1. INTRODUCTION

"Little drops of water make a mighty ocean"
"Water, water every where, not a drop to drink"

These well known sayings, referring to both the constitution of water and its uses for humankind, illustrate clearly an inherent flaw in the availability of water all over the world. Although 75% of the earth's surface is covered with water, only a miniscule proportion of it is available for human needs as fresh water. With so less water available and most of it polluted and depleted, disputes over the use of fresh water are becoming very common.[1]

Today in India, water is one of the two most important sources of conflict. The other is religion. The ranking of these issues is location– specific. The political system of India is based on multi-party democracy. Every political party gives a top slot to water resource development in its election manifesto. Every candidate, contesting the election, promises a water project to his/her constituency. The availability of water is seldom taken into consideration when making these electoral promises.

Non-availability can always be attributed to some one upstream who can be shown as having appropriated all the water, a ripe case for conflict. Water is an easily exploitable issue in electoral politics. The potential for conflict had always existed historically, but the political leadership facilitated the negotiations. Over the years, this spirit has changed to rigid postures, with every State rushing to overexploit water and accusing neighbours of "stealing" their share.

Given this political environment, it is not surprising that the national river interlinking plan has been offered as a miracle solution to water scarcity, primarily with the following claims:

i) First, interlinking would lead to a permanent drought proofing of the country by raising the irrigation potential to equal the current net sown area of about 150 million hectares.

ii) Second, it would mitigate the annual floods in Ganga and Brahamputra.

iii) Third, it would add 34,000 MW of hydropower to the national pool.

The passing observation of the President A.P.J. Abdul Kalam, on the eve of Independence day 2002, set the momentum for interlinking of rivers, hitherto a dormant idea. This prompted one advocate, Ranjit Kumar, to attach the copy of Kalam's speech with a Public Interest Litigation (PIL), which he had filed for the cleaning of Yamuna. Thus in August 2002 for the first time, the issue came up in the Supreme Court. Justice B. N. Kirpal, the then Chief Justice of India who was heading the bench responded so enthusiastically that he converted the PIL for cleaning of the Yamuna into an independent writ petition and issued notices to the Centre and the States for interlinking of rivers.

When the matter came up again on 31 October 2002, only the Centre and Tamil Nadu endorsed the Court's initiative. The absence of response from all but one State did not deter justice Kirpal and other Judges from pursuing the task which they took with missionary zeal. On the contrary, the learned judges ruled that in the absence of affidavits from other States, the assumption was clearly that they do not oppose the plan made in the Writ Petition and there is consensus among all of them that there should be inter-linking of rivers in India.

The order passed on 31 October 2002 formed the basis on which the Centre set up a high powered Task Force under Mr. Suresh Prabhu, former Union Minister of Power. The irony is that the very order that presumed an all India consensus on the subject went on record to suggest how the Task Force would go into bringing consensus among the States.

Another irony about this far-reaching order is that there is no mention of the 10 years deadline, though the deadline is presented as part of the project. Justice Kirpal was cautious enough not to put the deadline in writing lest it raise delicate Constitutional questions of the Court's jurisdiction in the realm of executive policy.

Interlinking of Rivers as a solution for drought and flood is not a new proposal. It was Sir Arthur Cotton who had originally proposed the networking of rivers more than a century ago, and Dr. K. L. Rao, the Minister of Power and Irrigation in the Cabinet of Smt. Indira Gandhi, revived this proposal in 1972. Both were no doubt eminent engineers. Sir Cotton's prime concern was for inland navigational network and Dr. Rao's concern was for irrigation and power. Neither could perceive that far wider issues were involved.[2]

Mr. Rao presented his plan to link the Ganga and Cauvery. In 1974, a similar proposal 'Garland Canal' was submitted by Captain Dinshaw J. Dastur, an air pilot. The Government prepared its own plan in 1980 and in 1982; the National Water Development Agency (NWDA) was set up to carry out detailed studies. It envisioned a 30 year plan but following the Supreme Court directive, the Task Force has published a time table which lists 2016 as the date for completion. No explanation has been provided how this is to be managed. Such a project should have been preceded by a study of:

i) Financial Viability

ii) Technological Capability

iii) Ecological Sustainability

iv) Detailed Environmental Impact Assessment.

The NWDA plan has divided the project into two broad 'components' - the Himalayan part with 14 river links estimated at Rs. 375,000 crores and the Peninsular component with 17 river links estimated at Rs. 185,000 crores.

Not only does the economics of the plan appear to be extremely improbable, but serious reservations are also raised about its claims. Let us look at two of these claims, that of flood control and the assumption that the Ganga, Brahamputra, Mahanadi and Godavari are "water surplus".

From being a river which supported inland trade and passenger traffic 150 years ago, the Ganga has become a silt-choked shadow of its former self. The British used it to ship their troops from Bengal to Kanpur and Delhi during the 1857 war of independence. Today, the Calcutta Port is so silted that crores of rupees have been invested to build another port at Haldia. It was to overcome the silting of the Calcutta Port that the Farakka barrage was constructed to divert more water to the Indian stream. While Farakka has led to drastically reduced water flows to Bangladesh and resulted in constant diplomatic tension with that country, it has not been able to save the Calcutta Port. One may be tempted to ask: Does the Ganga really have surplus water?

i) One, the source of the river is drying up, like almost all the other Himalayan rivers. It is well known that Gangotri Glacier which feeds the river has receded by over 14 km in the last century alone.

ii) Second, increasing amounts of the river's water are already being used for irrigation as well as urban needs.

iii) Third, almost half of the Ganga's water at Patna originates in Nepal which has its own plans to develop hydrological resources. Once these come up, flows would be further reduced in the Ganga.

Similar facts do not justify the claims that Brahamputra, the Mahanadi and the Godavari are water surplus. In any case, the riparian states through which these rivers pass have their own plans to use this "surplus water". This puts another question mark on the schemes political feasibility. Try visualizing Punjab parting with its water for Tamil Nadu to use, when neighboring Karnataka almost refused to obey the Supreme Court on this issue.

On the ecological front, consider the fall-out of building 200 large water storage reservoirs and an extensive network of canals. Linking these rivers and storage reservoirs would eat into the natural habitats of wild life and re-shape the ecology of the country with unknown consequences. There are no estimates regarding the number of people who would be dislocated, estimates vary from lakhs to a few crores. This would surely add to the political as well as economic costs of the project.

These rivers do have massive flood flows – estimated at 30,000 to 60,000 cubic metres of water per second (cusec) during a few days in the monsoon. The plan envisions tapping these flood flows, storing these in the reservoirs and draining this water over thousands of kms of canals to "parched" agricultural lands in Southern, Western, and Central India. While this may sound good, the fine analysis reveals that only 1,500 cusec water is to be lifted from a total flood flow of 60,000 cusec. How lifting only 2.5% of water flow can

solve, or even mitigate floods is a mystery. The other issue not being raised is why water rich reparians like the Cauvery basin and Cauvery delta are today "parched" and water-scarce.

Capturing all the water of a river and stopping its natural flow to divert it outside the basin is tantamount to killing it. Countries with a history of playing around with rivers and trying to control them, are now investing billions of dollars to restore them by removing dams and embankments. In the US alone, more than 100 dams were removed between 1999 and 2002. In 2001, over 115 miles of the river Baraboo were restored in Wisconsin. Attempts are now on to revive the Colorado in the Southwestern US as its waters dry up before reaching the ocean. An $ 8 billion plan has been passed in California to revive some of its rivers. In Spain, protests have stalled the second phase of water transfer from the Ebro river to the country's south.[3] ■

2. THE FINANCIAL COST

> Many canals will pass through national parks and sanctuaries. How many will be displaced? How will the flora and fauna and soil be affected.[5]
>
> ***R K Pachauri - TERI***

> When there is excess water in the Brahmputra, there will be excess in Ganga and Mahanadi, causing storages to flow.[6]
>
> ***Sunita Narain – Centre for Science and Environment***

> Lifting water from Northern rivers to the South will require a lot of energy which must be produced by hydropower – this renders the scheme infructuous.[7]
>
> ***Darryl D' Monte – Environmentalist***

> The Supreme Court's direction that the rivers of India shall be linked within 10 years is not at all a defensible instance of Judicial activism. That apart, turning to the merits of the direction, one wishes that the learned Judges had undertaken a more careful study of the subject before deciding to issue directions.[7]
>
> ***Ramaswamy R. Iyer – Former Secretary, Ministry of Water Resources Govt. of India***

> Consent of Nepal, Bhutan and Bangladesh is required. States may not cooperate. 4.5 lakh people may be displaced. 79,292 hectares of forest may be submerged.[8]
>
> ***Shankar Aiyar – Journalist***

There are at least three different estimates[3] for the financial implication of the project.

i) The National Water Development Agency budgets the entire project at Rs. 560,000 crores ($ 112 billion) at 2002 prices.

ii) However Mr. Prabhu himself accepts that it could cost up 1,000,000 crores ($ 200 billion). Mr. Prabhu would prefer to generate resources for the project within the country. According to him, Hydro-electric and navigational projects are two obvious areas where privatization will work well. According to Radha Singh, Additional Secretary in the Ministry of Water Resources, "the private sector will be *pitching* in."[4]

iii) According to a former Secretary in the Union Water Resource Ministry, the estimated cost of just the Peninsular component is about Rs. 500,000 crores. These links stretch from the Satluj in the North to the Vaippar in the South and from the Brahamputra in the East to the Mahi in the West.

Even the minimum estimated cost of Rs. 560,000 crores at 2002 prices equals 25 per cent of our Gross Domestic Product (GDP), or two and half times of our annual tax collection and double of our present foreign exchange reserves. Where is the investible capital of this magnitude available in the domestic market. According to *Economic Survey* for *2001-2002*, the country's Gross Domestic Savings were lower than the cost of this project. The cost is also higher than India's total outstanding external debt by close to $ 12 billion.

The only possible financing option would be funds from international sources. This would place a debt of about $ 112 on every Indian, whose average annual income range is between $ 400 and $ 800. It also raises questions about how this loan would be returned. The

guarantees and the counter-guarantees would be needed to secure it. Not only this, annual interest on this amount would range between Rs. 20,000 crores and Rs. 30,000 crores.

External borrowing of this scale would also make any future Government in the country more vulnerable to foreign financial pressures. The real threat is that after starting the project with much fanfare and investing thousands of crores into it, a future Government would have to simply abandon it as its financial implications unravel. This would leave billions of cubic metres of earth dug up and the face of the country scarred for centuries. The alternative left then would be to hand over the project, and along with it the entire water resources of the country, to MNCs to build and run.

It will be a matter of time before the government throws up its hands and asks for private participation. Bureaucrats, politicians and other apologists would argue that private participation is necessary to save the billions already sunk in the project. This is the thin edge of the wedge for wholesale privatization of water in India.

At the World Water Forum meeting in 2001, water MNCs successfully managed to get the UN to define water as a 'human need' as distinct from "human right." By the WTO's definitions, which are increasingly running the market, human needs can be supplied by the private entrepreneurs for a profit, unlike a human right which accrues equally to every one.

The World Bank estimated in 1998 that global trade in water would generate $ 800 billion a year in the first decade of the 21st century. It is not surprising to find that eventually funds for the scheme would come from the World Bank which ultimately control the market.

Untill recently, water like air has been very difficult to own and control privately. It is a vital common resource. However, due to great scarcity, even the piecemeal attempts to sell one river or one town's water supply has earned huge profits for the private companies. One may consider the drastic implications that interlinking of rivers will bring all the water under one organized command of global corporations.

The Promethean ambitions of engineers and the nexus between bureaucrats and contractors may seduce the larger public with dreams of water security. But in reality, this grandiose scheme may well create conditions where large scale privatization of water becomes the only option. Rushing blindly towards this future is the real danger. ■

3. PROPOSED NATIONAL PLAN FOR INTERLINKING OF RIVERS

In August 1980, the then Ministry of Irrigation (now Water Resources) formulated a National Perspective Plan for interlinking of rivers, which comprises of two components, namely

- Peninsular Rivers Development and
- Himalayan Rivers Development

Peninsular Rivers Component

The Scheme is divided into four major parts:

i) Interlinking of Mahanadi-Godavari-Krishna-Cauvery rivers and building storages at potential sites in these basins.

This part involves major interlinking of the river systems where surpluses from the Mahanadi and the Godavari are intended to be transferred to the needy areas in the South.

ii) Interlinking of west flowing rivers, north of Bombay and south of Tapi.

The Scheme provides for taking water supply by canal to the metropolitan areas of Mumbai; it also provides irrigation to the coastal areas in Maharashtra.

iii) Interlinking of Ken-Chambal

The scheme provides for a water grid for Madhya Pradesh and Uttar Pradesh, and interlinking canals backed by as many storages as possible.

iv) Diversion of other west flowing rivers

The Peninsular development is expected to provide additional irrigation of about 13 million ha. and is expected to generate about 4,000 MW of power.

Himalayan Rivers Component

The Himalayan Rivers Component envisages construction of storages on the principal tributaries of the Ganga and the Brahmaputra in India and Nepal. It calls for interlinking canal systems to transfer surplus flows of the eastern tributaries of the Ganga to the West. It also proposes to link the main Brahmaputra and its tributaries with the Ganga, and the Ganga with Mahanadi. This component would provide additional irrigation of about 22 million ha. and generation of about 30,000 MW of hydropower, besides controlling flood in the Ganga Brahmaputra basin. It would also provide the necessary discharge for augmentation of flows at Farakka required inter alia to flush Calcutta Port and the inland navigation facilities across the country.

Himalayan Rivers Development Component

1. Kosi–Mechi Link
2. Kosi–Ghaghra Link
3. Gandak–Ganga Link
4. Ghaghra–Yamuna Link
5. Sarda–Yamuna Link
6. Yamuna–Rajasthan Link
7. Rajasthan–Sabarmati Link
8. Chunar–Sone Barrage Link
9. Sone Dam–Southern Tributaries of Ganga Link
10. Brahmaputra–Ganga Link (Manas-Sankosh Tista-Ganga)
11. Brahmaputra-Ganga Link (Jogighopa Tista-Farakka)
12. Farakka–Sunderbans Link
13. Ganga–Damodar–Sundernarekha Link
14. Subernarekha–Mahanadi Link

It is estimated by the government that the National Perspective Plan would give additional benefits of irrigating 25 million ha. from surface waters, and 10 million ha. by increased use of ground waters, raising the ultimate irrigation potential from 13 million ha to 148–150 million ha. It also predicts the generation of 340,000 MW of power, apart from the benefits of flood control, navigation, water supply, fisheries, salinity and pollution control, etc.

Peninsular Rivers Development Component

1. Mahanadi (Manibhadra)–Godavari (Dowlaiswaram) Link
2. Godavari (Polavaram)–Krishna (Vijayawada) Link
3. Godavari (Inchamapalli)–Krishna (Nagarjunasagar) Link
4. Godavari (Inchampalli Low Dam)–Krishna (Nagarjunasagar Tail Pond) Link
5. Krishna (Nagarjunasagar)–Pennar (Somasila) Link
6. Krishna (Srisailam)–Pennar Link
7. Krishna (Almatti)–Pennar Link
8. Pennar (Somasila)–Cauvery (Grand Anicut) Link
9. Cauvery (Kattalai)–Vaigai (Gundar) Link
10. Parbati–Kalishindh–Chambal Link
11. Damanganga–Pinjal Link
12. Par-Tapi–Narmada Link
13. Ken–Betwa Link
14. Pamba–Achankovil–Vaippar Link
15. Netravati–Hemavati Link
16. Bedti–Varda Link

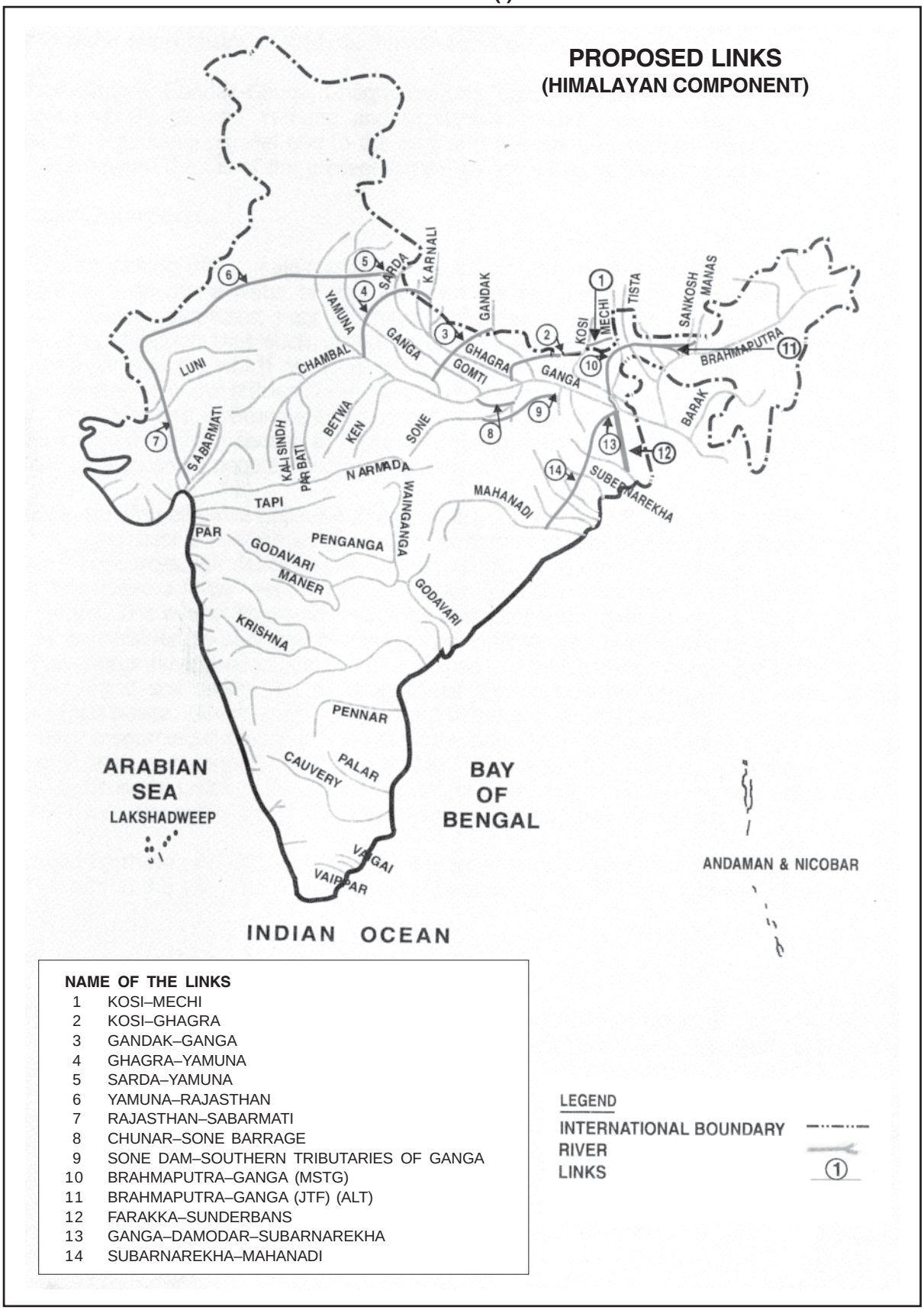
While Table 3(1) gives annual volume of water transfer from Peninsular rivers, table 3(2) gives surface water resource potential in the river basins of India. Map 3(i) and 3(ii) shows the proposed links of Himalayan and Peninsular components. Map 3(iii) shows Dr. K. L. Rao's proposal for interlinking of rivers. ■

Table 3(1)
Annual Volume of Water Transfer from Peninsular Rivers[8]

Name of Link	*From River*	*To River*	*Annual Volume of Transfer (mm^3)*
Manibhadra to Dowleswaram	Mahanadi	Godavari	11,176 (6,500)
Inchampalli to Nagarjunasagar	Godavari	Krishna	16,426 (14,200)
Inchampalli to Pulichintala	Godavari	Krishna	4,371
Polavaram to Vijayawada	Godavari	Krishna	4,903 (3,305)
Almatti to Pennar	Krishna	Pennar	1,980
Srisailam to Pennar	Krishna	Pennar	2,310 (2,095)
Nagarjunasagar to Somasila	Krishna	Pennar	12,146 (8,648)
Somasila to Grand Anicut	Pennar	Cauvery	8,565 (3,855)
Kattalai Regulator to Vaigai to Gundar	Cauvery	Vaigai	2,252

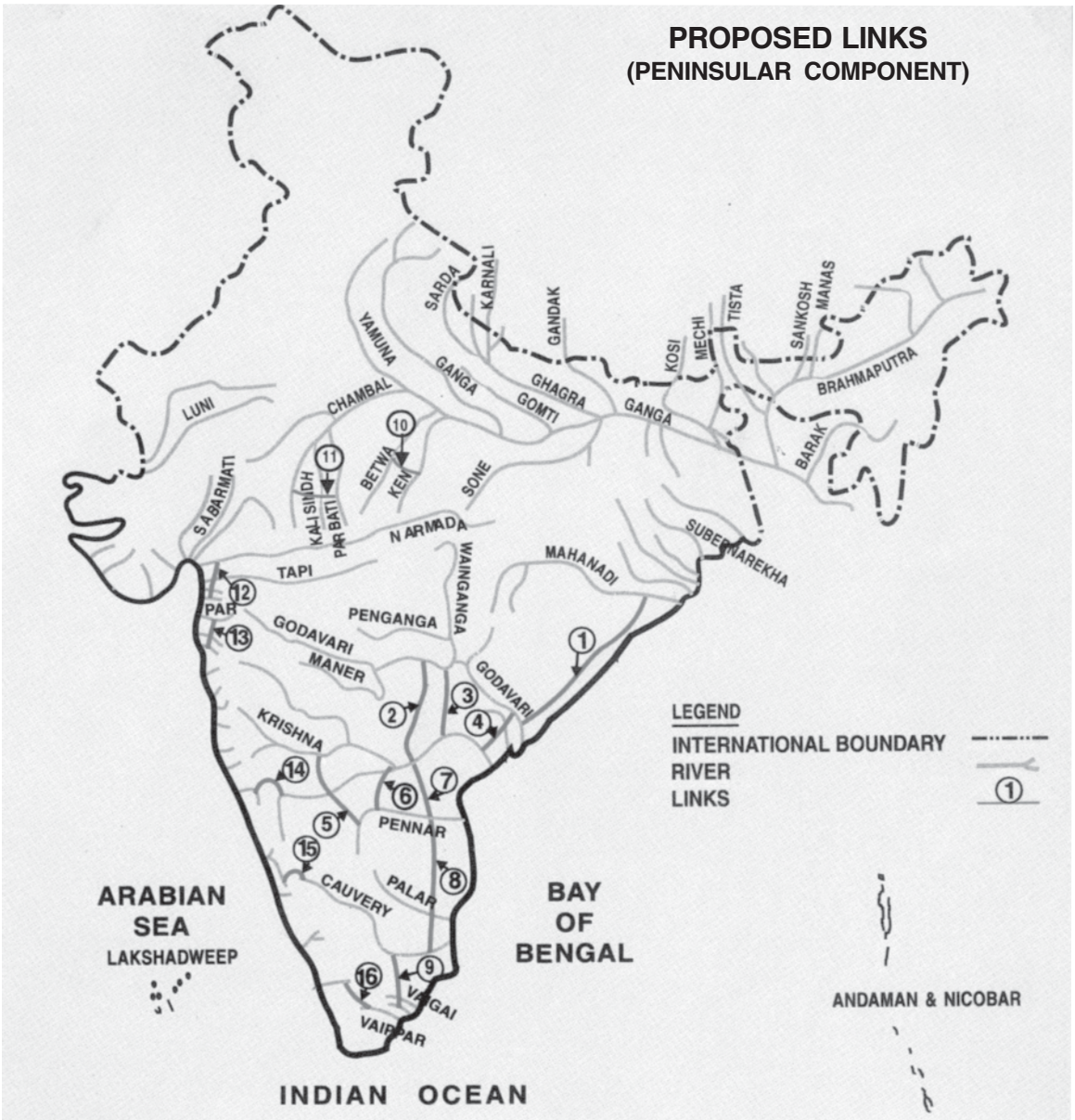
Lower figure in the bracket shows the quantity of water reaching the recipient river

MAP 3(i)



Source: *Report of The National Commission for Integrated Water Resources Development*, *Volume I*, Ministry of Water Resources, Govt. of India, New Delhi, September 1999.

MAP 3(ii)



NAME OF THE LINKS

1 MAHANADI (MANIBHADRA)–GODAVARI (DOWLAISWARAM)
2 GODAVARI (INCHAMPALLI)–KRISHNA (NAGARJUNASAGAR)
3 GODAVARI (INCHAMPALLI LOW DAM)–KRISHNA (NAGARJUNASAGAR TAIL POND)
4 GODAVARI (POLAVARAM)–KRISHNA (VIJAYAWADA)
5 KRISHNA (ALMATTI)–PENNAR
6 KRISHNA (SRISAILAM)–PENNAR
7 KRISHNA (NAGARJUNASAGAR)–PENNAR (SOMASILA)
8 PENNAR (SOMASILA)–CAUVERY (GRAND ANICUT)
9 CAUVERY (KATTALAI)–VAIGAI–GUNDAR
10 KEN–BETWA
11 PARBATI–KALISINDH–CHAMBAL
12 PAR–TAPI–NARMADA
13 DAMANGANGA–PINJAL
14 BEDTI–VARDA
15 NETRAVATI–HEMAVATI
16 PAMBA–ACHANKOVIL–VAIPPAR

Source: *Report of The National Commission for Integrated Water Resources Development*, *Volume I*, Ministry of Water Resources, Govt. of India, New Delhi, September 1999.

MAP 3(iii)

Source: *Report of The National Commission for Integrated Water Resources Development*, *Volume I*, Ministry of Water Resources, Govt. of India, New Delhi, September 1999.

Table 3(2)

Surface Water Resource Potential in the River Basins of India[9]

Sl. No.	*Name of the River Basin*	*Length (km)*	*C.A, in Sq.Km*	*Average Annual Potential*	*Estimated Utilisable Surface Water*	*Present Use of Surface Water*
				In Cubic Kilometres		
1	Indus (up to Border)	1,114	321,289	73.305	46.000	40.00
2	a) Ganga	2,525	861,452	522.803	250.000	—
	b) Brahmaputra at Jogighpoa	916	194,413	537.322	24.000	—
	c) Barak and other rivers flowing into Meghna like Gomti, etc.	—	41,273	48.357	—	—
3	Godavari	1,465	312,812	111.348	76.300	38.00
4	Krishna	1,401	258,948	23.500	58.000	47.00
5	Cauvery	800	81,155	21.594	19.000	18.00
6	Pennar	597	55,213	6.741	6.741	5.00
7	East Flowing Rivers between Mahanadi and Pennar	—	—	22.520	13.110	—
8	East Flowing Rivers between Pennar and Kanyakumari	—	—	16.453	16.453	—
9	Mahanadi	851	141,589	66.879	49.990	17.00
10	Brahmani & Baitarni	799	30,033	30.044	18.297	NA
11	Subarnarekha	—	—	12.748	6.813	—
12	Sabarmati	371	21,674	3.355	1.925	1.80
13	Mahi	583	34,342	11.020	3.095	2.50
14	West Flowing Rivers of Kutch, Saurashtra including Luni	—	—	15.098	14.980	—
15	Narmada	1,312	98,796	46.039	—	—
16	Tapi	724	65,145	14.879	—	8.00
17	West Flowing Rivers from Tapi to Tadri	—	—	87.411	11.936	—
18	West Flowing Rivers from Tadri to Kanyakumari	—	—	113.532	24.273	—
19	Area of Inland drainage in Rajasthan Desert	—	—	—	—	—
20	Minor River Basins Drainning to Bangladesh and Burma	—	—	31.000	—	—
	Total			**1875.948**	**688.913**	

4. RIVER BASINS

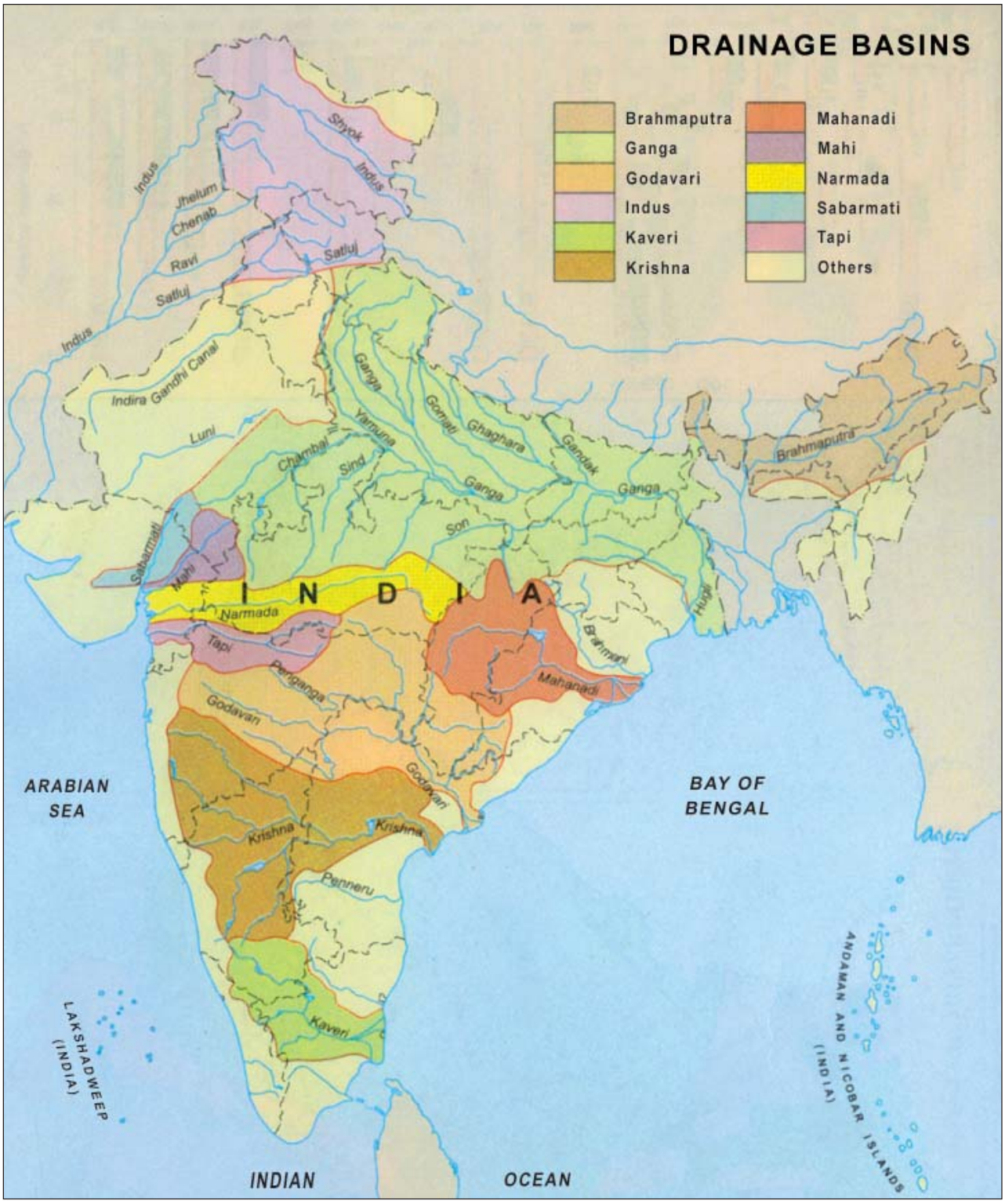
4a. Major River Basins in India

The river systems of the entire country have been divided into twenty river basins comprising twelve major basins with a drainage area exceeding 20,000 sq. km each and eight composite river basins combining the remaining medium and small river systems for the purpose of planning and development. Table 4a(1) and 4a(2) give details of the Major and Composite river basins with names of important rivers under each basin, catchment area, average annual surface water availability, and storage capacity. Map 4a(i) shows the drainage basins of major rivers of the country.[26]

Table 4a(1)
Major River Basins in India

Sl. No	*River Basin*	*Important Rivers of the basin*	*Catchment Area (Million Hect.)*	*Average Annual Surface Water Availability (BCM)*	*Live Storage Capacity of Dams Completed 1995 (BCM)*
1.	Indus	Sutlej, Beas, Ravi Chenab, and Jhelum	32.13	73.31	13.83
2 (a)	Ganga	Yamuna, Chambal, Sindh, Betwa, Ken, Sone, Ram-ganga, Ghagra, Gandak and Kosi.	86.15	525.02	36.84
2 (b)	Brahmaputra and Barak	Subansiri, Bhorelli, Manas, Buri Dehang, Dhansiri, Kopili, Tista Jaldhaka, Torsa, Barak, Gumti, Muhari, Fenny, Karnaphulli, Kaladan, Imphal, Tuxu and Nantaleik	23.61	585.6	1.10
3	Brahmani and Baitarni	Karo, Sankh, Tikra, Salandi and Matai	5.18	28.48	4.76
4	Mahanadi	Seonath, Jonk, Hasdeo, Mand Ib, Ong and Tel	14.16	66.88	8.49
5	Godavari	Pravara, Purna, Manjra, Pranhita, Indravati and Sabri	31.28	110.54	19.51
6	Krishna	Ghataprabha, Malaprabha, Bhima, Tungabhadra and Musi	25.89	78.12	34.48
7	Pennar	Jayamangli, Kunderu, Shagileru, Chitravati, Papagni and Cheyyeru	5.52	6.32	0.38
8	Cauvery	Harangi, Hemavati, Simsha, Arkavati, Lakshmanathirtha, Kabani, Suvarnavati, Bhavani, Noyil, Amravati.	8.12	21.36	7.43
9	Tapi	Bhokar, Suki, Mor, Harki, Manki, Guli, Aneri, Arunavati, Gomai, Gomati, Valer, Purna, Bhogvati, Vaghur, Girna, Bori, Panjhra, Buray, Amravati, Shiva, Rangavati and Nesu.	6.51	14.88	8.53
10	Narmada	Burhner, Banjar, Sher, Shakkar Dudhi, Tawa, Ganjal, Chotta Tawa, Kundi, Goi, Karjan, Hiran, Tendoni, Kolar, Man, Uri, Hatni and Orsang	9.88	45.65	6.60
11	Mahi	Som, Anas, Panam	3.48	11.02	4.76
12	Sabarmati	Sei, Wakal, Harnav, Hathmati, Watrak	2.17	3.81	1.35

MAP 4a(i)


DRAINAGE BASINS
Brahmaputra
Ganga
Godavari
Indus
Kaveri
Krishna
Mahanadi
Mahi
Narmada
Sabarmati
Tapi
Others
Shyok
Indus
Jhelum
Chenab
Ravi
Satluj
Satluj
Indus
Indira Gandhi Canal
Luni
Ganga
Yamuna
Gomati
Ghaghara
Gandak
Ganga
Brahmaputra
Chambal
Sind
Ganga
Son
Sabarmati
Mahi
I N D I A
Narmada
Tapi
Penganga
Godavari
Brahmani
Mahanadi
Hugli
Godavari
Krishna
Krishna
Penneru
Kaveri
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
LAKSHADWEEP (INDIA)
ANDAMAN AND NICOBAR ISLANDS (INDIA)

As per the latest assessment made by the Central Water Commission, the average annual flow in the river systems of India is about 1,869 Billion Cubic Metre (BCM), of which 1,122 BCM is utilizable, comprising of about 690 BCM as surface water and 432 BCM as replenishable Ground Water.

A total live storage capacity of about 177 BCM has been provided by large dams. An additional live storage capacity of 75 BCM will be created on completion of the dams, which are under various stages of construction. Proposals to take up additional dams to create a live storage of 132 BCM are also under formulation/consideration. The replenishable ground water resources are of the order of 432 BCM, out of which about 154 BCM has been developed for use.

In some of the river basins, namely the Indus, Krishna, Cauvery, Mahi and Sabarmati, the stage of present use is more than 80% of utilizable flow. ■

Table 4a(2)
Details of Composite River Basins

Sl.No	*River Basin*	*Important Rivers of the basin*	*Catchment Area (Million Hect.)*	*Average Annual Surface Water Availability (BCM)*	*Live Storage Capacity of Dams Completed (1995) (BCM)*
13	Subarnarekha	Kanchi, Karkari and Kharkai	2.92	12.37	0.66
14	West flowing rivers from Kutch and Saurashtra including Luni	Shetrunji, Bhadar, Machhu, Rupen, Saraswati and Banas	32.19	15.1	4.31
15	West flowing rivers from Tadri to Kanyakumari	Kodiyar, Pamba, Periyar Bharathapuzha and Chaliyar	5.62	113.51	10.24
16	West flowing rivers from Tapi and Tadri	Netravati, Sharavati, Gangali, Kalinadi, Mandori, Savitri, Ulhas, Vaitarani, Ambika and Purna	5.29	87.41	7.10
17	East flowing rivers between Mahanadi and Pennar	Rushikulya, Bahuda, Vamsadhara, Nagavali, Sarada, Varaha, Tandara and Eluru	8.66	22.52	1.63
18	East flowing rivers between Pennar and Kanyakumari	Kunteru, Swarnamukhi, Araniar, Kortalaiyar, Cooum, Adyar, Palar, Gingi, Ponnaiyar, Vellar, Varshalei, Vaigai, Gundar, Vaippar and Tambarparni	10.01	16.46	1.42
19	Area of Inland Drainage in Rajasthan		6		
20	Minor river basins draining into Bangladesh and Myanmar		3.63	31	0.31

4b. Features of Main River Basins

(i) GANGA BASIN

"Those who bathe at Ganga at least once in its pure water are protected from thousands of dangers for ever and get rid of sins of generations and are purified immediately."

— Brahmandapuranam

"The story of Ganga from her source to sea, from old times to new is the story of India's civilization and culture, of rise and fall of empires, of great and proud cities, of the richness, and fulfillment of life as well as its denial and renunciation."

Jawaharlal Nehru in *Discovery of India*

"Ae Aab Roode Ganga Wo Din He Yaad Tujhko, Jab Utra Tere Kinare Carvan Hamara"

Mohd. Iqbal, the Great Urdu Poet

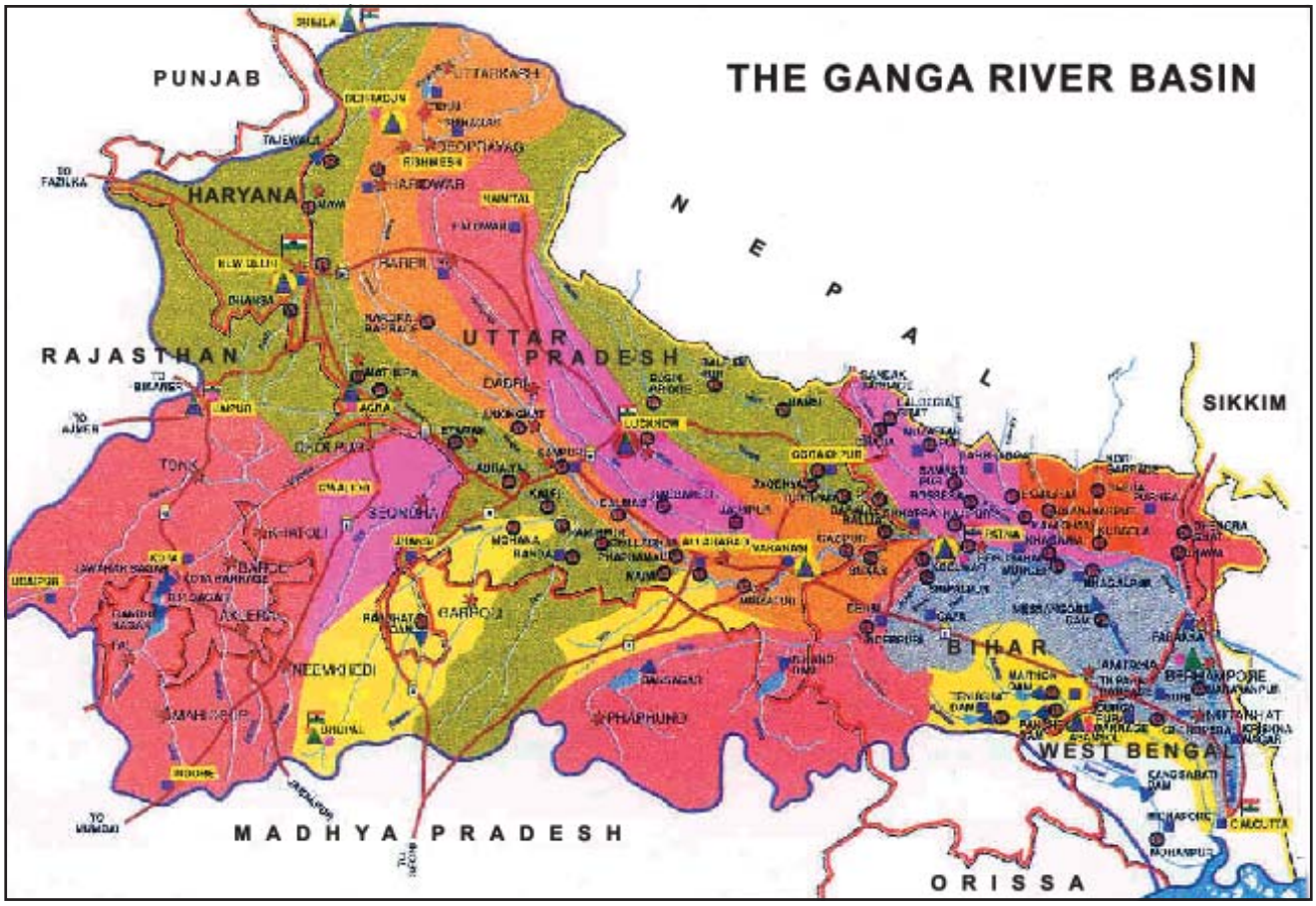
The few lines from *Brahmandapuranam, Discovery of India*, and the poem of Dr. Iqbal more than suffice to illustrate the significance of Ganga in the lives of Indians.

Legend of Ganga River

Ganga, the heavenly river was brought down to the earth through the efforts of King Bhagiratha, who underwent great penances for the salvation of the soul of his forefathers. Ganga is one of the two daughters of Meru (the Himalayas), the other being Uma, consort of Shiva. In her youth, Indra had asked for Ganga to be given to heaven to soothe the Gods with its cool. It is repeatedly invoked in the Vedas, the Purans and the two Indian epics, the *Ramayana* and the *Mahabharat*.

Barring the period of Harappan civilization, the Ganga basin shaped mythology, history and the people of India. It was in this plain that the great Kingdoms of India, namely Guptas and Mughals found their home. It was in this region that the great religions of

MAP 4b(i)



Hinduism, Buddhism, Jainism and Sikhism were established.

