sup>nd</sup> action plan comprising preliminary assessment for funding, execution / implementation, and cost recovery for the inter-basin water transfer program was submitted in July 2003; the meeting of Chief Ministers of states to build consensus was replaced with individual consultations.

The Government of India separately set up an officials group to build consensus and a group to critically review scope of each link. During consensus building, each link is likely to undergo a change in scope, complexion and the estimated cost. The detailed project report process will further modify it and will account for the BC analysis which could include indirect and incidental benefits and costs –both social, and environmental. It would also consider the avoided costs and costs of not doing each link.

The Ministry of Water Resources had set up at the instance of Task Force, several working groups of country's experts, Specialist Institutions, Organizations to deal with the Terms of Reference. Following studies were entrusted to them:

1. Wildlife / Environment – Central Pollution Control Board, National Environmental Engineering Research Institute, The Energy Research Institute, Forest Research Institute, Wildlife Institute;
2. Rehabilitation and Resettlement and social issues – Tata Institute of Social Science, Centre for Development Studies and Action;
3. Finance, economics – National Council for Applied Economic Research, Industrial Credit Insurance and Commerce Institute, National Institute for Food and Finance Programme;
4. International Dimensions – Foreign service specialists;
5. Institutional Arrangements – Indian Institute for Management Ahmedabad;
6. Engineering, technology, construction, R&D – Inst of Engineers, Indian Institutes of Technology, Indian Institute of Science, Indian Space Research Organisation;
7. Information Technology and Communications – National Information Centre, Telecom Commission.

8. Awareness – Communication Core Group, Water Management Forum – Institute of Engineers (India), Groups of Journalists, NGOs.
9. Mechanisation of Construction and Compressing Schedule of Construction;
10. Independent Group of Experts to consider proposals received as alternatives.

As the task entrusted to the Task Force was completed, it was wound up in December 2004. Around the same time, the Government of India set up an officials' Special Cell to carry out the follow up activities. A Committee of Environmentalists, Social Scientists and other experts was also set up to consider views expressed on the completed feasibility reports. This Committee is working on various issues and objections raised by those opposing the programme or individual links. As the detailed project report proceeds, the issues will be incorporated in the costs and benefits streams for each link and benefit cost analysis, internal rate of return, etc., will project them before the Government of India approves it. Some public representatives had in the meanwhile asked the Task Force to post the completed feasibility reports on the website. Accordingly by now all 14 feasibility reports are posted on the website.

## **DEVELOPMENTS POST-TASK FORCE**

During the year 2005, two important events provided a follow-up to the work of Task Force.

1. An expert panel discussion on inter-basin water transfer chaired by Dr Kirit Parikh Member Planning Commission was held on 23 February during the International Symposium on 'Sustainable Development of Hydrological Parametres' at Roorkee. The panel concluded that: inter-basin water transfer was inescapable for India to cope up with unmet needs and growing demands; reconciliation of approaches of National Water Development Agency and the erstwhile National Commission was necessary; follow-up and improvement in the good work done by working groups of the Task Force was urgently required; consensus building amongst states on links one by one was necessary; inter-basin water transfer calls for more hard work and less of counter-productive hype.
2. The 12<sup>th</sup> National Water Convention held at New Delhi on 11-12 May focused its attention on the proposed inter-basin water transfer program. A brain storming session of experts reviewed the work being done post Task Force. It was understood that reports of the Task Force working groups will be considered in depth and shared with other experts to sharpen the action plans; focused attention will be paid to preparation of the detailed project report; legal matters will be expedited; website will be activated to serve information sharing, eliciting suggestions and preventing spread of mis- and dis-information; inter-basin water transfer will serve as a vehicle for providing a win-win situation for states leading to national integration.

By now, feasibility reports have been completed for 16 links. The detailed project report for Ken-Betwa link for which an Memorandum of Understanding has been signed

between UP and MP has been entrusted to Central Water Commission at an estimated cost of Rs 300 Million for completion within 30 months time. The Memorandum of Understanding for Parbati-KaliSindh-Chambal link is likely to be signed soon. Its Detailed Project Report will be taken up thereafter. Presently, preparation of remaining feasibility reports is in progress; construction of the Ken-Betwa link can be launched in 2007 if Detailed Project Report is completed towards end of 2006; other links will be taken up for preparation of Detailed Project Report once concerned States agree on its parameters.

