Ganga

Common Heritage or Corporate Commodity?

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INTRODUCTION

Water has become the biggest problem of 21st century. People died in India during the recent past, crying for water. And the problem is worsening day by day.

Global consumption of freshwater increased six fold during 1900-95, at a faster rate greater than twice the rate of population growth. And if present trend continues, two out of every three people on earth will have to live in water stressed condition by the year 2025. A recent World Water Development Report corroborates this. About 20 per cent of the world's population do not have access to safe drinking water and 40 per cent do not have sufficient water for adequate living and hygiene. The report expects that by 2050, water scarcity will affect 2 to 7 billion people out of total 9.3 billion, depending on factors like population growth and measures taken by political leaders to tackle the crisis. The report also found that more than 2.2 million people die each year from diseases related to contaminated drinking water and poor living conditions, faced with water scarcity (Baxi and Sharma, 2003).

If we have to halve the number of people without access to safe water and sanitation by 2015, the world will have to spend up to $180 billion annually, more than double that is spent today (Toepfer, 2003).

As for India, the problem is more acute, as the population growth is spurring a demographic change, especially as towns become cities and cities become mega cities. This can be seen from the fact that the 23 million-plus cities in India in 1990 grew to 42 in 2000 and are expected to grow to 63 by 2010. Also, there are serious concerns on the availability of freshwater, as India with 16 per cent of the world's population has only 2.45 per cent of the world's land resources and 4 per cent of the fresh water resources. The per capita availability of fresh water in the country has dropped from an acceptable 5,177 cubic metres in 1951 to 1,820 cubic metres in 2001. It is estimated that it would further decline to 1,341 cubic metres by 2025 and 1,140 cubic metres by 2050 (table 1.1). This is alarming as the threshold per capita value for water stress is 1,000 cubic metres. Total water availability is 1,122 billion cubic metres as shown in table 1.2.

India ranks a poor 120 in a list of 122 countries ranked for their water quality as also their ability and commitments to improving its quality, in a World Water Development Report. In terms of water availability, India has not fared well. She is ranked lowly 133 in a list of 180 countries. India's neighbours, Bangladesh, Sri Lanka, Nepal and Pakistan have fared better than India, occupying the 40th, 64th, 78th and 80th slots respectively (*The Indian Express*, New Delhi, 6 March 2003).

India's population, recording a current annual increase by 15.5 million, has to inevitably face the greatest challenge of conservation and equitable distribution of the limited freshwater resources. And its management is inextricably intertwined with future growth and poverty alleviation.

Table 1.1: Population Growth and Per Capita Water Availability

Year	*Population (million)*	*Per Capita Water Availability (cubic metres)*
1951	361	5,177
1955	395	4,732
1991	846	2,209
2001	1,027	1,820
2025	1,394	1,341
2050	1,640	1,140

Source: Ministry of Water Resources, Government of India

Table 1.2: National Water Resources Potential

Precipitation	4,000 BCM
Average Rim-off in rivers	1,869 BCM
Utilizable Surface Water	690 BCM
Replenishable ground water	432 BCM
Total Water Availability	1,122 BCM
Irrigation Potential	140 million hectares
Hydropower Potential (L)	84,000 MW @ 60 per cent

Source: Ministry of Water Resources, Government of India

Water is the biggest crisis facing India in terms of spread and severity, affecting one in every three persons. Even in Chennai, Bangalore, Shimla and Delhi, water is being rationed and India's food security is under threat. With the lives and livelihood of millions at risk, urban India is screaming for water. For instance, water is rationed twice a week in Bangalore, and for 30 minutes a day in Bhopal; 250 tankers make 2,250 trips to quench Chennai's thirst. Mumbai routinely lives through water cuts from January to June, when some areas get water once in three days in Hyderabad (Aiyar, 2003).

As shown in table 1.3, a study of 12 major cities reveals that they do not get the required quantum of freshwater. Due to water shortage, over 200 million people are vulnerable to water wars. In Neemuch (Madhya Pradesh), one person was killed and six injured in May 2003, when people fought for water with swords and knives. Such sporadic incidents could become routine.

Table 1.3: Need and Shortfall of Water in 12 Major Cities

City	*Need (million litres/day)*	*Shortfall (million litres/day)*
Delhi	3,830	880
Lucknow	560	120
Kolkata	2,258	690
Jaipur	349	313
Jabalpur	239	945
Bhopal	335	70
Indore	318	134
Visakhapatnam	305	146
Mumbai	4,000	1,030
Hyderabad	956	186
Chennai	300	105
Bangalore	840	135

Source: Aiyar, India Today *(New Delhi), 9 June 2003*

Urban water privatisation is divorced from reality. It is obvious that the privatisation protagonists forgot to take into consideration the myriad complexities of the India's Water Management System that are deeply embedded in the country's society, politics and economy.

According to Prof. A. V. Vaidyanathan, water expert with Madras Institute of Development Studies in Chennai: "It is not correct to describe water as a commodity. It is a public utility which can be priced, but within certain socio-economic parameters."

However, Municipal Corporations under the pressure of privatisation lobby have proposed a huge tariff hike (table 1.4). For Delhi, the water cost will increase manyfold.

Contrary to popular perception, water shortage is not just an urban problem but is, in fact, worse in

Table 1.4: Privatisation of Water to Spawn a Steep Tariff Hike

City	*Current Tariff (Rs/kl)*	*Likely Extra Burden (Rs/kl)*
Hyderabad	6.00	4.00
Kolkata	3.00	7.00
Surat	2.00	8.00
Tiruppur	5.00	5.00
New Delhi	0.35	9.65
Mumbai	4.00	6.00
Bangalore	6.50	3.50

Source: Down to Earth, *New Delhi, 15 September 2002*

rural India. And as basins and rivers dry up, it also threatens the country's food security. According to the data available with the Ministry of Water Resources, eight of the 20 river basins are water deficit, threatening the lives and livelihoods of over 200 million people.

Water precedes *roti, kapada aur makan*. The people of Antarnesh in Patan district of Gujarat still remember the pitiful sight of an eight-year old girl dying of thirst. Women had gone to collect gum from the trees. The child was thirsty but there was no water to give. The water source was 6 kms away. She died crying for water (Saksena, 2003).

According to Shabana Azmi, the actress and nominated Member of Parliament, when the government social programme ran into a fierce opposition from the women, an NGO was called to break the impasse. When asked by the NGO, 'what was their biggest problem?' all the women in one voice said "water." It turned out that they had to walk miles for water because their hand pumps had broken down and the men of the villages could not repair it (D' Monte, 2003).