Ganga or Ganges is perhaps the most widely written about and worshipped of all the renowned rivers throughout the world. Although a number of rivers feature in human civilization in pre history and history, Ganga is considered the most sacred, with rich mythology related to it. The story of Ganga is the story of Indian civilization and culture. It is the symbol of Indian traditions and values providing physical and spiritual nourishment to millions of devotees. There are extensive classical and folk literature related to this heavenly river known by many as "Divine" river or "Devnadi". Down the ages people of all walks of life have worshipped this goddess of benevolence. There are a number of temples, ghats, ashrams and cities along Ganga descending from Rishikesh, Haridwar, Allahabad (Prayag), to Banares.[10] They represent centuries of cultural development in India.

Course of the River

The Ganga river system, along with its tributaries, is the single largest river system in India. The mighty river emerges from Gaumukh in the 25 km long Gangotri glacier. The point of origin is shaped like the mouth of cow, and hence the name "Gaumukh". The eternal flow is maintained by three Bhagirathi peaks where chunks of ice keep on falling in running water of Bhagirathi, which is only a few feet wide. At Devprayag, it assumes the name Ganga after meeting with river Bhilangana at Tehri and river Alakananda at Devprayag itself. The Gangotri shrine is about 22 km down the stream from Gaumukh.

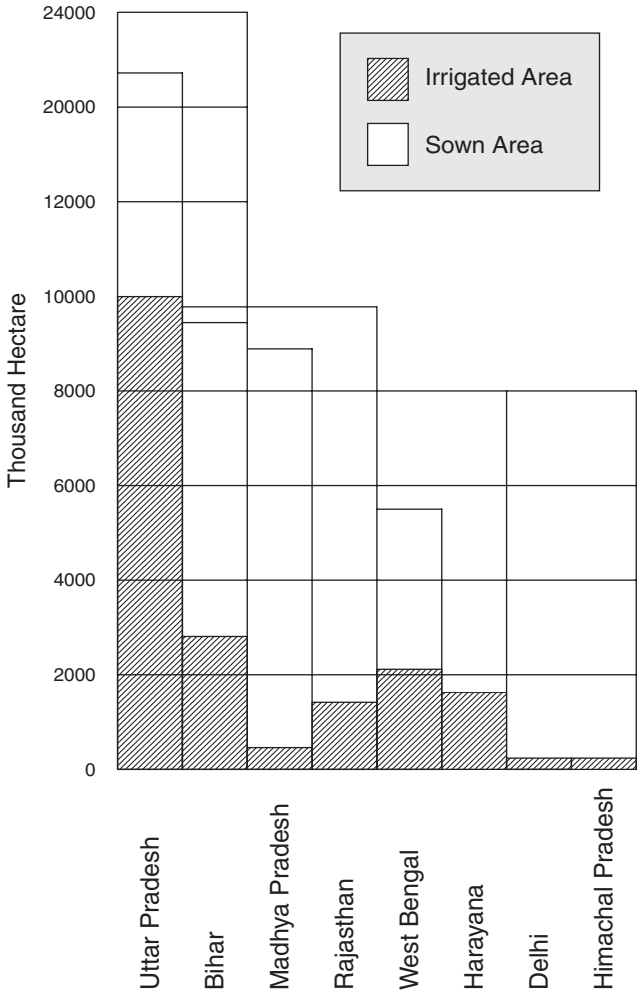
The Bhagirathi Ganga takes many twists and turns from Gangotri downwards traversing about 240 km long rocky path in Garhwal Himalaya. Then it comes to Rishikesh taking a further southward turn for a distance of about 30 km, coming down to the Indo-Gangetic plains at Haridwar leaving the Shivaliks. The river suddenly changes its profile at this point, widening to an extent of 750 metres. There are numerous tributaries meeting the mainstreams, the chief among them being the Dedar Ganga, Rudragaira and Jahanavi in Upper Ganga Valley. From Haridwar downwards, the river passes through various cities, towns and villages of U P, Bihar and West Bengal before reaching finally to the Bay of Bengal, covering vast distance of about 2,525 km.

Major Religious Places and Towns

There are 692 towns and cities distributed over the nine Gangetic States. During such a long journey in plains it embraces many small torrents and tributaries, the first major tributary being Ram Ganga at Kannauj followed by Yamuna at Allahabad. The united stream thus moves towards Varanasi. Uttarkashi, Devprayag, Rudraprayag, Karanprayag, Rishikesh, Haridwar, Allahabad and Banares are the important religious places on the bank of Ganga. It also flows past Garhmukteshwar in the Ghaziabad district of U P the very place where Goddess Ganga is said to have appeared to Shantanu (ancestor of Pandavas). From Haridwar to Allahabad, the Ganga flows parallel to the Yamuna, another important river flowing through North India.

Allahabad is a sacred place with soul-cleansing powers, particularly so because the mythical river Saraswati is said to join the Ganga and Yamuna at that point – a speck of white sand known as 'sangam'. In vedic times there was a settlement at this confluence, then known as 'Prayag', where the Vedas were written. Brahma himself is said to have performed a sacrifice

Fig 4b(i)



GROSS SOWN AND IRRIGATED AREAS IN GANGA BASIN

here. Huen Tsang – famous Chinese traveller visited Prayag in 634 AD. It was under Mughal Emperor Akbar, that Prayag was renamed Illahabas, later changed to Allahabad.

It is difficult to describe Varanasi. As Shri Ramakrishna once said, "one may as well try to draw a map of the universe as attempt to describe Varanasi." It was already well known in the days of Buddha, some 2500 years ago. It finds constant mention in ancient literature and has all along been the pilgrimage centre, sacred to Shiva. Hindus consider it as an auspicious place to die, for one goes straight to heaven. Surprisingly, Varanasi does not mark one of Ganga's great confluences, but is named after two small rivers that join here, the Varuna and Asi.

Crossing the vast Gangetic plain, the Ganga flows past Patna, the famous Pataliputra of yore. She flows past Mokamah, itself famous as the place where the great hunter-conservationist Jim Corbett worked for several years. It flows past Farakka Barrage, built to divert more water from Ganga to Hooghly to prevent the latter from silting. Soon, thereafter, the Ganga splits into numerous tributaries that form the 'Ganga delta'. The Hooghly, is one of these tributaries. The main channel proceeds to Bangladesh as the river Padma, so dearly loved by Rabindranath Tagore.

The Ganga Basin

The total length of the Ganga from its source to its fall into the sea is 2,525 km, shared as follows:

1450 km in UP including Uttaranchal
445 km in Bihar
520 km in West Bengal
110 km in the boundary between UP and Bihar

The area of the river basin in India is 861,404 sq.km and covers ten States. The percentage of catchment area to the area of the basin in India at state level is given below:

	Name of the State	Percentage
i)	Uttar Pradesh including Uttaranchal	34.2
ii)	Himachal Pradesh	0.5
iii)	Haryana	4.0
iv)	Rajasthan	13.0
v)	Madhya Pradesh	23.1
vi)	Bihar	16.7
vii)	West Bengal	8.3
viii)	Delhi	0.2

The basin area of Ganga is slightly more than one fourth (26.3) of Indian geographical area and is the biggest in the country. Some tributaries like the Ghagra, the Gandak and the Kosi drain areas in Nepal, amounting to 190,000 sq. km. The Mahananda has 9,000 sq.km catchment area in Bangladesh. Thus, the total drainage basin of the Ganga is 1,060,000 sq.km.

The Ganga basin is the largest and most important water shed of India, covering about 128,411 sq.km of total drainage area. The main features of the Ganga basin are summarized in table 4b(i). The Ganga river basin is shown in map 4b(i). Figure 4b(i) shows the sown and irrigated areas in the Ganga basin. Figure 4b(ii) shows the flow diagram of Ganga river.

Population

The Ganga basin contributes to about 37 per cent of the total population of the country, of which about 84 per cent inhabit in rural areas and 16 per cent live in towns and cities. The growth rate of population has more than doubled causing a lot of pressure on available resources.

Land use pattern in Ganga Basin

The Ganga basin is one of the most highly cultivated lands in the country. The cultivatable land covers about 509,994 sq.km, constituting almost 62.5 per cent of the total area of basin, the non-arable land being 23.2 per cent. Over 5% of the geographical area of the basin is used for human settlements. The net sown area constitutes about 52 per cent, with substantial portion under double cropping and some portion even for triple cropping.

The third category of land use is of land under forest cover, which is highly variable. Only about 14.3 per cent of the total basin area is under forest ranging from 2.43 per cent in Haryana to about 59.4 per cent in Himachal Pradesh. The comparable data on land use in Ganga basin and the whole country presented in table 4b(i) clearly indicates that the forest cover in Ganga basin has fast depleted due to pressure on land from grazing in high reaches and cultivation practices and human habitation in the lower hills and plains. There is an urgent need for precautionary measures to check such degradation. Table 4b(i) gives the land use pattern in Ganga basin.

Major Tributaries[11]

There are seven important tributaries feeding the Ganga from the North, with six joining from the South, and five joining the river in the last reaches of the Hooghly. Some important tributaries of Ganga are given below:

Table 4b(1)
Main Features of Ganga Basin[10]

Features	*Measurements*
Area of the river basin	861,404 sq.km
% in India	85%
Surface water availability	446 mill.acre feet (MAF)
Total cultivable area	21,109 sq.km.
Irrigation Potential	27,350 thousand hectares
Hydel Potential	11,579 mega watts (at 60% load factor)
Average annual rainfall	364 cm (total 78 cm in the upstream 104 cm in the middle course, and 182 cm in the lower delta
Cultivable net area covering Gangetic States	0.6 x 10^6 hectares (600,000 hectares)
Potential sites for dam	52 (total) 29 completed 23 proposed
Total flow availability a. Dry season (Nov.-May) b. Wet season (June-Oct.)	 50 MAF 322 MAF
Sediment Load	2.4 bill. met. tons per year
Temperature gradient	10 – 40 C
Annual discharge	459,040 million cubic mt.
Drainage Area	128,411 sq.km
Total Catchment Area	1,060,000 sq. km (Tributaries flowing in Nepal amounts to 190,000 sq.km and Mahananda has 9000 sq.km in Bangladesh

Table 4b(2)
Land Use Pattern

Area	*Cultivated*	*Non-Curable*	*Human Settlement*	*Forest*	*Net Sown*
Ganga Basin	62.45	23.2	5.35	14.3	52.4
India	47.87	22.5	3.49	20.4	42.6

The Ramganga: The Ramganga river rises at an altitude of 3,110 metres in the Garhwal district, and emerges from the hills into the plains at Kalagarh, the boundary of the district. After traversing through some more districts of UP, it joins the Ganga at Kannauj. Its total length is 596 km. The basin covers an area of 32,493 sq.km.

The Gomti: Rises about 3 km east of Pilibhit town of UP, at 200 metres elevation. It drains the area between the Ramganga and the Ghaghra systems. Its tributaries are the Gachai, the Sai, the Jomki, the Chuha and Sarayu. Lucknow is located on the banks of Gomti, the length of the river is 940 km and it drains a total area of 30,437 sq.km.

The Ghaghara: The Ghaghra is called Manchu and Karnali in Nepal and has its source near Lake Mansarovar. Its total catchment area is 127,950 sq.km of which 45% is in India. Its important tributary is the Sarda or Chauka, which forms the boundary between India and Nepal. The other tributary in India is the Saryu, famous for the location of Ayodhya (the capital of Dasharath Kingdom) on its banks. It spills and causes flooding every year in Azamgarh and Ballia districts in UP, sometimes to a width of 161 cm. Other tributaries are the Rapti and the Little Gandak, which starts as an old channel of the Gandak at an elevation of 300 m and joins the Ghaghra in Shajahanpur district of UP. The Ghaghra joins the Ganga a few km down stream of Chapra, lower in Bihar. The length of the Ghaghra is 1,080 km and it carries more water than the Ganga before its confluence.

The Gandak: The Gandak is also known as the Kali in Nepal and rises at 762 m in Tibet near the Nepal border overlooking the Dhaulgiri peak. Its drainage area is 46,300 sq.km of which 7,620 km is in India. In Nepal, there are a number of tributaries like the Mayandadi, the Bari and the Trisuli. The Gandak discharges into the plains at Tribeni in Bihar. At this site, a barrage has been constructed and canals take off on either side to irrigate 1.5 million ha in India and Nepal. Gandak flows for another 300 km before it joins the Ganga near Patna.

The Burhi Gandak: The Burhi Gandak is known as the Sikrahana in the upper reaches, and rises in the Champaran district of Bihar at an elevation of 300 m. It has a drainage area of 10,150 sq.km and a length of 320 sms. It joins the Ganga opposite Monghyr town.

The Bagmati: The Bagmati rises in the Shivpuri hills of Nepal at an elevation of 1500 metres, cuts across the Mahabharata range of hills and enters India in Muzaffarpur district of Bihar. On the banks of this river, is the famous temple of Pasupatinath in Nepal. The waters of Bagmati have a high fertility value, as they carry nitrous silt. It joins the Kosi in the lower reaches.

The Kosi: The Kosi is formed by the confluence of three rivers, the Sun Kosi, the Arun Kosi and the Tamur Kosi in Nepal. The total drainage area is 74,500 sq.km, of which 11,000 sq. km lie within India. Of the total water, the Sun Kosi contributes 44%, the Arun Kosi 37% and the Tamur Kosi 19%. The Tamur Kosi has the steepest slapes. Mount Everest and Mount Kanchenjunga lie in the catchment of the Arun Kosi.

The Kosi has been causing a lot of destruction by lateral movement, like the Yellow River of China. As its water carries a heavy silt load and the river has a steep gradient, there is a tendency for it to move sideways. Thus in about 200 years the river has moved laterally 112 km from Purnea to its present position.

The Mahananda: The Mahananda rises in the hills of Darjeeling district at 2,100 metres with a number of tributaries, viz. Balsan, Mechi, Ratna and Kanokai. The Kanokai is an erratic stream and as it rises in the Nepal Hills, it carries a lot of silt. The total drainage of Mahananda is 20,600 sq.km of which 11,530 sq.km lie in India. The river forms a boundary between India and Bangladesh in the last reaches before it enters Bangladesh to join the Ganga at Godagiri.

The total catchment area of the Northern tributaries of the Ganga is approximately 420,000 sq.km while that of the Southern tributaries is 580,000 sq.km. The drainage area of the tributaries joining the Bhagirathi-Hooghly is 60,000 sq. km. Due to heavier intensity of rainfall, the annual run off from the region north of the Ganga is 0.75 m while that from the south is only 0.3 m. This shows the importance of the contribution of the

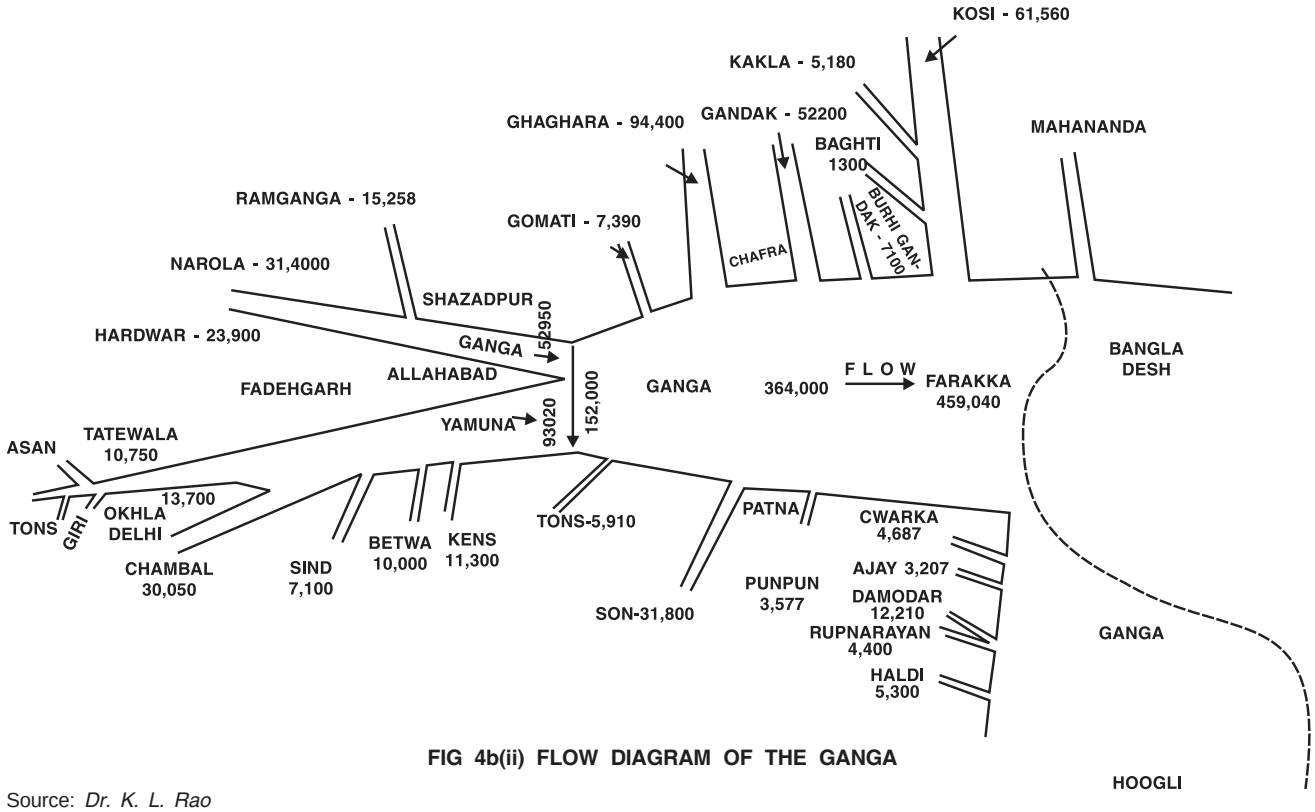


FIG 4b(ii) FLOW DIAGRAM OF THE GANGA

Source: *Dr. K. L. Rao*

flows from the Himalayan plain north of the Ganga to the main river. Nearly 60% of the water flowing in the Ganga comes from the drainage areas north of the river. Table 4b(3) gives the average annual flow in the Ganga and its tributaries.

Basin Data

The Ganga basin has by far the largest gross sown area of nearly 58 million hectares. The gangetic basin has approximately one third of the cultivated area in north of the river and the balance in south of the river. The percentage of gross cultivated area to cultivable area is about 95%. Only a third of this area is irrigated, the rest being rain fed. The important data such as cultivable area, sown area and irrigated area are given in table 4b(5).

The soils in the northern portion of the basin are mainly of three types. In the hills brown soil prevails. In the area just at the foot of the hills, Terai soils are found. In the rest of the plains, the soils are rich fertile alluvial soils. The depth of the soil is also variable throughout the basin, depending on the flow, rainfall and agricultural practices. The Himalaya being a young mountain range remains prone to soil erosion. The lower Peninsula receives the thick layer of sediment while soil of various thickness is found in the Southern Plateau. The high rate of siltation reduces the water holding capacity of the Ganga, resulting in devastating floods almost every year and causing innumerable sufferings to the inhabitants.

In the Southern region, Vindhya Plateau soil prevails; they are —

i) Vindhya upland coarse gravel–red, shallow and poor in nutrients,

ii) Vindhya plains containing fine grain material that can retain moisture, and

iii) Vindhya low land soils, which are alluvial. Besides these in the hills, there are forest soils. In some districts, laterite soils prevail.

Basin Water Potential and Utilization

The total water flow in the surface flow of the basin is 49,300 crore cu.m. There are four distinct regions in the Ganga Basin

i) Bhabhar area

ii) Terai

iii) Ganga plain, and

iv) Southern flat areas.

In the Bhabar area, the aquifers are located deep but occur under confined conditions. Until recently in Terai areas, which are lower than the Bhabar areas, the water table occurred near the surface and there were excellent ground water resources. The irrigated area in the Ganga basin is 19.5 million ha. The various sources

Table 4b(3)

Average Annual Flow in the Ganga and its Tributaries[11]

Sl. No	*Name of the Sub-basin*	*Average annual flow in Million cu.m.*
1	Yamuna at Allahabad (a) Chambal	93,020 (30,050)
2	Ganga at Allahabad (a) Ramganga (including Deoha)	58,980 (15,258)
3	Ganga at Allahabad after confluence with Yamuna	152,000
4	Ganga at Patna a) Tons b) Sone and other basins between Tons and Sone c) Gomti d) Ghaghara e) Gandak	364,000 (5,910) (31,800) (73090) (94,400) (52,200)
5	Ganga at Farakka a) Buri Gandak b) Kosi	459,040 (7,100) (61,560)
6	Ganga at Confluence below the Haldi a) Dwarka b) Ajoy c) Damodar d) Rupnarayan e) Haldi	493,400 (4,687) (3,207) (12,210) (4,400) (5,300)

of water for this utilization in different States are given in table 4b(5). It is interesting to observe that 40% of irrigation is by canals, 45% by ground water, and the balance by tanks and miscellaneous sources.

(ii) THE YAMUNA BASIN

The Yamuna is the most important tributary of Ganga, joining it on the right bank. The Yamuna originates from the Yamnotri Glacier in Uttar Kashi district of Uttaranchal at an elevation of 6,330 metres. Many small streams including the Rishiganga, the Uma and the Hanumanganga join it in the mountains. The Tons, the longest tributary, rises at an elevation of 3,900 metres and joins Yamuna below Kalsi. At this site, the Tons carries twice the water that is carried in the Yamuna.

The river flows 1,367 km from its source to its confluence with Ganga at Allahabad. Near Tajewala, about 172 km from its source, the water is taken off by the Western and Eastern canals. It flows further 280 km down to Okhla in Delhi territory from where the Agra Canal takes off. The Hindon, 256 km long, rises in the district of Saharanpur in UP and joins the Yamuna on its left bank, 40 km below Okhla.

From Delhi, at 130 km is located the Holy place of Mathura and further down 50 km, the city of Agra. Small tributaries like the Karam, the Sagar and the Sindhs join it on its left bank and the Chambal, the Sind, the Betwa, and the Ken, flowing from the Vindhyas, join it on the right bank.

The total catchment area of the river is 363,848 sq.km of which 139,468 sq.km is the drainage area of Chambal alone. The State level catchment area is given in the table 4b(4).

The Chambal rises in the Vindhya ranges and flows for 965 metres before it flows through the flat fertile Malwa Plateau and then enters a gorge at Chaurasingarh. The gorge is about 96 km long and stretches up to Kotah City. The river runs for another 34 km flowing through plains. As the river flows much below the bank and due to poor rainfall, severe erosion has occurred over centuries and numerous deep ravines have been formed in Chambal Valley (Chambal ravines are notorious for being the dacoit infested area).

Table 4b(4)

Yamuna Sub-Basin and Statewise Catchment Area (sq.km.)

State	*Total Catchment Area*
Uttar Pradesh including Uttranchal	74,208
Himachal Pradesh	5,799
Haryana	21,265
Rajasthan	1,20,883
Madhya Pradesh	1,40,208
Delhi	1,485
Total	3,66,848

The Sindh rises in Vidisha district of Madhya Pradesh at an elevation of 543 m. It is 415 km long and drains an area of 25,085 sq.km. It joins the Yamuna down stream of the confluence of the Chambal with the Yamuna. The Parvati, Kunwari and Pahuj are sources of its tributaries.

The Betwa rises at an elevation of 470 metres in the district of Bhopal in Madhya Pradesh. It joins the Yamuna near Hamirpur after flowing 590 km. The total catchment area of Betwa is 45,580 sq.km.

Ken rises in the Kampur hills of Satna district of Madhya Pradesh. It is 360 km long up to its point of confluence with Yamuna near Chilla. It drains an area of 28,224 sq.km.

The Tons has a drainage area of 16,860 sq.km. It rises in a tank at Tamakund in the Kaimur range of hills at an elevation of 610 metres and flows through the fertile lands of Rewa and Satna districts. The river receives the Belan in UP and joins the Ganga about 311 km downstream of the confluence of Ganga and Yamuna. The total length of the river is 264 km.

The Sone rises at Sonabhadhra at an elevation of 600 metres; it covers an area of about 71,259 sq.km. After passing in cascades over the hills, it receives the Rihand tributary and then passes through the Palamu district of Bihar. It joins the Ganga about 16 km upstream of Dinapur in Patna district. The total length of the river is 784 km. The important tributaries of the Sone (with their catchment shown in bracket) are the Mahanadi (4,843), the Banas (3,507), the Gapat (5,998), the Rihand (17,110) and the Kankar (5,903).

(iii) CAUVERY BASIN

Mythology has several stories about Kaveri's descent to the earth. The most popular is that a king by the name of Kavera, who lived in the Brahmagiri Hills, prayed to the Lord Brahma for a progeny. He was blessed with a daughter whom he named Kaveri. She was the water

Table 4b(5)
Basin Data – State wise[11]

State	*Cultivable Area*	*Net Sown Area*	*Gross Sown Area*	*Net Irrigated Area*	*Gross Irrigated Area*	*Sources of Irrigation*			
						Govt. & Private Canals	*Tanks*	*Other Sources*	*Tube wells*	*Wells*
1	2	3	4	5	6	7	8	9	10	11
Indus Basin				**In thousand Hectares**						
Haryana	828	752	1063	695	712	628	1	3	20	60
Himachal Pradesh	1807	489	811	84	145	-	-	144	-	1
Jammu & Kashmir	1209	679	815	317	383	90	-	292	-	1
Punjab	4289	3988	5435	3020	4354	2004	-	25	1525	800
Rajasthan	1505	1061	1198	654	740	740	-	-	-	-
Total	**9638**	**6969**	**9322**	**4770**	**6234**	**3462**	**1**	**464**	**1545**	**862**
Ganga Basin										
Bihar	9876	7233	9659	2448	3090	1399	98	776	500	317
Delhi	102	82	116	30	58	16	2	-	22	18
Haryana	3006	2765	4093	955	1684	868	2	14	400	400
Himachal Pradesh	179	57	87	12	15	-	-	14	-	1
Madhya Pradesh	12788	8503	9227	875	1020	335	156	45	-	484
Rajasthan	8190	5424	6393	1179	1552	323	174	23	2	1030
Uttar Pradesh	20765	17396	22688	8750	10164	3865	412	287	3200	2400
West Bengal	5255	4587	5430	1800	1213	812	361	608	120	12
Total	**60161**	**46047**	**57693**	**16049**	**19496**	**7618**	**1905**	**1767**	**4244**	**4662**
Brahmaputra Basin Including Barak										
Arunachal Pradesh	1630	55	55	-	-	-	-	-	-	-
Assam	2886	2153	2588	487	487	228	-	209	-	50
Manipur	80	71	75	5	5	-	-	5	-	-
Meghalaya	155	155	174	44	44	-	-	44	-	-
Mizoram	39	39	40	-	-	-	-	-	-	-
Nagaland	245	33	34	3	3	-	-	3	-	-
Tripura	298	192	273	20	22	-	-	22	-	-
West Bengal	312	722	864	128	205	100	3	22	-	80
Total	**6145**	**3420**	**4103**	**687**	**766**	**328**	**3**	**305**	**-**	**130**
Sabarmati Basin										
Gujrat	1343	1884	1299	226	285	89	10	1	10	175
Rajasthan	205	80	104	24	33	-	5	2	1	25
Total	**1548**	**1264**	**1403**	**250**	**318**	**89**	**15**	**3**	**11**	**200**
Mahi Basin										
Gujarat	806	750	836	102	166	91	13	1	11	50
Madhya Pradesh	464	362	383	19	19	2	1	1	-	15
Rajasthan	940	486	580	68	85	5	17	2	1	60
Total	**2210**	**1598**	**1799**	**189**	**270**	**98**	**31**	**4**	**12**	**125**

Narmada Basin										
Gujarat	837	738	753	85	94	2	13	13	1	75
Madhya Pradesh	4984	3681	3922	130	185	9	40	6	10	125
Maharashtra	80	80	87	5	5	-	-	-	-	-
Total	**5901**	**4499**	**4762**	**220**	**284**	**11**	**53**	**9**	**11**	**200**
Tapti Basin										
Gujarat	169	149	155	166	170	155	3	1	1	10
Madhya Pradesh	515	387	405	32	33	11	-	3	3	155
Maharashtra	3608	3264	3406	156	172	6	1	1	-	25
Total	**4292**	**3800**	**3966**	**354**	**375**	**172**	**4**	**5**	**4**	**190**
Subarnarekha Basin										
Bihar	798	448	480	50	52	38	4	6	-	4
Orissa	207	155	172	24	33	4	6	18	-	5
West Bengal	189	150	164	48	52	50	-	-	-	2
Total	**1194**	**753**	**816**	**122**	**137**	**92**	**10**	**24**	**-**	**11**
Brahamani Basin										
Bihar	918	537	584	75	12	-	3	5	-	4
Madhya Pradesh	70	50	53	2	3	-	1	1	-	1
Orissa	1372	895	1100	140	293	125	75	68	-	25
Total	**2360**	**1482**	**1737**	**317**	**308**	**125**	**79**	**74**	**-**	**30**
Mahanadi Basin										
Bihar	42	25	25	1	-	-	-	1	-	-
Madhya Pradesh	4078	3073	3711	512	444	322	90	16	-	15
Maharashtra	7	7	7	1	1	-	1	-	-	-
Orissa	3867	2519	3285	680	1115	795	125	150	-	45
Total	**7994**	**5624**	**7028**	**1194**	**1560**	**1117**	**216**	**167**	**-**	**60**
Godavari Basin										
Andhra Pradesh	4039	2742	3006	712	1214	767	251	26	20	150
Karnataka	402	296	329	2	4	-	1	1	-	2
Madhya Pradesh	2439	1727	1911	160	189	67	85	7	-	30
Maharashtra	11118	9077	9568	879	906	303	160	15	8	420
Orissa	933	593	646	9	26	-	4	15	-	7
Total	**18931**	**14435**	**15460**	**1762**	**2339**	**1137**	**501**	**64**	**28**	**609**
Krishna Basin										
Andhra Pradesh	5257	3627	4027	1130	1652	1292	170	20	20	150
Karnataka	9276	7093	7268	937	1056	565	214	52	-	225
Maharashtra	5766	4880	5062	563	743	286	9	40	8	400
Total	**20299**	**15600**	**16357**	**2530**	**3451**	**2143**	**393**	**112**	**28**	**775**
Pennar Basin										
Andhra Pradesh	3028	1845	1973	366	415	97	90	16	12	200
Karnataka	509	236	244	53	61	-	30	1	-	30
Total	**3537**	**2081**	**2217**	**419**	**476**	**97**	**120**	**17**	**12**	**230**

Cauvery Basin										
Karnataka	2424	1448	1595	240	393	170	154	19	-	50
Kerala	154	114	124	15	21	-	-	21	-	-
Tamil Nadu	2945	2081	2462	866	1421	940	116	80	5	280
Total	**5523**	**3643**	**4181**	**1121**	**1835**	**1110**	**270**	**120**	**5**	**330**
Grand Total	**149733**	**111215**	**130344**	**28984**	**37949**	**17599**	**2901**	**3135**	**5900**	**8414**

manifestation of the human form. The great sage Agastya, who married her, contained her in his "Kamandalu" also spelt as 'Kamandal' (spouted jug). When a drought encompassed the land, Ganesha in the guise of a crow, tipped the Kamandalu and outflowed Kaveri.

The river Cauvery, also spelt as 'kaveri' is an inter–state river in Southern India. It is one of the major rivers of the Peninsula flowing east and running into the Bay of Bengal. Cauvery is among the most sacred rivers of India and is known as "the Dakshina Ganga" or the Ganga of the South. After flowing 800 km, it joins the Bay of Bengal at Kaveripatnam as a small stream, all its waters being utilised higher-up.

The Cauvery rises at Talakaveri on the Brahmagiri Range of Hills in the Western Ghats, presently in the Coorg district of the State of Karnataka, at an elevation of 1341 m (4,400 ft.) above mean sea level. The catchment area of the entire Cauvery Basin is 81,155 sq.km including the other basin States of the Cauvery River System and their drainage areas, as indicated in table 4b(6).

The first dam built on this river is "Krishnaraj Sagar" at 19 km from Mysore where it meets with Hemavati and Lakshmanathirtha rivers. After 25 km from Srirangapatanam, it meets the Kabani and Suvarnavati rivers. Near Shivsamundram, it falls from the height of 90 metres and creates many beautiful water falls and springs. At 64 km from this place, it forms the border of Karnataka and Tamil Nadu. Here it meets with the Shimsha and Akravati rivers.

In Tamil Nadu, it flows in the east direction, but from the Hogenakkel water falls it flows in South direction. At 45 km from Mettur, it meets with its main tributary 'Bhavani'. When it enters into Tiruchirpalli district, it meets with the Noyill and Amravati rivers. Here it is the widest and hence, it is called "Akhand Kaveri".

Table 4b(6)
State Basins with Catchment Area of Cauvery

S.N.	*Name of the Basin State*	*Catchment Area in sq.kms.*
1	Karnataka	34,273
2	Kerala	2,866
3	Tamil Nadu	43,868
4	Pondicherry	148
	Total	**81,155**

Of the total drainage area, Kerala has 3.3%, Karnataka 41.2%, and Tamil Nadu 55.5%. Below Tiruchirapalli, the river divides into two branches, Coleroon and Cauvery. The upper Anicut was constructed in 1836 across the Coleroon to send the low flow into Cauvery. The two rivers join again 2.6 km down. Srirangam, the pilgrims centre, is located between the two branches of the river at the lower junction. The Grand Anicut was constructed in the first century AD across the Coleroon. The Cauvery splits again into two branches, the Cauvery and the Vennar. The great Tanjore delta is fed by these two rivers.

The total cultivated area is 4.2 million ha and forms 77% of the cultivable area of the land. The percentage of irrigation is 44%. The soil types are black, red, laterite, alluvial, forest and mixed.

The maximum discharge of the river is 12,913 cusec. The mean annual flow is 20,950 million cu.m. In Cauvery basin the irrigation had been practised from ancient times by wells and diversions from anicuts into small canals. The most important work is the Grand Anicut built in the first century AD. It was built of stone and mud, covered with an outer facing of dressed granite set in lime mortar.

The upper anicut was constructed by Sir Arthur Cotton in 1836. The lower anicut was also built about the same time, 110 km downstream. It irrigates 44,500 hectares. The Krishnarajasagar and Mettur dams were built in the thirties with live storage of 1,246 million cu.m and 2,652 million cu.m respectively.

The principal tributaries of Cauvery are the Harangi, the Hemavati, the Lakshmanathirtha, the Kabani, the Shimsha, the Arkavati and the Suvarnavati in Karnataka. In Tamil Nadu, they are the Bhavani, the Noyil and the Amravati. Brief discussion of these rivers is given in the Table 4b(7). Fig 4b(iii) shows the flow diagram of Cauvery, and map 4b(ii) shows the Cauvery River Basin.

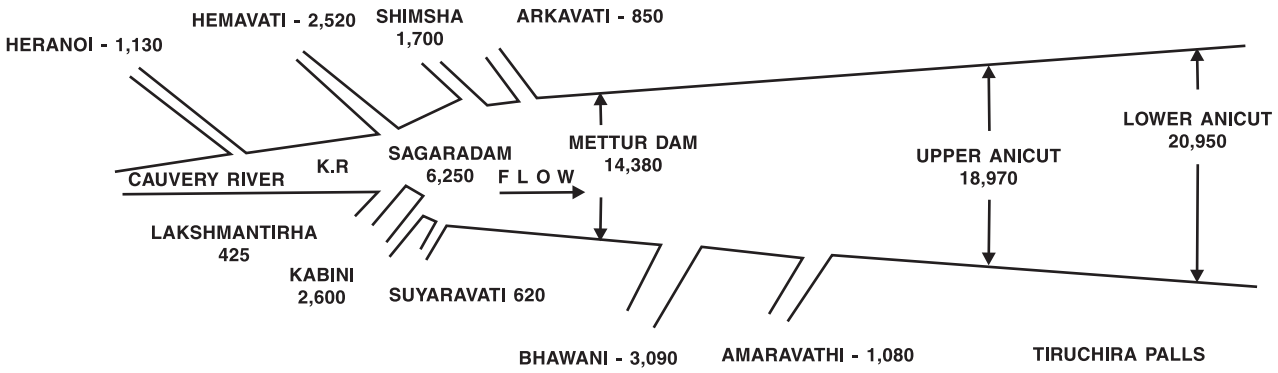


Fig 4b(iii) FLOW DIAGRAM OF THE CAUVERY

Source: *Dr. K. L. Rao*

Map 4b(ii)

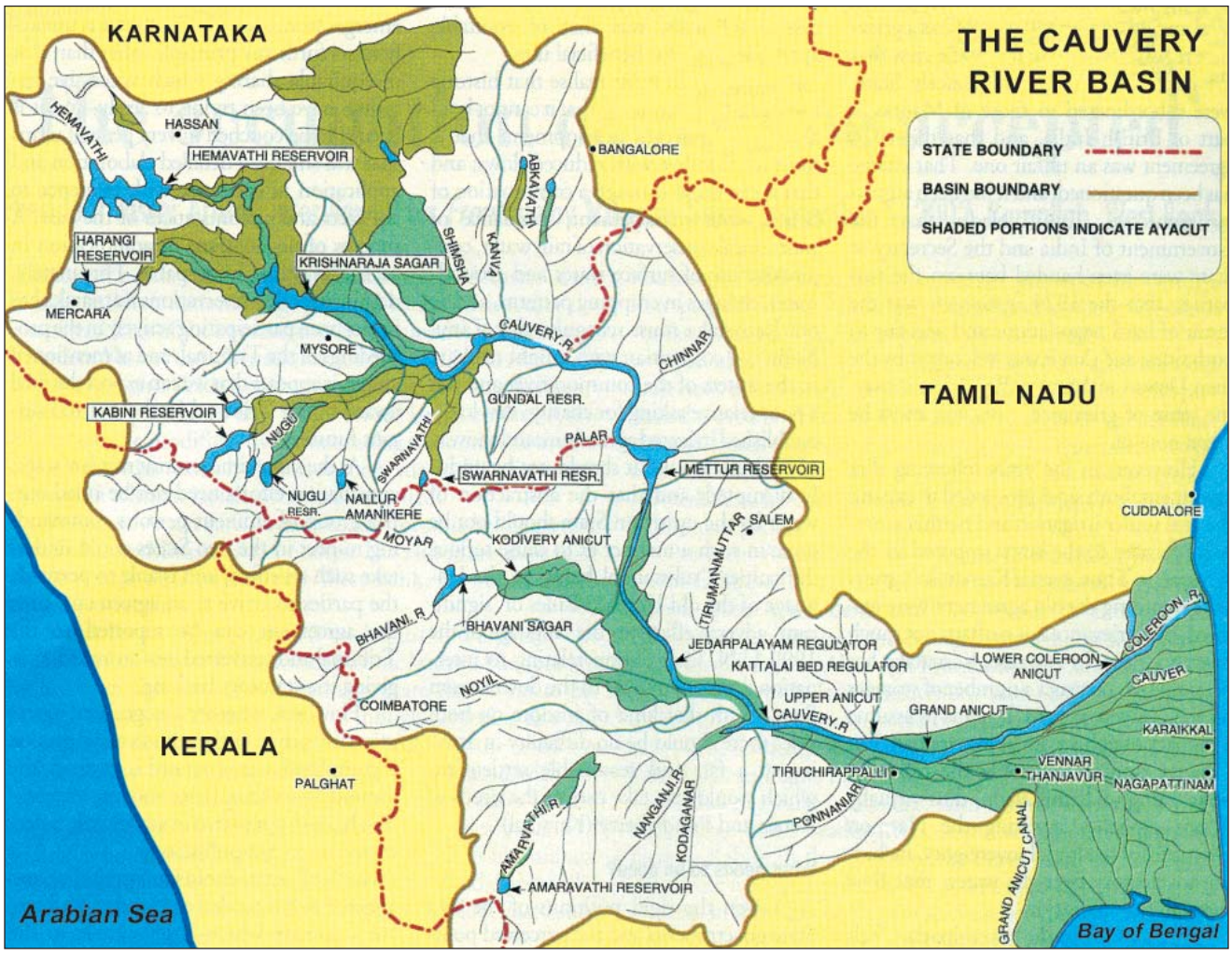


Table 4b(7)

Details of the Tributaries of Cauvery

Sl. No.	*Name of the tributary*	*Catchment rea in Sq.kms.*	*Origin, Altitude & Length*	*Sub-tributaries*	*Name of the State*
1	Harangi	717	Pushpagiri Hills of Western ghats, 1,067 metres, 50 km		Karnataka
2	Hemavati	5,410	Ballarayana Durga in western Ghats, 1,219 metres, 245 km		Karnataka
3	Kabani	7,040	Western ghats in Kerala, 2,140 metres, 230 km	Taraka, Hebballa, Nugu, Gundal	Karnataka, Kerala & Tamil Nadu
4	Suvarnavati	1,787	Nasrur ghat Range, Length 88 km.		Karnataka & Tamil Nadu
5	Lakshmanathirtha		Western ghats, 1,950 metres, 131 km.	Ramathirtha	Karnataka
6	Shimsha	8,469	Tumkur district, 914 metres, 221 km.	Veeravaishnavi, kanihalla, chickkhole, Hebbahalla, Mullahalla & Kanva	Karnataka
7	Arkavati	4351	Nandidurga 1,480 metres 161 km	Kumaudavati, Manihalla & kuttehole, Vrishabhavati	Karnataka & Tamil Nadu
8	Bhavani	7144	Silent Valley Forest, 216 km	Struveni, Kundha, Coonoor, Moyar.	Kerala, Tamil Nadu

(iv) GODAVARI BASIN

The river Godavari rises at Timbak in the Nasik district of Maharastra about 80 km from the shore of the Arabian sea, at an elevation of 3,500 feet. After flowing for about 1,446 km in a south-easterly direction it flows through Maharastra and Andhra Pradesh, and falls into the Bay of Bengal above Rajamundry. The Godavari has a drainage area of about 121,000 sq. miles. The peak discharge of Godavari at Dhawaleswaram is recorded to be 85,000 cubic metres per second (30 lakh cu.sec.) Map 4b(iii) shows Godavari river basin and Fig 4b(iii) shows the flow diagram of Godavari.

Godavari enters Andhra Pradesh in Adilabad district. The Godavari, which is the second largest river in India, flows through the Andhra districts of Nizamabad, Adliabad, Kauni Nagar, Warrangal, Khammam, East Godavari and West Godavari. At Dhawaleswaram, the river divides into two branches, the Gautami and Vashishta. Between the two lies the Godavari central delta. The two arms split into branches as they approach the sea, dividing the Central delta into a number of islands. These branches are said to have been made by seven great Rishis after whom they are named.