## **SOME RESERVATIONS, MISGIVINGS, OBJECTIONS**

The observations of the Supreme Court in Oct 2002 caught everybody off-guard. The Government of India however quickly responded by constituting a Task Force. A vortex of publicity grew around the announcements, followed soon by opposition. The size of the programme, the indicated scale of investment, the multi-pronged benefits were breathtaking. Benefits seemed to be exaggerated. Drought and flood proofing, hydropower generation, navigation, employment, poverty removal, end of scarcity were projected as outputs. Critics of conventional Water Resources sector as a whole were stunned and swept off their feet for some time for the sheer magnitude of the announced programme. Science and Technology community largely welcomed the initiative. Sceptics soon started projecting disadvantages. Keeping up with the hype from one side - imaginary disadvantages were put forth by the other side. Ballooning of expectations took place especially in context of the prevalent drought. The Interlinkage of Rivers (ILR) nomenclature appealed to many, while it served as a red rag to others. Parochialism soon took hold of the psyche, states claiming 'ownership' on river waters. The regions to receive extra water welcomed it, while the regions from which water would be transferred expressed concerns. A whole lot of questions which had been settled by the Tribunals were again opened. The political leadership and industry chipped in. NGOs and Media aired the familiar controversies.

The components of the programme were not yet formulated and so could not be placed in public domain. Issues of transparency, people's participation, water rights, human rights, etc became scoring points. Fuel was added to the fire by the general hype comprising: a series of interviews, statements, symposia, public meetings, media attention, and unfortunately half cooked information. Public psyche of emotional response to even serious issues requiring in-depth consideration, swung between glorification and denunciation. The Terms of Reference for the Task Force had indicated a clear gap between the present status of the inter-basin water transfer and what was intended. The events however eclipsed that status. In keeping with the high profile for the program in public psyche, some thought it fit to go beyond the Terms of Reference and assume a role of saviour of the WR sector; some attributed all the destructive facets to the programme. Pros and cons of the inter-basin water transfer programme have been debated extensively. Half truths have been touted as facts. Biases and prejudices are repeated. Most of these (in straight letters), along-with responses (in italics), are indicated below.

ILR was sprung as a surprise. It was due to Supreme Court's directions. *Coming from the Supreme Court, it did come a bit suddenly. But it was waiting to happen for a long time. It was not conceptualised overnight. It has had a long history and proven track-record within and outside the country.*

The ILR is not a completely studied project. Cost is gigantic. Benefits are not commensurate. It can't be implemented in 10 years. Likely socio-economic-ecological adverse impacts are not considered. More economic and eco-friendly options are not studied. People are not consulted. R&R problems will be vast, track record is dismal. *It is not one project. It indeed is a countrywide inter-basin water transfer programme promising huge socio-economic benefits. It will pass through Planning Commission process once Detailed Project Reports are ready. Time frame for implementation will depend upon deployment of requisite technology inputs with finance, HR, and enabling legal framework. It is in public / political knowledge for the last thirty years. At macro-scale, present assessment indicates on the balance positive impacts. Available options don't promise as much cost-effectiveness. R&R problems will be manageable.*

Studies conducted are not shared with civil society. *The National Water Development Agency is halfway through the promising task. That promise has been shared with the people, the states, and the Supreme Court. The feasibility reports are being discussed preparatory to preparation of Detailed Project Reports. Contours of each link will be in public domain once consensus of states is developed.*

Small is beautiful, big is harmful. *Not necessarily. A discrete combination is necessary.*

Giganticism will need private finance, privatization of WR, promotion of multi-nationals. *These aspects are under study. Giganticism if cost-effective will be preferable.*

ILR will breed inequality, corruption, cater to rich classes, marginalize poor. *These are imaginary fears. Aim of the programme is optimisation of output from all inputs.*

It will destroy eco-systems, transfer pollution, transfer hostile species to alien eco-systems, promote desertification, cause water-logging, salination of lands. *The cited effects are due to deficient management which needs improvement during planning for the programme.*