Indeed, judicious use is what is needed. Also in many areas, it is not how to save more water, but how not to waste water. In urban India, 12 to 15 litres of water is flushed per use. Experts believe it should not be more than 5 litres as practised in some western countries. Per household use of water should be brought down drastically. Also what is needed immediately is to find out new cropping patterns to save water. For instance, rice and sugarcane are high water intensive crops and we must look for alternatives.

Besides the management of water supply, there is also the need for technology to increase efficiency. It is time India should shift from the concept of yield per hectare to yield per cubic metre of water.

According to Ashok Khosla, president of the NGO, Development Alternatives, demand management now means "redesigning and restructure demand" to suit the emerging picture of need and availability. Should Andhra Pradesh grow paddy? Is sugarcane the right crop for Marathwada (Khosla, 2003)?

The National Water Policy passed in 2002 also addresses some of the concerns of the three main stakeholders (rural, urban and industrial) and identifies measures for developing and conserving the nation's water resources. In fact, to increase and optimise water availability in agriculture, it is important to use it optimally by adopting methods like water harvesting and recharging and recycling of water. Therefore, adopting modern techniques like deep and sprinkler irrigation would enable efficient utilization of the available water.

Water conservation programmes need to be initiated to generate awareness on conservation methodology by involving local communities. Industries also need to be encouraged to adopt the latest technologies available for effluent treatment. In urban areas, much water is lost due to technical losses by public water utilities.

About 70 per cent of the world's water is used for growing crops. The agricultural sector in India is the single largest user of water resources accounting for as much as 80 per cent of the total annual withdrawals. With India having the highest irrigated area in the world at 55.14 million hectare, out of total 255.46 million hectare, there is an urgent need for the efficient use of the available water resources. Also, as the population increases, there will be greater need for augmenting food production to achieve food security, and this in

turn will put greater pressure on water supply for irrigation.

Looking 30 years into the future, FAO estimated that feeding the world's population would require 60 per cent more food. Most of this increase will have to come from intensified agriculture, supported by irrigation. But water is already scarce in many countries and competition for water from industrial and domestic users continues to grow.

In irrigation, it is estimated that more than 60 per cent of the water seep from the distribution channels and are lost by evaporation. Moreover, seepage causes water logging and salinisation in irrigated lands, resulting in significant reduction of crop yield. And also, the rainfall shows great variation, unequal seasonal distribution as well as unequal geographical distribution and frequent departures from the normal. As much as 21 per cent of the area of the country receive less than 750 mm of rain annually, while 15 per cent receive rainfall in excess of 1500 mm. Annual rainfall of less than 500 mm is experienced in Western Rajasthan and adjoining parts of Gujarat, Haryana and Punjab. This shows the need for undertaking the measures, which are water prudent.

Groundwater today supplies as much as 80 per cent of the domestic water supply in rural areas and around 50 per cent of the urban and industrial needs. As per estimates, over 70 per cent of the value of irrigated products could depend on ground water resources. Groundwater is said to contribute 51 per cent of the irrigation potential created in the country through more than four million dug wells, five million shallow tube wells and some nine thousand public tube wells. The over exploitation of ground water is leading to a drop in ground water levels in many parts of the country.

According to forecasts by the Ministry of Water Resources and presentations by the Ministry of Agriculture, 11 river basins including the Ganga will be water deficit by 2025, threatening 900 million lives. The symptoms are already visible. Tungabhadra river, fed by the high rainfall catchment area of the Sahayadri range, has already gone dry, but is not yet put on the list of deficit basins.

Instead of focusing on long-term solutions, every government has found it easier to allow exploitation of groundwater. While for the government it meant less investment, for the farmer it was free water to irrigate his land. True, India's food security was propelled by the "tube well revolution," but it led to long-term damage as the pump culture has wrought havoc on the hydrological cycle. Groundwater levels have plunged in 206 districts in the country. Nine States, including Rajasthan, Maharashtra, Gujarat, Haryana, Karnataka and Punjab, are facing major water deficits, where demand exceeds supply. With 3.5 million hand pumps and 56 lakh tube wells in operations, pumping of underground water is now nearly double the rate of aquifer recharge from rainfall.

Industrial sector alleges that agriculture consumes water most inefficiently; however, as illustrated in tables 1.5, 1.6 and 1.7, the industry is not left behind in the misuse of water. Not only this, industry pays a pittance for the water (Bhushan, 2003).

Table 1.5: Industrial Use of Water

Sectors	***Water consumed (MLD)***	***Proportion consumed (per cent)***
Thermal Power Plants	82,194	87.87
Engineering	4,722	5.05
Pulp and paper	2,118	2.26
Textiles (cotton)	1,940	2.07
Iron and steel	1,208	1.29
Sugar	509	0.54
Fertilizers	456	0.49
Distilleries	172	0.18
Organic chemicals	114	0.12
Others	111	0.12

Source: Central Pollution Control Board and Ministry of Environment and Forests (2002): Water Quality in India – Status and Trends (1990-2001)

In India, of all the categories of water use, industrial water use is rising fastest. According to the Central Pollution Control Board (CPCB), water consumption by industry accounts for about 8 per cent of the total national use. By 2050, industry will need almost four times the current water use of industry.

Industry's use of water acts as a double-edged sword: by putting immense pressure on local water resources on one hand, and by devastating environment through wastewater discharges on the other. Essentially used as input, mass and heat transfer media and for other miscellaneous purposes, a very small fraction of the water is actually consumed. About 90 per cent of the water used in major water-consuming industries is ultimately discharged as wastewater. According to the CPCB, Indian Industry consumed 40 km^3 of water and discharged 30.31 km^3 of wastewater in 2001.

Table 1.6: Indian Industry as the Inefficient Consumer

Sectors	*Average Water Consumption*	*Global standard*
Thermal power plant	About 80 m^3/MWh electricity	Less than 10m^3/ MWh electricity
Textiles	200-250m^3/tonne cotton	Less than 100 m^3/ tonne cotton
Pulp and paper:		
i. Wood-based mills	150-200m^3/tonne	50-75m^3/tonne
ii. Waste paper-based mills	75-100m^3/tonne	10-25 m^3/tonne
Integrated iron and steel plant	20-25 m^3/tonne of finished product	5 m^3/tonne of finished product

Source: Down to Earth *(New Delhi), 15 June 2003, p. 28*

Industry doesn't only use up a huge amount of water; it does so in an extremely inefficient manner. Compared to globally acceptable standards, the water consumption efficiency (water consumed to produce a unit product) of Indian industry is dismal (table 1.6). Thermal power plants are the major consumers, accounting for a staggering 88 per cent of the total water consumed by industry (table 1.5). In a scenario where the availability of water is dipping alarmingly, this is a recipe for disaster.