Table 4b(8)

State Basins of Godavari with Catchment Area

Sl. No	*Name of the Basin State*	*Catchment Area in Sq. kms*
1	Maharashtra	152,192
2	Madhya Pradesh	65,252
3	Karnataka	4,403
4	Andhra Pradesh	73,198
5	Orissa	17,751
	Total	312,796

The peculiar characteristic of the river Godavari is that it receives most of its water not from the Western Ghats, but in the lower reaches. The Manjra, the Pranahita, the Indravati and Sabari contribute 6%, 40%, 20% and 10% of the water respectively. Almost two–thirds of the catchment of the Godavari drains into it in the last one-third of its length. When the river enters the state, its catchment is only 17% of the total catchment and yields a mere 6%. It flows into Bay of Bengal after traversing a total length of 1,446 km.

It has a catchment area of nearly 312,000 sq.km of which 48.6% lies in Maharastra, 10.7% in Madhya Pradesh, 14% in Karnataka, 5.5% in Orissa

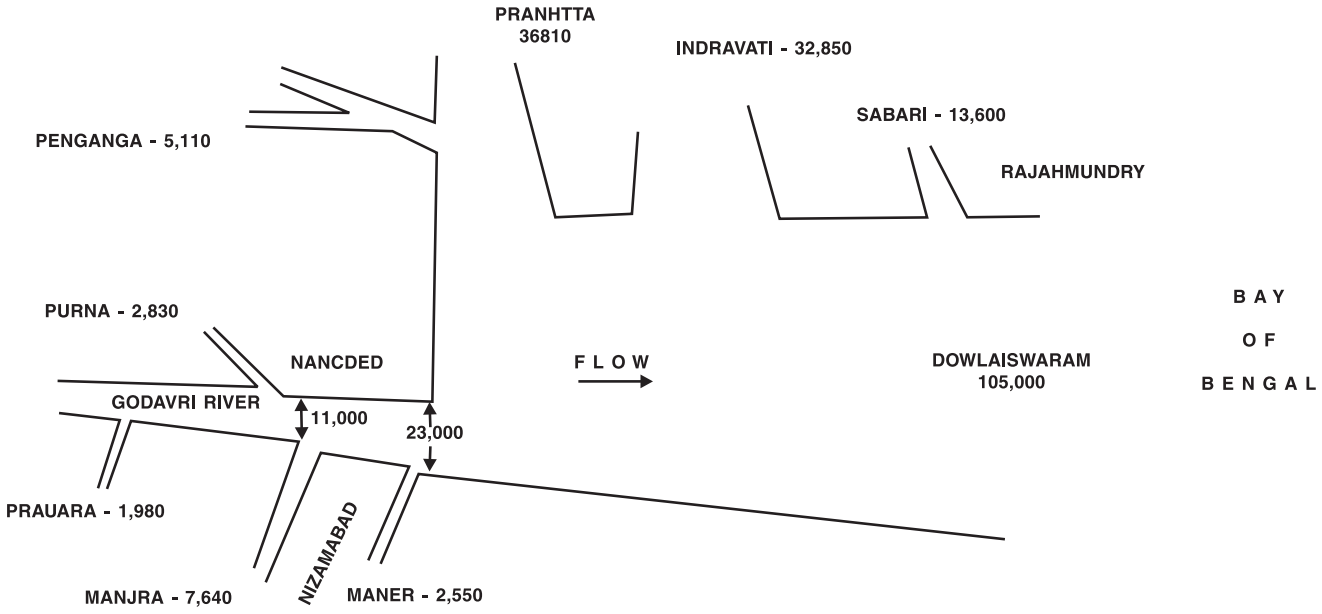


Fig 4b(iv) FLOW DIAGRAM OF THE GODAVARI

Source: *Dr. K. L. Rao*

Map 4b(iii)

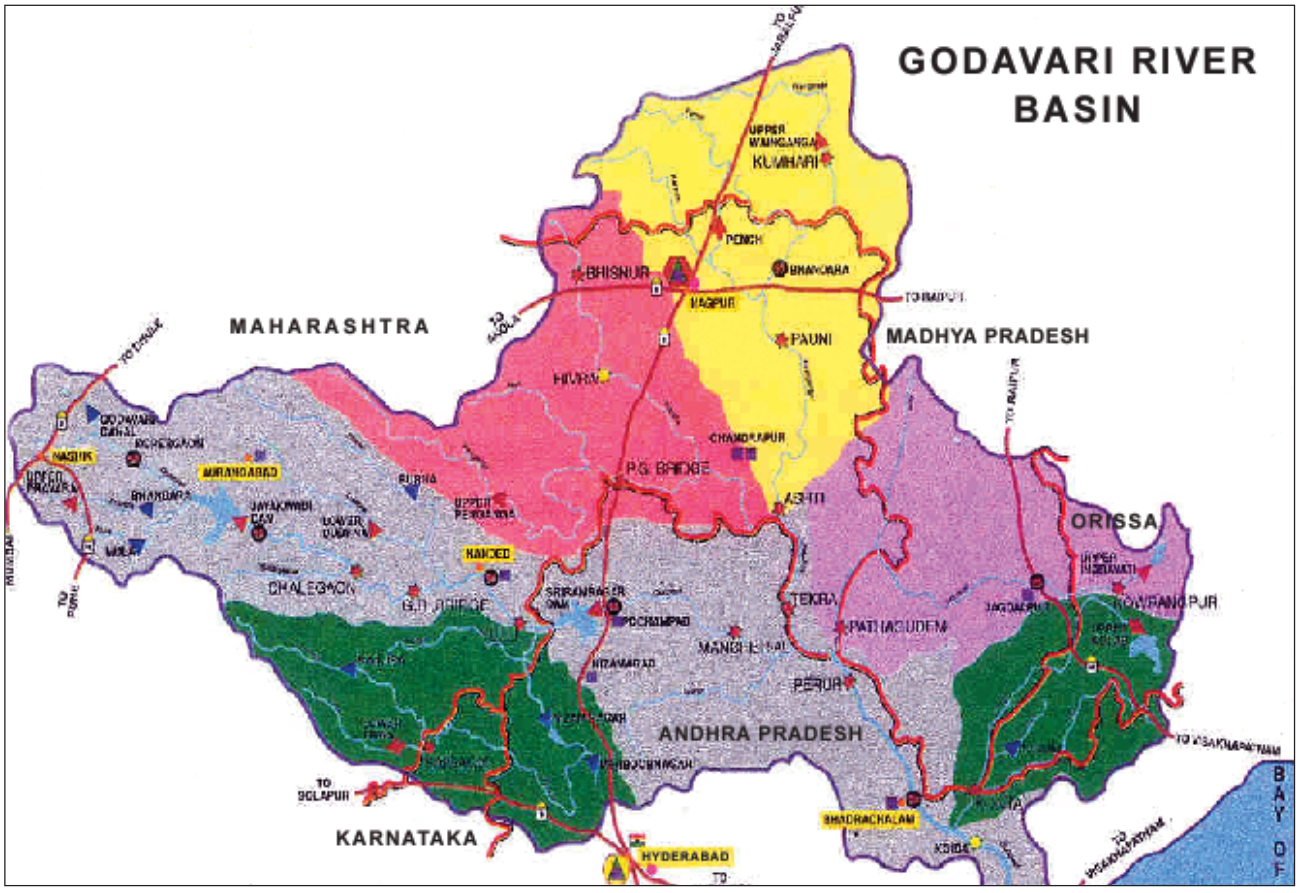


Table 4b(9)
Particulars of the principal tributaries are of Godavari

River	*Source*	*Sub-Tributaries*	*Length km*	*Catchment sq.km*	*Remarks*
1	2	3	4	5	6
The Pravara	Western Ghats	Mula	200	6,537	Poor rainfall
The Purna	Ajanta Hills	-	373	15,579	Tributary of Wardha
The Manjra	Balaghat	Tima, Kanaya	724	30,844	
Penganga	Buldana Range	Pus, Arns, Aran	676	23,895	
Wainganga	Seoni	Pench, Bagh, Andhari	609	61,093	
Wardha	Betul Distt.	Wunna, Bermbla, Penganga	483	24,087	
Pranhita	-	Wainganga Wardha	113 after confluence	109,077	
Indravati	Kalahand	Narangi, Kotri, Bandia, Nandira	531	41,665	
Maner	-	Haldi		13,106	
Sabari (Kolab)	Sinkaram Hills	Sileru	418	140,427	

and 23.8% in Andhra Pradesh. It is the largest of the Peninsular rivers and is held in reverence as 'Vridha Ganga' (old Ganga). The delta of the river consists of a wide belt of river borne alluvium and gradually extends into the sea. It pierces through the Eastern Ghats flowing through a narrow gorge of 130 km from the sea. There are holy places on its bank in Nasik and Bhadrachalam. State Basins of Godavari are shown in table 4b(8). Table 4b(9) gives the principal tributries of Godavari. Capacity of existing projects and those under construction are shown in table 4b(10).

The maximum discharge is 80,137 cu.mecs and the minimum is 42 cumecs. The flow in the river in different reaches is given in figure 4b(iv).

A large part of the basin lies over ancient crystalline and metamorphic rocks which are poor water bearing strata. The basin has 15.5 million hectare under cultivation forming 82% of the cultivable area. The percentage of irrigation is 15%. Tanks and wells have been used in the basin from ancient times for irrigating lands. The Godavari delta project was started in June 1847 by Sir Arthur Cotton to irrigate nearly half a million hectares. In Maharastra, the Godavari canal project, consisting of a dam on a tributary and weir across the Godavari built in 1915-16, irrigates 0.03 million hectare. The Pravara project, built in 1926, consists of a dam at Bhandandura and a pick-up weir lower down which irrigates 0.023 million hectare.

The Ramtak project consisting of a dam on the Sur, a tributary of the Wainganga, and built in 1910 irrigates 0.013 million hectare. The Wainganga canals, constructed in Madhya Pradesh in 1923, irrigate 0.03 million hectare, and the Nizamnagar dam built in 1933 irrigate 0.097 million hectare.

Table 4b(10)
Capacity of Existing Projects and Those Under Construction

Sl. No.	*Name of the Project*	*TMC*
1	Nizam Sagar	58.0
2	Kadam	11.60
3	Sriram Sagar St-1	140.27
4	Singur and Manjira Water Supply	15.99
5	Medium Irrigation Projects	48.44
6	Minor Irrigation Projects	85.70
7	Dhawaleshwaram	263.60
8	Medium Irrigation Projects	14.60
9	Minor Irrigation Projects	41.80
	Total	680

(v) KRISHNA BASIN

The river Krishna rises from a water spring in Western Ghats at an altitude of 1,360 metres near Mahabaleshwar in Maharashtra. The place is held in high esteem.

After flowing 1400 km it joins the Bay of Bengal. The catchment area of Krishna is about 258,448 sq.km, of which 26.8% lies in Maharashtra, 43.8 % in Karnataka and 29.4% in Andhra Pradesh. The river passes through a narrow gorge from Sangameswaram to Nagarjunasagar, a distance of 130 km just below the confluence of Tungabhadra with this river. It is in this reach that two large reservoirs, the Sreesailam and Nagarjunsagar are located. Table 4b(11) shows the State basins with catchment area, and table 4b(12) gives the tributaries of Krishna. Table 4b(13) gives the water utilisation from Krishna. Map 4b(iv) shows the Krishna river basin; fig 4b(v) shows the flow diagram of Krishna.

The chief tributaries of Krishna are the Koyna, the Ghataprabha, the Malaprabha, the Bhima, the Tungabhadhra, the Musi and the Muneri. The maximum discharge of Krishna river is 33,810 cu.mecs and the minimum is less than 3 cu.mecs. The total annual mean run off is 57,764 million cu.m.

Soil consists of black, laterite, alluvial, and mixed soils of saline and alkaline types. In areas underlain by crystalline rocks like granites, the quality of water is unsuitable for domestic purpose due to the presence of fluorides in excess of the prescribed safe limit. The tanks and wells irrigate more than 40% of the total irrigated areas. When the wells fail drought condition prevails.

Table 4b(11)
Krishna basin with catchment area

Sl.No.	*Name of the Basin State*	*Catchment area in Sq.kms*
1	Maharastra	69,422
2	Karnataka	76,249
3	Andhra Pradesh	113,276
	Total	**258,948**

Irrigation was practised in the basin from the earliest times by tanks and diversion. The Krishna delta canal system completed in 1855 provides irrigation for 0.56 million hectare. The original weir breached in 1952 was replaced by a barrage. The Kurnool-Cuddapah canal takes off from Sunkesila anicut to irrigate 100,000 hectares, though 39,510 hectares only are irrigated in the scarcity districts of Kurnool and Cuddapah. The Kurnool-Cuddapah canal was constructed in 1866. The Nira canal was constructed in 1846 and consists of a dam on the river Yelvandi at Bhotga and a canal system to irrigate 82,700 hectares.

After independence a large number of projects were started in the basin. The most important of these are Tungabhadhra, Rajolibanda, Musi, Nagarjunasagar, Radhanagri, Ghod, Khadakwasla, Koyna, Malprabha, Ghataprabha and Upper Krishna.

Table 4b(12)
Details of the Tributaries of Krishna

Sl. No.	*Name of the Tributaries*	*Source*	*Altitude (Meters)*	*Length (km)*	*Catchment Area sq.km*	*Subtributaries*
1	Ghataprabha	Western Ghats	880	282	8,829	Hiranya kashi, Markandyu
2	Malaprabha	- do -	789	304	11,548	Benihalla, Hirehalla, Tasnadi
3	Bhima	- do -	941	861	76,614	
4	Tungabhadra	-do- (at Gangamula)	1193	531	71,417	Combained water of Tunga and Bhadra, Varadi and Hagari
5	Musi	Medak District	-	240	11,212	
6	Muneru	-	-	235	10,400	

MAP 4b(iv)

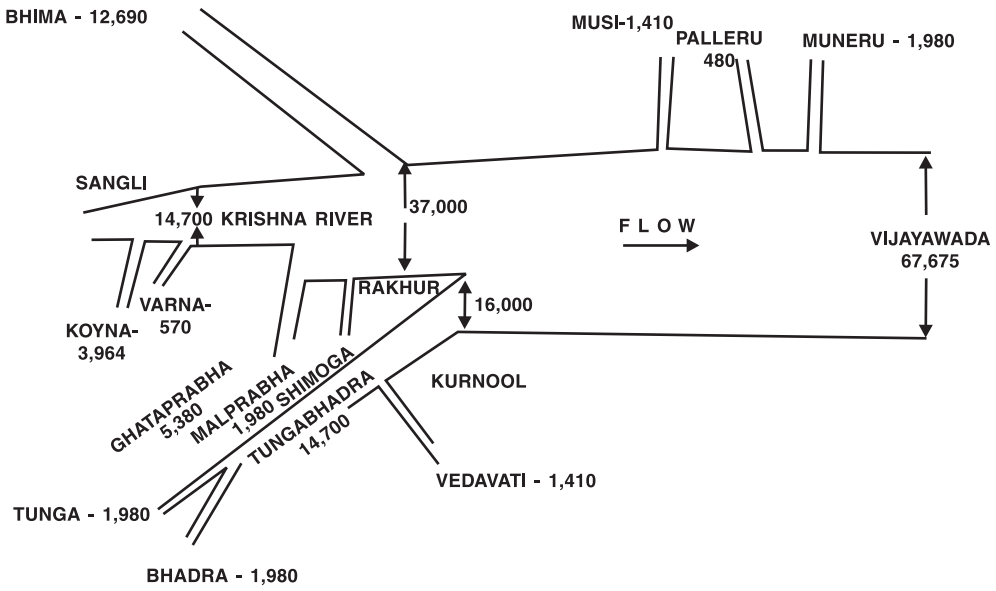


Fig 4b(v) FLOW DIAGRAM OF THE KRISHNA

Source: *Dr. K. L. Rao*

Table 4b(13)
Water Utilization Under Existing Projects from Krishna River[17]

Sl. No.	*Name of the Prioject*	*TMC*
1	Nagarjuna Sagar	281.00
2	Krishna Delta	181.20
3	Kurnool-Cuddappah Canal	39.90
4	Tungabhadra Right Branch Canal	29.50
5	Tungabhadra Right High Branch Canal	32.50
6	Srisailam	33.00
7	Jurala Phase -1	17.84
8	Rajolibanda Diversion Scheme	15.90
9	Minor Irrigation Schemes	116.00
10	Other Projects	52.90
11	Total	800.00

(vi) MAHANADI BASIN[11]

The Mahanadi rises from a pond near Pharsia village in Raipur district of Chhatisgarh. It drains an area of 141,600 sq.km, of which 53.1% is in Chhatisgarh and Madhya Pradesh, 46.5% in Orissa and the balance in Bihar (0.5%) and Maharashtra (0.1%). The length of the river is 857 km. Towards the end, it flows for 23 km through a narrow gorge starting 6 km upstream of Tikkapara Village, and finally emerges in the delta at Naraj 11 km West of Cuttak. Below Naraj the river breaks off into two branches, the Katjuri and the Birupa. The Mahanadi finally flows into the bay of Bengal. The important tributaries of the river are given in the table 4b(14). Fig 4b(vi) shows the flow diagram of Mahanadi and map 4b(v) shows the Mahanadi river basin.

After receiving the Sheonath river, below Baloda Bazar, it turns east and enters Orissa State.

It is one of the most active silt depositing streams in the Indian sub continent. The river supplies several irrigation canals, mainly near Cuttak. At one of its mouths is situated the famous pilgrimage site of Puri.

The basin consits of red and yellow soils. Mixed red and black soils are found in some districts like Sambalpur. In Puri and Cuttak district, laterite soils are found. Coastal plains have saline and deltaic soils. The Mahanadi has a maximum discharge of 44,740 cusecs. Its annual flow is 66,640 million cubic metre.

Granite found in the upper parts of the basin contains water in the weathered mantle and along the rift and horizontal joints. The sand stones are also good aquifers. Costal alluvial tracts have fresh water formations near the surface and depths below 150 metres. In some areas, artesian conditions are also found at depths of 200 metres. In costal areas, deeper aquifers have to be carefully exploited to avoid saline encroachment.

The Mahanadi basin has a gross sown area of 7 million hectare, which is 88% of the cultivable area. The irrigated area is 22% only. ■

Table 4b(14)
Tributaries of Mahanadi

S.No	*River*	*Source*	*Length (km)*	*Catchment (sq.km)*
Left Bank				
1	The Sheonath	Kotgal	383	30,761
2	The Hasdeo	North of Sarhat	333	9,803
3	The Mand	Raigarh	241	5,237
4	The Ib	Raigarh	251	12,447
Right Bank				
5	The Jonk	Khariar	196	3,673
6	The Ong	Hill	204	5,182
7	The Tel	Koraput	295	22,818

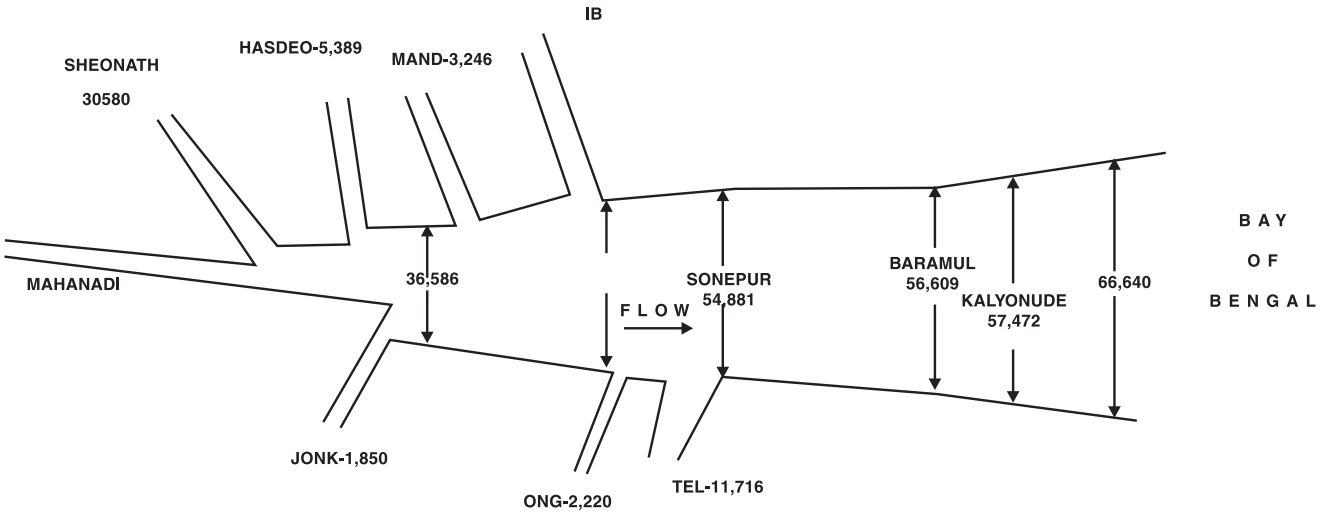
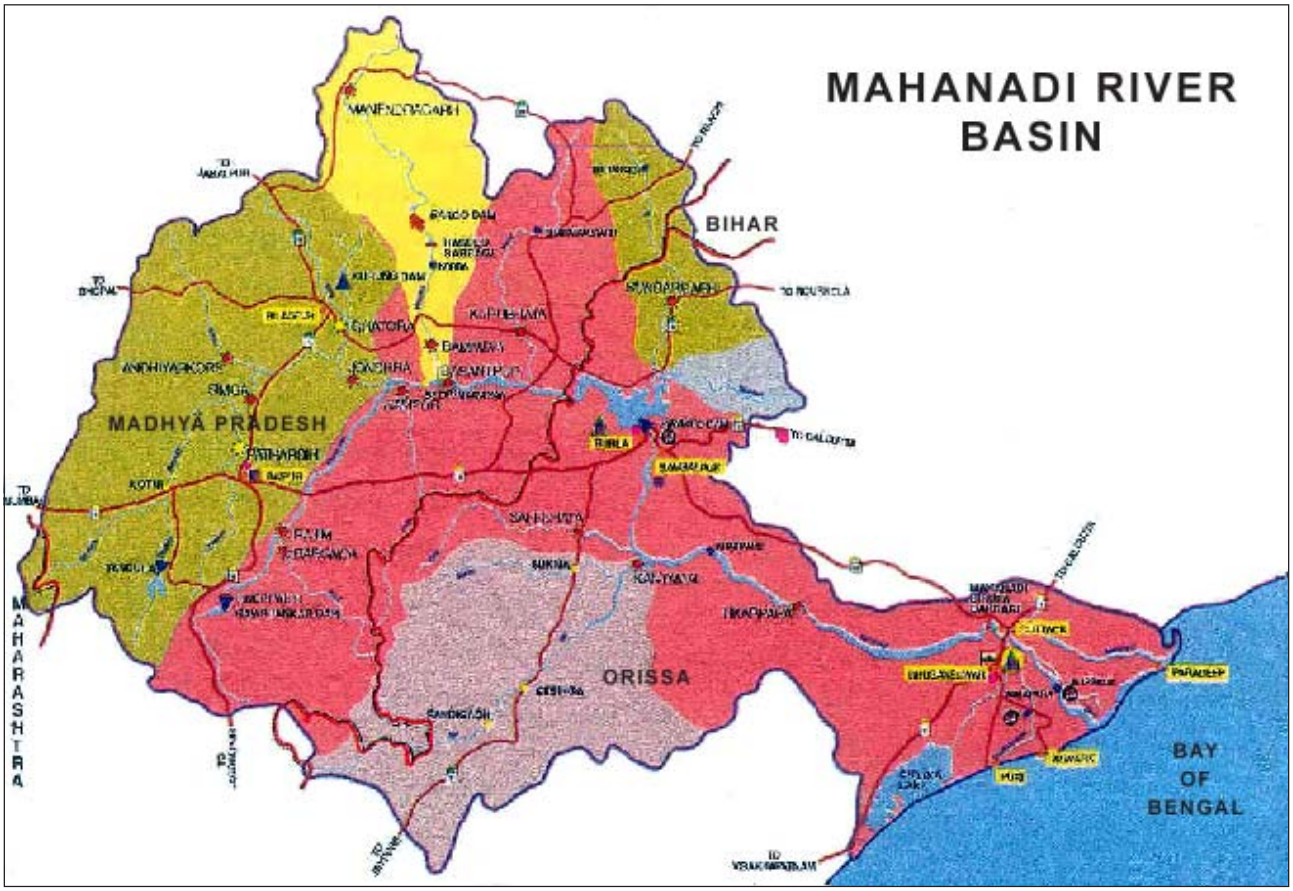


Fig 4b(vi) FLOW DIAGRAM OF THE MAHANADI

Source: *Dr. K. L. Rao*

MAP 4b(v)



4c. Linking the Ganga to the Yamuna
A Case Study in River Linking

Suez: privatising the Ganges to create water markets in Delhi

On August 9, 2002, on the eve of Quit India Day, more than 5000 farmers of Muradnagar and adjoining areas of western Uttar Pradesh gathered in a Rally at Village Bhanera. They came to protest the laying of a giant 3.25 metre-diameter pipeline to supply water from the river Ganga to the Sonia Vihar Water Plant for Delhi. The project, which has been contracted to Suez-Ondeo Degrémont of France by the Government of Delhi, will deprive the richest farmlands of India of irrigation water.

The Sonia Vihar water treatment plant, which was inaugurated on June 21, 2002 by the Chief Minister of Delhi, is designed for a capacity of 635 million liters a day on a 10 year BOT (build-operate-transfer) basis, at a cost of 1.8 billion rupees (approx. 50 million dollars). The contract between Delhi Jal Board (the Water Supply Department of the Delhi Government) and the French company Ondeo Degrémont (subsidiary of Suez Lyonnaise des Eaux Water Division – the water giant of the world) is supposed to provide safe drinking water for the city.

The water for the Suez–Degrémont plant in Delhi will come from Tehri Dam through the Upper Ganga Canal up to Muradnagar in Western Uttar Pradesh and then through the giant pipeline to Delhi. The Upper Ganga Canal, which starts at Haridwar and carries the holy water of Ganga up to Kanpur via Muradnagar, is the main source of irrigation for this region.

The 9th August Rally at Bhanera village was the culmination of the 300 kilometre-long mobilisation drive along the Ganga by the farmers of Garhwal and inhabitants of the devastated city of Tehri to liberate the river from being privatized. The rally was launched

Mother Ganga Is Not For Sale

The Haridwar Declaration

Today, the 8th of August 2002, on the eve of the 60th Anniversary of the "Quit India Movement", we all have gathered here to pledge that:

We will never let the river Ganga to be sold to any multinational corporations. Ganga is revered as a mother (Ganga Maa) and prayed to and on its banks important ceremonies starting from birth till death are performed (according to Hindu religious practices). We will never allow our mother or its water to be sold to Suez-Degrémont or any other corporations.

The sacred waters of the Ganga cannot be the property of any one individual or a company. Our mother Ganga is not for Sale.

We boycott the commodification and privatisation of the Ganga and any other water resources.

We pledge to conserve and judiciously use our regional water resources to save our environment and ecology, so that we would gift our coming generation a clean and beautiful environment as well as safeguard their right to water resources.

We pledge and declare that the local community will have the right over the local water resources. It is the duty of the local community to conserve and sensibly utilize their resources. Anyone from outside the community whether an individual, an organisation or a corporation have to take the permission of the Gram Sabha for utilizing these resources.

The river Ganga was brought upon the face of earth by Bhagirath through his yagna (prayers) to sustain the existence of life on Earth. The Ganga is now intrinsic to our culture and a part of our heritage and civilisation. Our life and progress over the millennia has been dependent upon the sacred waters of Ganga. We will fight any multinational company trying to take away our right to life by privatising Ganga waters.

The "Water Liberation Movement" will continue till we liberate the sacred waters of Ganga from the clutches of corporations like Suez-Ondeo Degrémont.

from Haridwar – one of the oldest and holiest cities of India built on the banks of Ganga - where hundreds of farmers, together with priests, citizens and worshippers of Ganga announced that **"Ganga is not for Sale**," and vowed to defend the freedom of this holy river. Thousands of farmers and others in villages along the route joined the rally to declare that they would never allow Suez to take over Ganga waters.

The rallyists joined by more than 300 people from across the country, representing over a hundred grassroots groups, intellectuals, writers and lawyers, at the 3-day 'Convention on Earth Democracy – People's Rights to Natural Resources', organised by Navdanya from 10 to 12 August 2002 at Indian Social Institute, New Delhi. The Convention sought to provide evidence of the state's violent appropriation of people's land, water and biodiversity, and evolve common action plans and strategies to defend collective community rights to resources.

"There is only one struggle left – the struggle for the right to life," said Magasaysay Award winning writer Mahasweta Devi. Eminent author Arundhati Roy and eminent scientist Vandana Shiva stressed the urgent need to take collective united action to defend people's rights to land, water and biodiversity.

Suez–degrémont water plant at Sonia Vihar

Ondeo Degrémont, a subsidiary of Suez Lyonnaise des Eaux Water Division, has been awarded a 2 billion rupees contract (almost 50 million dollars) for the design, building and operation (for 10 years) of 635 million liters/day Drinking Water Production Plant at Sonia Vihar in New Delhi to cater to the three million inhabitants of the capital.

Won through the collaboration of all the Group companies, within the context of an international call for tenders, this 2 billion rupees contract is the first contract of this size in India, after Bombay, for Degrémont.

Construction of the giant 3.25 metre-diameter pipe on a stretch of 30 kilometres from Muradnagar to Sonia Vihar is going on and till date, about 10 kilometres of pipeline has been laid down.

The disastrous impact of this project on the farmers of Western UP is evident from the fact that this area is totally dependent upon the canal for irrigation. Even before being operationalised to divert 630 million litres of water/day from irrigation, farmers are already feeling the impact of corporate greed for profits – the Upper Ganga Canal is being lined to prevent seepage into the neighbouring fields (an important source of moisture for farming) and recharge of ground water, and farmers are being prevented from digging wells even as they are reeling under severe drought.

The lining of the canal to prevent recharging of groundwater has terrified the farmers of the whole region of western UP. At a meeting organsied by Navdanya on 21 July at Chaprauli, the land of Choudhury Charan Singh, ex-Prime Minister, farmers stated "we will not allow the Canal to be lined and to supply water to Delhi. Instead the government should link the Upper Ganga Canal to the Yamuna Canal passing through this area to tackle the severe drought."

Who is paying for corporate profits?

Privatization of water has been justified on the ground that full cost must be paid when water giants get water markets, whereas with water privatization they demand a full price from the people. However, as the case of the Delhi Water plant shows, the corporations get the water for free without paying for full social and environmental cost to those rural communities from whom the water is taken.

The country has got into huge debt for the loans taken from World Bank for the Ganga Canal. At the same time the giant 3.25 metre-diameter pipe is being built through public finances. In effect, the public pays the price, while transnational companies make the profit.

Delhi Jal Board claims that they have no intention of raising the water rates for the time being. However, as has been seen in the case of Enron with electricity, the Orissa Lift Irrigation Corporation in Orissa, and other cases, privatization leads very quickly to a steep rise in the price of water and electricity. With regards to concession to the poor, DJB said there would be no such proposal. DJB will continue to deliver the water to Delhites and maintain infrastructure, i.e., burst water pipes, billing etc. Thus the people of Delhi will not just be paying Suez and the Jal Board for the water directly, they will be paying through taxes to maintain the infrastructure, thus freeing the corporation of any expenses which might detract from their profits.

Water requirement and sources of water in Delhi

Delhi is experiencing increasing pressure to meet demand for its water resources. Growing urbanization, improvements in living standards, and exploding population are just some of the contributing factors. The population of Delhi is expected to cross 15 million by the end of 2002. The city, at the moment, requires 3,324 million litres of water a day (MLD), while what it

gets stands closer to 2,634 MLD. Average water consumption in Delhi is estimated at being 240 litres per capita per day (lpcd), the highest in the country. The large-scale extraction of groundwater is a result of this widening gap between the demand and supply of water. And still worse, serious doubts are also being raised about both the quality and quantity of groundwater, which has gone down by about 8 metres in the last 20 years due to unsustainable demand and use.

Delhi's water and wastewater management is controlled by the Delhi Jal Board, which has signed the contract with Suez Degrémont. With the demand-supply gap projections for water set to increase in the next ten years, DJB have identified new raw water sources including Tehri, Renukal, Kishau and Lahawar dams. Plans also centre on the construction of new and existing sewage treatment plants (STPs) which will enable an increase in treatment capacity. Rainwater harvesting is another option that DJB is considering.

Corruption in Delhi Jal Board's Suez Degrémont plant

The process for allotment of contract for the Sonia Vihar Plant to Ondeo Degrémont has not been without controversy and objections by senior DJB members. Of the 3 companies that bid for the tender, Ondeo Degrémont was chosen despite being higher in cost than the two other contenders, and allegedly an inferior technology. It was also known that Ondeo Degrémont had already experienced problems with previous contracts in Surat and Delhi (Okhla) where they were 2 years behind in the project.

Jagdish Anand, a member of the Opposition party, has accused senior politicians of trying to bribe him into silence. He said: "Earlier also, I had exposed the irregularities committed by the Jal Board and its officials with regard to the allotment of Sonia Vihar 140 MGD plant … (they) approached me on more than one occasion. They independently requested me not to expose the working of the Delhi Jal Board… They also tried to tempt me with suitable reward and my adjustment in lieu of my not exposing the irregularities being committed by Delhi Jal Board..." (*The Hindu*, New Delhi, November 28, 2002).

Yet another accusation against the politicians and senior DJB members was of pushing through a contract to Larsen and Toubro for laying of water pipeline in Sonia Vihar at a cost that was approximately Rs 30 crore more than the justified amount. The clear water transmission mains will supply water from Sonia Vihar Water Treatment Plant to different parts of Trans-Yamuna Delhi.

Former mayors of Delhi, Yog Dhyan Ahuja and Shakuntala Arya (both members of DJB), said that though the appropriate amount for laying the 33,.948 km long water pipeline within Delhi was about Rs 85 crore, the contract has been awarded for Rs 111.31 crore.

Out of the four firms that were shortlisted, two did not even submit their tenders and the lowest tender bid was as high as Rs 148 crore. Though a final offer of Rs 111.31 crore was made by Larsen and Toubro only on February 27, 2001, the technical committee had already given its approval a month earlier.

Destruction of Tehri for water supply to Delhi

Ganga's waters, the lifeline of northern India and India's food security, are being handed over to Suez to quench the thirst of Delhi's elite even as a hundred thousand people are being forcefully and violently evicted from their homes in Tehri for the Tehri Dam.

Tehri, the capital of the ancient kingdom of Garhwal on the banks of the Ganga in the Himalayas, is in the process of being submerged as the tunnels of the controversial Tehri Dam are being closed. More than a hundred thousand people have been displaced by the Dam, costing thousands of crores of rupees. In 1994, a budget of Rs. 6,000 crores had been earmarked for it. The figure must have escalated substantially since then.

The Tehri dam project is located in the outer Himalaya in the Tehri-Garhwal district of Uttaranchal.

Uneven Distribution of Drinking Water in Delhi

The per capita daily water supply should be at least 150 litres as per the standards set by the Central Public Health and Environment Engineering Organisation of the Union Urban Development Ministry, Govt. of India.

Despite DJB claim of equal allocation of water, supply of drinking water in the Capital is charaterised by unequal distribution, with posh colonies and VIP areas getting several times more than the supply given to rural areas and resettlement colonies.

A recent report reveals that people in Mehrauli and Narela receive only 29 and 31 litres per person per day respectively, while those in the Cantonment Board get 509 litres and Lutyen's Delhi 462 litres. The Karol Bagh zone receives 337 litres per person per day. It is also estimated that unless the depleted water table in Mehrauli is maintained or replenished, Mehrauli will experience dessertfication within the next ten years.

It is planned to be the fifth highest dam in the world-260.5 metres high and spread over an area of 45 square kilometres in the Bhagirathi and Bhilangana valleys near Tehri town. The dam will submerge 4200 hectares of the most fertile flat land in the Bhagirathi and Bhilangana valleys without really benefiting the region in any way.

The huge Tehri dam is located in a seismic fault zone. This area is earthquake prone. Between 1816 and 1991, the Garhwal region has witnessed 17 earthquakes, the recent ones being the Uttarkashi earthquake of October 1991 and the Chamoli earthquake of 1998. The International Commission on Large Dams has declared the site "extremely hazardous".

In case the dam collapses due to an earthquake or any other fault, the devastation will be unimaginable. The huge reservoir built at such a height will be emptied in 22 minutes. Within 60 minutes, Rishikesh will be under 260 metres of water. Soon after Haridwar will be totally submerged under 232 metres within next 23 minutes. Bijnor, Meerut, Hapur and Bulandshahar will be under water within 12 hours (Sunderlal Bahuguna). Thus, the dam is potentially dangerous for large parts of north-western India, and large areas in the Gangetic plains could be devastated in the event of a mishap. It is also estimated that the life of the dam could not be more than 30 years, because of heavy sedimentation.

Ironically, the disaster management plan submitted by Tehri Project authorities states that Tehri dam has no builtin provision for providing protection against floods and that flood management of the down-stream area is not the direct responsibility of the project authorities.

Since 10% of the dams in India and abroad have failed or collapsed, it is important to make the dam-break analysis and disaster management reports mandatory. In fact, the disaster management report submitted to the Union Ministry of Environment by the project authorities clearly emphasises the need for such reports. Further, the Union Ministry of Environment in their conditional clearance insisted on the preparation of such a report in consultation with the people likely to be affected in case of a major accident. However, such report has not yet been prepared and the safety of the Tehri project have not been properly assessed.

Moreover, with the building of the dam, the river Ganga will become a dead river. Ganga is not just any river; it is a unique symbol of our ancient civilisation and culture. Ganga water has the quality of remaining fresh for many years and is, therefore, part of many sacred rituals, including the pouring of a few drops of Ganga jal into the mouth of a dying person. People come from all over the country to perform *asthi pravah* in the Ganga at Haridwar. Once the Ganga is made to flow through tunnels dammed at Tehri (and also at Bhaironghati Thala dam), this sacred river will soon lose the quality of freshness and purity it is mainly revered for.

Ever since the dam was sanctioned in 1972, local people have been opposing the dam and offering resistance to its construction. Many scientists and environmentalists have pointed out the grave risks involved in building this dam in a highly earthquake-prone zone. But the government dismisses these allegations of risk, saying that all those who oppose the Tehri dam are "anti-development".

Despite all these huge costs to the people and the government exchequer, Suez-Degrémont is not paying

GANGA AT A GLANCE

Length	: 2,525 sq. km
Source	: Gaumukh (Gangotri glacier) at 4,100 metres above MSL.
Ganga basin	: more than one million sq. km (1,060,000 sq. km)
Drainage area	: 861,404 sq. km (26.2 per cent of India's total geographical area)
Break up	
Uttar Pradesh	: 294,413 sq. km
Madhya Pradesh	: 201,705 sq. km
Bihar	: 144,410 sq. km
Rajasthan	: 107,382 sq. km
West Bengal	: 72,010 sq. km
Haryana	: 34,200 sq. km
Himachal Pradesh	: 5,799 sq. km
Delhi	: 1,485 sq. km
TOTAL	: **861,404 sq. km**

Annual flow: 468.7 billion cubic metres (25.2 per cent of India's total water resources)

Flow at Rishikesh: 27 billion cubic metres of water.

Important stations on the Ganga and distance from source:

Rishikesh 250 km,	Balawali 330 km,
Garhmukteshwar 440 km,	Kachla Bridge 510 km,
Fatehgarh 670 km,	Kanpur 800 km,
Allahabad 1,050 km,	Mirzapur 1,170 km,
Varanasi 1295 km,	Buxar 1,430 km,
Patna 1,600 km,	Baharampur 2,175 km,
Nabadwip 2,285 km	

any of the social, ecological or financial cost for the construction of Tehri Dam. Rather, it will get free water and will sell it to the people of Delhi at a very high cost.

Impact of diverting Ganga water on agriculture and food security

Upper Ganga Canal: the lifeline of Western UP

Upper Ganga Canal is one of the oldest canal in Western UP Initial discharge of water in the canal was 6,750 cusecs, which was later increased to 10,500 cusecs. The length of the canal is about 304 km and it irrigates about 9.24 lakh hectares of land in Haridwar, Roorkee, Saharanpur, Muzaffarnagar, Meerut, Ghaziabad, Gautam Budh Nagar, Bulandshahr, Aligarh, Mathura, Hathras, Mainpuri and Etah.

As said earlier, the 635 million litres daily (MLD) of Ganga water will be diverted from the Upper Ganga Canal to Delhi, which would affect the agriculture potential of the canal and the food security of the region where the canal had been irrigating since more than one century.

Some of the major crops in the area, which is irrigated by Upper Ganga Canal are Wheat, Rice (Basmati), Rice (Coarse), Sugarcane, Maize, Potato, Gram and others.

Water needs for different crops in the region

- 1 kg. of Basmati rice requires 4,200 litres.
- 1 kg of coarse rice (long duration) requires 2,500 litres.
- 1 kg. of coarse rice (short duration) requires 2,250 litres.
- 1 kg. of wheat requires 700 litres of water.
- 1 kg. of potatoes require 240 litres.

A) i) Water Requirement to grow wheat in Western UP & Delhi
= 30-35 cm (6-7 irrigation 5 cm per irrigation)
ii) For rice (Basmati) = 140-160 cm
iii) Rice (coarse) = 120-150 cm
iv) Maize = 30 cm
v) Potato = 60 cm

B) 1 Hectare = 2.46 Acre
1 Acre = .405 hec
1 Acre = 4000 sqm
1 hec = 1/.405
= 2.46 x 4,000 = 9,840 sqm or 1 hec = 10,000 sqm (approximate)

C) 1 hec = 100 × 100 m^2
or 1 hec = 100 × 100 × 100 × 100 cm^2
Volume of Water = 100 × 100 × 100 × 100 × 35 (CC)
or Volume of water = 100 × 100 × 100 × 100 × 35 litres = 3,500,000 litre per hec
1000

Water requirement for wheat

Average yield of wheat = 50 quintal per hectare (approximate)

Therefore, water requirement per quintal

$$= \frac{3,500,000}{50} = 700,00 \text{ litres.}$$

Water requirement for wheat per kilogram

$$= \frac{3,500,000}{50x100} = 700 \text{ litres.}$$

So, 700 litres of water is required to grow 1 kg of wheat; or 70,000 litres of water is needed for 1 quintal (100 kg.) of wheat; or 7,00,000 litres for 1 ton.

Water Requirement for Rice

Similarly, we may calculate the water requirement to grow rice.