Conventional irrigation has failed, ILR will worsen situation, will promote deforestation, will increase floods. *These are misconceptions. Irrigation wherever reached brought about rural transformation, reduced involuntary migration of rural people due to lack of employment, flood moderation and facilitated afforestation.*

ILR will increase fights or disputes between states. It will cause country's disintegration, will start new disputes with Nepal and Bangladesh. Constitutional provisions need amendment. *Existing legal framework is under study. Inter-state disputes need mature*

*response. Concerns of neighbouring countries and international obligations will be met with.*

The National Commission proposed inter-basin water transfer on a much lower scale as compared to National Water Development Agency. Why then go in for such a large-scale inter-basin water transfer, if it is really not required?

*Both accept the need for inter-basin water transfer, although proposed scale is different. NC studied inter-basin water transfer for the Peninsular Rivers Development only. Assumptions by NC differ from National Water Development Agency as follows:*

- A) Dependability of yield: NC -50% against National Water Development Agency - 75%.*
- B) NC considers surface and ground waters both, National Water Development Agency only Surfacewater like tribunals, as. Groundwater is locally useable and not transferable.*
- C) Regenerated water availability and water use efficiency assumptions differ. The Report of the National Commission has not been accepted by the Government of India yet for different reasons. Notwithstanding these reasons and different approaches, Detailed Project Report has to try to reconcile them.*

Some populous states get little advantage. Some will lose out more than what they gain. *This often happens in national programmes, when a common national asset is to be shared. Securing a win-win situation will be the aim. For needy areas of states at higher elevations, pumping greater than 125 m can be considered, in Detailed Project Report stage if power situation will be better.*

Inter-basin water transfer should not be undertaken unless within basin needs are satisfied. *The National Water Development Agency has assessed within basin / sub-basin needs (present and future) and then alone decided on how much water is available for transfer.*

Inter-basin water transfer will be more expensive than intra-basin transfers. *Inter-basin water transfer is to be adopted if needs can't be met with through in-basin availability.*

Inter-basin water transfer will face more imported pollution hazards. *Polluted waters are not to be transferred.*

Resettlement and rehabilitation, deforestation, land loss, livelihood loss, water logging and salinisation will be extensive in case of inter-basin water transfer. *For each of these adverse impacts, well-tried policies are by now available and accepted by the civil society. No doubt, amelioration cost is to be considered while considering benefits and costs streams.*

When Government of India is not able to cope up with funding for the ongoing programme, financing the new scheme will be difficult. *Detailed studies have been conducted by specialist institutions for funding the new programme. A road map is available including a "special purpose vehicle" for this purpose.*

Inter-basin water transfer could introduce alien / hostile species of plants causing ecological imbalance. It would cause drying up of rivers. *India has 100 year old inter-basin water transfer schemes in operation. They don't indicate any such adverse impact. Yet, a study of existing schemes is undertaken to identify such impacts if any and plan remedies. Altogether, about 7% of basin waters are proposed to be transferred. Such transfer is not expected to cause adverse impacts as feared. In fact due to irrigation regeneration and hydropower regulated releases, rivers are likely to carry more flow in post monsoon period.*

Water Laws and constitutional provisions are not adequate. More inter-state disputes will start due to inter-basin water transfer programme. *These issues have been examined in detail by the Task Force Working Group at the instance of the Supreme Court. The Government of India feels that a win-win situation can be adopted through Detailed Project Reports that are in progress for the concerned states. Also, no link will be taken up for construction unless concerned states agree.*

## **OPTIONS TO INTER-BASIN WATER TRANSFER AND THEIR EVALUATION**

Responses to some of the proposed options by opponents to the inter-basin water transfer programme are given below.