One of the main reasons that Indian industry wastes water wilfully is because it costs almost nothing. Companies pay a ridiculous 10 paise for 1,000 litres of water, while people in some cities end up paying Rs.10 to 50 for the same quantity. Recently, the government amended the Water (Prevention and Control of Pollution) Cess Act, 1977 and introduced a revised water cess for industry. The revised cost of water is still so low that it is imbecilic to expect industry to be pushed by it to improve its water-use efficiency.

Table 1.7: Industry Pays a Pittance

Water Consumed	*Old Rate*	*New Rate*
Industrial cooling, spraying in mine pits or feeding boilers	5 paise/ kilolitre (kl)	10 paise/ kilolitre (kl)
Domestic purposes	2 paise/kl	3 paise/kl
Processing (waste water with biodegradable, non-toxic wastes)	10 paise/kl	20 paise/kl
Processing (waste water with non-biodegradable, toxic wastes)	15 paise/kl	30 paise/kl

Source: Ministry of Environment and Forests: Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003

T. R. Balu, Union Minister of Environment and Forests, while presenting the Bill in Parliament, proclaimed that the new cess would augment the resources of Central and State Pollution Control Boards, promote economy in the use of water, and stop its pollution by industries. The new rates, explained Mr. Balu, are about three times higher than the existing rates. But as shown in table 1.7, industry pays a pittance; an increase of 1-15 paise per 1,000 litres will not make any difference.

II

SACRED GANGA

River systems have been the birthplace of civilization all over the world. They are woven into the social and economic fabric of society and penetrate deep into the psyche of the people living around them. Nowhere is this more evident than in India where the Ganga, Indus, Narmada and other rivers possess the cultural identity transmitted down the ages through our sacred literature, the Puranas and the Vedas, as well as through popular myths and legends (Paranjpye, 1990).

The Ganga, most sacred and important river of India, is regarded as the cradle of Indian civilisation. In *Bhagwad Gita*, Lord Krishna says, "Amongst rivers I am the Ganga." Several pilgrim centres have existed on its banks for centuries. Millions take holy dip in the river during religious festivals, especially during the Kumbh celebrations (Mehta, 1993).

In the words of Valmiki, "Let the pure murmuring waters of the Ganga, which removes evil, destroys sin, having pierced through the depth of the Himalayas, and flowing in waves to far distances, cleanse us ever."

For Emperor Akbar, Ganga was "the water of immortality." He had people stationed on the banks of the river to dispatch water in sealed jars to wherever he was.

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 the world, 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 prehistory and ancient history, Ganga is the most sacred and mythology related. 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 literatures 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, maths, ashrams and cities along Ganga, descending from Rishikesh, Haridwar, Allahabad (Prayag), to Benares (Varanasi) that developed through centuries of cultural development of our country.

For millennia, Indian civilization has made the Ganga its centre of activity. As the root of ancient civilization in northern India, Ganga has been integrated from time immemorial into the canon of Hindu literature, finding her place in the great epics, the Ramayana and the Mahabharata as well as Puranic texts. Her hagiography varies from text

to text, but her most popular myth is the celebration of her descent to earth to purify the souls of men.

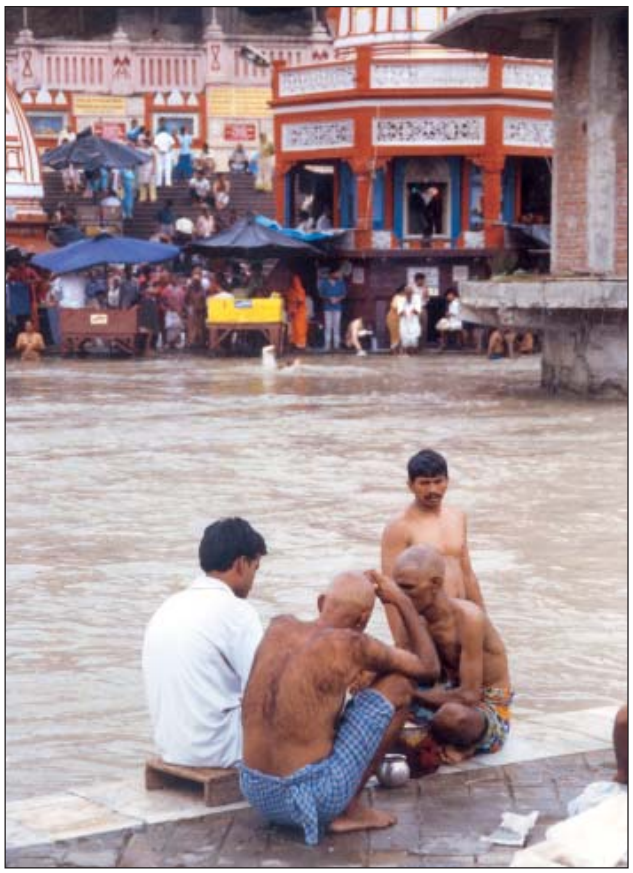
In the popular version, the great king Sagara's sixty thousand sons are burnt to ashes as punishment for disturbing the meditation of the sage Kapila. Bhagiratha, son of Sagara, was able to, through the heat of his austerities, propitiate Ganga and she descended on the earth to purify and wash away the ashes of Sagara's sons and purify their souls by washing away their misdeeds. Before arriving in this world, however, Lord Shiva had to act as a landing pad, for the strength of her fall would have been too great for this world to endure. Catching her in his matted locks, Lord Shiva mediated and tamed the flow of Ganga from the heavens into this world. Thus, the river represents a gateway to purify and absolution for the believers of Hindu religion. In its flow can be found a means to heavenly ascent (Yadav, 2002).

Because the Ganga descends from heavens, she is a sacred bridge to the divine. The Ganga is a *tirtha*, a place for crossing over from one place to another. The *Gangastothra-sata-namavali* is an ode to the river, and reveals the profound effect of the river in India. The salute has 100 and odd sacred names for the river. The Ganga's role as mediator between this world and the divine is embodied in death rituals among Hindus. The ashes of our ancestors and kin are immersed in the Ganga, so that, like the sons of Sagar, they too will be ensured a passage to the heavens (Shiva, 2002).