Water requirement for rice (Basmati)
= 140–160 cm per hectare
Average yield of rice Basmati
= 35 quintal per hectare
(4200 litres of water is needed to grow 1 kg of basmati rice)

Water requirement for rice (coarse)
= 120–150 cm per hectare (short duration)

Average yield of rice (coarse)
= 60 quintal per hectare
(2250 litres of water is needed to grow 1 kg of coarse rice (short duration)

Water requirement for rice (coarse)
= 140–160 cm per hectare (long duration)
Average yield of rice coarse
= 60 quintal per hectare
(2500 litres of water is required to grow one kg of coarse rice of long duration)

What does diverting water to Delhi mean for national food security?

The annual water diverted to Delhi from the Upper Ganga Canal at the rate of 635 million litres per day will

result in critical reduction in the production of food crops in the region, and thus possible threat of national food security.

This massive diversion of water would have produced in a year

- 3,310,550 quintals of wheat
- 5511,50 quintals of rice (Basmati)
- 927,100 quintals of rice (Coarse)
- 9,657,290 quintals of potato

Alternatives to privatisation of Ganga and meeting Delhi's water needs[13]

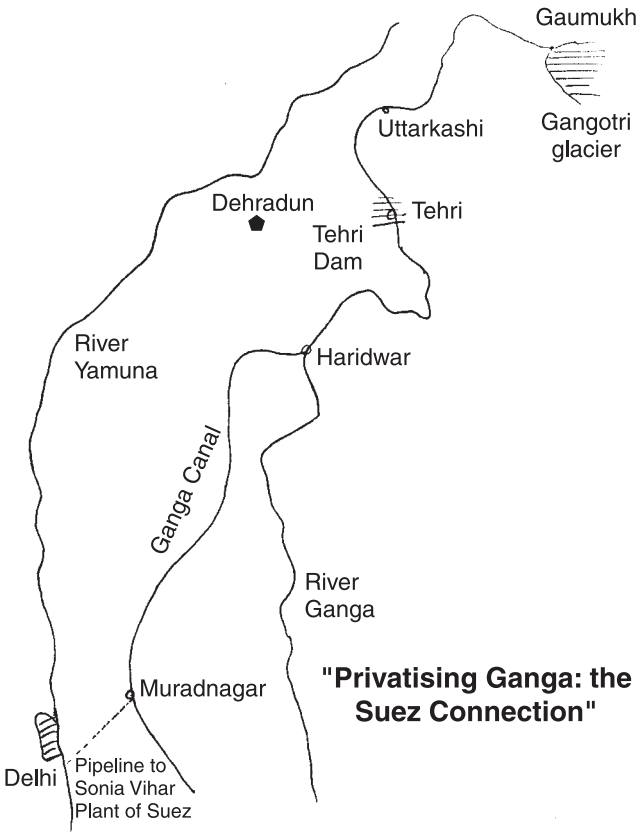
At present Delhi has allocation of waters from the Yamuna, the Ganga and the Beas [Bhakra project], in addition to ground water resources, with the total availability, as follows:

Water Source	Allocated	Usable
Yamuna	0.724 BCM	0.500 BCM
Beas	0.2464 BCM	0.1724 BCM
Ganga	0.1800 BCM	-
Treated sewage	0.100 BCM	-
Ground water	Govt. wells	Private wells
	0.012 BCM	0.010 BCM
Total		**0.9645 BCM**

The above capacity can be reinforced through the following means:

- Flood plain reservoirs at Wazirabad, Barswal, Badapur, Nala Mandela and at Nizamuddin bridge providing additional 0.168 BCM
- Rain water reservoirs at Tilpat/ Tughlakabad 0.010 BCM
- Reservoirs in the NCR at Najafgarh Jheel and Hindon-Ganga bed with the capacity 0.285 BCM.
- Harvesting in existing tanks and wells to the extent of 0.010 BCM
- Revival of dried up streams [through afforestation] of Delhi with capacity 0.015 BCM
- Increased ground water output in government and private wells due to better recharge of aquifers through greater flow in river Yamuna, yielding additional 0.033 BCM
- Greater output of treated sewage of higher quality in 9 eco-parks designed by Paani Morcha to the extent of additional 0.500 BCM

It can be seen that the above measures would yield an additional 1.011 BCM of usable clean water, giving Delhi sufficient water to meet its increased requirement of the next century and obviating the need to bring Tehri dam waters to Delhi. ■



"Privatising Ganga: the Suez Connection"

5. FOOD AND WATER SECURITY

5a. Prudent use of Water and Livelihood

The increased irrigation potential is a major justification of the River Linking Project. However, this ignores the fact that major river diversions will also deny irrigation to large fertile areas upstream and downstream. Large dams are necessary for large river basin diversions. Major dams submerge some of the most fertile irrigated valleys. Major diversions also deprive downstream areas of irrigation, both because there is less river flow and there is less ground water recharge. Agriculture in the river basin is therefore deprived of both surface and ground water sources of irrigation when water is diverted.

Further, much irrigated land has gone out of cultivation due to ecological problems such as water logging and salination. These are caused by large scale intensive irrigation systems. New large irrigation projects therefore do not necessarily translate into more irrigated areas.

Large scale intensive irrigation does not lead to better agriculture or more food security. It is often forgotten that 75% of agriculture is under rainfed conditions and only about 25% is under irrigated conditions. It is estimated that even if all the available water resources are developed for irrigation, about 55 per cent of the cultivated area would still continue to be rainfed. Irrigation can be either protective or intensive. Organic agriculture or indigenous agriculture depends on protective irrigation. Chemical Farming and Industrial agriculture (the Green Revolution) are based on intensive irrigation and non-sustainable water use. Green Revolution varieties need 4 to 5 times more water than traditional crop varieties. This is why large dams have been built and ground water has been ruined.

Water conservation in agriculture depends on the following measures.

1. *Water Harvesting*. Indigenous water conservation systems including Khadin and Johads in Rajasthan, Ahars and Pynes in Bihar, Eris in Tamil Nadu, have given water security to agriculture in spite of rain as low as 167 mm in Rajasthan and 200-600 mm in the semi arid Deccan.
2. *Increasing in-situ soil moisture conservation.* Organic matter and mulching increases water retention in soils dramatically.
3. *Biodiversity and Mixed Cropping*. Biodiversity and mixed cropping conserves moisture by reducing evaporation, increasing conservation, and improving water use efficiency. Gram alone used 12.51 cum of water and gave 10.68 Q/ha with a water use efficiency of 0.85. Barley alone used 14.91 cum of water and gave 16.41 Q/ha with water use efficiency of 1.85. A mixture of barley and gram used 15.89 cum of water, yielded 17.92 Q/ha, and increased water use efficiency to 1.91.
4. *Crop Selection.* Green Revolution wheat use 5 times more water than indigenous wheat. Soya bean and Bajra needs 500 mm, while rice needs 1,200 mm and sugarcane 2,200 mm.

Green Revolution agriculture destroys water resources and hydrological balance at many levels.

1. Green Revolution varieties and hybrid seeds are thirsty, water demanding varieties, which lead to high water withdrawals from rivers and underground aquifers.
2. Green Revolution varieties are dwarf varieties, bred to have lower biomass in terms straw, which deprives the soil of organic matter, and hence reduces soil moisture conservation, increasing drought and desertification.
3. Green Revolution monocultures and industrial farming reduce crop cover, lead to higher soil and water loss, higher erosion, and higher evaporation.
4. The agrochemicals necessary for green revolution go to pollute ground water and surface water. Recent studies carried out by CSE have shown that all bottled water, which is withdrawn from ground water sources, is contaminated with pesticide residues.

Besides depleting and destroying water through overuse and pollution, commercially driven agriculture also destroys water resources by inducing a shift from

water conserving crops for food security, to water wasteful cash crops. Ground water resources of Maharashtra have been destroyed because of the World Bank induced shift from jowar and bajra to sugarcane.

Ground water resources of Warangal are being destroyed because of the Corporate driven shift from staples such as ragi and tur to hybrid cotton.

Food insecurity and water insecurity therefore go hand in hand, and food security and water security reinforce each other. The dominant industrial agriculture paradigm has reduced labour inputs and increased chemical and water inputs. With respect to water, agricultural productivity has actually declined. Water conservation demands that we measure productivity with respect to water use. Once we focus on conserving water, organic farming is more productive than industrial agriculture; millets are more productive than rice, and farmers breeding is more efficient than the green revolution.[18]

Food and Water are our most basic needs. Without water, food production is not possible. Traditionally, food cultures evolved in response to the water possibilities surrounding them. Water-prudent crops emerged in water-scarce regions and water-demanding ones evolved in water-rich regions.

The water-use efficiency of crops is influenced by their genetic variation. Maize, sorghum, and millet convert water into biological matter most efficiently. Millet not only requires less water than rice, it is also drought-resistant, withstanding up to 75 per cent soil moisture depletion. The roots of pulses and legumes allow efficient soil moisture utilization.

Since the Green Revolution, the crops that produce higher nutrition per unit of water used have been called inferior, and have been displaced by water-intensive crops. Water productivity has been ignored.

Industrial agriculture has pushed farmers to use methods by which the water retention capacity of soil is reduced, and the demand for water is increased. By failing to recognize water as a limiting factor in food production, industrial agriculture has promoted waste. The shift from organic fertilizers to chemical fertilizers and the substitution of water-prudent crops by water-thirsty ones have been recipes for water famines, desertification, water-logging, and salinization.

The advent of the Green Revolution pushed Third World agriculture toward wheat and rice production. The new crops demanded more water than millet and consumed three times more water than the indigenous varieties of wheat and rice. The introduction of wheat and rice has also had social and ecological costs. Their dramatic increase in water use has led to the instability of regional water balances. Massive irrigation projects and water-intensive farming, by adding more water to an ecosystem than what its natural drainage system can accommodate, have led to waterlogging, salinization, and desertification.

In the Krishna basin, waterlogging at the Malaprabha irrigation project led to farmer rebellions. Before the introduction of the irrigation project, the semi-arid region had produced water-prudent crops such as *jowar* and *pulses*. The sudden climatic change, the intensive irrigation, and the cultivation of water-demanding cotton aggravated the problem. Intensive irrigation of black cotton soils, whose water retention capacity is very high, quickly created wastelands. While irrigation has been viewed as a means to improve land productivity, it has had the opposite effect in the Malaprabha area.

The shift from rainfed food crops to irrigated cash crops like cotton in Andhra Pradesh was expected to improve the prosperity of farmers. Instead, it has led to debt. Farmers borrowed money from banks for land development and for the purchase of seeds, chemical fertilizers and pesticides. While farmers were struggling with unproductive land, banks were making payment demands. At the same time, irrigation authorities levied a development tax on water, known as a betterment levy. The latter increased from 38 cents to 63 cents per acre for *jowar,* and from 38 cents to over a dollar per acre for cotton. A fixed tax of 20 cents per acre was effective with or without water use.

Like wise, the Aral Sea, the world's fourth-largest freshwater body, has been ruined by unsustainable agricultural activity. Rivers that recharge the lake are increasingly diverted toward the irrigation of 7.5 million hectares of cotton, fruits, vegetables and rice. Over the past few decades, two-thirds of the water has been drained away, salinity has gone up six fold, and water levels have dropped by 20 metres. Between 1974 and 1986, the Syr Darya river never reached the Aral Sea.

Many proposals to solve the problem of agricultural water waste deny water for food production altogether. Industrial shrimp farming is a case in point. The most obvious and important impacts of industrial aquaculture are land and water salinization and drinking water depletion. Paddy fields once fertile and productive are turning into what local people call graveyards. This is true not just in India. In Bangladesh

too, where shrimp farming is widespread, the amount of rice production has dropped considerably. In 1976, the country produced 40,000 metric tons of rice; by 1986, production had plummeted to 36 metric tons. Thai farmers report similar losses, harvesting 150 sacks of rice per year instead of the 300 sacks they were harvesting before the introduction of shrimp farms to the region.

Another argument is that genetic engineering will resolve the water crisis but it obscures two important points. First, peasants in drought-prone regions had bred thousands of drought-resistant crops, which were eventually displaced by the Green Revolution. Second, drought resistance is a complex, multigenetic trait, and genetic engineers have so far not been successful in engineering plants that possess it. In fact, the GM crops currently in the field or in labs will aggravate the water crisis in agriculture. For instance, Monsanto's herbicide-resistant crops such as its Round-Up Ready soya beans or corn have led to soil erosion. When all cover crops are killed by Monsanto's herbicide Round-Up, rows of soya and corn leave soils exposed to tropical sun and rain.

Similarly, the heavily advertised Vitamin A-rich golden rice increases water abuse in agriculture. Golden rice contains 30 micrograms of vitamin A per 100 grams of rice. On the other hand, greens such as amaranth and coriander contain 500 times more vitamin A, while using a fraction of the water needed by golden rice. In terms of water use, genetically engineered rice is 1,500 times less efficient in providing children with vitamin A, a necessary vitamin for blindness prevention. The golden rice promise is infact "a blind approach to blindness prevention."

The myth of water solution by way of GM crops obscures the hidden cost of the biotech industry – the denial of fundamental rights of food and water to the poor. Investing in indigenous breeding knowledge and protecting the rights of local communities are more equitable and sustainable ways to ensure access to water and food to all.

Table 5a(1)
Average Water use (cm)

Crop	*Water Requirement*
Paddy	1,756
Millet	521
Groundnut	750
Turmeric	1,200
Sugarcane	3,200
Ginger	250

Table 5a(2)
Water use Efficiency (WUE)

Crop	*Water Requirement*	*Yield kg/ha*	*WUE (per m of water)*
Rice	1,200	4,500	3.7
Sorghum	500	4,500	9.0
Bajra	500	4,000	8.0
Maize	625	5,000	8.0
Wheat	400	5,000	12.5

Table 5a(3)
Water Requirement for Small Millet, Sugarcane and Rice

Crop	*Water Requirement*	
	Cubic metre/Hectare	*Cubic metre/tonne*
Millet	1,000	11 90.40
Sugarcane	30,000	400
Rice	14,000	6264

Tables 5a(1) and 5A(2) show the water use and water use efficiency for different crops. Water requirement per hectare and per tonne for sugarcane, rice, and millet is shown in table 5a(3). Table 5a(4) shows the millet production for the same amount of water, consumed by sugarcane and rice production in 2000 AD. Total millet production of about 570 million tonnes in a year by

Table 5a(4)
Comparison of Water use Efficiency and Food Security – Rice and Sugarcane with Millet

Crop	*Production Million Tonnes 2000 AD*	*Area Million Hectares 2000 AD*	*Water Million Cubic metres*	*Millet production for same water use*	
				Production Million Tonnes	*Area Milllion Hectares*
Sugarcane	300*	4.0	120,000	100.84	120
Rice	89.40	40.0	560,000	470.58	560

** Most of the Sugarcane is non-food component.*

using water resources efficiently will increase the food security of the country five fold without additional irrigation capacity. What the country needs is changes in cropping patterns and biodiversity conservation, not river linking.

Instead of transporting water by interlinking of rivers, we should learn to manage water efficiently. We must adopt crops, which can be grown with minimum water. But the farmers of the Thanjavur delta in Tamil Nadu keep growing three crops of water intensive paddy for short term commercial gain. In Tamil Nadu, 62% of the river basin grows rice thrice – Kuruvai, Thaladi and Samba. Studies have shown that if it limits itself to a single crop, it can get far higher yield than today's three crops taken together. In Karnataka, the farmers of Mandya have been cultivating sugarcane, a water intensive crop in the name of protecting their rights. Similarly, farmers in Punjab are cultivating paddy, the high water demanding crop and the farmers in Western UP and Maharashtra are growing sugarcane on a large scale. Now the governments of these States are looking to the myopic demand of the interlinking of rivers so that the farmers can grow more cash crops wastefully. Punjab farmers in Ludhiana district have reduced water use by 60% in paddy by mixed cropping, while increasing farm income. Reduced water use can ensure more prosperity.

5b. Major Irrigation Projects

Water is vital for realizing the full potential of the agriculture sector and the country's development. Optimum development and efficient utilization of our water resources, therefore, assume great significance. Average run-off in the river system of the country has been assessed as 1,869 km^3 . Of this, the utilizable portion is estimated as about 690 km^3. In addition, there is substantial replenishable ground water potential in the country estimated at 432 km^3. The per-capita availability of water has reduced from about 5,175 cubic metre in the year 1951 to the present level of 1,820 cubic metre. The situation may aggravate in the future due to the growing water scarcity in the river basins. Expansion of irrigation facilities along with consolidation of the existing systems has been the main strategy for increasing production of food grains. Irrigation support is provided through major, medium, and minor irrigation projects and command area development. With sustained and systematic development of irrigation, irrigation potential has increased from 22.6 mha in 1951. When the process of planning began in India, it increased to about 89.56 mha in 1997. Irrigation expense of the country is given in the tables 5b(1) and 5b(2). Map 5b(i) gives the source of irrigation in the country.

Table 5b(1)

Major and Medium Irrigation Projects (Expenditure Incurred and Potential Created)

Period	*Outlay/Expenditure (Rs. Crore)*	*Potential Created (mha)*	*Cumulative*
1	2	3	4
Pre-Plan period	Not available	9.70	9.70
First Plan 1951-56	376	2.50	2.50
Second Plan 1956-61	380	2.13	14.33
Third Plan 1961-66	576	2.24	16.57
Annual Plans 1966-69	430	1.53	18.10
Fourth Plan 1969-74	1,242	2.60	20.70
Fifth Plan 1974-78	2,516	4.02	24.72
Annual Plans 1978-80	2,079	1.89	26.61
Sixth Plan 1980-85	7,369	1.09	27.70
Seventh Plan 1985-90	11,107	2.22	29.92
Annual Plans 1990-92	5,459	0.82	30.74
Eighth Plan 1992-97	21,838	2.22	32.96

Table 5b(2)

Central Loan Assistance Released under Accelerated Irrigation Benefits Programme, 1996-99

(Rs. In crore)

S.No	*States*	*Amount released*		
		1996-97	*1997-98*	*1998-99*
1	Andhra Pradesh	35.25	74.00	79.67
2	Assam	5.23	12.40	13.95
3	Bihar	13.50	14.04	47.82
4	Gujarat	74.77	196.90	423.82
5	Haryana	32.50	12.00	-
6	Jammu and Kashmir	1.30	-	-
7	Karnataka	61.25	90.50	94.50
8	Kerala	3.75	15.00	-
9	Madhya Pradesh	63.25	114.50	90.75
10	Maharashtra	14.00	55.00	50.86
11	Manipur	4.30	26.00	10.78
12	Orissa	48.25	85.00	71.50
13	Punjab	67.50	100.00	-
14	Rajasthan	2.67	42.00	140.05
15	Tripura	3.77	5.10	3.97
16	Tamil Nadu	20.00	-	-
17	Uttar Pradesh	43.50	78.00	76.50
18	West Bengal	5.00	20.00	10.00
19	Goa	-	5.25	-
20	Himachal Pradesh	-	6.50	5.00
	Total	500.00	952.19	1,119.18

Major and Medium Irrigation Projects

Irrigation projects with a Culturable Command Area (CCA) between 2,000 and 10,000 hectares are classified as medium projects and those with a CCA of more than 10,000 hectares as major projects. The expenditure incurred on major and medium projects, and the irrigation potential created during the various plan periods are given in table 5b(1). At the end of the Eighth Plan, there were 162 major, 240 medium, and 74 extension renovations and modernization schemes continuing from the previous plans. These spilled over to the Ninth Plan, with a total spill-over cost of Rs. 79,317 crore.

Hydrology Project

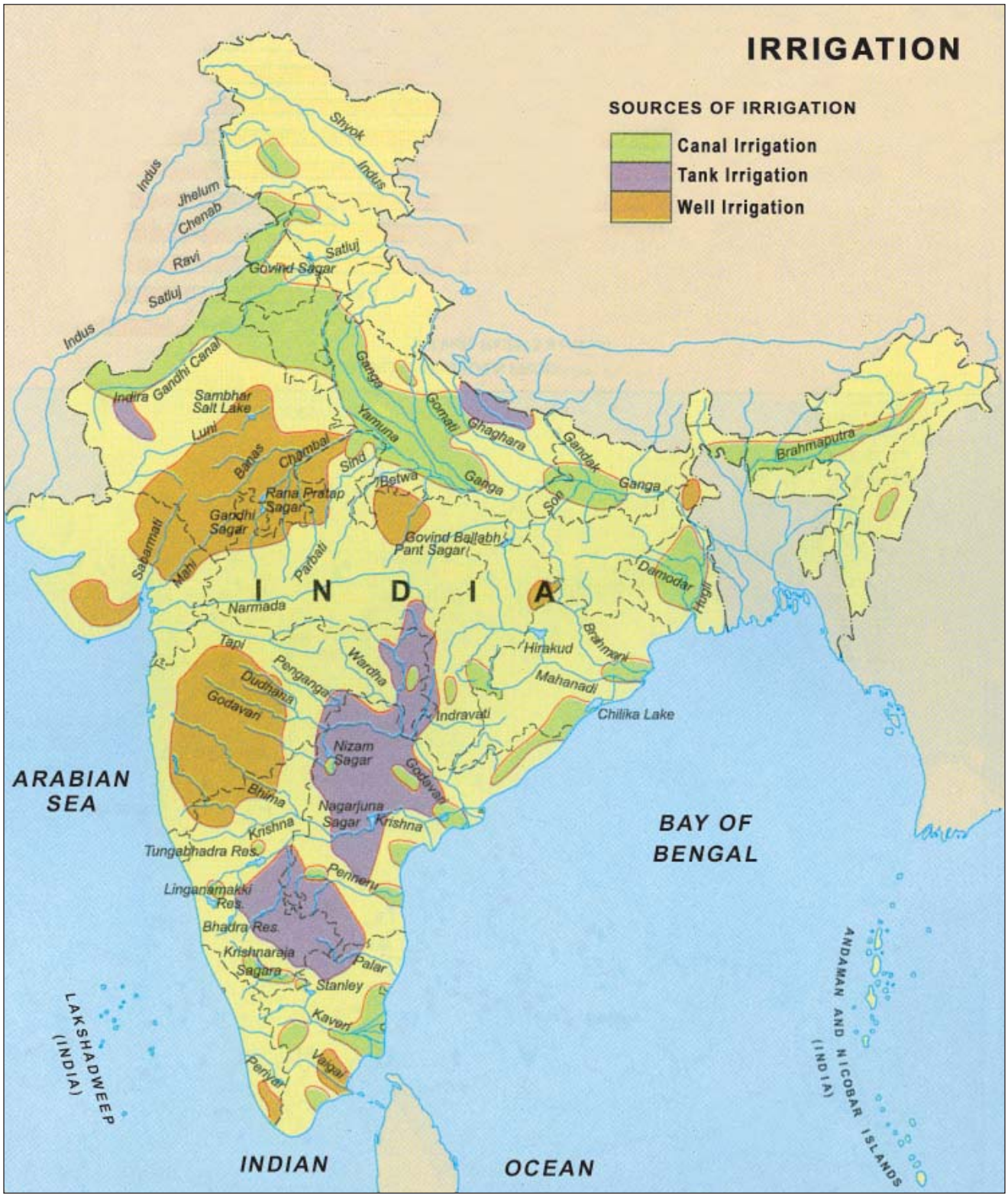
Hydrology Project has been launched for a period of six years beginning from 1995-96 at an estimated cost of Rs. 609.2 crore. The World Bank has extended a credit assistance of US dollar 142 million under the project. The projects cover the peninsular States of India, namely, Andhra Pradesh, Orissa, Maharashtra, Gujrat, Madhya Pradesh, Karnataka, Tamil Nadu and Kerala. The main objective of the project is to improve the infrastructure and staff capabilities of the Central and State agencies involved in surface and ground-water hydrology. The project area covers collection and management of hydrometric and water quality data, and the use of such data for water resources, evaluation and management.

Command Area Development Programme.

A Centrally-sponsored Command Area Development Programme was launched in 1974-75 with the objectives of improving the utilization of irrigation potential, and optimizing agricultural production from the irrigated areas by integrating all functions related irrigated agriculture.

Beginning with 60 major and medium irrigation projects in 1974, the programme included 217 irrigation

Map 5b(i)


IRRIGATION
SOURCES OF IRRIGATION
Canal Irrigation
Tank Irrigation
Well Irrigation
Shyok
Indus
Jhelum
Chenab
Ravi
Satluj
Govind Sagar
Indira Gandhi Canal
Sambhar Salt Lake
Luni
Banas
Chambal
Sind
Betwa
Rana Pratap Sagar
Gandhi Sagar
Sabarmati
Mahi
Parbati
Govind Ballabh Pant Sagar
Ganga
Yamuna
Gomati
Ghaghara
Gandak
Brahmaputra
Damodar
Hugli
Narmada
Tapi
Penganga
Wardha
Hirakud
Brahmani
Mahanadi
Chilika Lake
Indravati
Godavari
Nizam Sagar
Nagarjuna Sagar
Krishna
Tungabhadra Res.
Pennar
Linganamakki Res.
Bhadra Res.
Krishnaraja Sagara
Palar
Stanley
Kaveri
Vaigai
Periyar
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
LAKSHADWEEP (INDIA)
ANDAMAN AND NICOBAR ISLANDS (INDIA)

projects at the end of 1998-99 with Culturable Command Area (CCA) of 21.95 million hectares, spread over 23 States and two Union Territories. Since inception, an amount of Rs. 199385 crore has been released to the States as Central share for different activities of the Programme, while an amount of Rs. 175.77 crore was spent during 1998-99.

The programme involves execution of on-farm development works, like construction of field channels and field drains, land levelling and shaping, and conjunctive use of surface and ground-water. Warabandi, or the rotational system of water distribution, is undertaken with a view to ensure equitable and timely supply of water to the farmers. Adaptive trials, demonstrations and training of farmers are encouraged to disseminate technical know-how for establishing suitable cropping patterns, improved farming practices, and for maintaining soil health.

Under the Programme, the Ministry is trying to shift the management pradigm from fully state managed systems to farmer managed systems by encouraging farmers' participation in the management of irrigation. As an incentive, an one-time functional grant of Rs. 500/ha (Rs. 225/ha by Centre, Rs. 225/ha by State and Rs. 50/ha by Farmers' Association) is provided to the registered and functional Farmers' Associations. Reclamation of waterlogged areas in irrigated command areas is also an important component of the Programme.

Minor Irrigation

All ground-water and surface schemes having Culturable Command Area (CCA) up to 2,000 hectares individually are classified as minor irrigation schemes. The development of ground-water is mostly done through individual and cooperative efforts of the farmers with the help of institutional finance and through their own savings. Surface minor irrigation schemes are generally funded from the public sector outlay. Irrigation potential created and utilised under minor irrigation during the various plan periods are given in table 5b(3).

Table 5b(3)
Irrigation Potential Created and Utilised under Minor Irrigation

(In million hectares)

Plan	*Potential*	*Utilisation*
At the end of the Pre-Plan upto 1951	12.90	12.90
First Plan (1951-56)	14.06	14.06
Second Plan (1956-61)	14.75	14.75
Third Plan (1961-66)	17.00	17.00
Annual Plans (1966-69)	19.00	19.00
Fourth Plan (1969-74)	23.50	23.50
Fifth Plan (1974-78)	27.30	27.30
Annual Plans (1978-80)	30.00	30.00
Sixth Plan (1980-85)	37.52	35.25
Seventh Plan (1985-90)	46.61	43.12
Annual Plan (1990-92)	50.35	46.54
Eighth Plan (1992-97) (Provisional)	56.60	52.32
During 1997-98	00.80	01.44

5c. Major Dams

Land alienation since independence has been primarily the result of unsustainable agricultural and development policies such as construction of large dams and takeover of people's land for infrastructure purposes, including urban housing. During the last fifty years, an approximate 30 million people have been displaced due to "development" projects. In Orissa, about 1.5 lakhs were deprived of their livelihood in the name of national development, between 1951 and 1995. Forty-two per cent of them are

tribal people. An approximate 91544,257 acres of land has been alienated from tribals alone. Only 32% of all the displaced persons, and fewer than 25% of the tribal dispossessed persons were resettled, at least partially. The rest were impoverished and often turned into bonded labourers.

Big dams have several effects on the environment and the people, which are not foreseen during the planning of these projects. One of the most important of these effects is the degradation of soil in the command areas of irrigation projects, due to increase in soil salinity and water logging. The life of the Tehri reservoir may turn out to be only 30–40 years instead of 100 years.

Table 5c(1) gives the State-wise and river-wise distribution of large dams. Table 5c(2) lists Himalayan river dams which are higher than 100 metre. Heavy siltation has substantially reduced the storage capacity and life span of many reservoirs. Siltation rates in the tables 5c(3) and 5c(4) show that the rates observed were many times higher than the prediction. As a result, reservoirs are incapable of absorbing heavy floods and have to resort to panic discharges.

Map 5c(i) shows the major hydel thermal and atomic power in the country. Natural vegetation including forest and National Parks and wild life Sanctuaries are shown in maps 5c(ii) and 5c(iii). The interlinking of rivers will cause irreversible damage to the natural vegetation, parks and sanctuaries. The grandiose projects will also snatch the land from poor tribals.

Land is the basis of agriculture; today more than 70% of India's people depend on agriculture for their survival. The constitution has also been amended (the 73rd Amendment, and Extension Act in 1996) to allow tribal people to have total rights over their natural resources, including land together with the right to manage it. "Let it not be said of India that this great Republic in a hurry to develop itself, is devastating the green mother earth and uprooting our tribal populations," said Former President K. R. Narayan in his address on the eve of Republic day in 2001.

India has over 4,000 large dams. Three quarters of India's dams are in the three States of Gujarat, Maharashtra and Madhya Pradesh, and most at them are for irrigation. Till 1994, all dams were built without an environmental impact assessment (EIA). EIA become statutory only in 1994.[12]

Estimates of those displaced by large dams in India in the last 50 years vary from 21 to 56 million people. Forty per cent of those displaced are adivasis (tribal people). Some time they are even more; for instance, in the Sardar Sarovar Project area, the proportion of the tribal was about 56%. Less than 50% of people displaced by large projects are rehabilitated. Construction occurs under the Official Secrets Act, access is denied, information is withheld, participation is non-existent. The costs of dams are systematically underestimated and their benefits are inflated. Accepted cost benefit ratio for large dams is not met in 8 out of 10 cases. Heavy silting shortens the life of many dams. There have been 17 cases of earthquake tremor induced by large reservoirs in India

Studies have shown that the submergence of the villages and the agricultural land is much more than actually intended; sometimes, even two to three times. More than 50% of those displaced by large projects have been pauperized; many times, the proportion is closer to 100 per cent. This includes farmers, adivasis, non-adivasis, and other communities. People also starve to death or die of hopelessness. Most became rural paupers or ended up as the cheapest of labour. Self-sufficient farmers who once had self respect became lowly servants of others, grateful for a job as a watchman.

For every 10 displaced persons (DP), dams deprive six more of their livelihood without displacing them. Government officials usurps the large portion of the compensation amount. The consequence of the displacement is nothing but misery. For example, some 30,000 of the 150,000 construction workers of the Asiad Village in 1982 were bonded labours from Orissa and Chattisgarh, brought to Delhi by labour contractors with the promise of job in Baghdad. They had been displaced by Hirakud Dam and other projects.

As a result of some awareness about the Land Acquisition Act (LAA); people have started demanding their rights. The compensation has to be paid according to the replacement value. The draconian LAA ignores this basic issue. A new law that is favorable to the victim of development has to be enacted. The Act should begin by solving the problem of the millions of DPs of past projects who have not been settled.[13]

Table 5c(1)
State-wise and River-wise Distribution of Large Dams

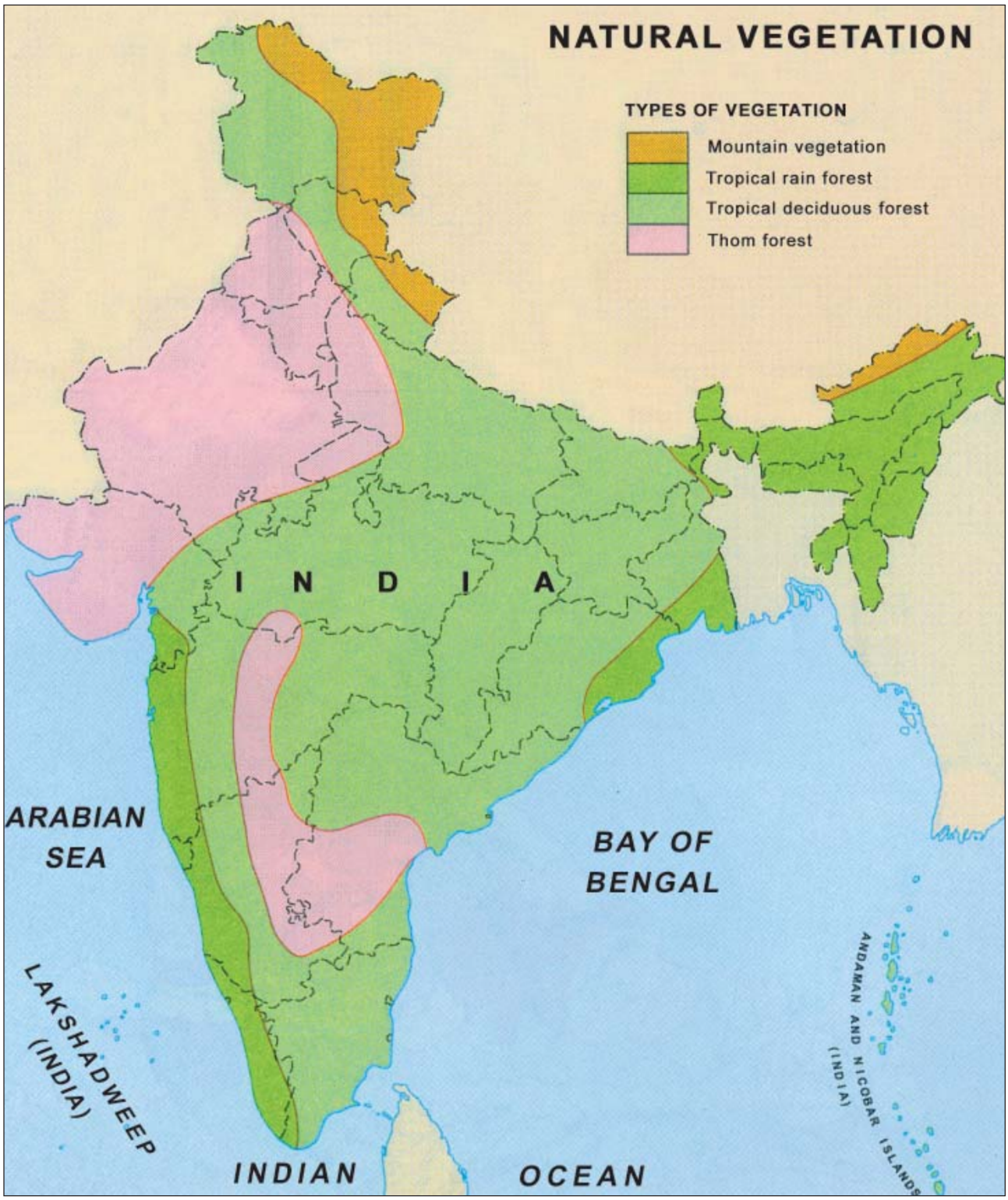
State	*Name of River*	*Name of Dam*
Andhra Pradesh	Godavari	Sriram Sagar dam
	Kaddam (tributary of Godavari)	Kaddam dam
	Krishna	Nagarjuna Sagar dam
	Krishna	Srisailam hydroelectric project
	Machkund	Jalaput dam
	Sileru	Forebay dam
Bihar	Badua	Badua reservoir
	Barakar	Maithon dam
	Barakar	Tilaiya dam
	Chandan	Chandan reservoir
	Damodar	Panchet hill dam
	Damodar	Tenughat dam
	Konar	Konar dam
	Subarnarekha	Getalsud dam
Gujarat	Banas	Dantiwada dam
	Machhundri	Machhundri irrigation scheme
	Mahi	Kadana reservoir
	Raval	Raval irrigation scheme
	Sabarmati	Dharoi dam
	Sakra	Tapar dam
	Shetrunji	Shetrunji irrigation scheme
	Tapi	Ukai dam
Himachal Pradesh	Beas	Beas dam at Pong
	Beas	Pandhoh dam
	Sutlej	Bhakra dam
Karnataka	Arkavally and Kumudwathy,	Chamarajasagar dam
	Bhadra	Bhadra reservoir
	Ghataprabha	Hidkal dam
	Harangi	Harangi reservoir
	Kabani	Kabani dam
	Krishna	Narayanpur dam
	Main Cauvery	Krishnarajasagar dam
	Malaprabha	Indira Gandhi dam
	Sharavathy	Linganamakki dam
	Talakalale	Talakalale dam
	Tungabhadra	Tungabhadra dam
	Vedavati	Vani Vilasa Sagar dam
Kerala	Ayalar	Pothundy dam
	Karuvannur	Peechi dam
	Malampuzha	Malampuzha dam
	Neyyar	Neyyar dam
	Periyar	Idukki dam
	Wadakkancherry	Vazhani dam
Madhya Pradesh	Barna	Barna dam
	Chambal	Gandhi Sagar dam
	Mahanadi	Mahanadi reservoir project
	Tawa	Tawa dam
Maharashtra	Ambi	Tanaji Sagar dam
	Aner	Aner dam
	Bagh	Sirpur dam
	Bhogawati	Radhanagari dam
	Boladwadi Stream	Kolkewadi dam
	Garvi	Itiadoh dam
	Godavari	Paithan dam
	Kadwa	Karanjwan dam
	Katepurna	Katepurna dam

	Koyna	Koyna dam
	Krishna	Dhom dam
	Mula	Mula dam
	Mutha	Khadakwasla dam
	Nirguna	Nirguna dam
	Pawna	Pawna dam
	Pench	Kamthikhairy dam
	Pravara	Wilson dam
	Purna	Sidheshwar dam
	Purna	Yeldari dam
	Pus	Pus dam
	Waghadi	Waghadi dam
	Wuna	Kanholi dam
	Yelwandi	Bhatghar dam
Orissa	Kolab	Upper Kolab dam
	Machkund	Balimela dam
	Mahanadi	Hirakud dam
Rajasthan	Chambal	Jawahar Sagar dam
	Chambal	Rana Pratap Sagar dam
	Gomti	Jaisamand tank
Tamil Nadu	Aliyar	Upper Aliyar dam
	Amaravati	Amaravathi dam
	Avalanche Stream	Avalanche dam
	Bhavani	Lower Bhavani dam
	Bhavani	Upper Bhavani dam
	Cauvery	Mettur (Stanley) dam
	Emerald	Emerald dam
	Gatanandi	Gatana dam
	Karuppanadhi	Karuppanadhi dam
	Kodayar	Kodayar dam I
	Kodayar	Kodayar dam II
	Kodayar	Peechiparai dam
	Kundah	Kundapalam dam
	Manimuthar	Manimuthar dam
	Mukurthi	Mukurthi dam
	Nirar	Lower Nirar dam
	Palar	Thirumurthi dam
	Palar-Porandalar	Palar Porandalar dam
	Paralayar	Perunchani dam
	Parambikulam	Parambikulam dam
	Parappalar	Parappalar dam
	Parson's Valley Stream	Parson's Valley dam
	Pegumbahalla	Pegumbahalla dam
	Periyar	Periyar dam
	Ponnaiyar	Sathanur dam
	Porthimund Stream	Porthimund dam
	Ramanadhi	Ramanadhi dam
	Sandy Nullah Stream	Sandy Nullah dam
	Sholayar	Sholayar dam
	Thambraparani	Thambraparani dam
	Tributary of Karampuzha	Western catchment no.2 dam
	Vaigai	Vaigai dam
	Varahapallam West	West Varahapallam dam
Uttar Pradesh	Betwa	Matatila dam
	Bhagirathi	Maneri Bhali hydroelectric project (stage 1)
	Ramganga	Ramganga dam
	Rihand	Obra dam
	Rihand	Rihand dam
	Tons	Ichari dam
West Bengal	Kangsabati and Kumari	Kangsabati-Kumari dam
	Mayurakshi	Massanjore dam

Map 5c(i)


POWER PROJECTS
MAJOR POWER PROJECTS
Hydel
Thermal
Atomic
Lower Jhelum
Pong
Bhakra
Bathinda
Yamuna
Panipet
Ramganga
Delhi
Narora
Faridabad
Harduaganj
Rajasthan Atomic Power Station
Panki
Parichha
Rana Pratap Sagar
Kota
Ganghi Sagar
Gandhinagar
Vanakbari
Sabarmathi
Ahmadabad
Dhuvaram
Satpura
Koradi
Bhusawal
Tarapur
Nashik
Trombay
Uran
Tata
Parli
Chandrapur
Ramagundam
Koyna
Kottagudem
Nagarjuna Sagar
Srisailam
Kalinadi
Jog
Sharavathi
Ennur
Kalpakkam
Mettur
Neyveli
Idukki
Periyar
Sabarigiri
Tuticorin
Kodayar
Obra
Singrauli
Rihand
Barauni
Amarkantak
Subernarekha
Bokaro
Chandrapura
Durgapur (DVC)
Santaldih
Kolkata
Korba
Hirakud
Talcher
Balimela
Sileru
Vijayawada
Namrup
Bongaigaon
Loktak
I N D I A
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
LAKSHADWEEP (INDIA)
ANDAMAN AND NICOBAR ISLANDS (INDIA)

Map 5c(ii)


NATURAL VEGETATION
TYPES OF VEGETATION
Mountain vegetation
Tropical rain forest
Tropical deciduous forest
Thom forest
I N D I A
ARABIAN SEA
BAY OF BENGAL
LAKSHADWEEP (INDIA)
INDIAN OCEAN
ANDAMAN AND NICOBAR ISLANDS (INDIA)

Map 5c(iii)


NATIONAL PARKS & WILDLIFE
National Parks
Wildlife Sancturies
Karakoram
Salim Ali
Dachigam
Kishtwar
Ramnagar
Kugti
Great Himalayan
Govind Sagar
Rupi Bhawa
Harike
Abohar
Kedarnath
Rajaji
Nanda Devi
Corbett
Sultanpur
Dudwa
Khangchendzhonga
Moiling
Mehao
Desert
Sariska
Katerniaghat
Sonal Rupai
Pabha
Keoladeo Ghana
Sohagbarwa
Jaldapara
Kaziranga
Ranthambore
Madhav
Manas
Fakim
Mount Abu
Ranipur
Bhimbandh
Nokrek
Chandra Prabha
Narayan Sarovar
Gandhi Sagar
Panna
Kaimur
Siroy
Hazaribagh
Keibul Lamjao
Wild Ass
Van Vihar
Bandhavgrah
Sanjay
Palamau
Trishna
Murlen
Satpura
Nal Sarovar
Kanha
Dalma
Gir
Pachmarhi
Yaval
Melghat
Pench
Simlipal
Nawegaon
Sitanadi
Ushakothi
Gautala
Karlapat
Bhittarkanika
Sanjay Gandhi
Chilika Lake
ARABIAN SEA
Karnala
Indravati
Kawal
BAY OF BENGAL
Koyna
Eturnagaram
Chandoli
Papikonda
Radhanagari
Kolleru Lake
Ghataprabha
Nagarjuna Sagar
Dandeli
Anshi
Ranebennur
Sharavathi
Sri Venkateswara
Pulicat
Bannerghatta
Guindy
Ranganathittu
Vedantangal
Nagarhole
Bandipur
Wayanad
Mudumalai
Silent Valley
Indira Gandhi
Kodikkarai
Idukki
Periyar
Marine
Mundanthurai
LAKSHADWEEP (INDIA)
ANDAMAN AND NICOBAR ISLANDS (INDIA)
INDIAN OCEAN

Table 5c(2)
Himalayan River Dams higher than 100 m.[14]

S.No.	*Dam*	*River*	*Height (Metres)*
1	Bhakra	Sutlej	226
2	Pandoh	Beas	116
3	Kalagarh	Ramganga	126
4	Pong	Beas	133
5	Thein	Ravi	147
6	Kothar	Kosi	155
7	Kishau	Tons	253
8	Tarbela	Indus	143
9	Mangla	Jhelum	118
10	Tehri	Bhagirathi	260.5

Table 5c(3)
Annual Rate of Siltation in Select Reservoirs (in Acre Feet)

S.No.	*Reservoir*	*Assumed Rate*	*Observed Rate (Acre Feet)*	*Ratio of Assumed Rate to observation*
1	Bhakra	23,000	33,475	1.45
2	Mauthon	684	5,980	8.75
3	Mavura Kashi	538	2,000	3.71
4	Nizamsagar	530	8,725	16.46
5	Panchet	1,982	9,533	4.82
6	Ramganga	1,089	4,366	4.009
7	Tungabhadra	9,796	41,058	4.19
8	Ukai	7,448	21,758	2.92

Table 5c(4)
Estimated and Actual Rates of Siltation of Dams in Jharkhand (in Acre Feet)

Project	*Estimated Siltation rate*	*Actual Siltation rate*	*Ratio of Actual Estimated*
Masanjor	538	2,000	3.7
Maithar	684	5,980	8.74
Panchet	1,982	9,533	4.8

In the case of tribal areas, the provisions of the Panchayats (Extension to Scheduled Areas) Act, 1996 empowers the Gram Sabha to manage all resources within its jurisdiction according to its customs and traditions. The Extension Act is the most radical law of the 20th century.