- a) **Micro Watershed Development and Rainwater Harvesting.** Macro to micro scale of WRD, caters to different needs. Micro facility operates within a narrow band of meteorological parameters of intensity, duration, antecedent rainfall, potential evaporation, infiltration capacity etc. and has strong limitations. Being scattered, it calls for dedicated 'cadre' for implementation as compared to the organized WR projects. It has a crucial role in conserving catchment area. For the rain-fed areas and non-commanded areas of irrigation schemes, it can provide supplementary waterings. It recharges ground water and admirably satisfies small needs. Micro and macro scales are basically complementary. About 30 BCM of water could be harnessed through micro scale, whereas due to larger scale it could be as high as 400 BCM.
- b) **Small or Big Dams.** A large or a small dam is built depending upon location and economical-hydro-geo-technical considerations. In a basin, a discrete combination of large to small facilities is required. Claims of small dams meeting all demands are not correct. Relatively larger proportion of captured water is lost to evaporation in case of small structures. A recent study to revive old tanks in TamilNadu indicated, that it is more expensive than building new large systems. For new facilities, capital cost in US\$ per 1000 cub m storage varies from: for large storages at 8 to 100 US\$, to micro: at 160 to 600. O&M costs increase with decreasing size. When large quanta are to be harnessed, large organized facilities prove cost-effective and are unavoidable (Keller, A.R., R. Sahktivadiverl, D. Seckler, 1999, Water Scarcity and the Role of Storage in Development, International Water Management Institute, Colombo).

- c) Run-of-the-River Hydropower Stations. In Indian monsoon conditions, such stand-alone installations without upstream storages are not found viable. Their reliability in post monsoon season is questionable.
- d) Solar and Non-conventional Energy as an Alternative to Hydropower. Although they undoubtedly constitute the ultimate inexhaustible source for the future, the alternative sources at present are still in development stage. Present costs are unaffordable. The bio-mass based gasifiers, require land for growing bio-mass, which might not be available or which would in turn require water supply from conventional WRD schemes. They are therefore presently not viable.
- e) Effects of diversion. inter-basin water transfer from a basin jeopardises its future water development; spreads pollution and transmits invasive species to transferee basin. Planning for each link and Detailed Project Report will address these issues.

### **ADVANTAGES OF THE INTER-BASIN WATER TRANSFER PROGRAMME AND SHAPE OF THINGS TO COME**

A far-reaching programme such as the one under detailed examination is expected to be one of the main contributors in accelerating the much needed WRD in the country. The benefits of drought mitigation will accrue due to the envisaged programme to approximately 25 lakh hectares in 11 states. Addition of 35 Mha of irrigation potential would enhance food production by 70 M tonnes. Fishery would significantly grow in new lakes and canals. The degradation of environment in the upstream will be reversed. In the downstream, it will improve by a better lean season flow due to regeneration and regulated releases.

Many cities, industries and rural habitations are water short. Their supplies will be augmented by about 12 BCM. Several link canals can facilitate inland navigation reducing fossil fuel consumption. Hydropower potential will increase by 34,000 MW. It will take care of peak load and bring about a more efficient hydro / thermal mix. Peak flood moderation due to reservoirs will be about 30% and due to diversions about 5%.

The migration of rural population to urban complexes would be arrested. The programme would generate about 50 Million jobs during the construction period and beyond, due to enhanced economic activities. About half a million people may get affected or displaced due to reservoirs and canals. An improved rehabilitation & resettlement package will ensure a better status for them. Due to storages about 79,000 ha forest-land is likely to be submerged. Compensatory afforestation, catchment area treatment and other conservation programmes will offset the loss. Ill-effects on bio-diversity in particular in Himalaya could be taken care of through gene-banks for preservation and replication. When each link undergoes Detailed Project Report stage, the scope is likely to change including advantages and disadvantages. Effort will be to maximize the former and minimize the latter.

## **SUMMING UP**

The inter-basin water transfer comprises a viable and inescapable augmentation programme and a quicker booster for the ongoing conventional effort. It is socially needed, technically feasible, economically viable and environmentally sustainable. It holds immense potential to unite the people of the country through emphasis on integration, interdependence, and avoidance of fissiparous tendencies. It will boost growth and development. Its indirect, incidental, multiplier and triggering effects on the benefits stream at macro level envisaged will be substantial. Lack of development causes faster and larger level of social-environmental degradation than that due to development. Such assessment of benefits and costs without and with the programme, will be attempted in Detailed Project Report stage.