At an altitude of 10,500 feet stands the Gangotri, where a temple is dedicated to Mother Ganga, who is worshiped as both a sacred river and a goddess. The Bhagirath Shila, a stone upon which King Bhagirath supposedly meditated to bring the Ganga to the earth, is situated a few steps from the Ganga temple. The shrine opens every year on *Akshaya Tritiye*, which falls during the last week of April or the first week of May. On this day, farmers prepare to plant their new seeds. The Ganga temple closes on the day of Deepavali (Diwali), the festival of lights, and the shrine of the goddess Ganga is then taken to Haridwar, Prayag and Varanasi.

Fourteen miles beyond Gangotri is Gaumukh, a glacier formed like the snout of a cow that gives rise to the Ganga. The Gaumukh glacier, which is 24 kilometres in length and six to eight kilometres in width, is receding at a rate of 15 metres per year. The receding glacier of the Ganga, the lifeline for millions of people in the Gangetic plains, has serious consequences for the future of India (Pandey, 2003).

It is "Ganga Ma" that is mother Ganga, as millions of Indians address her, that mercifully provides for the people each year with her swelling levels as she sweeps through the principal cities of northern India, such as Allahabad, where it joins the Yamuna river at a place called "sangam," Varanasi, the oldest living city of the world, and Patna, the erstwhile Pataliputra, to name a few. As the river winds through the pastoral countryside of Uttar Pradesh, Indians receive her with great blessings and appreciation; village farmers benefit greatly from the fertile silt and soil that the great Ganga brings along and leaves behind. Seasonal



Man performing last rites on the bank of Ganga

flooding leaves small pools and lakes that are diverted to irrigate crops in an otherwise dry land. It is Ganga that gives life, renewal, and fertility to the people of the Gangetic basin, one of the most fertile and densely populated areas in the world.

Shri Veer Bhadra Mishra, a recognized mahant (high priest), as well as a professor of Hydraulic Engineering at Benares Hindu University (BHU) at Varanasi founded the "Sankat Mochan Foundation" to maintain the purity of Ganga. Shri Mishra tells the devotees about the Goddess Ganga, that their loved one is polluted and no longer sacred. He knows that any policy and action involving the Ganga must utilize and recognize the religious idiom that constitutes the Ganga for the rest of India. Western science and Hinduism, along with local perceptions, must co-operate. Specialized research conducted by outsiders must be balanced by localized response and action. He illustrates the modern dilemma for Hindus and their practices, as he observes: "There is a struggle and turmoil inside my heart. I want to take a holy dip. I need it to live. The day does not begin for me without the holy dip. But, at the same time, I know what is BOD and I know what is fecal coliform." He is also convinced that science and religion have to match if the Ganga has to be saved (Yadav, 2002).

The late Rajiv Gandhi, the then Prime Minister was moved, seeing the plight of Ganga. In his inaugural speech on the occasion of launching of the 'Ganga Action Plan' at Varanasi on 14 June 1986, he said: "The Ganga Action Plan is not just a government Plan. It has not been prepared for the Public Works Department or the government official alone. It is a plan for all the people of India, in which they can come up forward and participate. It is up to us to clean the whole of the Ganga and refrain from polluting it."

Unfortunately what Rajiv Gandhi said did not prove to be true. Ganga Action Plan became the victim of red tape-ism.

Ganga water has the unique property for

Women from the interior villages of Rajasthan arriving to take holy dip in Ganga

purification, as the bacteria decompose everything in Ganga ecosystem. The quality of river water greatly depends upon the concentration and quality of bacteria. They cause efficient and rapid disintegration of animal and plant tissues and other organic matter, introduced in the river system in the form of sewage, sullage and industrial waste. Bacterial concentration of Ganga water varies with the organic load, season, water content, depth and nature of pollutants. Water in Himalayan ranges from Gangotri to Rishikesh has lower bacterial count, whereas in plains it is highest in Kanpur followed by Varanasi.

Giving "Value" to Water

The worth of water rests on its role and function as a life force for animals, plants and ecosystems in communities where water is considered sacred. However, commodification of water reduces its value only to its commercial value.

The water crisis results from an erroneous equation of value with monetary price. However, resources can often have very high value while having no price. Sacred sites like sacred forests and rivers are examples of resources that have very high value but no price. Oceans, rivers, and other bodies of water have played important roles as metaphors for our relationship to the divine. Diverse cultures have different value systems through which the ethical, ecological, and economic behaviour of society is guided and shaped. Similarly, the idea that life is sacred puts a high value on living systems and prevents their commodification.

Protection of vital resources cannot be ensured through market logic alone. It demands a recovery of the sacred and a recovery of the commons. And these recoveries are happening. Lakhs of pilgrims used to walk from villages across north India to Haridwar and Gangotri to collect Ganga water for Shivratri, the birthday of God Shiva. Carrying *kavads* (yokes from which two jars of holy water dangle and are never allowed to touch the ground), the *kavdias* now number in the millions. Villages and towns put up free resting and eating places along the entire pilgrimage route. The brightly decorated *kavads* containing Ganga water are dedication to the sacred (Shiva, 2002).

No market economy could make millions walk hundreds of kilometres in the muggy heat of August to bring the blessings of the sacred waters to their village. The 30 million devotees who went to bathe in the sacred Ganga for the Kumbh Mela did not see the value of the water in terms of its market price but in terms of its spiritual worth. States cannot force devotees to worship the water market.

Sacred waters carry us beyond the market place into a world charged with myths and stories, beliefs and devotion, culture and celebration. We are all Sagar's children, thirsting for water that liberate and give us life – organically and spiritually. They struggle over the kumbh, between Gods and demons, between those who protect and those who destroy, between those who nurture and those who exploit. Each of us has a role in shaping the creation of the future. Each of us is responsible for the kumbh, the sacred water pot.

Water and religion are inextricably woven in the pattern of Indian life. One starts the day with a Surya Pranam, standing waist deep in water. Before marriage, womenfolk of the house go to the water to make offerings. On birth of a child, offerings are made to the river; and on death one is cremated on the bank of river (Maitra, 2003).

Sradh, performed in some of the special locations such as Haridwar and Varanasi absolves one of all mortal bonds with the world and enhances Moksha. Similarly, it is believed that cremation on the banks of Ganga and particularly at Manikarnika in Varanasi sends one to heaven. Such beliefs are still very alive in the minds of Indian population, and disrespect to such beliefs is considered sacrilegious.

Several religious festivals, Sankrantis, new moon and full moon days, eclipses, special poornimas such as Kartik, Rush and Buddha draw phenomenal crowds to some of the towns on the banks of the rivers. A dip in the river at these

locations is considered holiest of the holy, and so is the desire of every Hindu to do the same.