In its landmark judgment passed in 1997 in the Samata case, Supreme Court upheld that the government land, tribal land and forest land in the scheduled areas cannot be leased out to non-tribal or private companies.

Some of the important points laid down by the court are:

i) Government lands, forest lands and tribal lands in Scheduled Areas cannot be leased out to non-tribals or to private companies for mining/industrial operations.

ii) The SC also recognised that under the 73rd Amendment and the Panchayat (Extension to Scheduled Areas) Act, the Gram Sabhas are competent to preserve and safeguard community

resources and reiterated the right of self-governance of adivasis.

iii) In States where similar Acts do not totally prohibit granting of mining leases to the lands in the Scheduled Areas, similar Committees of Secretaries, and State Cabinet Sub-Committees should be constituted and decision on the issue taken thereafter.

iv) Before granting leases, it would be obligatory for the State government to obtain concurrence of the Central Government. The centre would, for this purpose, constitute a Sub-Committee consisting of the Prime Minister of India, Union Minister for Welfare, and Union Minister for Environment so that the State's policy would be consistent with the policy of the nation as a whole.

v) It would also be open to the appropriate legislature, preferably after a thorough debate/ conference of all the Ministers concerned, to take a policy decision so as to bring about a suitable enactment in the light of the guidelines laid down above. This was so that there would emerge a consistent scheme throughout the country, in respect of the tribal lands under which national wealth in the form of minerals is located.

vi) Finally the SC also ruled that at least 20% of the net profits should be set up apart as a permanent fund as part of business activity for establishment and provision of basic facilities in areas of health, education, roads and other public amenities.

The estimated numbers of people predicted to be displaced by large dams is very low when compared to actual numbers of people displaced.

Given the massive scale of displacement, the state machinery invariably resorts to violence in the face of people's resistance to being deprived of their resource base for sustenance.

Almost a million people are being displaced because of the Tehri Dam; the figures quoted by government are based on the outdated 1973 census. In Sardar Sarovar Project, about 38,000 hectares of land has been submerged, affecting 245 villages and displacing 200,000 people. Maheshwar dam, in the heart of Nimad region of Madhya Pradesh, displaced 35,000 persons involving 61 villages.

Koel Karo: Offering Tribals at the Altar of Profits

The Koel-Karo Hydroelectric Project, on the rivers Koel and Karo in Jharkhand, is projected at generating 710 MW through the damming of the rivers, and linking them by a 34.7 km long canal. The area is inhabited by three culturally distinct tribal groups – the Munda-Khadia, the Kudukh and the Sadan, who have a close relationship with their land and all that grows and lives on it. A traditional governance system, called padha, controls their social life and facilitates community decision making.

Agriculture is the primary economic resource. The forest provides supporting subsistence and economic sustenance, such as material for housing, for agricultural implements and for the traditional system of healing, which is the prominent system in the area. The prominent economy of the area is not cash based, but of a subsistence kind, dependent on locally available natural resources. The project, begun 30 years ago has yet seen no construction.

There is no official accurate data on displacement of tribal people. A rehabilitation report prepared by the Collector of Ranchi in 1986 estimated that 7,063 households, spread over 112 villages would be affected by the project. According to the Koel-Karo Project Director, only 4,700 households from 42 villages will be affected. The Rehabilitation Plan of the Directorate of Rehabilitation and Land Acquisition, Department of Energy, Ranchi reads as follows :

Table 5c(5)
Estimated and Revised Oustee Figures for Dams and Irrigation Projects

Project	*Original estimate (Year)*	*Revised estimate (Year)*
Andhra Pradesh Irrigation II	63,000 (1986)	150,000 (1994)
Gujarat Medium Irrigation II	63,600	140,370 (1994)
Karnataka Irrigation	20,000 (1978)	240,000 (1994)
Madhya Pradesh Medium Irrigation	8,000 (1981)	19,000 (1994)
Sardar Sarovar	33,000 (1985)	320,000 (1993)
Upper Indravati	8,531	16,080 (1994)

The reservoir to be created would displace 26 villages in Gumla District, affecting 3287 families; and 1157 families in 16 villages of Ranchi district. The project compels displacement of nearly 25,000 persons, comprising 4,995 families as per the 1981 Census in 41 villages. A good 70% of the displaced persons are members of the Scheduled Tribes, 5% belongs to the Scheduled Castes and the remaining to other categories.

The Koel Karo Jan Sangathan estimates that 256 villages, with a population of 150,000, 90% of whom are tribals, are going to be affected.

Approximately 66,000 ha of land will be submerged, of which half is under cultivation. The remainder is under forests, and has around 152 sacred groves and 300 ancestral burial sites, all of which would be submerged.

The Koel Karo Project, which is destroying thousands of acres of pristine forests and prime agricultural land as well as rich forest biodiversity (fruit, timber, tubers and medicinal herbs as well as animals) and agricultural biodiversity (several indigenous varieties of paddy and other crops), has yet to receive proper environmental clearance. Since 1994, all projects that are likely to acquire more than 10 ha must have proper environmental impact analysis, based on Social Cost and Benefit analysis.

A primary environmental concern regarding the project is that the water levels, rates of flow, and the course of the Koel and Karo rivers have changed considerably over the past 30 years, since the sanction was given. This could lead to increased siltation rate and reduce the storage capacity of the dam as well as the overall life of the project.

The government's attempts to amend the *Land Acquisition Act, 1894* accelerated in 1998 when the Union Cabinet approved the *Land Acquisition (Amendment) Bill* prepared in 1998, and deferred the draft of the National Rehabilitation and Resettlement Policy for Displaced Persons prepared in 1994, thus exposing the real intentions of the welfare state to appease big business interests and multinationals ignoring the plight of 50 million people who already are displaced and millions who will be displaced in future (see table 5c(5). This move by the government was stalled by people's organisations, social activists, lawyers and concerned citizens who made hue and cry about the bill. As a result, the Ministry of Rural Development was forced to convene a meeting of experts, activists working with the displaced people, and government officials on 21st January 1999. In the meeting, the concept of eminent domain (the right of the state to its property is absolute) and public purpose (including industrial estates, private, national and multinational corporations) were challenged.

Since then the *Land Acquisition (Amendment) Bill, 2000* has been introduced in parliament. The main purpose of the Bill is to acquire land for private business interests without recognizing resettlement and rehabilitation rights of displaced people. It is being submitted to the Union Cabinet. The entire process is shrouded in secrecy, with a view to undermine people's right over livelihood resources.

Salient Features of the alternative "Land Acquisition, Rehabilitation and Resettlement Bill 2000," drafted by Voluntary Organisations are given below:

- The process of land acquisition is made justifiable by including provisions for rehabilitation and resettlement in the draft.
- The doctrine of eminent domain is replaced by Principle of Trusteeship where government is a trustee of the property and has a moral and legal responsibility to justify that the acquisition is for the welfare of the people.
- The concept of public purpose has been defined as where acquisition of land for private companies that work for profit cannot be considered public purpose.
- The term 'project affected person' is defined to include displaced persons, partially displaced persons and other affected persons deprived of livelihood resources (rural artisans, traders, collectors of non wood forest produces, etc):
- Detailed provision about the publication of notices and notifications (under different sections of the draft 612161725 and 51) is laid down for the benefit of the concerned person.
- Provision is made for getting information at different stages regarding the nature of the project, cost/ benefit analysis, extent of acquisition and displacement, to raise objections.
- Government will approve the project only after obtaining consent of the gram sabha. The gram sabha has the right to give or withhold its consent. In case of scheduled areas, by following the *Panchayat (Extension to Scheduled Areas) Act*, the gram sabha will be deemed to be concerned even if one household from the area of the gram panchayat is affected.

- 'Adult members' includes both men and women of the household. The allotted lands should be in the joint names of husband and wife. In any public hearing on the project related matters, 50% of the participants should be women.
- The amount of the solatium will be equal to the value of compensation awarded, i.e., 100%. If persons and households are displaced for the second time within a period of 30 years an additional amount of solatium will be paid.
- The State Land Acquisition and R&R Commission will monitor the implementation of the Act. The persons displaced before the commencement of this Act shall also get some relief.
- There shall be provision for special officer for the collection of data on displacement since independence at State as well as national level.
- National Land Acquisition and R&R Commission shall deal with households displaced in two or more States.
- The process of land acquisition to be completed within 18 months of the notification of the intention of acquisition. If the land is not acquired within stipulated time, the notification is deemed to be invalid. If the land is to be acquired again, the entire procedure will have to be repeated.
- Land acquired for specific purpose cannot be utilised for another purpose.
- Displacement shall not take place unless the compensation and solatium is paid, an alternate land is allotted, and R&R process is completed. ■

6. WATER RIGHTS

6a. Whom Does Water Belong To?

"BIG IS BEAUTIFUL," A Colonial Military Legacy

While water wells and irrigation systems in India are ancient, building big was a colonial legacy.

In the early period of colonial rule, irrigation was the responsibility of the Engineer corps of the East India Company under the overall charge of the Military Board.

In 1854, the Public Works Department (PWD) replaced the Military Board. However, Military Engineers continued to execute irrigation projects. Arthur Cotton, Col. T Cautley, S L Jacob and John Colomn were among the army engineers who played a major role in developing irrigation systems.

These systems proved so profitable that two private companies were floated in England to exploit the irrigation potential in India: the East India Irrigation Company and the Madras Irrigation Company. However, these profit driven enterprises did not survive and were taken over by government.

Under the Montague Chelmsford Reforms and the Government of India Act, irrigation became a provincial, but reserved subject, with control of Secretary of State. With the Government of India Act 1935 irrigation became a transferred subject falling within the sole legislative competence of the provinces.

Usurping Power from the States

Entry 17, list 11 of the seventh schedule of the Constitution recognizes the primary role of the States over water. It says: "Water, that is to say, water supplies, irrigation and canals, drainage and embarkments, water storage and water power subject to provisions of entry 56 of list I. Entry 56, list I gives Centre the responsibility of "regulation and development of interstate rivers and river valleys to the extent to which such a regulation of development under the control of the Union is decided by Parliament by law to be expedient in the public interest."

Beyond legislating the River Boards Act, the Centre hardly had any power in the matter of water development. However, the River linking project allows the Centre to usurp the power of States and will be a major source of Centre-State conflicts.

Usurping Power from People

The 73–74th Amendment and the Extension to Scheduled Areas give local communities (gram sabha) rights to local water resources.

In any case, in common law, water is common property. Johads and tanks have traditionally been managed by communities. Mysore had a "Tank Panchayat Act" for community management of water resources.

The regulation of water systems in Rajasthan, Gujarat and Madhya Pradesh in contemporary times is based on communities mobilizing as collective, working for the common good, conserving and utilizing water as commons.

The River Linking Project usurps the rights of local communities, allows a Centralized State to act undemocratically on the principle of the eminent domain in violation of the public trust doctrine and it creates conditions for transfer of a common property to private ownership. It is, in effect, an enclosure of the hydrological commons.

Community control over common resources represents the only real mechanism for ensuring sovereign control over natural resources. This framework does not determine how community norms function. It merely recognizes the rights of communities and hence opens the legal option of limiting the rights of corporations. National legislation needs to recognize community rights.[19]

Justice Krishna Iyer stated in the closing address a seminar on *Intellectual Property Rights, Community Rights and Biodiversity* organized by the Research Foundation for Science, Technology and Natural Resources Policy at Delhi on February 20, 1996:

"All of us have been progressing on the Ango-Saxon jurisprudential assumption that only

individuals had any rights. We have to revise our notions about community wealth, community rights and community property. The village communities in India have rights, they have legal persona, they can go to court, they can fight for defense of what they have as a community. Collectivity itself is the persona. It is time that we introduce this into the jurisprudence that is being taught. And communities are fluctuating bodies but they have a certain identity. This right is embodied in the hierarchy of democratic institutions where the gram-sabha which is above all, even parliament. It is natural right. Such a community right has already been recognized by the highest court of Australia which had held that the occupation and colonization of Australia by Britain did not take away the rights of the aboriginals as no compensation was given."

Community rights are sacrosanct because the Preamble of the Indian Constitution speaks of 'We, the People of India individually and collectively.' Article 38 of the Indian Constitution speaks of the social order and not of individual rights and imposes on the state 'the bounden duty to guarantee the preservation of a social order that is just'.

Further, Article 51 (a) of the Constitution states: 'It shall be the duty of every citizen of India to value, cherish and preserve the rich heritage of our composite culture.' India has an agricultural culture, a water culture, a medicinal culture, a herbal culture, a curative culture, a pharmaceutical culture, a therapeutic culture, a psychic culture, a national culture. 'It is impossible, therefore, to conceive of Indians abdicating the fundamental duty of not fighting to preserve their culture'.

For the first time, after 50 years of India's Independence, a significant step has been made by the introduction of the Provisions of the Panchayats (Extension to the Scheduled Areas) Act 1996, whereby the village communities (gram sabha) have been granted legal recognition as a community entity. It has also recognized control over their commons. This new law (which provides as extension to the provision of Part IX of the Constitution of India) for the scheduled areas, came into force on December 24, 1996. It envisages village communities (gram sabha) as being the basic unit of the self-governing system. According to Section 4(b):

> *A village shall ordinarily consist of a habitation or a group of habitations, or a hamlet or a group of hamlets comprising a community and managing its affairs in accordance with traditions and customs.*

In this formulation, it is the community which has been accorded the formal status of gram sabha. Moreover, the village community as gram sabha has also been endowed with specific power. These powers include management of community resources, resolution of disputes, approval of plans and programmes and also mandatory consultation before the acquisition of the land. Conferral of certain other powers on the gram sabha concerning vital matters such as ownership of minor forest produce, enforcement of prohibition, restoration of unlawfully alienated lands, control over money lending and marketing, etc., has been made mandatory under the Provisions of the Panchayats (Extension to the Scheduled Areas) Act 1996.

According to this Act, State legislature shall make suitable laws accordingly, within a period of one year. Any such law of the State not in consonance with the provisions of this Act shall become invalid thereafter.

The Act accepts the traditions of the people and their cultural identity in the key opening formulation under section 4, sub-section (a). But can the cultural identity of a people be sustained without honouring their traditional relationship with their habitat, comprising the natural resources, the very foundation of their community life? This has been provided for the first time in Indian legal history. Section 4(A) states that:

> *a state legislation on the panchayats that may be made, shall be in consonance with the customary law, social and religious practices and traditional management practices of community resources.*

It is important to note that the significance of command over community resources has been recognised not in isolation, or as a mere economic issue, but in relation to the cultural identity of the people. Moreover, sub-section (d) of section 4 also sates:

> *every gram sabha shall be competent to safeguard and preserve the traditions and customs of the people, their cultural identity, community resources and the customary mode of dispute resolution.*

Thus, through the new Act, the sate recognises the relationship between the communities and the commons, hence bestowing a very significant and pivotal role to the village communities to safeguard their interests and empowering them to meet the challenges, both from within and outside.

The importance and significance of the *Provisions of the Panchayats (Extension to the Scheduled Areas) Act of 1996* to the recovery of the commons in India cannot be over-emphasised.

Local common management of the water resources has been a historic reality in India. Several examples of the community control and management of the water resources are still found in some parts of India. There are also examples of community efforts to create an ecological and equitable system of water use in dry regions and droughts prone areas.

For example, the villages and tribal communities in some areas of Maharashtra have taken a revolutionary step to establish their rights over water through a movement called 'Pani Panchayat' launched in 1972 by the Gram Gourav Pratisthan (GGP). In the Pune district of Maharashtra, the rainfall is rather scanty therefore, the area usually faces water scarcity. With a view to meet the serious situation, people in the area prepared a plan and decided to capture the water where it touches the ground and to use it optimally. The question of rights over the use of water was amicably resolved and it was decided that everyone in the village could have equal rights over the water for irrigation, irrespective of the size of land they may have.

Therefore, a landless person could either sell his share of water to a land owner or he could use that water in a field in accordance with an arrangement with the land owner in which both of them can share its benefits. While members of the panchayat were free to decide how to use their water allocation, sugarcane (an important cash crop in this drought affected region) cultivation was completely banned as being inconsistent with the principles of responsible resource use. A suitable 'Patkari', or water distributor, was appointed by the Pani Panchayat to assure fair day to day allocations of water to all its beneficiaries.

The experiments of the Pani Panchayat have demonstrated that it is possible to treat water as a common resource, not as private property, and that community management of a scarce common resource is necessary to ensure justice and sustainability.

Another initiative in the community management over water resources was found in the village Prithvipur (Vijaypur Tehsil of Sabahautha district of Gujarat). Due to scarcity of water, the village people decided to dig a well collectively with everyone contributing their labour. To meet the financial investment, the villagers collectively requested the government for financial assistance. When they failed to get assistance as a group, they presented the well construction scheme a collective effort and one person's name was used only obtaining financial assistance. The community took full responsibility for the repayment and possessed full rights over the well and ensuing benefits.

After the irrigation well was completed, the village community took an unusual decision concerning the use of well water. Previously the village people were growing only Kharif, which required little irrigation. They decided to continue growing kharif in their respective fields. However, construction of this well made the growing of rabi crops now possible. A single well could not irrigate all the fields in the entire village, nor did everyone in the village have equal command. Therefore, to share the benefit from the well equally, all the village people decided to do rabi cultivation collectively and thus use the irrigation well for the common good. Regardless of the legal position of land ownership, everyone in the village has a right over it for rabi cultivation.

Another example of community control over water is found in the north-east of India. The Bodo Kacharis in Kokrajhar and Darrang areas have over generations developed a very extensive traditional irrigation system called the dong or jampui, which take care of the water requirement during the dry season. These dongs are common property and generally all the villagers participate in its construction. During the rainy season tribals will make artificial dams (a bund) along the rice field which helps retain water. If this is not adequate, they regulate small nallahs and gullies and divert water to the field through gravity canals. To ensure that water is available equally to all families, they have developed an inter-linked rotational system for water distribution. These are successful examples of equitably using water resources as common property, as well as equal rights and equal distribution of benefits from the commons through collective or participatory management.

The traditional irrigation system in the form of community managed tanks (Eries) was found in the peninsular States of Andhra Pradesh, Tamil Nadu and Karnataka. In these States, tanks have been a major source of water for the irrigation system, which has survived over centuries. Many of them date back many milennia, as testified by inscriptions. Under the traditional system, they were being managed and controlled by local communities with the proprietary rights resting with them. The tanks, being within the confines of a village or a small group of villages, held no scope for an outside authority to control them.

Jal, Jangal, Jameen (Water, Forest, Land)

The story of Tarun Bharat Sangh (TBS), founded by Shri Rajendra Singh, can never be complete without the

mention of Gopalpura, a small village in Alwar District of Rajasthan. Rajendra Singh, an Aurvedic doctor who hails from Meerut district of U P, had no prior knowledge of water conservation or water management. It was his sincerity, dedication and commitment to the mission, which moved village after village.[20]

This area faces a serious water shortage, and johads (water tanks) were constructed in the village as a solution with inputs from the local villagers themselves. In Goplapura, the villagers assessed topography, helped design the checkdam system with local skills and traditional technology, and contributed one-fourth of the cost, aside from giving shramadan (free labour). As a consequence, the area classified as the 'dark zone' (a place where there is insufficient potable water to sustain population), was re-classified as the 'white zone' (where potable water is easily available) by the Rajasthan Government.[20]

The successful construction of johads and the immediate results (more water in the dry season, improved soil moisture and plant growth) provided the confidence and the will to move to the protection of forests. Villagers became increasingly more conscious of the relationship between Jal, Jangal, Jameen (Water, Forest, Land)

The then President of India Mr. K. R. Narayan travelled to this remote region to honour the villagers for what he called their path breaking efforts. He told the gathering of about 10,000 villagers in Alwar that they had shown the world how one could achieve development without causing any harm to the nature and the environment.

Some Facts : National Geographic, one of the most prestigious journals of the world, on 26 July 2000 had reported some facts about the glorious achievement of Mr. Rajendra Singh.[21]

- Inspite of two years chronic drought in the Alwar district of India's desert State of Rajasthan, hundreds of villagers are flush with water because they have gone back to using traditional water harvesting as a way of life.
- Without financial support from the government, largely illiterate villagers have built over 3500 water harvesting structures that have benefited 750 villages, spread over 2,600 square miles (6,500 square kilometres) sustaining over half a million people.
- The region's water table, which had dropped to below 100 feet (approximately 30 metres), has slowly risen and stabilized, as ground water has been boosted by villagers who did not rely on trained civil engineers to design their dams, but used traditional construction.

There has been 400 per cent return on investment from the traditional water harvesting structures.

Five rivers that in living memory had been seasonal are now perennial source of water. This was achieved, because the villagers protected with tenacity, and against all odds, the catchment forests of the river.

This is the first time in India that rivers have been brought back to life. TBS did not start with the aim of bringing perennial flow to the dry rivers. When johads were built and water run off arrested, percolation gradually recharged underground aquifers. As these slowly filled up, excess water started to flow into the rivers.

With water more readily available, buffalo breading has received new inputs, the supply of milk increased, and the regional milk products are again being offered for sale. Women, freed from the time consuming task of fetching water, have more time to invest in common life.

SMALL IS BEAUTIFUL

Studies in Israel and elsewhere in the world have shown that small catchments manage to hold more water than large ones. 3,000 micro-catchments of 0.1 hectares each give five times more water than one catchment of 300 hectares. Similar studies by the Central Soil and Water Conservation Research Institute at its various campuses have shown that 10 tiny dams with catchments of one hectare each would collect more water than one larger dam with a catchment of 10 hectares.

It is also estimated that on average each Indian village can harvest about 3.75 billion litres of water every year, which will not only cater to all the drinking water needs of the human and cattle population, but will also provide for some irrigation. According to Himanshu Thakkar, a Delhi based water expert, the government has never assessed the potential of rain water harvesting. Indian villages get most of their rain as a heavy downpour of just 100 hours out of the total 8,760 hours in a year. This water must be stored properly and used sensibly during the 8,660 hours without rain.

The river linking project is virtual rejection of 'Small is Beautiful', i.e., the decentralized water harvesting technologies, which can certainly meet all the legitimate

water needs at much cheaper costs. This is also the denial of the potential of percolation tanks which, if resurrected, can cope with successive years of drought by preserving water underground in evaporation-free condition.

Apparently, the government has also abdicated its primary duty of indicating:

1. which crops are suitable for which climate condition,
2. which combination of crops, including coarse cereals, pulses and oil seeds is most suitable for the nutritional needs of the masses,
3. and which kind of irrigation or drainage is suitable.

While much noise is being made about the wide navigation opportunities to be provided by Inland Water Grid, not even the first step has been taken for encouraging large scale boat movements on the existing inland water ways to carry cargo. The water driven cargo crafts are known to be the cheapest mode of transportation.

6b. Water Laws

The framers of the Indian constitution have drawn up very specific laws and provisions governing the development and management of the country's water resources. During the 52 years, since the Constitution of India was enacted in 1950, changes have become necessary in these laws.

Disputes relating to water: Article 262

"Adjudication of disputes relating to waters of Inter-State rivers or river valley -

1. Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any Inter-State river or river valley".
2. "Notwithstanding anything in this Constitution, Parliament may by law provide that neither the Supreme Court nor any other court shall exercise jurisdiction in respect of any such dispute or complaint as is referred to in clause (1)".

The Inter State water Disputes Act, 1956 (ISWD) has been enacted by Parliament in exercise of the power conferred by this article. The subject matter of the Act is not covered by any of the Entries in the Legislative Lists. Moreover, the power conferred by this article overrides the legislative Entries. Under this Act, five Tribunals i.e., Krishna water Dispute Tribunal, Godavari water Dispute Tribunal, Narmada water Dispute Tribunal, Ravi Beas water Dispute Tribunal and Cauvery water Dispute Tribunal, have been setup, which are elaborated in subsequent sections. Some Inter-State disputes have been resolved through a process of negotiations.

Article 246: Provisions between Centre and State

The Constitutional provisions related to water between Centre and State are given in Article 246.

"Subject matter of laws made by Parliament and by Legislatures of States"

1. Notwithstanding anything in clauses (2) and (3), Parliament has exclusive power to make laws with respect to any of the matters enumerated in List I in the Seventh Schedule (in the Constitution referred to as the "Union List").
2. Notwithstanding anything in clause (3), Parliament, and subject to clause (1), the Legislature of any State also, have power to make laws with respect to any of the matters enumerated in List III in the Seventh Schedule (in the Constitution referred to as the "Government List").
3. Subject to clause (1) and (2), the Legislature of any State has exclusive power to make laws for such State or part thereof with respect to any of the matters enumerated in List II in the Seventh Schedule (in the Constitution referred to as "State List").
4. Parliament has power to make laws with respect to any matter for any part of the territory in India notwithstanding that such matter is a matter enumerated in the State List".

As per the existing Constitutional provisions relating to 'water', the primary responsibility for development rests with the State Governments. However, if water is transferred from List II to List III

- Concurrent List, as per Article 246(2), Parliament as well as the legislature will have the power to make laws with respect to water.

Entry 56 of List I does not deprive the States of any power to which they are entitled under Entry 17 of List II; List I stipulates in respect of "Regulation and Development of Inter-State rivers and river valleys."

Article 253: Legislation for giving Effect to International Agreement

"Notwithstanding anything in the foregoing provisions of this chapter, Parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or any decision made at any international conference, association or other body." Entry 10 of the Union List I under Seventh schedule, confers on the Union Parliament right on "Foreign affairs; all matters which bring the Union into relation with any foreign country" and Entry 14 empowers the Union to "Enter into treaties and agreements with foreign countries for implementation of treaties, agreements, and conventions with foreign countries."

Article 253 makes it clear that the power to enter into treaties conferred on Parliament carries with it, as incidental treaties, a power to override the State list, to enable the Union to implement the treaty. Thus, a law passed by the Parliament to give to an international convention shall not be invalidated on the ground that it contained provisions relating to the State subjects.

The effect of Article 253 is that if a treaty, agreement, or convention with a foreign State deals with a subject within the competence of the State legislature, Parliament alone has, notwithstanding Article 246(3), the power to make laws to implement the treaty, agreement or convention or any decision made at any international conference, association or other body. The article deals with legislative power; thereby power is conferred upon Parliament, which it may not possess otherwise.

Under the powers conferred under the above, the Union of India signed the Indus water Treaty with Pakistan in the year 1960. In conformity with the Treaty provisions, further Inter-State Agreements have been signed from time to time. Under the same Article, the Treaty with Nepal on the Integrated Development of the Mahakali Treaty, 1996 and the Treaty on Ganga water sharing at Farakka, 1996 with Bangladesh had been signed.

Central Government Acts and Policies on Inter-State Water Resources

The Central Govt. has enacted a number of Acts and Laws on Inter-State Water Resources, and also enunciated a National Water Policy.

The River Board Act 1956

This Act, which came into effect on 12 September 1956, provides for the establishment of River Boards for the Regulation and Development of Inter-State rivers and river valleys. The Central Government has not constituted any River Board under this Act. The role of the River Boards, as envisaged in the Act, is only advisory in nature. The Government of India, however, constituted the Betwa River Board, Bansagar Control Board, Tungabhadra Board, Brahmaputra Board, and Yamuna Board, outside the River Board Act 1956, for specific purpose.

Inter-State Water Disputes Act 1956, as modified/ amended up to 1986

This Act is to provide for the adjudication of disputes relating to waters of Inter-State Rivers and River Valleys. The Act came into effect on 28 August 1956, has been modified from time to time, and was last amended on 18 March 1986 with the insertion of a new provision, Section 14, to achieve the objectives set forth. The Act empowers the Central Government to set up, on a complaint from a State Government that a water dispute with the Government of another in relation to the water of an Inter-State river or river valley has arisen or is likely to arise, a tribunal for adjudication of the dispute. The Tribunal shall consist of a chairman and two other members nominated in this behalf by the Chief Justice of India from among persons who at the time of such nomination are judges of the Supreme Court or of a High Court.

After constitution of the Tribunal under Section 4, the Central Government shall, under Section 5 of the Act, refer the dispute and any other matter appearing to be connected with, or relevant to, the water dispute to the Tribunal for adjudication. The decision of the Tribunal shall be published in the official gazette and the decision shall be final and binding on the Parties to the dispute and shall be given effect to by them. Under Section 6, no reference shall be made to a Tribunal of any dispute that may arise regarding any matter which may be referred to

arbitration under the River Board Act 1956. Under Section 11, neither the Supreme Court nor any other court shall have, or exercise jurisdiction in respect of, any water dispute, which may be referred to a Tribunal under this Act. The above Act has been used to set up several Tribunals to settle the Inter-State water disputes.

Standing Committee on Inter-State Issues in Water Resources

This Committee has been set up by the Ministry of Water Resources on 6 April 1990, to assist the National Water Resources Council (NWRC), and to enable it to advise on the modifications of resolving Inter-State differences with regard to specific elements of water Plans and such other issues that may arise during the planning or implementation of projects. The Committee comprises of the Union Minister of Water Resources as the chairman, and the Union Ministers of Agriculture, Energy, Urban Development, Environment and Forests, and Science & Technology as its members. The Secretary (Water Resources) serves as Member-Secretary. The Chief Ministers of the concerned States are special invitees to the meetings of the Committee. The recommendations of the Committee are advisory in nature, and are without prejudice to the provisions of the Inter-State Water Disputes Act.

The Sarkaria Commission on Centre-State Relations

This Commission, while examining matters of Inter-State relationships, also examined the Constitutional provisions related to water dealing with Inter-State water disputes. In the opinion of the Commission, the goal of the constitution was that there was a need for union control over waters of Inter-State rivers and river valleys for their regulation and control, but in matters of local concern, as in the case of 'land', States should have powers in respect of waters which are not part of inter-State rivers and are located within the territory of each State.

The Commission was of the view that the existing arrangements in the constitution are the best possible method of distributing powers between the Union and the States with respect to a highly difficult and sensitive subject. The Commission also ruled out entry of the subject in the 'Concurrent list'.

The Sarkaria Commission also examined the provisions of the Inter-State water Dispute Act of 1956. It made several recommendations for amending the Act, out of which the Inter-State council and its Standing Committee, after examination, endorsed the following.

Once an application under Section 3 of the Inter-State River water Disputes Act (33 of 1956) is received from a State, it should be mandatory on the Union Government to constitute a Tribunal within a period not exceeding one year from the date of receipt of complaint from any disputant State; modified by the Council to the extent that "the disputes already settled may not be re-opened."

There should be a Data Bank and Information System at the national level and adequate machinery should be set up for this purpose at the earliest.

There should be a provision in the Inter-State Water Disputes Act, that States shall be required to give necessary data, for which purpose the Tribunal may be vested with the powers of a Court.

The Tribunal should give its award within a period of three years from the date of its constitution. However, if for unavoidable reasons the award could not be given within the specified period of three years, the Union Government may extend the period suitably not exceeding two years. The award should be implemented two years from the date of notification of the award. If for unavoidable reasons the award could not be implemented within period of two years the Union Government may extend the period suitably.

The Inter-State water Disputes Act, 1956 should be amended so that a Tribunal's award has the same force and sanction behind it as an order or decree of the Supreme Court to make a Tribunal's award really binding.

The Commission's recommendations are being worked upon. Other Commissions and Committees have from time to time given similar recommendations and also suggested action on Sarkaria Commission's recommendations. The Inter-State Water Dispute (ISWD) Act, as and when amended, may give effect to the Sarkaria Commission's recommendations.

6c. Water Conflicts

India, considering it as one geographical unit, is endowed with potentially large water resources. There are, however, serious constraints in fully realizing this potential. The monsoon climate is one such constraint. Over 80% of the precipitation occurs in less than 90 days. The monsoon begins in May at the southern tip of India and reaches the Himalayan foothills in July. The second constraint is the highly uneven spatial and temporal distribution. The entire annual rainfall may take place in one or two spells. The result is drought in some places and floods in others, all in the same year. Water is not available where it is required and when it is required. The only way to get over these constraints is to store the rainwater from the monsoon. Ecologically sustainable water harvesting is based on small storage reservoirs, good forests in catchments, and rich organic matter in soil.

However, our ancient time-tested systems were ignored. "Small is beautiful" philosophy of water harvesting was replaced by "big is beautiful". Post-independence (1947) India embarked on the construction of large storage reservoirs. That was also the beginning of major water sharing conflicts. India is an agrarian economy. More than two thirds of the population has agriculture as its occupation. Agriculture needs water, either as water retained in soil for rainfed farming, or rainwater has to be stored to ensure reliable water supply to sustain irrigated agriculture. Large-scale diversion or storage on the upstream reduces flows on the downstream, where agriculture might have developed historically and where the population has been used to enjoying their riparian rights. They then feel that they have been deprived of their natural rights.

Thus started the conflict between the upstream and downstream stakeholders. As the large storages and diversion increased, the conflicts became more pronounced. It would be accurate to say: "No dams, no conflicts." To obtain some perspective of the conflicts, it is necessary to examine briefly the hydrological setup of the country.

Hydrological Set-up of India

India has an excellent network of river systems, which have been categorized into 20 major river basins. There are 12 major river basins that are Inter-State in nature, with a combined catchment area of 256 million hectares (m. ha). There are 8 composite river basins with a total catchment area of about 75 m. ha, and other water bodies, including tanks and ponds, draining a total area of 7 m. ha. The total water resources (surface and ground water) have been estimated at about 2,300 billion cubic metres (BCM), of which the surface water resources are estimated by the Central Water Commission at 1,870 BCM, and the ground water potential assessed by the Central Ground water Board to be about 431 BCM. The total utilizable flow is estimated as 1,086 BCM (surface water 690.03 BCM, and 395.6 BCM. of groundwater), of which 37% surface water and 38% ground water have been utilized so far.

Apart from being inter-State, the Indus, Ganga and Brahmaputra basins are also international river basins. It is a fact of geography that the Himalayas, through the large network of rivers originating from it, have linked India with Pakistan on the West through the Indus system of rivers, and with Nepal, Bhutan and Bangladesh through the Ganga-Brahmaputra-Meghna river system (commonly known as the GBM region, the second largest hydrological system in the world). India accounts for 40% of the geographical area in the GBM basin, and 9.8% in the Indus basin.

India is a union of States and Union Territories. The political boundaries of the States cut across the hydrological boundaries of the river basins, each of which gets shared by more than one State. The demands of the States are not compatible with the availability of water. The multi-party political system of democracy makes the demands inflexible, and conflicts in sharing become intractable. The demands are by and large a political expediency. The problems with international basins are not dissimilar from those of inter-State basins.

(i) INTERNATIONAL CONFLICTS

(a) India–Pakistan Conflict on Indus River

The Indus basin extends over an area of 1,165,500 sq. km. and lies in Tibet (China), India, Pakistan and Afghanistan. According to the Indus water Treaty of 1960, India has exclusive rights to the uses of the three Eastern rivers (the Sutlej, the Beas and the Ravi) and Pakistan has full rights on the uses of the three Western rivers (the Indus, the Jhelum, and the Chenab). The drainage area is nearly 9.8% of the total geographical area of the country. The basin lies in the States of Jammu and Kashmir, Himachal Pradesh, Haryana, and Punjab.

For the three western rivers — Indus, Chenab and Jhelum, India has only very limited rights for consumptive uses, but full rights for non-consumptive uses. The development has not been as extensive as in the Eastern rivers of Ravi, Beas and Sutlej. As against a power potential of 8,845 MW (60% load factor), only 1,350 MW has been developed. Even the Tulbul Navigation Project on the Jhelum in Jammu and Kashmir is pending since 1984.

Pakistan's objection to this project is that it is a storage project. Re-regulation is not permitted, and hence cannot be accepted under the Indus Water Treaty. India argues that the scheme as envisaged is only a control structure (barrage) to regulate the natural storage of the Wullar Lake, without any additional storage and rise in water level in the lake. The objective is only to improve the navigable draft in the river after the floods, over a period of four months during the winter season. India has also highlighted the additional power benefits that would accrue from all the hydroelectric projects downstream, to both India and Pakistan, due to increased regulated lean season flow, downstream of the lake. The objection of Pakistan is therefore not technical but political. There is no conflict if the Tulbul scheme is removed from the political agenda.

(b) India-Nepal Conflict on Indus River

The basins of importance with respect to disputes between Nepal and India are the Ghaghra system (which includes its tributaries Mahakali and the Karnali), the Gandak, and the Kosi systems.

Ghaghra Sub Basin

One of the important tributaries of this sub-basin is the Sarda River (Mahakali in Nepal), which forms the western border of Nepal with India. The Uttaranchal State of India has a common border with Nepal up to the Banbasa (Sarda) Barrage on the Sarda River. Below this barrage the river flows entirely in Uttar Pradesh State and joins the Ganga as Ghaghra. The issues of dispute on this river arises from the following:

i) The reservoir submergence of a small area at the border in Nepal territory due to the construction of the Tanakpur barrage and Power project in the Indian Territory:

ii) The power benefits are to be shared equally, with additional water allocation for irrigation in Nepal areas from the barrage:

iii) Equal sharing of waters was demanded by Nepal on the basis that the river forms a common border in certain stretches as against equitable sharing suggested by India:

iv) The prescriptive rights of irrigation established in India, which according to Nepal, were to be treated as an additional benefit from the proposed dam.

v) Incidental benefits of flood control in India should also be assessed in working out benefits and apportioning the cost of the dam.

Nepal desired all hydropower projects to be designed as peaking stations, and a separate tariff to be worked out for the purpose based on the generation costs of alternative energy from coal/nuclear/gas to decide the rate of sale of power to India. However, under the Mahakali Treaty signed in 1996 for the Integrated Development of the Mahakali (Sarda) River including Sarda Barrage, Tanakpur Barrage and Pancheswar Project, it has been agreed that both countries have equal entitlement to the utilization of the waters of the Mahakali River without prejudice to their respective existing consumptive uses of it.

There are no existing dams in the Ghaghra sub basin of the Ganga. However, several dams have been proposed, of which the Pancheswar dam with 6.8 BCM of storage, with power generation of 4,000 to 6,000 MW and irrigation benefits on the Sarda (Mahakali) is located along the common border between India and Nepal.

Another important aspect in Nepal's case is the approval of the Treaty and any subsequent agreements to build projects by the Nepalese Parliament by a two-thirds majority. While the Treaty has been ratified by Nepal's Parliament, it remains to be seen, in view of the high politicization of water issues in Nepal vis-à-vis India, as to how the agreement for construction of the Pancheswar Project will be worked out.

The other major dam proposed in the Ghaghra basin is the Karnali (Chisapani) dam with 15 BCM storage, power generation and irrigation) in Nepal territory for which no agreement has been possible over the last four decades. The Karnali dam project, for which Nepal has been preparing Detailed Project Report (DPR), has been discussed several times between the two countries but the issues of conflict have been intractable. The disputes have mainly centered around Nepal's claim of sovereign rights (territorial ownership) over water, not recognising existing irrigation benefits in India. India's overall approach is that: Nepal has the first right to use the water of rivers for legitimate uses

in its territory, and should follow an equitable principle of sharing trans-boundary rivers, recognizing existing uses in India.

Gandak Sub Basin

The source of the Gandak River is in the Great Himalayas in Tibet. The river flows through Nepal for a major stretch before it enters the Terai region of India. At the border, a major irrigation diversion scheme has been built under a 1959 Agreement, called the "Agreement between the Government of India and the Government of Nepal on the Gandak Irrigation and Power Project." The construction of the barrage was completed in 1968.

Water rights have been established under the agreement, with utilization planned on the left and right bank canal systems supporting irrigation in both countries. A navigation lock has also been constructed upstream of the barrage on the right bank for river traffic at the barrage. A power station with 15 MW capacity has been built utilizing the drop on the Western Canal at a location where the canal crosses the Nepal territory. The Western Canal benefits Nepal as also the Indian State of Uttar Pradesh in the upper reaches, and then flows into Bihar.

The Bihar government operates the barrage under the guidelines that divide the water between Left and Right Bank canal systems. Nepal has planned to build six reservoirs on the tributaries of the Gandak. Negotiations have been held on all these projects between Nepal and India, and no progress has been achieved in reaching an agreement.