According to Vedas, the fire at the 'shamshan ghat' on the bank of Ganga in Varanasi has to keep burning always. As belief goes, Lord Shiva carries fire inside his third eye. That is why the bodies burnt at either Manikarnika ghat or the Harish Chandra ghat is supposed to be relieved of any bondage whatsoever and the soul attains 'Moksha' (Salvation), ticket to heaven. It is this belief, which drives the faithful to arrive, and hope to die here only.

According to Prof. Rana P. B. Singh of BHU, the Ganga river front spreads in Varanasi over the arc line of 6.4 kms where lies 84 ghats between the confluence of the Asi in the south and the Varuna in the North. In arch-type connotation, each ghat represents one lakh organic species as described in Hindu mythologies. Further, the 12 zodiac signs multiplied by seven layers of atmosphere come to 84. Thus the annual cycle of the cosmic journey is complited with the sacred at the 84 ghats (Sen, 2000).

Prof. Rana also states: "There are 98 sacred water fronts. These form the cosmic frame linking 14 bhavana kosa of the human body and the seven layers between earth and the heaven, thus the product of 14 with seven comes to 98."

Among the 84 ghats, five are considered more auspicious. These are Asi, Dashashwamedha, Manikarnika, Panchganga and Adikeshava. These five ghats, called panchatirthas are eulogised and are still popular sites to visit. These five ghats symbolise the microcosmic body of Vishnu. Asi is the head, Dashashwamedha the chest, Manikarnika the navel, Panchganga the thighs and Adikeshava the feet. This tells us that Vishnu first placed his holy feet in Varanasi on the banks of Ganga, and that is why the banks are said to symbolise Vishnu's body.

The river introduces a dynamic element in the urban-scape of a city, and thus pre-industrial cities opened on to the river. Ghats (stepped platforms leading to water) facilitating safe access to water became part of urban architecture in India, particularly at Varanasi where the architecture and activities of the people form an intricate web and provide a spectacular architectural form.

Due to the flat Indo-Gangetic terrain and the wide seasonal variation in flow pattern, the carriage of the river is very wide, and over the years the course of the river has shifted. Particularly Ganga's course has shifted considerably resulting in increase of the distance between the river and the human settlements, and ghats at Kanpur and Patna have been rendered infructuous. Yamuna, on the other hand has a deeper carriage and ghats at Mathura and Vrindavan provide rare architectural ensembles. Delhi, in Daniel's paintings, depicts a close relation with the river, when it flowed along the walls of the Lal Quila (now removed by about ½ km). Some efforts have been made recently to create safe ghats in Haridwar during Kumbh Mela where virtually new cities have to be developed temporarily for a month or so, or for even a lesser period.

In the last few years, the Ganga has shifted its course away from Patna due to large-scale pollution and huge sand and soil deposits along its banks. The Bihar government has embarked upon an ambitious project to bring the Ganga back to the city. The 28 crores rupees project involves digging three-metre deep and 40 metre wide trench along the nine km route of the river from Digha to Mahendru.

Environmentalists had warned that the changed course of the river could spell ecological disaster for the State, which has depended so much on it since time immemorial. The residents of the city have been facing acute hardship due to the vanishing Ganga. They have to walk up to 4-5 kms to cremate the bodies on the banks of the river. The city's water level has also gone down, causing severe water crisis in many locations.

Synonymy of the River Ganga

The river Ganga has acquired several synonyms. Following list of such names is taken from *Water Wars* written by Dr. Vandana Shiva (Shiva, 2002).

No.	Name	Meaning
1	Ganga	Ganga
2	Visnu-padabja-sambhuta	Born from the lotus-like foot of Vishnu
3	Hara-vallabha	Dear to Hara (Siva)
4	Himancalendra-tanaya	Daughter of the Lord of Himalaya
5	Giri-mandala-gamini	Flowing through the mountain country
6	Tarakarati-janani	Mother of the demon Taraka's enemy
7	Sagaratmaja-tarika	Liberator of the 60,000 sons of Sagar who had been burnt to ashes by the energy glance of sage Kapila
8	Sarasvati-samayukta	Joined to the river Sarasvati (said to have flowed underground and joined the Ganga at Allahabad)
9	Sughosa	Melodious, Noisy
10	Sindhu-gamini	Flowing to the ocean
11	Bhagirathi	Pertaining to the saint Bhagirath (whose prayers brought the Ganga down from heaven)
12	Bhagyavathi	Happy, fortunate
13	Bhagiratha-rathanuga	Following the chariot of Bhagirath (who led the Ganga down to purify the ashes of Sagara's Sons)
14	Trivikaram-padoddhuta	Falling from the foot of Vishnu
15	Trilka-patha-Gamini	Flowing through the three worlds (i.e., heaven, earth, and the atmosphere or lower regions)
16	Ksira-subhra	White as milk
17	Bahu-ksira	A cow which gives much milk
18	Ksira-vtksa-samakula	Abode of "milk-trees," i.e., Naya-grodha (Banyan), Udumbara (glamorous fig tree), and Madhuka (Bassia Latofolia)
19	Trilocana-jata-vasini	Dwelling in the matted locks of Siva
20	Traya vimochini	Releasing from the three debts, viz. 1. Brahma-carya (study of the Vedas) to the Trilocana-traya-vimochini rishis, 2. Sacrifice to and worship of the gods 3. Procreation of a son
21	Tripurari-siras-cuda	The tuft on the head of the enemy of Tripura or Siva (Tripura was a triple fortification, built in sky, air and earth of gold, silver and iron respectively, by Maya for the Asuras, and burnt by Siva)
22	Jahnavi	Pertaining to Jahnu who drank up the Ganges in a rage after it had flooded his sacrificial ground, but relented, and allowed it to flow from his ear.
23	Nata-bhiti-hrt	Carrying away fear
24	Avyaya	Imperishable
25	Nayananda-dayini	Giving delight to the eyes
26	Naga-putrika	Daughter of the mountain
27	Niranjana	Not painted with collyrium (i.e., colourless)
28	Nitya-suddha	Eternally pure
29	Nira-jala-pariskrta	Adorned with a net of water
30	Savitri	Stimulator
31	Salila-vasa	Dwelling the water-drops
32	Sagaranbusa-medhini	Swelling the water of the ocean
33	Ramya	Delightful
34	Bindu-saras	River made of water-drops
35	Avyakta	Un-manifest, un-evolved
36	Vrndarka-samasrita	Resort of the eminent
37	Uma-sapatni	Having the same husband (i.e., Siva) as Uma (Parvati)
38	Subhrangi	Having beautiful limbs (or body)
39	Srimati	Beautiful, auspicious, illustrious
40	Dhavalambara	Having a dazzling white garment
41	Akhandendu-vana-vasa	Having Siva as a forest dweller (hermit)
42	Khandendu-drta-sekhara	Having the crescent moon as crest
43	Amrtakara-salila	Whose water is of nectar
44	Lila-lamghita-parvata	Leaping over mountains in sport
45	Virinci-kalasa-vasa	Dwelling in the water-pot of Brahma (or Vishnu or Siva)
46	Triveni	Triple-braided; Consisting of the water of three rivers Ganga, Yamuna, and Sarasvati
47	Trigunatmika	Possessing the three gunas

No.	Name	Meaning
48	Sangataghaugha-samani	Destroying the mass of sins of Sangata
49	Sankha-dundubhi-nisvana	Making a noise like a conch-shell and drum
50	Bhiti-hrt	Carrying away fear
51	Bhagya janani	Creating Happiness
52	Bhinna-brahmanda-darpini	Taking pride in the broken egg of Brahma
53	Nandini	Happy
54	Sighra-ga	Swift-flowing
55	Siddha	Prefect, holy
56	Saranya	Yielding shelter, help or protection
57	Sasi-sekhara	Moon-crested
58	Sankari	Belonging to Sankara (Siva)
59	Saphari-puran	Full of fish (especially carp of Cyprinus Saphore, a kind of bright little fish that glistens when darting about in shallow water)
60	Bharga-murdha-krtalaya	Having Bharga's (Siva's) head as an abode
61	Bhava-priya	Dear to Bhava (Siva)
62	Satya-sandha-priya	Dear to the faithful
63	Hamsa-svarupini	Embodied in the forms of swans
64	Bhagiratha-suta	Daughter of Bhagiratha
65	Anatra	Eternal
66	Sarac-candra-nibhanana	Resembling the autumn moon
67	Om-kara-rupini	Having the appearance of sacred syllable, Om
68	Atula	Peerless
69	Krida-Kallola-karini	Sportively billowing
70	Svarga-sopana-sarani	Flowing like a staircase to Heaven
71	Sarva-deva-svarupini	Embodies about the continuance of peace
72	Ambhah-prada	Bestowing water
73	Duhkha-hantri	Destroying Sorrow
74	Santi-santana-karini	Bringing about the continuance of peace
75	Daridrya-hantri	Destroyer of poverty
76	Siva-da	Bestowing happiness
77	Samsara-visa-nasini	Destroying the poison of illusion
78	Prayaga-nilaya	Having Prayaga (Allahabad) as an abode, name of the eastern branch of the four mythical branches
79	Sita	"Furrow" heavenly angles, supposed to divide after falling on Mount Menu
80	Tapa-traya-vimocini	Releasing from the Three Afflictions
81	Saranagata-dinarta-paritrana	Protector of the sick and suffering who come to you for refuge
82	Sumukti-da	Giving complete spiritual emancipation
83	Siddhi-yoga-nisevita	Resorted to (for the acquisition of success or magic powers)
84	Papa-hantri	Destroyer of sin
85	Pavanangi	Having a pure body
86	Parabrahma-svarupini	Embodiment of the Supreme Spirit
87	Purna	Full
88	Puratana	Ancient
89	Punya	Auspicious
90	Punya-da	Bestowing merit
91	Punya-vahini	Possessing or producing Merit
92	Pulomajarcita	Worshipped by Indrani, wife of Indra
93	Puta	Pure
94	Puta-tribhuvana	Purifier of the Three Worlds
95	Japa	Muttering, Whispering
96	Jangama	Moving, alive
97	Jangamadhara	Support or substratum of what lives or moves
98	Jala-rupa	Consisting of water
99	Jagad-d-hita	Friend of benefactor of what lives or moves
100	Jahnu-putri	Daughter of Jahnu
101	Jagan-matr	Mother of what lives or moves
102	Jambu-dvipa-viharini	Roaming about or relighting in Rose-apple-tree Island (India)
103	Bhava-patni	Wife of Bhava (Siva)
104	Bhisma-matr	Mother of Bhisma
105	Siddha	Holy
106	Ajnana-timira-bhanu	A light amid the darkness of ignorance

III

THE GANGA RIVER BASIN

This section is based mostly on the booklet *The Impact of River Linking Project* (Shiva and Jalees, 2003).

Course of the River

Ganga river system along with tributaries is the single largest river system in India. The mighty river emerges from Gaumukh in the 25 kms long Gangotri glacier. The point of origin is shaped like the mouth of cow, and hence the name Gaumukh. The three Bhagirathi peaks maintain the eternal flow, where chunks of ice keep on falling in the running water of Bhagirathi, which is only 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 kms 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 turn further southwards for a distance of about 30 kms, coming down to 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 mainstream, the chief among them being the Dedar Ganga, Rudraganga and Jahnavi in Upper Ganga Valley. From Haridwar downwards, the river passes through various cities, towns and villages of UP, Bihar and West Bengal before reaching finally to Bay of Bengal, covering vast distance of about 2,525 kms.

Major Religious Places and Towns

There are 692 towns and cities distributed over the ten 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 and the united stream thus moves towards Varanasi. Uttarkashi, Devprayag, Rudraprayag, Karanprayag, Rishikesh, Haridwar, Allahabad and Benares are the important religious places on the banks of Ganga. It also flows past Garhmukteshwar in Ghaziabad district of UP, 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 the point – a spot of white sand known as *sangam*. In Vedic times, there was a settlement at this confluence, known then as *Prayag*, where the Vedas were written. Brahma himself is said to have performed a sacrifice here. Huen Tsang, the famous Chinese traveller, visited Prayag in 634 AD. It was under Mughal Emperor Akbar, that

Prayag was renamed Illahabad, 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 an auspicious place to die, for them 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.