Kosi Sub Basin

This is a very important tributary of the Ganga, not only from an international point of action, but also due to the fact that it is the most flood-prone region in the Indian State of Bihar. The total catchment area of the river up to its confluence with the Ganga is 74,500 sq. km, out which 35 % is in Tibet, 50% in Nepal and the remaining 15 % in India. This river is called the "river of sorrow" on account of the devastation it causes due to floods and frequent change of course in the Terai region of Nepal and in Bihar.

The first bilateral agreement was signed between Nepal and India in 1954, and revised in 1966, for constructing a barrage on the river at the border between India and Nepal. The Agreement gives full freedom to Nepal to use its waters in her territory without restriction, and as may be required in the future. The Government of India has been given the right to regulate the balance of the supplies at the barrage for irrigation and power benefits. As part of this development undertaken by India, that country also investigated a high dam in Nepal upstream of the barrage near Barakshetra as a long-term measure to augment the lean season flow for irrigation, to control floods with specific flood cushion in the reservoir, and for power generation.

(c) Indo-Bangladesh Conflicts

The major issue of dispute, which originated even before Bangladesh came into existence as an independent Nation, was the construction of the Farakka Barrage by India at the apex of the Ganga delta, a few km upstream of the common international border. The main point of dispute initially was the diversion of 40,000 cusecs of water of the Ganga into the Bhagirathi tributary through a feeder canal, entirely in the Indian Territory, with the intention of increasing the flow in the Hooghly River. The goal was to flush siltation in the lower reaches and improve the navigability of the Bhagirathi-Hooghly stretch of the river. This envisaged diversion of a part of the lean season flows (January to May), when the problem of water scarcity is acute, and was resulting in insufficient flows of the Ganga in Bangladesh for maintaining agriculture and ecology.

With Bangladesh becoming an independent nation in 1971, the two countries set up the Indo-Bangladesh Joint Rivers Commission (JRC) in 1972 to resolve these issues and also to discuss all matters pertaining to the 54 common rivers between the two countries, of which the four major rivers are the Ganga, the Brahmaputra, the Teesta and the Barak/ Meghna. Several exchanges of charges and counter charges took place between the two countries, regarding the adverse effects of Farakka Barrage in Bangladesh due to diversion of flows in the lean season. The matter was even taken to the United Nations by Bangladesh.

The adverse effects mentioned by Bangladesh were:

(i) Reduced flow in the tributaries of the Ganga (Gorai)

(ii) Increased water salinity

(iii) Reduced water in the lean season leading to reduced agricultural crops

(iv) lowering and salinization of ground water levels

(v) Reduced navigation, health risk from salinity of drinking water, and problems for water-using industries.

India countered the allegations with technical explanations. Special studies undertaken by experts could not resolve the issues because of the complexity of the process involved, particularly the political overtones of the dispute. Eventually, political pragmatism prevailed and an agreement was reached on the sharing of Ganga waters in September 1977, with a 5-year validity period. In spite of substantial concessions by both sides with respect to the sharing of the lean season flows (Bangladesh got a share of 60%), the agreement did not resolve the question of how to increase the lean season flows of the Ganga.

India and Bangladesh signed a Treaty in December 1996 which came into effect from the first lean season starting from January 1, 1997. This Treaty is generally an equal sharing (50:50) agreement with certain stipulations. The Treaty provides for sharing the Ganga waters at Farakka in 10-day periods from 1 January to 31 May. It is based on a water sharing formula and an indicative schedule, which is based on a 40-year (1949-1988) 10-day period average availability of water (as against 75% availability used in the earlier agreements), at Farakka. The basic sharing formula is as mentioned below.

Availability at Farakka

Share of India	*Share of Bangladesh*
70,000 cusecs or less 50%	50%
70,000-75000 cusecs	Balance of flow
35,000 cusecs	75,000 cusecs or more
40,000 cusecs	Balance of flow

The Treaty also states that every effort would be made by the upper riparian (India) to protect the flows of water at Farakka as in the 40 years-average availability. Bangladesh and India each shall receive a guaranteed 35,000 cusecs of water in alternate 10 day periods between 11 March and 10 May.

There is a clause in the treaty, which says if the flow falls below 50,000 cusecs in any ten day period, the two governments will enter into immediate consultations to make adjustments. The clause became operative as the flow in the river remained below 50,000 cusecs for a few days in March and April. This led to a serious dispute; Bangladesh accused India of violating the Treaty and wanted India to protect the average flows and assure 35,000 cusecs to Bangladesh in its turn irrespective of the actual flows in the river at Farakka.

The issue remains unresolved. The issue may again crop up, as it is very likely that the flows in the lean season in future years may go down below the average figures and may also go down below 50,000 cusecs. A final solution is called for, since the Treaty also provides for a review after every five years or earlier. The issue of joint observation also needs to be resolved, since the second site at Hardinge bridge in Bangladesh (about 150 km below the first point of joint observations in India near Farakka Barrage) could lead to more confusion.

"Nepal has always been at the receiving and so much so that the late Nepalese King Birendra was even prompted to say Nepal has been cheated by India."

"Even the latest Treaty on Pancheshwar Integrated Project, popularly known as the Mahakali Treaty, has generated overwhelming resentment with the Nepalese. It might not be irrelevant to bring to your notice here that the Arun III hydro power project that could have changed the face of Nepal to a great extent had to be abandoned on Indian pressure."

"Nepalese people are against the Kosi High Dam project."

Chenterdra Jung Himali in "Some burning issues of Nepal India Relations," a paper presented at Asian Social Forum, 1-7 Jan, 2003.[15]

"In the Dragon kingdom of Bhutan, nearly three decades after a bilateral agreement on the Chukha hydro electric project, water authorities and experts are repentant. India, being the facilitator, developer and operator of the project, enjoys monopoly over Chukha waters as Bhutanese hopelessly look on."

Surendra Phuyal in a paper presented at Asian Social Forum, 1-7 Jan, 2003.[16]

(ii) INTER-STATE CONFLICTS

(a) Conflict Between Haryana and Punjab on Ravi-Beas Waters

With the Reorganization of the Punjab into the two separate States of Punjab and Haryana in November 1966, the distribution of the waters of the Ravi and Beas became a major issue of contention. Notwithstanding the special provisions made with respect to the rights and liabilities of successor States in relation to Bhakra-Nangal Project and Beas Project, claims and counter-claims were raised by both Punjab and Haryana. A lasting and satisfactory solution could not be reached even after 20 years of negotiations. Finally an Accord, called the "Punjab Settlement," was signed between Mr. Rajiv Gandhi

and Mr H. S. Longowal of Punjab in July 1985, which also dealt with the question of sharing of the Ravi-Beas waters.

This settlement led to the setting up of a Tribunal in April 1986 to adjudicate the claims of the States regarding their share of the Ravi-Beas waters. The Tribunal was presided over by Justice Balakrishna Eradi, a Supreme Court Judge. The Tribunal, after hearing the arguments of all the parties to the dispute, gave its report in January 1987. The Tribunal started hearing the references in September 1987, but since then the hearings have only been held in fits and starts. The Final Award of the Tribunal, which was to be originally given within six months of constituting it, is yet to see the light of day. The Ravi-Beas water sharing conflict remains.

(b) Conflicts between UP, Delhi and Haryana on Yamuna Water

The reach of the river from its origin up to Delhi is called the Upper Yamuna River, involving the States of Himachal Pradesh, Haryana, Delhi, Uttaranchal and Rajasthan. Near Tajewala, about 172 km from its source, water is taken off by the Western and Eastern Canals. It flows further 280 km to Okhla in Delhi.

The most recent agreement is the Upper Yamuna Agreement of May 1994. This agreement has a significant bearing on the evolution of the water Plans of the States, since it takes note of the maximization of use of the surface flow of the river through a number of identified storage projects on the river, upstream of Tajewala. The Upper Yamuna Board, set up to monitor the implementation of the agreement, is now fully functioning. An interesting feature of these negotiations was that the total demand of the basin States was over three times the available flow in the river. These demands were based purely on political grounds. Another interesting aspect of the conflict deals with the established irrigation needs of Uttar Pradesh (UP) and Haryana, and the projected Municipal and Industrial (M&I) needs of Delhi and Rajasthan. Notwithstanding the agreement, the conflict is far from over. The Courts had to intervene often to ensure that Delhi gets its share to meet M&I needs. UP and Haryana can otherwise withdraw all the water upstream of Delhi for irrigation.

(c) Conflict Between UP and Bihar over Sone River

The Sone River is a south bank tributary of the Ganga, covering the States of Madhya Pradesh, Uttar Pradesh, and Bihar. The utilization plans for the waters of this river have been formulated, and specific agreements reached among the co-sharing States for sharing of the waters, as also the benefits from identified projects. The Bansagar Board, comprising the States of Bihar, Madhya Pradesh (MP) and Uttar Pradesh (UP) and the Central Government, controls the construction and operation of the Bansagar dam project on the Sone under an agreement.

However, the Rihand dam constructed on the Rihand river, a tributary of the Sone, has been built by the Uttar Pradesh Government. Bihar, which has a large irrigation system in its territory that developed since 1874 through a weir (replaced by a barrage), commanding an area of 350,000 ha for irrigation, did not contribute to the cost of construction of Rihand dam. They also did not object to the project. The Rihand dam has only a power generation component and it can enhance the lean season flow in the river to the advantage of Bihar. Bihar might have assumed that the water will be released through the power station to meet their requirements.

The hydropower Plant at Rihand is operated to meet the emergency requirements of the large UP power grid. The operation hardly ever synchronizes with Bihar's needs, creating a conflict that frequently requires the intervention of the Central Government.

(d) Conflict Between West Bengal and Jharkhand on Damodar

Damodar is the first basin in India where Integrated River Basin development was started, patterned on the lines of the Tennessee Valley Authority (TVA) in USA. The development envisaged the building of seven reservoirs on the Damodar and its tributary rivers, with the joint participation of the basin States of then Bihar (now Jharkhand), West Bengal, and the Central Government. The objectives of this integrated development were the construction and operation of irrigation facilities, water supply, drainage, flood control, hydro-electric generation, navigation, control of soil erosion, and the agricultural, industrial, and economic development of the valley. The implementation of the Plan was initiated in 1948, when India was still a Dominion.

The Damodar Valley Corporation (DVC) was set up under an Act of the Parliament as a semi-autonomous organization. DVC has been faced with multiple conflicts. It would like to operate the dams for optimization of power benefits, whereas West Bengal wants the water for irrigation. Irrigation and power demands do not coincide. The important benefit of flood

moderation cannot be realized fully, because Jharkhand does not allow full flood storages in the reservoirs, as the submergence effect is in their State. The upstream riparian State of Jharkhand has to acquire land for reservoir submergence, which is a difficult task now. It will be difficult to reconcile the conflicting interests of the basin States and to develop the basin as envisaged originally.

(e) Conflicts Between Karnataka, Maharashtra and Andhra Pradesh on Krishna

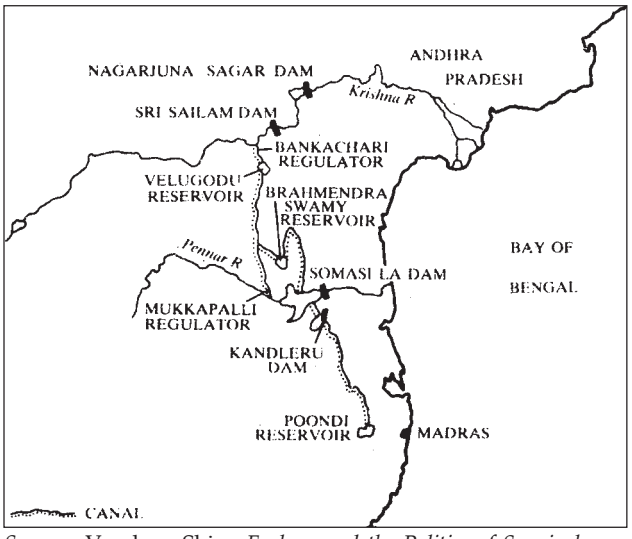
The Krishna has the second largest Inter-State river basin in Southern India, covering the States of Maharashtra, Karnataka, and Andhra Pradesh. The basin is agriculturally well developed, with major irrigation works undertaken since the 1855.

For allocation of water between Andhra Pradesh, Karnataka and Maharastra, the Tribunal was set up.

The Tribunal Award expired in May 2000. One of the upper riparian States (Karnataka) has filed a petition in the Supreme Court on 29 June 2001, seeking the Court's directive to restrain Andhra Pradesh from taking up any new projects on the Krishna River until the water sharing issue is settled again. Thus, even before the issue could be taken up for conciliation, the matter has reached the Court. It is inevitable that the matter will now be referred to a Tribunal by the Central Government after the case filed in the Court is heard and judgment is given.

(f) Conflict Between Karnataka and Andhra Pradesh over Telugu Ganga Project (TGP)

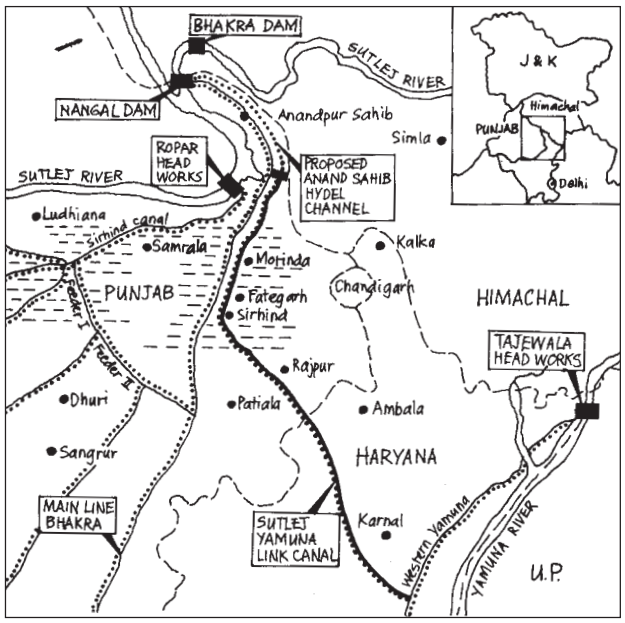
This is another dispute arising out of differing interpretations of the Award by Andhra Pradesh, Karnataka and the Central Water Commission (CWC), the Project clearing authority. The award allows Andhra Pradesh (AP) the use of surplus water without conferring a prescriptive right. AP claims that TGP is just that it utilizes the surplus water of Krishna. Karnataka is concerned that AP will claim prescriptive rights on this water, when the award comes up for review. CWC maintains that AP can use surplus water in existing projects only, and not in new projects. The conflict continues.



Source: Vandana Shiva *Ecology and the Politics of Survival*

(g) Dispute Between Punjab and Haryana Over Sutlej–Yamuna Link

Sutlej Yamuna Link (SYL) is the bone of contention between Punjab and Haryana. About Rs. 850 crores have been spent, building the 306 kilometre long canal. But because Punjab refuses to build the small section of the project that has yet to be completed, it carries no water. The 1,700 strong staff that Punjab employs to build the canal has not had a serious day's work for the past two decades.



Source: Vandana Shiva *The Violence of the Green Revolution*

On January 15, 2002 the Supreme Court ordered Punjab to finish work on the canal within a year. Failing this, it said, the "Union government would have to undertake the work." January 15, 2003 was the seventh deadline for the completion of the canal, after the ones in December 1983, August 1986, December 1987, March 1988, June 1989 and January 1991. Like the previous ones, this was also ignored.

A fresh legal intervention by Punjab is now awaiting hearing. Punjab, in essence, argues that it has no

surplus water to release. Punjab argues that the release of water through the SYL canal is contingent on other key components of the 1985 Rajiv Gandhi and H. S. Longowal Accord, intended to end the terrorist violence in the State.

(h) Conflict Between Karnataka and Tamil Nadu over Cauvery

The Inter-State River basin in the southern peninsula lies in the States of Karnataka, Kerala, Tamil Nadu and Pondicherry. During the 200 years of British rule, until India attained independence in 1947, substantial development of irrigation took place in the deltaic plains of Tamil Nadu and only partly in the princely State of Mysore, now Karnataka. The two important storage projects of the pre-independence period are the Krishna Raja Sagar dam (1931) in Karnataka and the Mettur dam (1934) in Tamil Nadu. Prior to these two dams, the Tanks and Anicuts dominated the irrigation development in the basin.

Since independence, the pace of development has been remarkable and almost 95 % of the surface water is reported to be utilized, which is the highest for any basin in the country. The earliest Agreements that governed the use and development of the Cauvery waters are the 1892 and 1924 Agreements between the erstwhile princely State of Mysore and the province of Madras. These are the Agreements on which the case of the Cauvery water Dispute hinges, with Karnataka calling it unjust while Tamil Nadu swears by its validity considering their established prescriptive rights.

Cauvery Tribunal

The 1924 Agreement, a water sharing agreement, came up for review at the end of its 50 years of validity, and since then the sharing of the waters of the Cauvery remained under discussions between Karnataka and Tamil Nadu, with the Centre acting as a mediator. The course of the negotiations from 1968 to 1990, until the Tribunal was set up, at the bilateral level and at the Central level, swung from periods of hope to periods of despair. Even before the 50 years of validity period expired, Tamil Nadu approached Centre to refer the dispute to a Tribunal, and in the absence of any response from the Central Government, approached the Supreme Court requesting for a direction to be given to set up a Tribunal and to direct Karnataka not to proceed with its new projects.

Kerala also filed suits to refer the disputes to the Tribunal. Efforts by the Central Government to find a solution did not result in the settlement of the dispute. The writ petition of the Tamil Nadu Government was heard by the Supreme Court in April 1990, and it directed the Central Government to set in motion the legal proceedings, as statutorily mandated. The Cauvery Waters Dispute Tribunal was accordingly set up in June 1990 for adjudication of the dispute. The cases made out by the Party States are summarized below:

Arguments by Karnataka

The main arguments of Karnataka are:

i) The Agreements of 1892 and 1924 are void since they were 'imposed' by the British on the ' Princely State' of Mysore.

ii) The 1924 Agreement has expired in its entirety in 1974 at the end of the 50 year period. The 1892 agreement placed restrictions on Karnataka for the development of irrigation, while Tamil Nadu had no corresponding restrictions.

iii) Tamil Nadu has the benefit of being exposed to both the South-West and North-East monsoons.

iv) Tamil Nadu's canal systems are to be modernized.

v) Karnataka's drought prone area is almost double that of Tamil Nadu, and has therefore a right to use of more water; Trans-basin diversions for irrigation or power should not be permitted.

vi) The ground water resources in the Delta region are to be taken into account for the purpose of equitable distribution.

Objections of Tamil Nadu

Tamil Nadu's objections are:

i) The Central Fact-Finding Commission's (CFFC) reports of 1972 and 1973 with regard to yield and utilization should be revised.

ii) The average annual utilization is already higher than the yield, even at 50% availability, and hence there is no scope for savings.

iii) The 1892 and 1924 agreements are inviolable, binding on all the States, and there is no need to work out any fresh allocation of waters in terms of actual quantum or periodic releases.

Argument of Kerala

The allocation of Cauvery waters should be made taking into consideration the quantum and percentage contribution of each State.

Demand of Pondicherry

The full allocation of a minimum quantity of 9.355 TMC of water for irrigation and drinking water purposes should be made during normal years.

Interim Award

The Tribunal gave an interim order on 25 June 1991. Karnataka was directed to release 205 TMC of water from its reservoirs in Karnataka so as to ensure that it is available in Tamil Nadu's Mettur Reservoir from June to May, effective from 1 July 1991 in accordance with the monthly inflows schedule. Restrictions were also placed on Karnataka not to increase its area under irrigation by the waters of the Cauvery beyond the existing 11.2 lakh acres. Karnataka felt aggrieved and reacted very strongly to the above order and raised several legal and technical lacunae, some of which are:

i) the interim relief is arbitrary, granted without prima facie assessing the yield, utilization, basin needs and other relevant matters;

ii) the unworkable schedule for the release of water is arbitrary, since it operates irrespective of availability of waters in Karnataka.

iii) It also represented to the Central Government not to implement the Tribunal's order, and to stay all the proceedings of the Tribunal until a National Water Policy was formulated and an appropriate amendment was brought to the Inter-State Disputes Act of 1956, and the Tribunal given clear guidelines.

Due to the urgent nature of the matter, Centre approached the Supreme Court seeking clarifications. The Supreme Court ruled that the order of the Tribunal be published in the official gazette. The Tribunal upheld its order. Following this, there was political one-upmanship in both the States. Until the end of the 1994-95 season there was no crisis as the monsoon was favorable. However, in 1995, due to delayed monsoon and low flows in the river, the dispute again came up before the Supreme Court on the issue of non-compliance of the Tribunal's order by Karnataka. The Supreme Court, in December 1995, asked Tamil Nadu to approach the Tribunal.

The Tribunal directed Karnataka to release 11 TMC, being the cumulative deficit up to mid December 1995, and to keep up further release of 17.4 TMC until end of May. Karnataka did not release the flows as directed by the Tribunal. The Supreme Court on a petition by Tamil Nadu requested the Prime Minister to intervene and find a solution within three days. The Prime Minister after intense parleys and discussions with the Chief Ministers of the States, announced a three-point package, which diffused an otherwise explosive situation. The details of the PM's package are mentioned below.

Package 1: PM requested Karnataka for immediate release of 6 TMC of Cauvery waters, against 11 TMC as per the Tribunal Order, to Mettur in Tamil Nadu. This was complied with. In subsequent years, this is being done under a formalized institutional arrangement.

Package 2: A three member Expert Group was set up to make an on-the-spot assessment of the status of standing crops in Cauvery basin in Tamil Nadu and Karnataka and their water storage levels and immediate requirement of water to save standing crops in both the States. This was only an interim action to diffuse an otherwise sensitive situation. Such solutions may soon become necessary in exceptional cases in the future.

Package 3: This addressed the larger issue of sharing of river waters at a policy level by proposing to hold a meeting of the National Water Resources Council (NWRC), on which all the Chief Ministers are represented, to evolve guidelines for sharing of Inter-State river waters. This meeting had been held and a Working Group had been set up to work out the modalities for preparing the guidelines.

(iii) CENTRE STATE CONFLICTS

Fortunately, there has been no major conflict between Centre and States over sharing of river waters. Basically, 'water' is a State subject, with the Union's role limited to the Inter-State Rivers. The Constitutional provisions related to water are contained in the Seventh Schedule: Article 246, as discussed earlier. The Union list, concurrent list and State list cover water. Since water is a primary need, water resource development could be covered under Concurrent List also. Only Entry 17 of List II has been in operation all along. However, Entry 20 of List III (Concurrent List) could also be said to have operated indirectly in view of the fact that the Central Government, through the Planning Commission, has to clear water Resources Development projects for investments if these projects are to be eligible for central funds.

Centre may bring an appropriate legislation so that the need for the consent of the States will not arise. If a legislation under Entry 56 List 1 of the Constitution is made, the need for the consent would not arise and the Centre would be in a position to undertake the project

and complete the same within a reasonable period of time.

However, this will be a major source of Centre-State conflict.

(iv) STATE VS PEOPLE

The hydroelectric power generation from river water has come into conflict with irrigation needs both in terms of the spatial and temporal characteristics of water storage and distribution. The maximization of power generation from Koyna demands that the water of the Krishna basin, draining into Bay of Bengal, be diverted to the Arabian Sea.

Industrial use of the river system is also a major source of conflict. For example, the pulp-based industries on Tungabhadra have polluted the river and destroyed the fishing economy, 20 km downstream. Moreover, the large-scale cultivation of pulpwood species like Eucalyptus in this part of the basin has impaired the groundwater recharge potential.

Dams for irrigation and/or power are also a source of conflict between the traditional rights of people to land and water and the role of the state to displace and uproot them for building river valley projects as in the case of Srisailam Dam. Large dams require massive submergence areas, and hence necessitate the displacement of large number of people. Major diversions from the river basin, as in the case of the Telugu-Ganga Canal taking off from Srisailam Dam, affect the riparian rights of the states and have generated unresolvable inter-State conflicts.

Farmers who are supposed to be the 'beneficiaries' become victims of irrigation projects. The "Mitti Bachao Andolan" in the Tawa command area is an example of such conflicts. In the Krishna basin, conflicts generated by irrigation projects were highlighted by the farmers' agitations in the command area of the Malaprabha project.

The Telugu Ganga Canal, which takes off from the Srisailam Dam, is probably the most conflict-ridden river diversion project in contemporary India. While the decision to supply drinking water to Madras was agreed by all the States, conflicts arose when Andhra Pradesh decided to use the Telugu Ganga project for irrigation.

Karnataka had objected to the Telugu Ganga irrigation scheme on the grounds that its own projects to harness Krishna waters were still incomplete and what appeared to be excess, could be used in the future. Karnataka had made it clear that surplus Krishna waters would not be available for the Telugu Ganga project.

The intensive use of water also has major ecological impacts. The dramatic increase in water use with the Green Revolution has led to a total destabilization of the water balance in the region. The water cycle can be destabilized by adding more water to an ecosystem than the natural drainage potential of that system. This leads to desertification through waterlogging and salinisation of the land.

In India, 10 million hectares of canal irrigated land have become waterlogged, and another 25 million hectares are threatened with salinity. Land gets waterlogged when the water table is within 1.5 to 2.1 metres below the ground surface. The water table goes up if water is added to a basin faster than it can drain out. Certain types of soils and certain types topography are most vulnerable to waterlogging. The water logged areas in Punjab are shown in table 6c(1).

Table 6c(1)
Distribution of water logged areas in different districts of Punjab
(Water table less than 1.5 m)

Sl. No.	*Districts*	*Waterlogged area (Lakh hectares)*	*Percentage in each*
1	Faridkot	1.12	39.16
2	Ferozepur	1.02	35.66
3	Bhatinda	0.32	11.19
4	Sangrur	0.09	3.15
5	Amritsar	0.08	2.80
6	Hoshiarpur	0.07	2.45
7	Gurdaspur	0.06	2.10
8	Jalandhar	0.05	1.75
9	Ludhiana	0.04	1.40
10	Ropar	0.005	0.17
11	Patiala	0.005	0.17
	Total	**2.86**	

What the Punjab experience in conflicts over rivers has shown is that a 'just' distribution of water is not a matter of dividing a fixed stock of resources among a fixed set of needs, because neither the resources nor the demands are fixed. Injustice is being experienced by all parties concerned because of the fluidity of the resource, the exploding demand for water and the fluidity of political actors making a demand on the resource and on its control.

(v) PEOPLE VS PEOPLE

The relatedness of Water availability in different parts of a basin, and the linkage between land use and water use entail that activities in one part of the river basin can negatively or positively influence other parts of the basin. Yet it has been assumed that multi-purpose river valley projects that provide irrigation as well as generate hydro-power do not have conflicting objectives.

However, the very location of these projects is primarily determined on the basis of these objectives and water releases are also determined by priorities for power or for irrigation. Other inter-sectoral conflicts include diversion of water for irrigation from drinking water, or for industry from agricultural and domestic use. Not only do diverse uses conflict with each other inter-sectorally, they can also occur on the basis of conflicting interests between the rich and powerful and the poor and marginal.[22]

Thus, state planned quarrying of minerals or timber extraction in the river catchments affects the river flow. And generating marketable surpluses of cash crops conflicts with people's needs. Finally state plans tend to serve the interests of the economically and politically powerful groups of society and hence generate new gaps between the rich and poor in terms of access to water resources.

These conflicts and destruction are more aggravated in India than in America because India is a riparian civilization, which had evolved in a monsoon climate.

One type of conflict relating to water projects arises from the ecological impact of impounding large quantities of water, transporting it across drainage boundaries and using it for intensive irrigation. Displaced people are, of course, in direct conflict with those who benefit from massive irrigation system.

Since water flow creates interconnectedness within the basin, each intervention in land and water use, depending on its scale, can become the source of conflicts. The mining of iron ore at Kudremukh and Manganese ore in Sandur in the upper catchments of Tungabhadra has seriously affected the stability of the catchment and has led to severe soil erosion and silting of the Tungabhadra reservoir, thus conflicting with irrigation needs.

(vi) POTENTIAL OF FUTURE CONFLICT WITH CHINA[24]

Where does Asia's water come from? Due to its geographic location and geological formation, the Tibetan plateau is the main water shed for Asia. Some of the world's greatest rivers, such as Brahamputra, Yangtze, Mekong, Yellow River, Salween, Sutlej and the Indus originate in Tibet. When Mao invaded the Roof of the World in 1950, he knew Tibet's strategic position and that more than 90 per cent of the water running off to china, South East Asia and South Asia come from the region.

However, the most important factor seems to have been overlooked: who controls the flow of the Brahamputra, Indus and Sutlej in their Tibetan segment? In this context, it is interesting to go back to 15 August 1950. On the day, in the evening, a terrible earthquake shook eastern Tibet. This was no ordinary earthquake; it felt like the end of the world. Mountains and valleys exchanged places insantly; hundreds of villages were swallowed up, and for hours afterwards, the sky over the South-eastern Tibet glowed with an internal red light, diffused with the pungent scent of sulphur. And during those few hours, the course of the Brahamputra changed. One may argue that only nature can produce such an upheaval, but nothing is certain.

On August 4, 2000, the *Tribune* reported a very strange event. Even three days after the disaster, the mystery of the flashfloods in the Sutlej, which wreaked havoc along its 200 km length, remains unresolved. Experts were at a loss to understand where the huge mass of water came from. It was not possible to understand that from where 50 ft high walls of water descended into the gorges of Kinnaur in Himachal Pradesh. In a few hours, more than 100 people died, 120 km of a strategic highway in Cheni section was washed away, and 98 bridges destroyed. A similar incident had been reported earlier in 2000 in Arunachal Pradesh.

A detailed study carried out a few months later by ISRO Scientists affirmed that the release of excess water accumulated in man made and natural water bodies in the Sutlej and the Siang river basins in Tibet had led to the flooding. These lakes disappeared, soon after the disaster struck Indian territory.

It is possible that the Chinese had breached these water bodies and as a result lakhs of cusecs of water were released into the Sutlej and Siang river basins. Given the fact that the Chinese are planning to pump 48 trillion litres of water a year from the Yangstse, across 800 miles to drought striken northern China, until a treaty like the Indus Water Treaty between India and Pakistan is signed between India and China, any plans of the Task Force to link rivers may turn to be futile. ■

7. UNASSESSED COSTS AND UNANSWERED QUESTIONS

It was only during Indira Gandhi's time that the project of river linking was seriously discussed and given up because of formidable geographic hurdles and colossal costs. At Patna, which is the only point along the course of Ganga with a divertible surplus, the Ganga flows 200 ft. above the mean sea level (MSL). If it has to be linked with any river in the peninsula, the water has to be raised over the Vindhya chain, i.e., 2860 ft above MSL. Pumping 20,000 cusecs of water to that height would have required the entire day's power generated in the country at that time.[2] Apart from the huge demand on power, the project was likely to entail a construction of at least Rs. 200,000 crores (at the price index of 1972).

Let us suppose for a moment that, despite the colossal financial costs, the country decides to take up the interlinking project. The cost in terms of human displacement and ecological destruction will be terrible. The construction of barrages and excavations of thousands of kilometres of canals will make villages disappear, flood towns, and cut through millions of hectares of agricultural and forest lands. It will uproot millions, the number exceeding the population shifts of partition.[2]

Even financially there is no accurate and reliable estimate regarding the mind boggling cost. There are at least three different estimates.

i) The NWDA budgets the entire project at Rs. 560,000 crores ($112 billion) at 2002 prices.

ii) How ever Mr. Prabhu himself accepts that it could go up to 1,000,000 crores ($ 200 billion). Mr. Prabhu would prefer to generate resources for the project within the country. According to Mr. Prabhu, Hydro-electric and navigational projects are two obvious areas where privatization will work well.[25]

iii) According to a former Secretary in the Union Water Resource Ministry, the estimated cost of only the Peninsular component is about Rs. 500,000 crores. These links stretch from the Sutlej in the North to the Vaippar in the South and from the Brahmaputra in the East to the Mahi in the West.

Remember, all these figures have been estimated by the government agency (NWDA), a well known expert in the field of Water Management and a former Union Minister, who made a name as a Union Minister of Environment and Forest? Which one is accurate? Nobody knows!

Before launching such a mammoth project, government should come out with reliable and accurate estimation dealing with each and every component of the task.

Incomplete Projects and Sources of Funds

The government spent 22% of its revenue on irrigation in 1966 which came down to 6% in the 1990s. The government's 9th plan outlay is only Rs. 40,000 crores for water and irrigation, just enough to pay salaries of the Water Resource Ministry. The tenth plan does not even mention the interlinking of rivers.

There are 400 major and medium projects pending, which require an investment of Rs. 77,000 crore. The cost to complete minor projects is 55,000 crores, and the cost to implement the ground water recharge scheme is 24,500 crore. The total comes out to be 156,500 crores. While the government is not able to generate the funds even to complete the pending projects, one wonders from where the sum of Rs. 6.60 lakh crores will come for interlinking of rivers?

Private Investment

Already it is clear that this money will not come from budgetary allocation. According to Radha Singh, the Additional Secretary, Water Resources, the private sector will be pitching in. The government will raise money through joint ventures and private initiatives.

The Confederation of Indian Industries (CII) has already started discussing money with State governments. It is also setting up its own Water Committee. With the Supreme Court's directive, CII is in business.

Once industrialists invest money, water will become a commodity. Eventually, the poor will be deprived of their rights of water. You cannot have dams like the roads where contractors charge on every vehicle. If it is going to be privatised, there are a number of questions which the government should answer. For instance, how it will be tied to water pricing, tarrif structure, diversification of cropping pattern, internal cost of return, maintenace and so on?

Ecological Imbalance

Large-scale deforestation for dams and canals can lead to imbalances in the eco-system. Following the construction of dams, aquatic life is often grievously harmed. Changes in water velocity, water chemistry, temperature and turbidity disturbs the free passage of fish. Weeds often proliferate in irrigation reservoirs. Many of these weeds can spread disease among human beings and cattle.

Construction of dams on many rivers make them lifeless, especially the smaller ones. The impounding of river waters in reservoirs reduces the flow in many rivers to a trickle. Thus, they are unable to withstand the ever-increasing pollution load.

One of the most important environmental effects of the big dams is the degradation of the soil in the command areas of irrigation projects, due to increase in the soil salinity and water logging.

There is always a threat of extinction posed by the dams to the tremendous variety of biological species.

Does the Government have any clue about the ecological imbalance, which the interlinking of rivers will cause? Government should conduct a thorough comprehensive environmental impact assessment (EIA) before making project feasibility report (PFR) and detailed project report (DPR)

Assault on Tribal Culture

Construction of dams effectively results in a direct assault on the country's tribal population. Dams are usually constructed in remote forest areas, where most of the tribal population lives. The sudden influx of the modern system, destruction of the surrounding nature in which their lives are dependent, and ultimately displacement and resettlement will leave the tradition-bound tribal family totally bewildered, powerless and on the verge of total social, cultural and economic collapse. Among tribals, the basis of mutual cooperation and relationship is not economic, but social and cultural. However, the displacement and resettlement will destroy this fabric of tribal culture.

The constitution has also been amended through the 73rd Amendment to allow tribal people to have total rights over their natural resources including land together with the right to manage it. Do not forget the words of K. R. Narayanan: "Let it not be said of India that this great Republic in a hurry to develop itself, is devastating the green mother earth and uprooting our tribal populations."

Activists from around the world met at Navdanya's organic farm on 16 December 2001 to develop national and global strategies to defend water as a collective community commons, and drafted the Water Liberation Declaration.

The Declaration is supported by over five hundred signatories.

WATER LIBERATION DECLARATION

Water is life. It's a gift of nature. The access to water is a natural and fundamental right. It is not to be treated as a commodity and traded for profit. People shall have the right to freedom from thirst, and shall have adequate access to safe water for all of their living needs.

Experiences all over the world reveal quite convincingly that water which is "life", is being privatized and brought under corporate control. This will deprive the people of water lifeline for survival. All the water resources should be owned, controlled, managed and utilized by local communities in their natural setting.

We the people from all over the world will not allow our waters to be made a commodity for profit.

We will work together to liberate water from corporate/private agencies, control and return it to the people for common good.

We demand the Governments all over the world should take immediate action to declare that they accept waters in their territories a public good and exact strong regulatory structure to protect them.

Ten Questions to the Task Force

1. Justice (Retd) B. N. Kirpal has clarified that the Supreme Court observation on linking of rivers was only a suggestion, not an order. What, then is the legal basis of the Task Force?
2. Will the financial outlay of project of $ 200 billion to link rivers not make privatization inevitable?
3. Is the project not violative of the Seventh Schedule?
4. In scheduled areas, will it not be violative of the Fifth Schedule and the Provisions of the Panchayats (Extension to the Scheduled Areas) Act 1996?
5. How much land will be destroyed for the project?
6. How much land will go out of agriculture, downstream of river diversions?
7. How many people will be displaced?
8. How much biodiversity of forests will be destroyed?
9. What will be the impact on the hydrological cycle on drainage when canals block natural flows, on deltic regions when water does not reach the sea, and on rivers when water is diverted?
10. What are the alternatives which cost less, do not cause ecological and social disruption, but provide more equitable distribution of water for drinking and irrigation?

The Jal Swaraj Abhiyan of Navdanya/RFSTE will also take these questions to the people. Let the people decide.

We will strive for Jal Swaraj and Water for all.

PEOPLES NATIONAL WATER FORUM

15-16 March, 2003 at IIC Annexe

On 15-16 March 2003, the Jal Swaraj Abhiyan and the Jal Yatra organised by the Jal Biradari met at a two day forum to evolve collective strategies to conserve water, defined people's water rights and resisted the river linking project. The forum was opened by Dr. Vandana Shiva of Jal swaraj Abhiyan, Sundarlal Bahuguna of the Chipko movement, and Anil Chaudhary of Peace. Oscar Oliviera of Bolivia was special guest.

Mr. Ambuj of Tarun Bharat Sangh (TBS), Alwar District, spoke about the success of reviving conventional water management practices. In Alwar district, the ground water table has receded below the critical level, forcing the State Government to declare the area as 'dark zone'. The people of Alwar district revived traditional water harvesting technology 'Johad' (water tank) to restore the ecological balance of the region. United Nations Environmental Programme (UNEP) made a documentary about the water harvesting success of Nimmi village, which is 30 km from Jaipur. At present, more than 5000 Johads have been revived in entire Rajasthan. The TBS success in constituting Gram Sabhas and ensuring that the village bodies have the ultimate say in managing Johads and decision making process is the key message.

But there is apprehension in the minds of the people that the 'Water Policy 2002' will not allow grass-root workers to take initiative.

Arjun of Bhavata Koyala said: "Even the cruelest king will not have control on water, but now the Government is going ahead to privatize water because there is a high profit in water." Mr. Arjun went back to trace the history of TBS founded by Rajendra Singh. TBS began in 1984 in a village Bhikampura of Alwar. Rajendra Singh motivated the villagers to take water harvesting by reviving Johads. Johads have transformed the ecology, agriculture, economy and the general well being of the population in the villages in the district. Handpumps are back to life and water gushes out of them at one stroke. Several seasonal rivers have been converted into perennial source of water. The 'dark zone' had turned out to be the brightest spot.

Prior to undertaking any developmental activity in the village, the cost component is discussed by the Gram Sabha, constituted by the villagers (Gram Sabha is a village institution created in each village associated with TBS it is different from the Gram Sabha denoted under the Panchayat Raj Act in Rajasthan). Apart from Shram Dan (voluntary work), Gram Sabha has to pay minimum 33% contribution of the total. TBS mainly contributes resources for hiring skilled labour, buying cement, iron and diesel for tractors. All the decision are taken collectively by Gram Sabha.

According to Mr. Arjun, if Johads are to be saved, forest must be saved. The story of water harvesting by constructing Johads moved the then President K. R. Narayanan who visited village Bhavata Kayala to honour Arjun and other villagers.

Arjun was not the only one with the experience. Kajori Mai, who also took up water harvesting in a village in Alwar, said that earlier water was not available easily. She used to walk miles to fetch water. Now, because of harvesting, water table has increased in the wells and water is available in the wells without any drudgery. Creation of the water harvesting structures has benefited women immensely. The increased availability of water for cooking, washing and bathing has definitely improved their quality of life.

"Though poverty is prevailing in Orissa, all global tenders are floated and given to outsiders," said Mr. Aditya Patnaik. He further added: "Privatisation has ruined the Orissa Life Irrigation Corporation (OLIC). Government may declare Pani Panchayat as defunct and will handover to MNC. Orissa is in the grip of colonialism, where present system is the root cause of this situation. 21 years ago, a project displaced about 14,000 people; today only 8000 have been identified. No body knows where the rest have gone."

According to Mr. K. R. Chaudhary of Andhra Pradesh, C. B. Naidu, Chief Minister of Andhra Pradesh abruptly raised the issue of interlinking of rivers just to

divert the public attention from other burning issues. In the State, due to want of funds, the projects are pending since last 30 years without completion. Andhra Pradesh Government is refusing to divert surplus to Tamil Nadu and Pondichery but demanding the Ganga Cauvery link. Not only C. B. Naidu, even Lalu Prasad, of Bihar has denied sharing of surplus water. There is apprehension in the minds of the people about the cost involved. Lifting of water will require half days' energy generated in the country.

To conserve the water, there should be change in the cropping pattern. Paddy and sugarcane should be replaced by water prudent corps." emphasized Mr Chaudhary.

Parvesh Mishra from Chattisgarh pointed out about the sufferings and hardship of the victims of Hirakud dam. Village like Udaigarh, once the richest village in the region, has become the poorest village. Communities like Kewat, Maajhi and Nishad depending on the river of Mahanadi have been pauperized. Government acquired the land in 1948; however, the people are yet to be settled. In the name of relief works, Government has taken only constructing of roads where people are hired for digging of gitties (small stones) from Danav Parbat. Instead of desilting of rivers or tanks, Government is throwing the dust, stones and waste in the river which is chocking its flow.

Initially the height of the dam was 630 ft which later on was reduced to 627 ft. The reduction in the height could have facilitated the return of land to 22 villages; however, State Government never returned the land to the farmers.

Chhajju Ramji through a song conveyed the message to save Johads and river to save water. He quoted great Hindi poet Rahim that without water, crops and human beings can not survive.

Aniket Alam, a journalist from *The Hindu*, Hyderabad primarily delved upon the financial aspect of the river linking project. He briefly traced the origin of the project. This is not a new idea. The idea basically was given by Sir Arthur Cotton in 1860. Even today he is very popular in South India. It is said about Sir Arthur that if he was alive today, he could defeat NTR. Sir Arthur had the opinion that whole of the country could be linked with canals so that people can transport their goods. For that time, troops movement was essential. Britishers could transport their troops in ships from Calcutta to Kanpur. The idea was dropped because of two reasons. First Railway lobby was very strong in Britain, second he got involved in one scam. It is said that his brother-in-law was making money, so the plan was shelved.

"The National Water Development Agency (NWDA) budgets the entire project as Rs.560,000 crores at 2002 prices, which however may go up to 1000,000 crores. The NWDA plan has divided the project into two broad components. The Himalayan part with 14 river links estimated at Rs. 375,000 crores and the Peninsular component with 17 river links estimated at Rs. 185,000 crores," said Mr. Aniket. If the economics of the scheme seems to make it extremely impossible, serious reservations can be raised about some of its claims and assumptions too.

Oscar Olivera from Bolivia is one of the world's leading water activists who with his people threw out one of the world's biggest corporations. He said: "I am very happy that you are interested to know about our struggle in Bolivia. US is planning to take over entire Bolivia. Bolivia is a country with about 80 lakh population. Out of this, 50 lakh are rural and 30 lakh are urban. Population of Cochabamba is about 10 lakh. India and Bolivia are common in many aspects. As far as the Bolivian Government is concerned, though it is a democracy, it should be said that people are not allowed to participate. Government may take any decision without consulting people.

In south Bolivia, there is water, but there was problem about how to transport water. 50% of Bolivia's water supply come from Municipal sources, 30% from tanks and 20% from private sources.

To solve the problem, the Government under world Bank pressure gave the water contract to Bechtel, a Multi National Corporation. There is a clause in the contract, by which even the private wells went in the hands of the MNC. By one signature even the personal resources were handed to the MNC.

Water Privatisation started in October 1999; however, service tax and the cost of water increased from 30% to 300%. Every Bolivian had to spend about 20% of his income only for water. Apart from economic aspect, water privatization caused cultural and moral impacts. Since centuries, there was tradition where people were using water the way they liked. The exploitation of the water united the people against MNC.

People started fighting from January 2000 and they demanded:

i) First cancel the contract and send back Bechtel.

ii) Instead of Bureaucrats, and Corporations, Public will run the show.

As a result of a the people's movement, the Government was forced to cancel the contract with Bechtel in April 2002.

Democracy took a new direction. Democracy was rediscovered in Bolivia.

In Cochabamba, 1 lakh people organised the rally and decided to run the water system on Four pricniples

(i) Transparency

(ii) Efficiency

(iii) Participation

(iv) Social justice

These four elements were absent in the earlier contract. Once the people have taken over the company, the people came to know about the corrupt practices of the company. 50% was total corruption. The contract was for 40 years with 17% guaranteed profits. After leaving Bolivia, the company filed a suit for 250 lakh dollar as compensation. The asset of the company is 12 million dollars, double the total asset of the Bolivian Government.

Every company says that your infrastructure is poor, your technology is inferior. However, surprisingly Bechtel did not invest a single dollar in Bolivia. The company used the same old infrastructure without putting any new technology.

Oscar Oliviera added "You should not be afraid of MNCs, success will be yours. You have to take the decision that you have to fight, on the basis that water is a birth right. Finally you will win."

Shri Ramaswamy R. Iyer, Former Secretary, Ministry of Water Resources said: 'There has been a great deal of publicity regarding the river linking project in the newspapers. It was Supreme Court which gave the direction. In fact, it arose in the context of Cauvery issue. Supreme Court asked the Government of India whether interlinking of river is possible. Initially, the Government of India made a very cautious approach keeping in view the environmental and displacement cost. Government gave the idea that the project shall be completed within 40 years. Government also gave some idea about the money involved. Government constituted the Task Force and appointed Mr. Suresh Prabhu, Former Union Minister for Power as Chairman. One interesting aspect of this project is that before the Supreme Court's direction there was no mention of the project. National Water Development Agency (NWDA) has prepared voluminous report, mainly on engineering works, one for Peninsular component and other for Himalayan component. All these are the secret documents, not available for public. Except Ministry of Water Resources, nobody knows what is there in these reports."

"People give the analogy of Highway construction. However, river is the creation of nature. They are not pipelines. The inter river basin transfer must overcome the natural barrier. Government officials claim that water will be lifted by gravity by minimum energy, but this is not true.

"In Constitution Law, we can amend the Constitution, but we cannot change the basic structure. Who gave the Government this Right? To avoid the Centre-State conflict, Government may bring the water from the State list to the Centre list. Government wants to get the political mileage by announcing this kind of mega project. So even the leader of Opposition has welcomed the initiative of the Government. This is the battle, which we have to fight from outside the Government. Mr. Prabhu has invited me. He said, please find the way to accelerate the project, and he asked the participants and experts not to examine but to consider the project.

"There is no mention of this mega project in 9th or 10th Plan. When P M addressed the National Water Council in April 2002, there he did not mention regarding this project. The river linking project will result in the submergence of forest, displacement of the people, loss of biodiversity, change of morphology. Government is distorting the planning process. Any water resource project first must be studied by NWDA, then it must go to Ministry of Environment and Forests for environmental clearance (to study whether project will cause any adverse ecological impacts and how it can be avoided or mitigated). At the third stage, project goes to Planning Commission for investment approval. However, in this case the Planning process has been totally distorted.

"With this kind of mega project, no money will be left for water harvesting. Once this kind of mega project starts, it will suck the entire money. We have already seen this in Gujarat."

Mr. Iyer praised Rajendra Singh. Rajendra Singh has shown that where the rain fall's as low as 20 mm, it is possible to overcome the 3-4 consequent droughts. Regarding Cauvery, he said that there is no shortage of water in Cauvery basin. There is water mismanagement. If you grow only sugarcane in Mandya and Paddy in Tamilnadu, there will be water shortage.

Mr. Sinha of Pani Morcha is a leading water activist of Delhi. "I have filed an application in Supreme Court for early hearing regarding the interlinking of rivers. In the petition, I have mentioned that first Feasibility Project Report (FPR) should be conducted. If it is approved then it must go to technical advisory committee for Detailed Project Report (DPR). If PFR is approved then 1% of the total cost should be released for DPR. But

all these norms have been overlooked in interlinking project," said Mr Sureshwar D. Sinha.

1500 years ago Al-Beruni, and Fahian visited India and they said, that "wells never die in the country, even if rain fails because there is flow of water in the river. Now, when the water table goes down 150 ft below, you need borewell. In war situation, all the power projects may get bombed, this is one of the long term adverse effect. When there is enough ground water, it is sufficient to dilute the pollution. Today Arsenic poisoning is rampant. The day the Government is going to start this project, Arsenic poisoning is going to increase.

He added, "I have quoted a Government of India report of last 50 years Project. Your aim was to irrigate 30 million hectares, of which 6 million, i.e., 25% of arable land has been lost due to salinity, alkalinity and water logging. I doubt that Government official may fudge the figures to get the approval of the project. For instance, in Narmada's case there was only 23 BCM water available. However, Government official claimed 28 BCM. The difference of 5 BCM. The officials who gives the false information should be penalized."

We want to supply water from Bhakra. But there is 40% loss in the transfer. Tribunal has accepted that your irrigation efficiency is 35% which means that 65% of water is lost. Therefore, with interlinking of rivers, at an average, 65% of water will be lost every year.

There are going to be water wars and million mutinies. In the case of Ganga, the most important item which is ignored is that is being destroyed by this project. Forest cost is also not included in this project. This is just hoodwinking the public. Now it is internationally recognized that river has the natural role of recharging your ground water. Now because of the low flow in the river, the polluted water is recharging your ground water. Reservoirs also induce seismic activity. There are 71 reservoirs, which have induced earthquake. There is example in your own country where Koyna dam was burst in Maharashtra. Victims of major dams are not able to be resettled and some of the victims take begging and prostitution. Likewise, Tehri dam may face the induced seismic activity and earthquake because it is only 6 km away from the fault line.

Shri Sundarlal Bahuguna, the famous environmentalist briefly spoke about the 'austerity' and alternatives to avoid the wastage of water. There is need for afforestation. According to Shri Bahuguna, the solution of water problem will solve the problem of Food, Fuel, Fertilizer, Fodder and Fibre, i.e., 5 F

According to Anil Choudhary of PEACE, water issue has become important during last 5 years. To understand 'water privatisation', we must understand the divide between rich and poor. The main aim of the market forces is to increase the production and develop technology. We have to understand why the MNCs are behind water privatization. The community rights over water must be clearly defined.

"Resettlement is a serious problem. Some people have been settled in Dehradun and Haridwar. Nearly 8 lakh people are estimated to be affected by the construction of the dam. Earthquake of 7 Richter scale will devastate the new Tehri city. Though 66% area in Uttaranchal is reserved as forest, reality is totally different" said Mr. Upadhyay who is also a Minister in Uttaranchal Government.

He pleaded for help on Tehri issue. Though the initial estimate was 2,000 crores, which later increased to 10,000 crores in his assessment, it is about 16,000 crores. one doesn't know whether Uttaranchal Government, Tehri Development Board or Centre is serious about this huge investment. Tehri dam will generate about 2,400 MW of electricity; at least 5% of it should be given to Uttranchal. Dr. Ashok Panigrahi, in his presentation on the Mahanadi, showed that contrary to the assumption of the river linking project, Mahanadi is not a surplus river.

Mr. Sat Pal Choudhary of Dehat Morcha highlighted about the water diversion form Upper Ganga Canal. The total carrying capacity of upper Ganga is 1,110 cusec. Out of this, 720 cusec, i.e., 70% is diverted for privatization at Muradnagar. Not only this, nearly 110 cusec is extracted at Masoori village in Ghaziabad district by the private company. Dehat Morcha has been able to stop the laying of concrete on the canal. Sat Pal Choudhry and his organization are actively creating awareness about the water diversion from Upper Ganga Canal, and extraction of water at Masoori village.

Now, even river can be sold out like land by the government. River Sheonath near Raipur in Chhatisgarh has been sold out to one Kailash Soni by Chhatisgarh Government. "One most surprising aspect of this sale out is that government paid Rs. 4 crore loan to Kailash Soni which he has not returned to the government. Nearly 60-70% of the people on the bank of the river were dependent on fishing. They are not allowed to enter in the river by Kailash Soni," said Mr. Binayak Sen who is planning to file a case in Chhatisgarh High Court. From Raipur to Durg and Bhilai, Kailash Soni controls the river. Agreement exists for 30 years which can be further extended for another 15 years, i.e., total 45

years. Farmers are not allowed to take water from the river. Meter has been attached to the pumps so that the farmers can pay accordingly. There is a clause in the contract, which says "take or pay," which means even if you are not taking any drop, you will have to pay the fixed amount.

Encouraged by the sale of Sheonath, government is planning to sell Kharoon river to one Mr. Jaiswal, a well known industrialist in the region.

The plight of river Bhawani in Tamil Nadu was illustrated by Mr. Shrinivasan. The river originates from Western Ghats, goes to Coimbatore where metal plating units are polluting it. "In Tiruppur town the textile industries are polluting ground water," added Mr. Shrinivasan. A subsidiary of Vivendi has the contract to collect the city garbage, which is being dumped at the site of freshwater. There is a water market of Rs. 300 crores. Tamil Nadu government is forcing the people for privatization.

A joint venture of three companies by the name of New Tiruppur Development Authority has been launched. The total cost of the venture is Rs. 1300 crores of which 400 crores are equity. Three companies involved in the venture are Mahindra & Mahindra, Bechtel and Universal. Bechtel will lay down the pipeline for a stretch of 60 km, Mahindra & Mahindra will construct 25 reservoirs, and Universal will collect the money from the users.

Mr. S. A. Naqvi, an engineer from Delhi Jal Board (DJB) gave the vivid description about religion and faith. Our faith in one form or other is linked to water. Mr. Naqvi particularly mentioned about the significance of water conservation in Islam. Islam lays emphasis to use 3 jugs of water for taking bath. There are similar provisions in Islam for other daily chores such as washing clothes. He quoted a Sanskrit shloka which means 'water is the life for all living creatures'.

Multinational Corporations, World Bank and Asian Development Bank, all are trying to control water and they are successful to great extent. Vivendi is blaming DJB. While DJB is charging only Rs. 15, Vivendi is charging Rs. 40 for the same amount of water. World Bank is not contributing in the development of the Nation. World Bank is only interested in privatization of water, as it generates huge profits.

In 1998, World Bank team visited Delhi with a package of Rs. 1,625 crore assistance for sanitation and water supply. The terms and conditions laid down by World Bank are ridiculous. 35 companies will pre-qualify out of which 6 will be selected and finally only two will be chosen, and none of them will be from India.

Mr Sanjay, also from DJB, mentioned about the corrupt practices adopted by the MNCs like Vivendi to get the contract. Vivendi is total fraud. Though Vivendi claims to have 2.80 lakh staff, however the investigation shows that the company has only 70,000 staff. Likewise Vivendi also says that the total turnover of the company is 40 $ billion per year; however, its water business is of 6.45 billion Euro dollar only.

There were other prominent speakers such as Dr. Bhartendu Prakash of Vigyan Shiksha Kendra, Banda and Shri Shrivastava of Azadi Bachao Andolan who spoke about the water security in the country and the implications of water privatization. Dr. Bhartendu Prakash from Bundelkhand highlighted the need to create movements against river linking in his region, since many of the rivers to be divided originate in Bundelkhand. Azadi Bachao Andolan has launched a movement against Coke and Pepsi and also a movement for bringing back the culture *Piaos*. In Punjab, activists have started a movement to save the public water tap (Tooti Bachao Andolan), destroyed under world Bank projects to impose privatisation on rural commnities.

JAL SURAKSHA, ADHIKAR, MUKTI DECLARATION

15-16 March 2003

Water is nature's gift. The right to water is a natural basic right of all living beings, and a human and fundamental right for human beings.

Communities are the custodians of water resources and the highest rights for conservation, management, sustainabale utilisation and equitable distribution should be with the community.

Water cannot be commodified and privatised. Rivers are natural living systems, which are the lifelines of ecosystems, biodiversity and human settlements.

Water conservation and rejuvenation, and river rejuvenation need afforestation of catchments and decentralised water harvesting and management throughout the basin.

Increasing water availability requires reduction in water wastage in agriculture, mining, industry and urban domestic utilisation. Excessive water demands for wasteful activities is the main driving force for long-distance transfer and over-exploitation. Recycling, pollution prevention and improving water use efficiency are necessary. In the urban context, water supply for potable and non-potable use should be separated.

Sustainable traditional water systems in rural and urban areas should be rejuvenated and resources for their maintenance and repair should be ensured to all local authorities to keep water as a common natural resource.

We reject the water privatisation in the New Water Policy and demand that the Community Rights be the foundation of the New Water Policy.

Water cannot be treated as private property or an asset to be bought and sold, but as a natural common resource.

We condemn the backdoor privatisation through schemes like the Pani Panchayat in Orissa and Water Users' Associations across the country, Swajal in Uttaranchal and Uttar Pradesh and Swajal Dhara. Using Panchayats and NGOs to dismantle public systems and universal entitlement is the first step towards privatisation.

Across the country communities have created sustainable alternatives that conserve water through reforestation and water harvesting, and improved efficiency through water prudent agriculture such as organic farming. Rivers have come alive as in Alwar, Rajasthan, and ground water levels have risen as result of people's community efforts.

In spite of the proven experience of improving water availability and quality through conservation, reduction of waste, prevention of pollution, the government is rushing through the River Linking Project, which will be socially and ecologically destructive, killing our rivers and creating newer sources of endless conflict.

Water is a State subject. The River Linking Project amounts to a subversion of the federal structure of the Constitution and the balance of rights between State and centre.

The Project is being rushed through without assessment, proper planning or transparency, or any attempt to secure a people's mandate. We condemn this fait accompli and its use for narrow political agendas.

We demand that all project documents related to River Linking Project be put in the public domain and that the entire planning exercise be subjected to the Right to Information.

No implementation of this Project should begin without democaratic clearance through a people's mandate and scientific clearance through independent evaluation. The JAL SWARAJ ABHIYAN and the RASHTRIYA JAL BIRADARI will be doing such evaluation through the JAL YATRAS that are being undertaken across the country.

If all of the above conditions are not met, the JAL SWARAJ ABHIYAN and the RASHTRIYA JAL BIRADARI will be compelled to launch JAL SATYAGRAHAS.

ACTION PLAN

16 March 2003

1. Following the inspiration of community-based water conservation and harvesting initiatives across the country, both ancient and contemporary, we commit ourselves to promote water harvesting in every household and in every urban and rural human settlement.
2. We commit ourselves to reducing water wastage in domestic use and agricultural activities and to act as the social conscience to ensure that industry uses water on the basis of the "Polluter Pays" principle.
3. We commit ourselves to the "SAVE THE PUBLIC TAP, SAVE THE COMMUNITY WELL" (Tooti Bachao, Kunwa Bachao) Campaign to prevent privatisation, which begins by dismantling public supply and public taps, thus denying the public the right to water as a public service and a common good.
4. We commit ourselves to boycott bottled and packaged water which is being promoted as a source of "pure water" to destroy public supply and access. Instead of privatising local water

supply, the government must ensure that local authorities have adequate resources to perform their mandatory pubic service funtions of providing clean water under the democratic control of society.

5. We will launch a campaign to stop the Railways from supplying packaged water, and to ensure that every tap at every station supplies clean potable water.
6. We will rejuvenate the culture of *piaos* (water temples) to provide safe drinking water.
7. We commit ourselves to taking The Campaign for the Right to Water to future generations in schools and colleges.
8. We will assess the impat of the River Linking Project and release reports to the public.
9. We are launching a Campaign on Transparency and Right to Information to demand that all documents related to water projects are put in the public domain.
10. The National JAL YATRA will lead to the formation of JAL JAN AAYOG, and the release of White Papers on the status of India's rivers and India's water systems. The next meeting will be held on April 1 and 2, 2003 at Sewagram (Wardha).
11. We will support the relevant local groups in Chattisgarh to fight on the issue of the privatisation of the River Shivnath and will support the Public Interest Litigation for the cancellation of the contract.

JAL YATRA

A People's Movement to Rejuvenate Rivers And Reclaim Community Water Rights

India is her rivers, our National Anthem says:

For millennia our rivers have flown free and sustained our people and life in all its forms. Rivers were kept alive by the culture of care and conservation, which gave back to nature as much as it took, and in almost same purity. This kept alive hydrological cycle (Jal Chakra). The current crisis of the water scarcity is a result of breaking our links with our rivers and water, disrupting the hydrological cycle.

The culture of conservation has been replaced by the 'culture' of over-consumption, waste and pollution. Our Living Rivers have become dead severs! The water crisis started breaking our living relationship with water and undermining the ethics and practices of water conservation, and is being addressed by false solutions, which will aggravate the crisis, instead of solving it.

The National Water Policy declared on 1 April 2002 has defined water as property - a tradable commodity and is promoting water privatization. Thus, drive for privatization and commoditification will further destroy community rights and erode community responsibility in water conservation and its sustainable use. The Jal Yatra is committed to rejuvenating our culture and practices of the water conservation. It will bring to the nation's attention millions of local traditions and initiatives to revive our rivers, recharge our aquifers, and rejuvenate nature.

In our opinion, the project of 'Inter-linking of Rivers' is gigantic, entails huge financial outlay, and is not in the interest of the people. This illusion and false promise is ecologically and politically dangerous. At the ecological level it perpetuates the culture of waste and non-sustainability. It falsely identifies some river basins as 'surplus' and some others as "scarce" and offered linking as a means to water balance. However, nature did not create "surplus" and "scarcity". The society has made dead and living rivers!

Rivers have been killed by pollution, large dams, and major diversions. Rivers that are still alive have water flowing in them, where communities have organized to protect the catchments and conserve the run off through building water harvesting structures like Johads, Ahars, Erries, Talabs and many other forms of check dams and utilized river waters within the limit of ecological sustainability.

The linking of our rivers simultaneously implies disrupting the hydrological cycle and ecological

relationship of people with the water. It also sows the seeds of conflict between regions and States as experienced by river linking project such as Sutlej Yamuna Canal and Telugu Ganga. The River Linking has become a **political stunt** in the election year to divert people's attention from local, sustainable, and equitable solutions, based on community rights. It creates opportunities for **economic plunder** and corruption in the Rs. 560,000 crore project, while simultaneously creating a divide and rule policy. The RL project is also false promise and megalomania because it is based on fallacious assumption that 70% of the river flows of the most rivers is going waste (?) into the sea, when in fact the most rivers no longer flow into the sea, due to diversion and over exploitation.

The Jal Yatra will be issuing periodic report to the nation on the state of our rivers from the concerned people on the basis of actual ground realities. While, the Jal Yatra would continue to raise people's consciousness on the water conservation, we demand the government immediately reverse its water privatization policy and recognize and strengthen the people's community rights to water. The communities that conserve water need to be rewarded and those who pollute and overexploit should be penalized. We also demand that the irresponsible announcements related to the river linking be immediately stopped till the actual state of river flows is verified by independent studies, full exploration of conservation based alternatives is undertaken, and participatory plans and water sharing are made by the River Sansad (Water Parliament). ■

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APPENDIX 1

SUPREME COURT ON INTERLINKING OF RIVERS

THE HUMBLE APPLICATION ON BEHALF OF THE AMICUS CURIAE IN THE SUPREME COURT OF INDIA

MOST RESPECTFULLY SHOWETH

1. That this is an application for directions in the pending Writ Petition wherein direction have been issued from time to time to the effect that there should not be any discharge of polluting effluent in the River Yamuna and that the Pollution Control Board is to take effective steps in this regard and monitor the effluent discharge of the industries and also monitor as to whether the discharge is within the parameters prescribed under the Environment Protection Act and the Rules and otherwise prescribed by the Central Pollution Control Board.

2. That this application is being filed based on the points raised by his Excellency the President of India in his address to the Nation on the eve of Independence Day, i.e., August 14, 2002 wherein he told the Nation about problem which is perennial in nature and no thought is being given to the same. The problem is such which can be solved and it is in that context that this application has been necessitated.

   His Excellency the President in his address, a portion of which I most respectfully quote, stated:

   "Let us now look at a long term problem. It is paradoxical to see floods in one part of country while some other parts face drought. This draught-flood phenomenon is a recurring feature. The need of the hour is to have a water mission which will enable availability of water to the fields, villages, towns and industries throughout the year, even while maintaining environmental purity. One major part of the water mission would be networking of our rivers. Technological and project management capabilities of our country can rise to the occasion and make this river networking a reality with long term planning and proper investment."

3. It is most respectfully submitted that today in a country of a population of approximately 1.2 billion citizens the vagaries of nature, despite the considerable scientific and technological advancement, continues to play havoc while in some parts of the country there is perennially a problem of floods, such as those mostly located in the North-Eastern region and in the North as well as Indo-Gangetic Plains causing great distress to the citizens at large and causing harm and erosion of economies of the State, requiring considerable expenditure year after year by the Exchequer to save the lives of people and to save their homes and business, trade and occupation alike. It is here relevant to mention that as far back as in 1980 according to the statistics given by the National Commission on Floods the total loss caused by floods during the three year period from 1976 to 1978 amounted to Rs.3180 crores which works out to an average of over Rs.1000/- crores per annum, which itself speaks of the burden put by these floods on the Exchequer.

   On the other hand, there are vast many places that have droughts year after year where no water is available and people and animals/cattle alike have starvation deaths because of want of water and because of want of food. This great country being agriculture based, which agriculture is based on water and which agriculture is not able to take off in all parts of the country because of the perennial droughts. There are several parts of the country, both on the Eastern side coastal region and otherwise Central India and the Western India, i.e., Orissa, Madhya Pradesh, Rajasthan and part of Andhra Pradesh where there is a problem of drought and starvation deaths.

The aforesaid itself enough reason for the Central Government as well as for the State Governments to get together to work out a solution which is not only ever lasting but also takes care of future so that neither any part of the country suffers from drought nor any part of the country suffers from floods year-after-year. The same story need not be repeated and ought not to be repeated with so much of money going down the drain, which is to solve these problems year after year. There has to be a long lasting solution and that long lasting solution is in the form of networking of the rivers throughout the country, as has been spoken of by His Excellency the President of India.

4. There are many benefits/advantages which will be derived from such networking and they are :

(a) We have been seeing that there is a perennial dispute going on between very many States – both in the Northern as well as in the Southern part of the country – with reference to sharing of river waters and the disputes are sought to be sorted out by adjudication through the inter-State River Water Disputes Tribunals which are working as per the provisions of Article 262 of the Constitution of India. The perpetual problem that is complained of is that the State from which the river flows to another State, that State which is before the latter State does not pass on enough water for the use of the other State causing acrimony and debates. It is most respectfully submitted that once all the river water is networked and the rivers are connected with each other, there will be no problem of enough water being available and consequently there would be no problem of distribution and use of such water. This will be a major problem that would be taken care of apart from what has been stated in paragraph 3 above.

(b) That with the networking of rivers the availability of water being the main source of irrigation in the agriculture sector and our country being an agriculture sector, the availability of water will give a boost to the agriculture sector in almost all parts of the country, especially those areas where the agriculture suffers because of lack of water. The networking of rivers will make it possible for the availability of water and thus there will be a great boost to the agriculture economy, which will itself generate and uplift economy of this country raising as per capita income, etc.

(c) Internationally it is well known that river is used as a major form of transportation of goods and with the networking of the rivers the transportation of goods can also take place through rivers in the various parts of the country which will not only be a cheaper form of transportation, but would also lessen the burden on the traffic on the roads which is becoming more and more hazardous every day. That apart, it would be a considerable saving for the Exchequer on the foreign exchange outgo of the country for the import of petroleum products from outside.

(d) It is a known natural phenomenon that because of floods there is great amount of soil erosion, both of the top soil and of the sub-soil and this soil erosion causes great damage to the agriculture sector as well as to the ground water resources. It is most respectfully submitted that once networking of rivers is done, the phenomena of floods would be by and large negatived thus helping in the cause of stopping erosion of the top-soil and the sub-soil.

(e) The ground water level will be greatly benefited by adequate spread of water all over the country which would be re-charged by this networking of rivers because water would be available in almost entire part of the Nation through the very many rivers that this country naturally possesses along with the very many tributaries of the very many rivers. The re-charging of the ground water level is the need of the hour for looking at the long term prospects of the availability of water.

(f) When there is continuous flow of water in the rivers and the tributaries which would be possible because of the networking of the rivers, the quality of water would improve leading to the improvement of environment. The quality of water gets polluted mainly because of stagnant water and also because there is not enough water flow in the rivers. It is known today that a lot many cities and towns discharge their pollutants into the rivers which are mostly untreated – both industrial and otherwise – causing deterioration

of the quality of water and making it entirely unfit for drinking with places having zero oxygen in that water, such as the Yamuna at Delhi itself. By the networking of the rivers there will be constant flow of water in the rivers which would consequently improve the quality of water and with various steps being taken not to discharge pollutants in the rivers and that the discharge should be only after the treatment of pollutants, the quality of water will greatly improve and the purity of the rivers would be restored. This will be a great boon for the environment of this country.

(g) That the monsoon in our country is very much dependent on the vagaries of the nature and dependence on monsoon in very many part of the country would be of no effect because of the networking of rivers because there are certain rivers which are always flooded and always have enough or more than enough water because of the melting of the snow in the mountains which give a constant flow of water. Thus the dependence of the agriculture sector only on monsoon would be minimised.

(h) That with the networking of the rivers one more benefit would be of the development of the tourism sector. It is already known that in the States of Kerala and West Bengal tourism is being promoted through the rivers and the waterways. The promotion of tourism through the waterways with access to many parts of the country because of the networking will generate foreign exchange in our country causing a boost to the tourism sector.

(i) That the networking of the rivers would also generate a lot of employment of all the factors taken hereinabove cumulatively inasmuch as, firstly, the networking itself will generate employment and thereafter the consequences arising out of the networking such as transportation, the agriculture sector, tourism sector will all generate employment and thus it will have a great impact in a country where there is large scale unemployment. It will be a great boost to the fisheries sector as well which by itself create a separate compartment altogether.

It is understood by the Amicus that what is being stated hereinabove is not really a new phenomenon inasmuch as this has been thought of and talked of after our independence by several bureaucrats and politicians who have talked of networking. It is also understood that there was a Rao Committee Report submitted in the early 80s with reference to networking of rivers and subsequently spoken of by the Central Ground Water Board and also agriculture economists. One of the greatest basic resources of this great country is land and water and if there is proper water management, the land management would itself taken place.

In the facts and circumstances stated hereinabove, it is in the interest of justice that appropriate directions be issued by this Hon'ble Court, in the first instance, to form a High Powered Committee to look into this suggestion, as has been mooted by His Excellency the President of India, which would submit its report and thereafter to issue further directions in consonance with the objective to be achieved of networking of rivers.

PRAYER

It is therefore most respectfully prayed to this Hon'ble Court that this Hon'ble Court may be pleased to :

a) Issue appropriate directions, in the first instance, to form a High Powered Committee to look into the suggestion of networking of rivers, as has been mooted by His Excellency the President of India, and, after the submission of its report, issue further directions, in consonance with the objective to be achieved of networking of rivers,.

b) Dispense with filing of affidavit in support of this application.

c) Pass such other Order or Orders as this Hon'ble Court may deem fit and proper in the facts and circumstances of the case.

(RANJIT KUMAR)
AMICUS CURIAE

REPLY BY THE GOVERNMENT IN THE SUPREME COURT OF INDIA CIVIL ORIGINAL JURISDICTION WRIT PETITION (CIVIL) NO.512 OF 2002

IN RE: NETWORKING OF RIVERS

COUNTER AFFIDAVIT ON BEHALF OF RESPONDENT NO.1 UNION OF INDIA

I, B.P. Pandey, age 36 years, presently working as Deputy Commissioner (Basin Management), Ministry

of Water Resources, Government of India, do hereby solemnly affirm and state as under:

1. That I am conversant with the facts and circumstances of the case from the official records pertaining to the matter and am competent to swear this affidavit on behalf of the Respondent – Union of India. I have read and understood the contents of the Writ Petition.

PRELIMINARY SUBMISSIONS

2. Before giving a parawise reply the deponent craves leave of this Hon'ble court to make the following preliminary submissions:

   (a) It is respectfully submitted that the assumption on which the present writ petition is apparently based – that the networking of rivers remains at the level of being "thought of and talked of … by several bureaucrats and politicians" – is not accurate. Even after the Rao Committee Report, as submitted below, the Government of India has been studying and planning for interlinking of rivers for over two decades now. Further it is respectfully submitted that, taking into consideration the facts stated below, the prayer of the Petitioner to form a Higher Powered Committee may not be necessary. Most importantly, it is respectfully submitted that there are four major constraints on implementing the networking of river as follows. First, the consent of all the States affected by the interlinking of rivers, especially those from which surplus waters would be diverted, has to be obtained. Second, studies and surveys are underway on the optimal routes for various canals that would be required for interlinking of rivers in order to avoid huge electricity charges for pumping of water. In some cases, even surveying these optimal routes requires permissions under environmental statutes for passing through nature sanctuaries. Clearances sought from the Ministry of Environment and Forests for undertaking surveys have not been granted. Third, interlinking of rivers would involve construction of several storages and conveyance system resulting in displacement of human settlement and habitation. Fourth, the project, as currently envisaged, has enormous financial implications. Estimates of the project cost are in the region of Rs.560,000 crores at current prices.

   (b) The background to the work undertaken by the Government of India is as follows. The erstwhile Ministry of Irrigation (now Ministry of Water Resources) and the Central Water Commission (CWC) had formulated in 1980 a National Perspective Plan (NPP) for optimum utilization of Water Resources in the Country which envisages inter-basin transfer of water from surplus to deficit areas. Apart from diverting water from rivers, which are surplus in ultimate stage of development to deficit areas, the plan enables mitigation of flood and droughts also.

   (c) The National Perspective Plan comprises of two main components, namely the Peninsular Rivers Development and Himalayan Rivers Development. Under the Peninsular rivers component, interlinking of Mahanadi-Godavari-Krishna-Cauvery rivers and building storages at potential sites in these basins involves major interlinking of the river systems where surpluses from the Mahanadi and the Godavari are intended to be transferred to the needy areas in the South, through the Krishna and Cauvery rivers. Interlinking of west flowing rivers, north of Bombay and South of Tapi provides for taking water supply canal to the metropolitan areas of Mumbai; it also provides irrigation in the coastal areas in Maharashtra. Interlinking of Ken-Chambal provides for a water grid for Madhya Pradesh and Uttar Pradesh and interlinking canal backed by as much storage as possible. Diversion of other west flowing rivers involves construction of an interlinking canal system backed up by adequate storages to meet all requirements of Kerala as also for transfer of some waters towards the east to meet the needs of drought affected areas.

   (d) The Himalayan Rivers Component envisages construction of storages on the principal tributaries of Ganga and the Brahmaputra in India and Nepal, along with interlinking canal systems to transfer surplus flows of the eastern tributaries of the Ganga i.e. Kosi, Gandak, Sarda and Ghagra to the deficit and drought prone areas of Bihar, UP, Haryana,

Rajasthan and Gujarat. The surplus in the river Ganga available through the proposed Gandak-Ganga and Ghagra-Yamuna links are proposed to be diverted to the deficit areas of Central Bihar through the Chinar-Sone Barrage and Sone Dam, and Southern Tributaries of Ganga Links Cana Projects. In order to make the surplus water of Himalayan river available to the southern region, the Himalayan and Peninsular components are proposed to be integrated by linking major tributaries of Brahmaputra with Ganga through a link named Manas-sankosh–Tista–Ganga link. Then, Ganga is further proposed to be linked with Mahanadi, a major river of peninsular India, through two links namely, Ganga-Damodar–Subernarekha and Subernarekha – Mahanadi.

(e) On implementation of the proposed National Perspective Plan for inter-basin transfer of water, accrual of irrigation benefits would be to the extent of about 35 Million hectare (Mha) (25 Mha from surface water and 10 Mha by increased use of ground water) which will be over and above the ultimate potential of 140 Mha from Major, medium and Minor irrigation projects and generation of 34 Million KiloWatt of hydropower, apart from the benefits of flood control, navigation, water supply, fisheries, salinity ingress and pollution control, recreational facilities, employment generation, infrastructure and socio-economic development, etc.

(f) The National Water Development Agency (NWDA) was set up in July, 1982 as an autonomous society under the Societies Registration Act, 1860 under the Ministry of Water Resources to carry out the water balance and other studies on a scientific and realistic basis for optimum utilization of Water Resources of the Peninsular Rivers System for preparation of feasibility reports for inter basin transfer of water and thus to give concrete shape to Peninsular Rivers Development Component of National Perspective Plan envisaged by the Ministry of Water Resources. The NWDA society is headed by the Minister of Water Resources and Chief Ministers/Irrigation Ministers are the members. The Governing Body of the NWDA is headed by the Secretary (Water Resources) and Technical Advisory Committee of NWDA headed by Chairman, Central Water Commission. In 1990, NWDA was also entrusted with the task of Himalayan Rivers Development Component of the National Perspective.

The pre-feasibility reports of all the 30 identified links under the Peninsular and Himalayan components have been completed by NWDA. The estimated costs for executing all the linkage is around 560,000 crores (2002 prices). Copies of the Interbasin Water Transfer Links under Peninsular and Himalayan Rivers Development Components of National Perspective Plan for which Feasibility Reports are being prepared by NWDA are annexed herewith and marked as Annexures R1 and R2 respectively.

(g) Under Peninsular Component, feasibility reports of the following six links have also been completed:

1. Keb Betwa Link
2. Par–Tapi–Narmada Link
3. Pamba–Achankovil–Vaippar Link
4. Godavari (Polavaram)–Krishna (Vijaywada) Link
5. Krishna (Srisailam)–Pennar (Prodattur) Link
6. Krishna (Nagarjunasagar)–Pennar (Somasila) Link

Currently, the surveys and investigations for preparation of feasibility reports of 18 links are under progress. Is programmed to complete feasibility reports of all the identified water transfer link schemes under Peninsular Component by the year 2004 and those under Himalayan Component by the year 2008.

(h) The implementation of the link schemes are to be preceded by the following steps after the completion of feasibility report:

1. Negotiations and agreements amongst the concerned States to arrive at consensus regarding surplus and deficit availability of water.
2. Preparation of Detailed Project Reports (DPRs) of the links.
3. Techno-economic Appraisal and Investment Clearance by Planning Commission.

4. Funding arrangement and financing of the projects.
5. Fixing Agencies and execution of the link project.

(i) The Programme of implementation of interbasin transfer of water depends of early completion of the negotiations and interstate agreements to arrive at consensus amongst the States regarding availability and surplus water, which is a pre-requisite for the preparation of Detailed Project Report. In order to achieve this, it is necessary that the State Governments should start a dialogue among themselves promptly and earnestly and, if required, also under the aegis of the Central Government on important issues.

(j) Some States have expressed apprehensions about the reliability and adequacy of the water transfer from distant sources. Other States have apprehensions that the existing Tribunals awards would get disturbed. They feel that on water can be taken out of the basin due to the Tribunal awards. Generally, the States having surplus water in the rivers flowing through their territories have apprehensions regarding the availability of such surpluses after meeting all the water requirements.

(k) At the ultimate stage of development, under the Peninsular component, the major link is Mahanadi-Ganga-Krishna-Cauvery-Vaigai. In the ultimate stage of development of inter linking proposals, the link from Brahmaputra to Mahanadi is proposed to be integrated with Peninsular link from Mahanadi – Vaigai in order to provide additional supplementation to deficit Peninsular basins. The Manas-Sankosh-Tista-Ganga link, which does not involve any lift, was taken up for surveys and investigations for preparation of Feasibility Report. The reach from Tista Barrage to Ganga was taken up by NWDA while the reach from Manas to Sankosh and Sankosh to Tista was entrusted to CWC by the Ministry of Water Resources. The topographical survey work of Tista-Ganga reach by the NWDA is almost complete whereas in the case of other reach, CWC could not take up the surveys in the Manas-Sankosh and a portion of the Sankosh – Tista reaches, because of denial of permission of Ministry of Environment and Forests, since these reaches fall under Manas and Buxa Tiger Reserves/other Wild Life Sanctuaries, in spite of concerted efforts made by CWC and Ministry of Water Resources to obtain the same. Besides, the length of canal, which falls within Bhutan territory, has also not been taken up for survey and investigations, as the required permission from the Royal Govt. of Bhutan is yet to be obtained.

(l) The Ministry of Water Resources through the NWDA has been striving to remove apprehensions of the States through technical interaction and dialogue with them. At these meetings, all the concerned States are represented on the above forums and the decisions taken are with the consent of the States. Further, a Group headed by Chairman, CWC and Secretaries of Water Resources/ Irrigation Departments of concerned States as members, has been constituted by the Ministry of Water Resources to expedite the process of arriving at consensus amongst the States and preparation of Detailed Project Reports, etc.

(m) A presentation was made by the Ministry of Water Resources on inter-linking of rivers before the Hon'ble Prime Minister on October 05, 2002, where the Dy. Prime Minister and other senior Ministers and officers were also present. It was suggested after presentation that a High Level Task Force can be formed which will go into the modalities for bringing consensus among the States. A similar presentation has also been made to His Excellency the President of India on October 16, 2002. In view of the above facts, it is respectfully submitted that the prayer of the Petitioner to form a Higher Powered Committee may not be necessary at this stage.

PARA-WISE REPLY

3. Para 1 of the Petition need no reply.
4. In reply to Para 2, it is respectfully submitted that the contents of the speech of His Excellency, the President of India, are a matter of record and need no reply.
5. In reply to Para 3, it is respectfully submitted that there can be no dispute about the importance to national development and the future progress of

the nation to implement a plan of networking of rivers after careful study and thorough preparation. The contents of the preliminary submissions may be read as part of the reply to this paragraph as well.

6. In reply to Para 4, it is respectfully submitted that the consent of the States is also necessary in order to implement any scheme of networking of rivers. Further, as stated above, the networking of rivers, as currently planned, would bring important benefits to the agricultural sector, flood control, navigation, power generation, salinity ingress, employment generation, infrastructure and socio-economic development. The contents of the preliminary submission may be read in reply to this paragraph as well.

ORDER OF THE SUPREME COURT

Pursuant to the notice issued by this Court to all the States and the Union Territories in relation to the inter-linking of the rivers, an affidavit has been filed by the Union of India and also by the State of Tamil Nadu. No other State or Union Territory has filed any affidavit and the presumption, therefore, clearly is that they do not oppose the prayer made in this writ petition and it must be regarded that there is a consensus amongst all of them that there should be inter-linking of rivers in India.

In the counter affidavit filed on behalf of the Union of India, it has, inter alia, been stated that after Rao Committee's Report was received, the Government of India has been studying and planning for inter-linking of rivers for over two decades. It is almost mentioned in this affidavit that the Ministry of Water Resources had made a representation on 5th October, 2002 before the Prime Minister on inter-linking of rivers and in that presentation the Dy. Prime Minister and other senior Ministers and Officers were also present. It was suggested that a High Level Task Force can be formed which will go into the modalities for bringing consensus among the States. This affidavit further states that the presentation was also made to the President of India on 16th October, 2002 which also shows interest of the President of India in this project and it is in view of his broadcast to the nation on the eve of the Independence Day where emphasis was laid on inter-linking of rivers that has given rise to the filing of the present petition.

Learned Attorney General states that a High Powered Task Force, as referred in the Affidavit of the Union of India, has not yet been formed and by the next date of hearing he should be in a position to inform this court with regard to the formation of the said task force as well as the decision of the said Force. The Union of India has accepted the concept of inter-linking of rivers and in the Affidavit spelt out the benefits which will annure after the entire project has been completed.

The State of Tamil Nadu is the only State which has responded to the notice issued by this Court and filed an affidavit. The said State also supports inter-linking of the rivers and in its affidavit has prayed that a direction be issued to the Union of India for constituting a High Powered Committee in order to see that the project is completed in time schedule. Alongwith this affidavit the prospective plan for implementation of inter-basin water transfer proposals prepared by the National Water Development Agency in May, 2000 has been placed on record. We are distressed to note that milestone for the perspective plan indicated in the report of the Agency shows that even though the Pre Feasibility Reports regarding the Peninsular and Himalayan projects are already completed, the completion of the link projects ultimately will be by the year 2035 in respect of Peninsular Link Project and 2043 regarding Himalayan Link Project.

It is difficult to appreciate that in this country, with all the resources available to it, there will be a further delay of 43 years for completion of the project to which no State has any objection and whose necessity and desirability is recognised and acknowledged by the Union of India. The project will not only give relief to the drought prone areas but will also be an effective flood control measure and would be a form of water harvesting which is being rightly propagated by the Union of India and all the States.

Learned Attorney General states that a more realistic view will be taken and a revised programme on completion would be drawn up and be presented to the court. We do expect that the programme when drawn up would try and ensure that the link projects are completed within a reasonable time of not more than ten years. We say so because recently the National Highways Projects have been undertaken and the same is nearing completion and the inter-linking of the rivers is complimentary to the said Project and the water ways which are so constructed will be of immense benefit to the country as a whole.