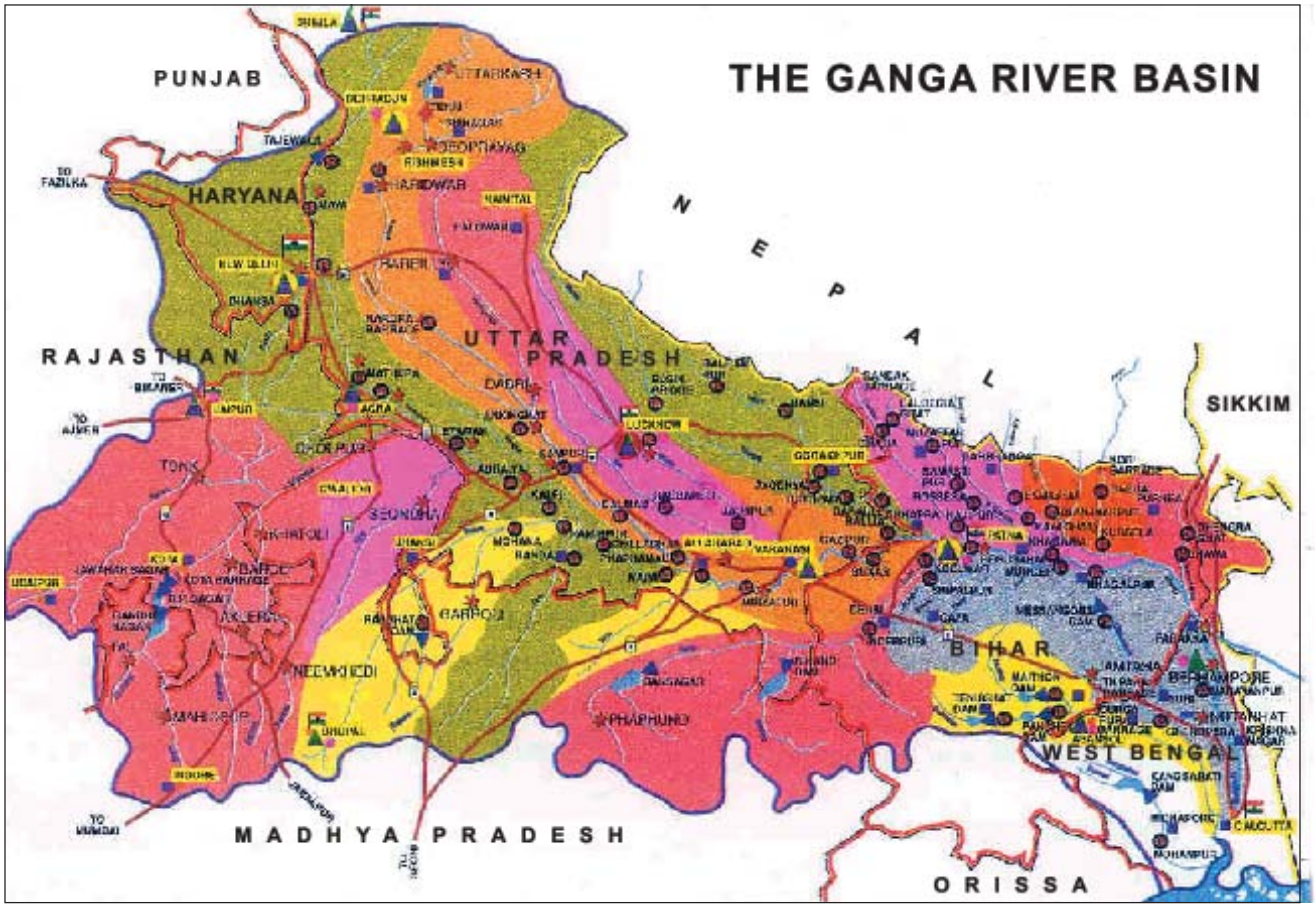
Crossing the vast Gangetic plain, the Ganga flows past Patna, the famous Pataliputra of yore. She flows past Mokamah, famous as the place where the great hunter-conservationist Jim Corbett worked for several years. It flows past Farakka Barrage, built to divert more water from Ganga to Hooghly to prevent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

The Ganga Basin

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

- 1,450 kms in UP including Uttaranchal,
- 445 kms in Bihar,
- 520 kms in West Bengal, and
- 110 kms in Boundary between UP and Bihar.

The total area of the river basin stretched in India is 861,404 sq. kms and covers ten States. The percentage of catchment area to the area of the basin in India in each State is given below (data for Uttaranchal and Haryana are not separately given).



Name of the State		*Percentage*
i & ii)	Uttar Pradesh & Uttaranchal	34.2
iii)	Himachal Pradesh	0.5
iv & v)	Punjab & Haryana	4.0
vi)	Rajasthan	13.0
vii)	Madhya Pradesh	23.1
viii)	Bihar	16.7
ix)	West Bengal	8.3
x)	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 Ghaghra, the Gandak and the Kosi drain areas in Nepal amounting to 190,000 sq. kms. The Mahananda has 9,000 sq. kms of catchment area in Bangladesh. Thus, the total drainage basin of the Ganga is over 1,060,000 sq. kms.

The Ganga basin is the largest and most important water shed of India covering a total drainage area of about 1,28,411 sq. kms. The main features of the Ganga basin are summarized in table 3.1.

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 in towns and cities. The average density of population in the Ganga basin is 297 persons per sq. kms, while it is 196 persons per sq. kms for the whole of India. The growth rate of population has more than doubled causing a lot of pressure on the available resources.

Land use pattern in Ganga Basin

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

Table 3.1: Main Features of Ganga Basin

Features	*Measurements*
Area of the river basin	861,404 sq. kms
Percentage in India	85 per cent
Surface water availability	446 million acre feet (MAF)
Total cultivable area	21,109 sq. kms
Irrigation Potential	27,350 thousand hectares
Hydel Potential	11,579 mega watts (At 60 per cent 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 10 Indian States	0.6×10^6 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 billion metric tons per year
Temperature gradient	10-40 C
Annual discharge	459,040 million cubic metres
Drainage Area	128,411 sq. kms
Total Catchment Area	1,060,000 sq. kms (Tributaries flowing in Nepal amounts to 190,000 sq. kms and Mahananda has 9,000 sq. kms in Bangladesh).

The third category of land use is of land under forest cover, which is highly variable. Only about 14.3 per cent of 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 3.2) clearly indicate 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 lower hills and plains. There is an urgent need for precautionary measures to check such degradation.

Table 3.2: Land Use Pattern (in per cent)

Area	*Cultivated*	*Non-arable*	*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

Major Tributaries

There are seven important tributaries from the north, six joining from the south and five joining the river in the last reaches of the Hooghly. Some important tributaries of Ganga are described below.

The Ramganga

The Ramganga River rises at an attitude 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 kms. The basin covers an area of 32,493 sq. kms.

The Gomti

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

The Ghaghra

The Ghaghra is called Manchu and Karnali in Nepal and has its source near Lake Mansarovar. Its total catchment area is 127,950 sq. kms of which 45 per cent 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's kingdom) on its banks. It spills and causes flooding every year in Azamgarh and Ballia districts of UP. Other tributaries are the Rapti, and the Little Gandak that starts as an old channel of the Gandak at an elevation of 300 metres and joins the Ghaghra in Shajahanpur district of UP. The Ghaghra joins the Ganga a few kms downstream of Chapra in Bihar. The length of the Ghaghra is 1,080 kms 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 metres in Tibet near the Nepal border overlooking the Dhaulagiri peak. Its drainage area is 46,300 sq. kms, of which 7,620 kms are in India. In Nepal, there are a number of tributaries like the Mayandadi, the Bari and the Trisuli. The Gandak debouches 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 hectares in India and Nepal. Gandak flows for another 300 kms before it joins the Ganga near Patna.