The report of the National Water Development Agency refers to negotiations and signing of agreements. This aspect is also adverted to by the Union of India in its affidavit when it mentioned that consent of all

the States affected by the Inter-linking of the rivers has to be obtained. Learned Attorney General would like to consider this aspect as it is contended by Mr. Ranjit Kumar that if a legislation under Entry 56 List I of the Constitution is made, the need for the consent would not arise and the Centre would be in a position to undertake the project and complete the same within a reasonable period of time.

It is not open to this Court to issue any direction to the Parliament to legislate but the Attorney General submits that the Government will consider this aspect and, if so advised, will bring an appropriate legislation.

Mr. Ranjit Kumar, Learned Amicus has drawn our attention to River Board Act, 1956 which has been enacted by the Parliament. Learned Attorney General would look into this in order to examine whether any further piece of legislation is necessary for bringing about the inter-linking of the rivers.

ANNEXURE R-1

List of Water Transfer Links under Peninsular Rivers Development Component for which Feasibility Reports are to be prepared by NWDA.

1. Mahanadi (Manibhadra)–Godavari (Dowlaiswaram) Link
2. Godavari (Polavaram)–Krishna (Vijayawada) Link
3. Godavari (Inchampalli)–Krishna (Nagarjunasagar) Link
4. Godavari (Inchampalli Low Dam)–Krishna (Nagarjunasagar Tail Pond) Link
5. Krishna (Nagarjunasagar)–P ennar (Somasila) Link
6. Krishna (Srisailam)–Pennar (Prodattur) Link
7. Krishna (Almatti)–Pennar Link
8. Pennar (Somasila)–Cauvery (Grand Anicut) Link
9. Cauvery (Kattalai)–Vaigai–Gundar Link
10. Parbati–Kalisindh–Chambal Link
11. Damanganga–Pinjal Link
12. Par-Tapi-Narmada Link
13. Ken-Betwa Link
14. Pamba–Achankovil–Vaippar Link
15. Bedti–Varda Link
16. Netravatii–Hemavani Link

ANNEXURE R-2

List of Water Transfer Links under Himalayan Rivers Development Component for which Feasibility Reports are to be prepared by NWDA.

1. Kosi–Meethi Link
2. Kosi–Ghagra Link
3. Gandak–Ganga Link
4. Ghagra–Yamuna Link
5. Sarda–Yamuna Link
6. Yamuna–Rajasthan Link
7. Rajasthan–Sabarmati Link
8. Chunar–Sone Barrage Link
9. Sone Dam–Southern Tributaries of Ganga Link
10. Brahmaputra–Ganga Link (Manas-Sankosh-Tista-Ganga)
11. Brahmaputra–Ganga Link (Jogighopa–Tista–Farakka)
12. Farakka–Sunderbans Link
13. Ganga (Farakka)–Damodar–Subernarekha Link
14. Subarnarekha–Mahanadi Link

ON THE EVE OF THE INDEPENDENCE DAY (14.08.2002) ADDRESS BY THE PRESIDENTL OF INDIA

RELEVANT PARAGRAPH REGARDING INTERLINKING OF RIVERS

Let us now look at as long-term problem. It is paradoxical to see floods in one part of our country while some other parts face drought. This drought-flood phenomenon is a recurring feature. The need of the hour is to have a water mission which will enable availability of water to the fields, villages, towns and industries throughout the year, even while maintaining environmental purity. One major part of the water mission would be networking of four rivers. Technological and project management capabilities of our country can rise to the occasion and make this river networking a reality with long term planning and proper investment. In addition, the vast sea around us can be held by providing potable water through desalination as a cost effective technology. There are of

course short term techniques such as water harvesting by revitalizing rural ponds, water recycling to water conservation. Such programs should have a large scale people participation even at the conceptual and project planning stages. The entire programme should revolve around economic viability leading to continued prosperity for our people with larger employment potential, environmental sustainability, grass root level motivation and benefit sharing.

RESOLUTION

(TO BE PUBLISHED IN THE GAZETTE OF INDIA IN PART-I, SECTION-I) No.2/21/2002-BM
GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES

New Delhi, the 13th December, 2002

1. The Ministry of Water Resources (then known as Ministry of Irrigation) in the year 1980 formulated a National Perspective Plan for water resources development by transferring water from water surplus basins to water deficit basins/regions by inter-linking of rivers. The National Perspective Plan has two main components, i.e., the Himalayan Rivers Development and Peninsular Rivers Development. The National Water Development Agency (NWDA) was set up as a Society under the Societies Registration Act, 1860 in 1982 to carry out the detailed studies and detailed surveys and investigations and to prepare feasibility reports of the links under the National Perspective Plan.
2. NWDA has, after carrying out detailed studies, identified 30 links for preparation of feasibility reports and has prepared feasibility reports of 6 such links. The various basins States have expressed divergent views about the studies and feasibility reports prepared by NWDA. With a view to brining about a consensus among the States and provide guidance on norms of appraisal of individual projects and modalities for project funding, etc, the Central Government hereby sets up a Task Force.
3. The Task Force shall be as under :
   (i) Shri Suresh Prabhu, Member of Parliament, Lok Sabha, Chairman
   (ii) Shri C. C. Patel, Vice-Chairman; and
   (iii) Dr. C. D. Thatte, Member Secretary.
4. In addition to the above members of the Task Force, part-time members will also be nominated in consultation with the Chairman of the Task Force and with the approval of the Prime Minister. These part-time members will be as under :
   (i) a member from water deficit States,
   (ii) a person from water surplus States,
   (iii) an economist,
   (iv) a sociologist, and
   (v) a legal/world wildlife expert.
5. The terms of reference of the Task Force will be to:
   i) Provide guidance on norms of appraisal of individual projects in respect of economic viability, socio-economic impacts, environmental impacts and preparation of resettlement plans;
   ii) Devise suitable mechanism for bringing about speedy consensus amongst the States;
   iii) Prioritize the different project components for preparation of Detailed Project Reports and implementation;
   iv) Propose suitable organizational structure for implementing the project;
   v) Consider various modalities for project funding; and
   vi) Consider international dimensions that may be involved in some projects components.
6. The Task Force shall have its headquarters in New Delhi and shall meet as and when necessary.
7. The terms and conditions for Chairman, Vice-Chairman, Member Secretary and other Members shall be decided in due course.
8. The milestone/time table for achieving the goal of inter-linking of rivers by the end of 2016 is as given below.
9. The financial provisions of the Task Force will be regulated as under:
   i) All the capital and revenue expenditure required to be incurred by the Task Force shall be borne by the Central Government through the grants-in-aid to National Water Development Agency; and
   ii) National Water Development Agency will account for expenditure of the Task Force as a part of its establishment expenditure and would provide such other secretarial/ ministerial assistance as may be required.

Audit of Controller General of Accounts and Comptroller and Auditor General of India would be incidental on such expenditure in the same manner as it would be on National Water Development Agency's other usual expenditure.

MILESTONE DATES/TIME TABLE FOR INTERLINKING OF RIVERS

(i)	Notification of the Task Force By	16.12.2002
(ii)	Participation of Action Plan-I, giving an outline of the time schedules for the completion of the feasibility studies, detailed project reports, estimated cost, implementation schedule, concrete benefits and advantages of the project, etc.	30.04.2003
(iii)	Preparation of Action Plan-II, giving alternative options for funding and execution of the project as also the suggested methods for cost recovery.	31.07.2003
(iv)	Meeting with the Chief Ministers to deliberate over the project and to elicit their cooperation.	May/June 2003
(v)	Completion of Feasibility Studies (already in progress).	31.12.2005
(vi)	Completion of Detailed Project Reports. (Preparation of DPRs will start simultaneously since FSs in respect of six river links have already been completed).	31.12.2006
(vii)	Implementation of the Project (10 years).	31.12.2016

APPENDIX 2

NATIONAL WATER POLICY

(As adopted by National Water Resources Council in its 5th meeting held on April 1, 2002)

Need for a National Water Policy

1.1 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 perspectives.

1.2 As per the latest assessment (1993), out of the total precipitation, including snowfall, of around 4000 billion cubic metre in the country, the availability from surface water and replenishable ground water is put at 1,869 billion cubic metre. Because of topographical and other constraints, about 60% of this, i.e., 690 billion cubic metre from surface water and 432 billion cubic metre from ground water, can be put to beneficial use. Availability of water is highly uneven in both space and time. Precipitation is confined to only about three or four months in a year and varies from 100 mm in the western parts of Rajasthan to over 10,000 mm at Cherrapunji in Meghalaya. Rivers and underground aquifers often cut across State boundaries. Water, as a resource is one and indivisible: rainfall, river waters, surface ponds and lakes and ground water are all part of one system.

1.3 Water is part of a larger ecological system. Realising the importance and scarcity attached to the fresh water, it has to be treated as an essential environment for sustaining all life forms.

1.4 Water is a scarce and precious national resource to be planned, developed, conserved and managed as such, and on an integrated and environmentally sound basis, keeping in view the socio-economic aspects and needs of the States. It is one of the most crucial elements in developmental planning. As the country has entered the 21st century, efforts to develop, conserve, utilise and manage this important resource in a sustainable manner, have to be guided by the national perspective.

1.5 Floods and droughts affect vast areas of the country, transcending State boundaries. One-sixth area of the country is drought-prone. Out of 40 million hectare of the flood prone area in the country, on an average, floods affect an area of around 7.5 million hectare per year. Approach to management of droughts and floods has to be co-ordinated and guided at the national level.

1.6 Planning and implementation of water resources projects involve a number of socio-economic aspects and issues such as environmental sustainability, appropriate resettlement and rehabilitation of project-affected people and livestock, public health concerns of water impoundment, dam safety, etc. Common approaches and guidelines are necessary on these matters. Moreover, certain problems and weaknesses have affected a large number of water resources projects all over the country. There have been substantial time and cost overruns on projects. Problems of water logging and soil salinity have emerged in some irrigation commands, leading to the degradation of agricultural land. Complex issues of equity and social justice in regard to water distribution are required to be addressed. The development, and overexploitation of groundwater resources in certain parts of the country have raised the concern and need for judicious and scientific resource management and conservation. All these concerns need to be addressed on the basis of common policies and strategies.

1.7 Growth process and the expansion of economic activities inevitably lead to increasing demands for water for diverse purposes: domestic, industrial, agricultural, hydro-power, thermal-power, navigation, recreation, etc. So far, the major consumptive use of water has been for irrigation. While the gross irrigation potential is estimated to

have increased from 19.5 million hectare at the time of independence to about 95 million hectare by the end of the Year 1999-2000, further development of a substantial order is necessary if the food and fibre needs of our growing population are to be met with. The country's population which is over 1,027 million (2001 AD) at present is expected to reach a level of around 1,390 million by 2025 AD. (Ministry of Water Resources, April 1, 2002.

1.8 Production of food grains has increased from around 50 million tonnes in the fifties to about 208 million tonnes in the Year 1999-2000. This will have to be raised to around 350 million tonnes by the year 2025 AD. The drinking water needs of people and livestock have also to be met. Domestic and industrial water needs have largely been concentrated in or near major cities. However, the demand in rural areas is expected to increase sharply as the development programmes improve economic conditions of the rural masses. Demand for water for hydro and thermal power generation and for other industrial uses is also increasing substantially. As a result, water, which is already a scarce resource, will become even scarcer in future. This underscores the need for the utmost efficiency in water utilisation and a public awareness of the importance of its conservation.

1.9 Another important aspect is water quality. Improvements in existing strategies, innovation of new techniques resting on a strong science and technology base are needed to eliminate the pollution of surface and ground water resources, to improve water quality. Science and technology and training have to play important roles in water resources development and management in general.

1.10 National Water Policy was adopted in September, 1987. Since then, a number of issues and challenges have emerged in the development and management of the water resources. Therefore, the National Water Policy (1987) has been reviewed and updated.

Information System

2.1 A well developed information system, for water related data in its entirety, at the national / state level, is a prime requisite for resource planning. A standardised national information system should be established with a network of data banks and data bases, integrating and strengthening the existing Central and State level agencies and improving the quality of data and the processing capabilities.

2.2 Standards for coding, classification, processing of data and methods/ procedures for its collection should be adopted. Advances in information technology must be introduced to create a modern information system promoting free exchange of data among various agencies. Special efforts should be made to develop and continuously upgrade technological capability to collect, process and disseminate reliable data in the desired time frame.

2.3 Apart from the data regarding water availability and actual water use, the system should also include comprehensive and reliable projections of future demands of water for diverse purposes.

Water Resources Planning

3.1 Water resources available to the country should be brought within the category of utilizable resources to the maximum possible extent.

3.2 Non-conventional methods for utilisation of water such as through inter-basin transfers, artificial recharge of ground water and desalination of brackish or sea water as well as traditional water conservation practices like rainwater harvesting, including roof-top rainwater harvesting, need to be practiced to further increase the utilisable water resources. Promotion of frontier research and development, in a focused manner, for these techniques is necessary.

3.3 Water resources development and management will have to be planned for a hydrological unit such as drainage basin as a whole or for a sub-basin, multi-sectorally, taking into account surface and ground water for sustainable use incorporating quantity and quality aspects as well as environmental considerations. All individual developmental projects and proposals should be formulated and considered within the framework of such an overall plan keeping in view the existing agreements/awards for a basin or a sub-basin so that the best possible combination of options can be selected and sustained. (Ministry of Water Resources, April 1, 2002).

3.4 Watershed management through extensive soil conservation, catchment-area treatment, preservation of forests and increasing the forest cover and the construction of check-dams should

be promoted. Efforts shall be to conserve the water in the catchment.

3.5 Water should be made available to water short areas by transfer from other areas, including transfers from one river basin to another, based on a national perspective, after taking into account the requirements of the areas / basins.

Institutional Mechanism

4.1 With a view to give effect to the planning, development and management of the water resources on a hydrological unit basis, along with a multi-sectoral, multi-disciplinary and participatory approach as well as integrating quality, quantity and the environmental aspects, the existing institutions at various levels under the water resources sector will have to be appropriately reoriented/reorganised and even created, wherever necessary. As maintenance of water resource schemes is under non-plan budget, it is generally being neglected. The institutional arrangements should be such that this vital aspect is given importance equal or even more than that of new constructions.

4.2 Appropriate river basin organisations should be established for the planned development and management of a river basin as a whole or sub-basins, wherever necessary. Special multi-disciplinary units should be set up to prepare comprehensive plans taking into account not only the needs of irrigation but also harmonising various other water uses, so that the available water resources are determined and put to optimum use having regard to existing agreements or awards of Tribunals under the relevant laws. The scope and powers of the river basin organisations shall be decided by the basin States themselves.

Water Allocation Priorities

5. In the planning and operation of systems, water allocation priorities should be broadly as follows:
   - Drinking water
   - Irrigation
   - Hydro-power
   - Ecology
   - Agro-industries and non-agricultural industries
   - Navigation and other uses.

However, the priorities could be modified or added if warranted by the area/region specific considerations.

Project Planning

6.1 Water resource development projects should as far as possible be planned and developed as multipurpose projects. Provision for drinking water should be a primary consideration.

6.2 The study of the likely impact of a project during construction and later on human lives, settlements, occupations, socio-economic, environment and other aspects shall form an essential component of project planning.

6.3 In the planning, implementation and operation of a project, the preservation of the quality of environment and the ecological balance should be a primary consideration. The adverse impact on the environment, if any, should be minimised and should be offset by adequate compensatory measures. The project should, nevertheless, be sustainable.

6.4 There should be an integrated and multi-disciplinary approach to the planning, formulation, clearance and implementation of projects, including catchment area treatment and management, environmental and ecological aspects, the rehabilitation of affected people and command area development. The planning of projects in hilly areas should take into account the need to provide assured drinking water, possibilities of hydro-power development and the proper approach to irrigation in such areas, in the context of physical features and constraints of the basin such as steep slopes, rapid run-off and the incidence of soil erosion. The economic evaluation of projects in such areas should also take these factors into account.

6.5 Special efforts should be made to investigate and formulate projects either in, or for the benefit of, areas inhabited by tribal or other specially disadvantaged groups such as socially weak, scheduled castes and scheduled tribes. In other areas also, project planning should pay special attention to the needs of scheduled castes and scheduled tribes and other weaker sections of the society. The economic evaluation of projects benefiting such disadvantaged sections should also take these factors into account.

6.6 The drainage system should form an integral part of any irrigation project right from the planning stage.

6.7 Time and cost overruns and deficient realisation of benefits characterising most water related projects should be overcome by upgrading the quality of project preparation and management. The inadequate funding of projects should be obviated by an optimal allocation of resources on the basis of prioritisation, having regard to the early completion of on-going projects as well as the need to reduce regional imbalances.

6.8 The involvement and participation of beneficiaries and other stakeholders should be encouraged right from the project planning stage itself.

Ground Water Development

7.1 There should be a periodical reassessment of the ground water potential on a scientific basis, taking into consideration the qualit y of the water available and economic viability of its extraction.

7.2 Exploitation of ground water resources should be so regulated as not to exceed the recharging possibilities, as also to ensure social equity. The detrimental environmental consequences of overexploitation of ground water need to be effectively prevented by the Central and State Governments. Ground water recharge projects should be developed and implemented for improving both the quality and availability of ground water resource.

7.3 Integrated and coordinated development of surface water and ground water resources and their conjunctive use, should be envisaged right from the project planning stage and should form an integral part of the project implementation.

7.4 Over exploitation of ground water should be avoided especially near the coast to prevent ingress of seawater into sweet water aquifers.

Drinking Water

8. Adequate safe drinking water facilities should be provided to the entire population both in urban and in rural areas. Irrigation and multipurpose projects should invariably include a drinking water component, wherever there is no alternative source of drinking water. Drinking water needs of human beings and animals should be the first charge on any available water. (Ministry of Water Resources April 1, 2002).

Irrigation

9.1 Irrigation planning either in an individual project or in a basin as a whole should take into account the irrigability of land, cost-effective irrigation options possible from all available sources of water and appropriate irrigation techniques for optimising water use efficiency. Irrigation intensity should be such as to extend the benefits of irrigation to as large a number of farm families as possible, keeping in view the need to maximise production.

9.2 There should be a close integration of water-use and land-use policies.

9.3 Water allocation in an irrigation system should be done with due regard to equity and social justice. Disparities in the availability of water between head-reach and tail-end farms and between large and small farms should be obviated by adoption of a rotational water distribution system and supply of water on a volumetric basis subject to certain ceilings and rational pricing.

9.4 Concerted efforts should be made to ensure that the irrigation potential created is fully utilised. For this purpose, the command area development approach should be adopted in all irrigation projects.

9.5.1 Irrigation being the largest consumer of fresh water, the aim should be to get optimal productivity per unit of water. Scientific water management, farm practices and sprinkler and drip system of irrigation should be adopted wherever feasible.

9.6 Reclamation of water logged/saline affected land by scientific and cost-effective methods should form a part of command area development programme.

Resettlement and Rehabilitation

10. Optimal use of water resources necessitates construction of storages and the consequent resettlement and rehabilitation of population. A skeletal national policy in this regard needs to be formulated so that the project affected persons share the benefits through proper rehabilitation. States should accordingly evolve their own detailed resettlement and rehabilitation policies for the sector, taking into account the local conditions. Careful planning is necessary to ensure that the construction and rehabilitation activities proceed simultaneously and smoothly.

Financial and Physical Sustainability

11. Besides creating additional water resources facilities for various uses, adequate emphasis needs to be given to the physical and financial sustainability of existing facilities. There is, therefore, a need to ensure that the water charges for various uses should be fixed in such a way that they cover at least the operation and maintenance charges of providing the service initially and a part of the capital costs subsequently. These rates should be linked directly to the quality of service provided. The subsidy on water rates to the disadvantaged and poorer sections of the society should be well targeted and transparent.

Participatory Approach to Water Resources Management

12. Management of the water resources for diverse uses should incorporate a participatory approach; by involving not only the various governmental agencies but also the users and other stakeholders, in an effective and decisive manner, in various aspects of planning, design, development and management of the water resources schemes. Necessary legal and institutional changes should be made at various levels for the purpose, duly ensuring appropriate role for women. Water Users' Associations and the local bodies such as municipalities and *gram panchayats* should particularly be involved in the operation, maintenance and management of water infrastructures/facilities at appropriate levels progressively, with a view to eventually transfer the management of such facilities to the user groups / local bodies. (Ministry of Water Resources, April 1, 2002)

Private Sector Participation

13. Private sector participation should be encouraged in planning, development and management of water resources projects for diverse uses, wherever feasible. Private sector participation may help in introducing innovative ideas, generating financial resources and introducing corporate management and improving service efficiency and accountability to users. Depending upon the specific situations, various combinations of private sector participation in building, owning, operating, leasing and transferring of water resources facilities may be considered.

Water Quality

14.1 Both surface water and ground water should be regularly monitored for quality. A phased programme should be undertaken for improvements in water quality.

14.2 Effluents should be treated to acceptable levels and standards before discharging them into natural streams.

14.3 Minimum flow should be ensured in the perennial streams for maintaining ecology and social considerations.

14.4 Principle of 'polluter pays' should be followed in management of polluted water.

14.5 Necessary legislation is to be made for preservation of existing water bodies by preventing encroachment and deterioration of water quality.

Water Zoning

15. Economic development and activities including agricultural, industrial and urban development should be planned with due regard to the constraints imposed by the configuration of water availability. There should be a water zoning of the country and the economic activities should be guided and regulated in accordance with such zoning.

Conservation of Water

16.1 Efficiency of utilisation in all the diverse uses of water should be optimised and an awareness of water as a scarce resource should be fostered. Conservation consciousness should be promoted through education, regulation, incentives and disincentives.

16.2 The resources should be conserved and the availability augmented by maximising retention, eliminating pollution and minimising losses. For this, measures like selective linings in the conveyance system, modernisation and rehabilitation of existing systems including tanks, recycling and re-use of treated effluents and adoption of traditional techniques like mulching or pitcher irrigation and new techniques like drip and sprinkler may be promoted, wherever feasible.

Flood Control and Management

17.1 There should be a master plan for flood control and management for each flood prone basin.

17.2 Adequate flood-cushion should be provided in water storage projects, wherever feasible, to facilitate better flood management. In highly flood prone areas, flood control should be given overriding consideration in reservoir regulation policy even at the cost of sacrificing some irrigation or power benefits. (Ministry of Water Resources, April 1, 2002).

17.3 While physical flood protection works like embankments and dykes will continue to be necessary, increased emphasis should be laid on non-structural measures such as flood forecasting and warning, flood plain zoning and flood proofing for the minimisation of losses and to reduce the recurring expenditure on flood relief.

17.4 There should be strict regulation of settlements and economic activity in the flood plain zones along with flood proofing, to minimise the loss of life and property on account of floods.

17.5 The flood forecasting activities should be modernised, value added and extended to other uncovered areas. Inflow forecasting to reservoirs should be instituted for their effective regulation.

Land Erosion by Sea or River

18.1 The erosion of land, whether by the sea in coastal areas or by river waters inland, should be minimised by suitable cost-effective measures. The States and Union Territories should also undertake all requisite steps to ensure that indiscriminate occupation and exploitation of coastal strips of land are discouraged and that the location of economic activities in areas adjacent to the sea is regulated.

18.2 Each coastal State should prepare a comprehensive coastal land management plan, keeping in view the environmental and ecological impacts, and regulate the developmental activities accordingly.

Drought-Prone Area Development

19.1 Drought-prone areas should be made less vulnerable to drought-associated problems through soil moisture conservation measures, water harvesting practices, minimisation of evaporation losses, development of the ground water potential including recharging and the transfer of surface water from surplus areas, where feasible and appropriate. Pastures, forestry or other modes of development, which are relatively less water demanding, should be encouraged. In planning water resource development projects, the needs of drought-prone areas should be given priority.

19.2 Relief works undertaken for providing employment to drought-stricken population should preferably be for drought proofing.

Monitoring of Projects

20.1 A close monitoring of projects to identify bottlenecks and to adopt timely measures to obviate time and cost overrun should form part of project planning and execution.

20.2 There should be a system to monitor and evaluate the performance and socio-economic impact of the project.

Water Sharing/Distribution among the States

21.1 The water sharing/distribution amongst the States should be guided by a national perspective with due regard to water resources availability and needs within the river basin. Necessary guidelines, including for water short States even outside the basin, need to be evolved for facilitating future agreements among the basin States.

21.2 The Inter-State Water Disputes Act of 1956 may be suitably reviewed and amended for timely adjudication of water disputes referred to the Tribunal.

Performance Improvement

22. There is an urgent need of paradigm shift in the emphasis in the management of water resources sector. From the present emphasis on the creation and expansion of water resources infrastructures for diverse uses, there is now a need to give greater emphasis on the improvement of the performance of the existing water resources facilities. Therefore, allocation of funds under the water resources sector should be re-prioritised to ensure that the needs for development as well as operation and maintenance of the facilities are met.

Maintenance and Modernisation

23.1 Structures and systems created through massive investments should be properly maintained in good health. Appropriate annual provisions should be made for this purpose in the budgets.

23.2 There should be a regular monitoring of structures and systems and necessary rehabilitation and modernisation programmes should be undertaken.

23.3 Formation of Water Users' Association with authority and responsibility should be encouraged to facilitate the management including maintenance of irrigation system in a time bound manner.

Safety of Structures

24. There should be proper organisational arrangements at the national and state levels for ensuring the safety of storage dams and other water-related structures consisting of specialists in investigation, design, construction, hydrology, geology, etc. A dam safety legislation may be enacted to ensure proper inspection, maintenance and surveillance of existing dams and also to ensure proper planning, investigaton, design and construction for safety of new dams. The Guidelines on the subject should be periodically updated and reformulated. There should be a system of continuous surveillance and regular visits by experts.

Science and Technology

25. For effective and economical management of our water resources, the frontiers of knowledge need to be pushed forward in several directions by intensifying research efforts in various areas, including the following:

- Hydrometeorology;
- Snow and lake hydrology;
- Surface and ground water hydrology;
- River morphology and hydraulics;
- Assessment of water resources;
- Water harvesting and ground water recharge;
- Water quality;
- Water conservation;
- Evaporation and seepage losses;
- Recycling and re-use;
- Better water management practices and improvements in operational technology;
- Crops and cropping systems;
- Soils and material research;
- New construction materials and technology (with particular reference to Roller-compacted concrete, fib-reinforced concrete, new methodologies in tunnelling technologies, instrumentation, advanced numerical analysis in structures and back analysis);
- Seismology and seismic design of structures;
- The safety and longevity of water-related structures;
- Economical designs for water resource projects;
- Risk analysis and disaster management;
- Use of remote sensing techniques in development and management;
- Use of static ground water resource as a crisis management measure;
- Sedimentation of reservoirs;
- Use of sea water resources;
- Prevention of salinity ingress;
- Prevention of water logging and soil salinity;
- Reclamation of water logged and saline lands;
- Environmental impact; and
- Regional equity.

Training

26. A perspective plan for standardised training should be an integral part of water resource dvelopment. It should cover training in information systems, sectoral planning, project planning and formulation, project management, operation of projects and their physical structures and systems and the management of the water distribution systems. The training should extend to all the categories of personnel involved in these activities as also the farmers.

Conclusion

27. In view of the vital importance of water for human and animal life, for maintaining ecological balance and for economic and developmental activities of all kinds, and considering its increasing scarcity, the planning and management of this resource and its optimal, economical and equitable use has become a matter of the utmost urgency. Concerns of the community needs to be taken into account for

water resources development and management. The success of the National Water Policy will depend entirely on evolving and maintaining a national consensus and commitment to its underlying principles and objectives. To achieve the desired objectives, State Water Policy backed with an operational action plan shall be formulated in a time bound manner say in two years. National Water Policy may be revised periodically as and when need arises.

National Water Policy, 1987

The need for a National Water Policy (NWP) stated: "Water is a scarce and precious national resource to be planned, developed and conserved as such, and on an integrated and environmentally sound basis, keeping in view the needs of the States concerned." This policy was approved by the `National Water Resources Council' (NWRC) in the meeting held in 1987 under the chairmanship of the Prime Minister of India, with participation by the Chief Ministers of the States and Administrators of Union Territories as members. The NWRC is an 'Apex body' to evolve National Water Policy for the development and use of Water Resources, in conformity with National interests. The National Water Policy has stated that Resource planning in the case of water has to be done for a hydrological unit such as a drainage basin as whole, or for a sub-basin.

All individual developmental projects and proposals should be formulated by the States and considered within the framework of such an overall plan for a basin or a sub-basin, so that the best possible combination of options can be made." In the National Water Policy, water allocation priorities have been recommended as follows:

- Drinking water
- Irrigation
- Hydropower
- Navigation
- Industrial and other uses

The policy suggests an adjustment to suit particular regions (area specific considerations) and that drinking water needs of human beings and animals should be the first charge on any available water. It further states: "Irrigation and multi purpose projects should invariably include a drinking water component, wherever there is no alternative source of drinking water." With regard to Irrigation, the policy document states: "There should be a close integration of water-use and land-use policies. Water allocation in an irrigation system should be done with due regard to equity and social justice." No details on the division of waters between the States were discussed in the Policy paper.

National Water Policy (as Adopted in April, 2002)

National Water Policy was adopted in September 1987. Since then a number of issues and challenges have emerged in the development and management of the water resources. Therefore, the National Water Policy (1987) has been reviewed and updated, which states: "Water is a prime natural resource, a basic human need and a precious national asset. Planning development and management of water resource need to be governed by national perspectives. Realising the importance and scarcity attached to the fresh water, it has to be treated as an essential environment for sustaining all life forms."

As the country has entered the 21st century, efforts to develop, conserve, utilise and manage this important resource in a sustainable manner have to be guided by the national perspective. Approach to management of drought and floods has to be coordinated and guided at the national level. The development and over-exploitation of ground water resources in certain parts of the country have raised the concern and need for judicious and scientific resource management and conservation.

The demand in the rural areas is expected to increase sharply as the development programmes improve economic conditions of the rural masses. Demand for water for hydro and thermal power generation and for the other industrial uses is also increasing substantially. As a result, water, which is already a scarce resource, will become even scarce in the future. This underscores the need for utmost efficiency in water utilization and public awareness. In the planning and operation of systems, water allocation priorities should be broadly as follows:

- Drinking Water
- Irrigation
- Hydropower
- Ecology
- Agro Industries and non-agricultrual Industries
- Navigation and other uses.

However, the priorities could be modified or added if warranted by the area or region specific consideration.

(The full text of the National Water Policy 2002 is given in the Appendix 2).

APPENDIX 3

GROUND WATER DEVELOPMENT

In India, ground water has been used for irrigation and domestic water supply since time immemorial. At present, more than 70 per cent of the population use ground water for its domestic needs and more than half of irrigation is provided from this source.

The total replenishable ground water in India is estimated to be about 43.18850 million hectare metre per year (about 432 billion cubic metre). About 7.1 m ha m/yr is used for domestic and industrial use. It is estimated that about 32.47264 m ha m/yr is available for irrigation. According to an estimate by Central Ground Water Board, 32 per cent of available ground water resources have so far been developed.

In spite of the overall satisfactory availability of groundwater, there are some areas in the country, which are facing scarcity of ground water. The reason for this is that the development of ground water in different areas of the country has not been uniform. Highly intensive development of ground water in certain areas in the country has resulted in its over-exploitation leading to fall in the level of ground water and salinity ingress in costal areas.

Out of 5,711 blocks in the country, 310 blocks have been categorisd as "over-exploited", i.e., the stage of ground water development exceeds the annual replenishable recharge and 160 blocks are "dark", i.e., the stage of ground water development is more than 85 per cent. Twelve mandals have been categorized as "over-exploited" and 15 as "dark" out of 1,104 mandals in Andhra Pradesh. Similarly in Gujarat, out of 184 talukas, 13 are "over-exploited" and 15 are "dark".

The ground water in most of the areas in the country is fresh. Brackish ground water occurs in the arid zones of Rajasthan, close to costal tracts in Saurashtra and Kuchch, some areas in the east coast and some pockets in Punjab and Haryana. However, contaminants and pollutants are being found increasingly in ground water, which make it unutilisable for drinking and in some cases injurious to health.

Table (1)

Plan-wise Position of Irrigation Potential (Surface and Ground Water Created and Utilised)

Plan	*Major & Medium*	*Potential Created Minor*			*Total*	*Major & Medium*	*Potential Utilised Minor*			*Total*
		SW	*GW*	*Total*			*SW*	*GW*	*Total*	
At the end of										
I plan 1951-56	12.20	6.43	7.63	14.06	26.26	10.98	6.43	7.63	14.06	25.04
II plan 1956-61	14.33	6.45	8.30	14.75	29.08	13.05	6.45	8.30	14.75	27.80
III plan 1961-66	16.57	6.48	10.52	17.00	33.57	15.17	6.48	10.52	17.00	32.17
Annual Plans 1966-69	18.10	6.50	12.50	19.00	37.10	16.75	6.50	12.50	19.00	35.75
IV Plan 1969-74	20.70	7.00	16.50	23.50	44.20	18.69	7.00	16.50	23.50	42.19
V plan 1974-78	24.72	7.50	19.80	27.30	52.02	21.16	7.50	19.80	27.30	48.46
Annual plans 1978-80	26.61	8.00	22.00	30.00	56.61	22.64	8.00	22.00	30.00	52.64
VI plan 1980-85	27.70	9.70	27.82	37.52	65.22	23.57	9.01	26.24	35.25	58.82
VII Plan	29.92	10.99	35.62	46.61	76.53	25.47	9.97	33.15	43.12	68.59
Annual Plans 1990–92	30.74	11.46	38.89	50.35	81.09	26.32	10.29	36.25	46.54	72.86
VIII Plan 1992–97 (provisional)	32.96	N.A	N.A.	56.60	89.56	28.44	N.A	N.A.	52.82	80.76

Table (2)
Ground-Water Resources and Irrigation Potential of India

Sl. No	*States/UTs*	*Total replenishable Ground Water, Water Resources (m.ham/yr*	*Provision for Domestic & Industrial & water Other uses (m.ham/yr)*	*Available Ground Water Delta Resource for irrigation in next terms (m.ham/yr)*	*Utilisable Ground Water Potential Resource for irrigation in next terms (m.ham/yr)*	*Gross Draft Estimated on Priority Basis (m.ham/yr)*	*Net Draft (m.ham/yr)*	*Balance Ground Resources for Future Use in net terms (m.ham/yr)*	*Level of Ground Develop-ment (%)*	*Weighted Average Delta (m)*	*Utilisable Irrigation for Develop-ment (m.ha)*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1.	Andhra Pradesh	3.52916	0.52938	2.09978	2.69981	1.01318	0.70922	2.29056	23.64	0.047-1.472	3.96000
2.	Arunachal Pradesh	0.14385	0.02158	0.12227	0.11005	—	—	0.12227	—	—	0.01800
3.	Assam	2.47192	0.37079	2.10113	1.89102	0.13455	0.09418	2.00695	4.48	1.283	0.90000
4.	Bihar	3.35213	050282	2.84931	2.56439	0.78108	0.54676	2.30255	19.19	0.40-0.65	4.94763
5.	Goa	0.02182	0.00327	0.01865	0.01670	0.00210	0.00164	0.01701	8.30	0.570	0.02020
6.	Gujarat	2.03767	0.30565	1.73202	1.55881	1.02431	0.71702	1.01500	41.45	0.45-0.714	2.75590
7.	Haryana	0.85276	0.12792	0.72484	0.65236	0.86853	0.60798	0.11686	83.88	0.385-0.8	1.46170
8.	Himachal Pradesh	0.03660	0.00731	0.02929	0.02637	0.00757	0.00530	0.02300	18.10	0.385	0.00850
9.	Jamu & Kashmir	0.044257	0.06639	0.37618	0.33858	0.00713	0.00500	0.37118	1.33	0.385-0.6	0.70795
10.	Karnataka	1.61857	0.24279	1.37578	1.23821	0.61443	0.43010	0.94568	31.26	0.18-0.74	2.57281
11.	Kerala	0.79003	0.13135	0.65868	0.59281	0.14374	0.10062	0.55806	15.28	0.53-0.88	0.87925
12.	Madhya Pradesh	5.08892	0.76332	4.32560	3.89298	1.01866	0.71312	3.61249	16.49	0.400	9.73249
13.	Maharashtra	3.78673	1.23972	2.54701	2.29231	1.10576	0.77403	1.77298	30.39	0.43-1.281	3.65197
14.	Manipur	0.31540	0.04730	0.26810	0.24129	Neg.	Neg.	0.26810	Neg.	0.650	0.36900
15.	Meghalaya	0.05397	0.00810	0.04587	0.04128	0.00260	0.00182	0.04405	Neg.	0.650	0.06351
16.	Mizoram	Not	Assessed								
17.	Nagaland	0.07240	0.01090	0.06150	0.05535	Neg.	Neg.	0.06150	Neg.	—	—
18.	Orissa	2.00014	0.30002	1.70012	1.53009	0.20447	0.14313	1.55699	8.42	0.34-0.44	4.20258
19.	Punjab	1.86550	0.18652	1.67898	1.51109	2.25109	1.57576	0.10322	93.85	0.518	2.91715
20.	Rajasthan	1.27076	0.19945	1.07131	0.96418	0.77483	0.54238	0.52893	50.63	0.457-0.6	1.77783
21.	Sikkim	Not	Assessed								
22.	Tamil Nadu	2.63912	0.39586	2.24326	2.01892	1.93683	1.35578	0.88748	60.44	0.37-0.93	2.83205
23.	Tripura	0.06634	0.00995	0.05639	0.05076	0.02692	0.01885	0.3754	33.43	0.630	0.08056
24.	Uttar Pradesh	8.38210	1.25743	7.12467	6.41233	3.83364	2.68354	4.44113	37.67	0.20-0.50	16.79896

1	2	3	4	5	6	7	8	9	10	11	12
25.	West Bengal	2.30923	0.31642	1.96281	1.76653	0.67794	0.47452	1.48829	24.18	0.33-0.75	3.31794
	Total States	43.14769	7.07414	36.07355	32.46621	16.42936	11.50055	24.57300	31.88	—	64.04513
	Union Territories										
26.	Andaman & Nicobar Islands	Not	Assessed								
27.	Chandigarh	0.002968	—	—	—	0.00351	0.002454	0.000512	—	—	—
28.	Dadra & N.Haveli	0.004220	0.000633	0.003587	0.00323	0.00065	0.000457	0.003130	12.74	0.640	0.00504
29.	Daman & Diu	0.001300	0.000200	0.001100	0.00099	0.00129	0.000900	0.000200	—	—	—
30.	NCT Delhi	0.029154	0.017832	—	—	0.01684	0.011800	—	—	—	—
31.	Lakshadweep	0.000243	—	—	—	0.00022	0.000155	0.000088	63.79	—	—
32.	Pondichery	0.0002877	0.000432	0.002445	0.00220	0.00085	0.000595	0.001850	24.34	—	—
	Total UTs	0.040760	0.019197	0.007132	0.00642	0.02336	0.016362	0.005780	—	—	0.00504
	Grand Total	43.18850	7.093337	36.08062	32.47264	16.45272	11.516912	24.57878	31.02	—	64.05017

Col. 5 = Ground-water Resource - Provision of Domestic, Industrial and other uses (Col. 3 - Col. 4)

Co. 6 = 90% of Column 5

Col. 7 = Gross draft is the total withdrawal from Groundwater Resources from Irrigation

Col .8 = 70% of Gross draft (bulk of the losses return back to the Groundwater reservoir)

Col. 9 = Col. 5 – Col. 8 in net terms

Col.10 = Level of Ground-Water Development (Col. 8/Col. 5) X 100

Col.12 = Utilisable Groundwater Resource for Irrigation/Weighted Average Delta (Col. 6/Col. 11)

(This is 90% of ultimate irrigation potential which was computed as per available groundwater resources for irrigation and limited it as per the land availability)

Utilised irrigation potential has been kept as 90%of the ultimate irrigation potential which Is reasonable in view of the following:

1. To ensure sustainable development, the level of extraction has to be kept at a level lower than the ultimate availability.
2. To maintain river ecology, minimum flows have to be ensured by limiting extraction of ground water that contributes to the lean season flows in the rivers.

Table 10(3)

Categorisation of Blocks/Mandals/Talukas/Watersheds as Overexploited and Dark on all India Basis

Sl. No	*States/UTs*	*No. of Blocks/Mandal/ Taluks/Watersheds*	*No. of blocks/Taluks/Mandals/Watersheds*			
			Over-exploited		*Dark*	
			No.	*%*	*No.*	*%*
	States					
1	Andhra Pradesh	1,104	12	1.09	14	1.27
2	Arunachal Pradesh	0	0	0.00	0	0.00
3	Assam	134	0	0.00	0	0.00
4	Bihar	589	3	0.51	9	1.53
5	Goa	12	0	0.00	0	0.00
6	Gujarat	184	13	7.07	15	8.15
7	Haryana	108	33	30.56	8	7.41
8	Himachal Pradesh	69	0	0.00	0	0.00
9	Jammu & Kashmir	123	0	0.00	0	0.00
10	Karnataka	175	7	4.00	9	5.14
11	Kerala	154	0	0.00	0	0.00
12	Madhya Pradesh	459	2	0.44	1	0.22
13	Maharashtra	231	2	0.87	6	2.60
14	Manipur	26	0	0.00	0	0.00
15	Meghalaya	29	0	0.00	0	0.00
16	Mizoram	20	0	0.00	0	0.00
17	Nagaland	21	0	0.00	0	0.00
18	Orissa	314	4	1.27	4	1.27
19	Punjab	138	72	52.17	11	7.97
20	Rajasthan	236	74	31.36	20	8.47
21	Sikkim	4	0	0	0	0
22	Tamil Nadu	384	64	16.67	39	10.16
23	Tripura	17	0	0.00	0	0.00
24	Uttar Pradesh	819	19	2.32	21	2.56
25	West Bengal	341	0	0.00	1	0.29
	Total States	**5,691**	**305**		**158**	
	Union Territories					
1	Andaman & Nicobar	0	0	0	0	0
2	Chandigarh	0	0	0	0	0
3	Dadar & Nagar Haveli	0	0	0	0	0
4	Daman & Diu	2	1	50.00	1	50.00
5	NCT Delhi	5	3	60.00	1	20.00
6	Lakshdweep	9	0	0.00	0	0.00
7	Pondicherry	4	1	25.00	0	0.00
	Total UTs	**20**	**5**		**2**	
	Grand Total	**5,711**	**310**		**160**	

..... सुजलाम् सुफलाम् मलयज शीतलाम्
शस्य श्यामलाम् मातरम्
वन्दे मातरम्।

.....विन्ध्य हिमाचल यमुना गंगा
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