The Burhi Gandak

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

The Bagmati

The Bagmati rises in the Shivpuri hills of Nepal at an elevation of 1,500 metres, cuts across the Mahabhrata 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. kms, of which 11,000 sq. kms lie within India. The Sun Kosi contributes 44 per cent, the Arun Kosi 37 per cent and the Tamur Kosi 19 per cent of the total water. The Tamur Kosi has the steepest slopes.

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 waters carry 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 kms 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 Kankai. The Kankai is an erratic stream, as it rises in Nepal Hills and carries a lot of silt. The total drainage area of Mahananda is 20,600 sq. kms, of which 11,530 sq. kms 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. kms while that of the southern tributaries is 580,000 sq. kms. The drainage area of the tributaries joining the Bhagirathi-Hooghly is 60,000 sq. kms. 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 flows from the Himalayan plain north of the Ganga to the main river. Nearly 60 per cent of the water flowing in the Ganga come from the drainage areas, north of the river.

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 the north of the river, and the rest is in south of the river. The percentage of gross cultivated area to cultivable area is about 95 per cent. Only a third of this area is irrigated, the rest being rain-fed. The important data such as the percentage cultivable area, sown area and irrigated area are given in table 3.2 and box 3.1.

Box 3.1: GANGA AT A GLANCE

Length: 2,525 sq. kms
Source: Gaumukh (Gangotri glacier) at 4,100 metres above MSL
Ganga basin: more than one million sq. kms (1,060,000 sq. kms)
Drainage area: 861,404 sq. kms (26.2 per cent of India's total geographical area)

Break up

Uttar Pradesh: 294,413 sq. kms
Madhya Pradesh: 201,705 sq. kms
Bihar: 144,410 sq. kms
Rajasthan: 107,382 sq. kms
West Bengal: 72,010 sq. kms
Haryana: 34,200 sq. kms
Himachal Pradesh: 5,799 sq. kms
Delhi: 1,485 sq. kms
TOTAL: 861,404 sq. kms

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

Flow at Rishikesh: 27 billion cubic metres

Important Stations on the Ganga and distance from source:

Rishikesh 250 kms, Balawali 330 kms, Garhmukteshwar 440 kms, Kachla Bridge 510 kms, Fatehgarh 670 kms, Kanpur 800 kms, Allahabad 1,050 kms, Mirzapur 1,170 kms, Varanasi 1,295 kms, Buxar 1,439 kms, Patna 1,600 kms, Baharampur 2,175 kms, Nabadwip 2,285 kms.

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 Himalayas, being young mountain range, remains prone to soil erosion; the Lower Peninsula receives the thick layer sediment while soil of various thickness is found in Southern Plateau. The high rate of siltation reduces the water holding capacity of the Ganga resulting in devastating floods almost every year, causing innumerable sufferings to the inhabitants.

In the southern region, Vindhya Plateau soil prevails. They are upland, plain and lowland soils:

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

ii) Vindhya plains contain fine grain material and can retain moisture.

iii) Vindhya low land soils, which are alluvial.

iv) Besides those in the hills, there are forest soils.

v) In some districts, lateritic soils prevail.

The basin has a high water potential and the total water flow in the surface of the basin is 493 thousand million cubic metres. The four distinct regions in the Ganga Basin are:

i) Bhabhar area,

ii) Terai,

iii) Ganga plain, and

iv) Southern flat areas.

In the Bhabhar area, the aquifers are located deep but occur under confined conditions, but in Terai areas, which are lower than the Bhabhar areas, where till recently water table occurred near the surface and there were excellent groundwater resources. The irrigated area in the Ganga basin is 19.5 million hectares. Average annual flow in the Ganga and its tributaries is given in table 3.3.

Table 3.3: Average Annual Flow in the Ganga and its Tributaries

Name of the Sub-basin	***Average annual flow in million cubic metres***
Yamuna at Allahabad	93,020
(a) Chambal	(30,050)
Ganga at Allahabad	58,980
(a) Ramganga (including Deoha)	(15,258)
Ganga at Allahabad after confluence with Yamuna	152,000
Ganga at Patna	364,000
(a) Tons	(5,910)
(b) Sone and other basins between Tons and Sone	(31,800)
(c) Gomti	(73,090)
(d) Ghaghra	(94,400)
(e) Gandak	(52,200)
Ganga at Farakka	459,040
(a) Burhi Gandak	(7,100)
(b) Kosi	(61,560)
Ganga at Confluence below the Haldi	493,400
(a) Dwarka	(4,687)
(b) Ajoy	(3,207)
(c) Damodar	(12,210)
(d) Rupnarayan	(4,400)
(e) Haldi	(5,300)

IV

PRIVATIZATION OF GANGA

This section is largely drawn from the work, Corporate Hijack of Water *by Dr. Vandana Shiva and others (Shiva et al, 2003).*

In response to a request from the United States government for the purchase of land from indigenous people for colonists who were arriving thick and fast from Europe and further east, Chief Seattle in 1852 wrote a moving piece of prose, so poetic and metaphoric of rivers and worth quoting. Chief Seattle wrote:

The shining water that moves in the streams and rivers is not just water, but the blood of our ancestors. Each ghostly reflection in the clear waters of the lakes tells of events and memories in the life of my people. The water's murmur is the voice of my father's father. The rivers are our brothers. They quench our thirst. They carry our canoes and feed our children. So you must give to the rivers the kindness you would give any brother (Davies and Day, 1998).

The words of Chief Seattle are relevant for any river of India, be it Ganga or Brahmaputra. The words also convey the agony, anguish and the loss of livelihood, if the rivers are privatised or if their waters are diverted for sale for profit, at the behest of thirsty corporate houses and MNCs.

Suez: Privatising the Ganges to create water markets in Delhi

On 9 August 2002, on the eve of the Quit India Day, more than 5,000 farmers of Muradnagar and adjoining areas of Western Uttar Pradesh gathered in a rally at village Bhanera to protest the laying of a giant 3.25 metre-diameter pipeline to supply

Shri Sunderlal Bahuguna, Shri Rajendra Singh, Dr Vandana Shiva and Oscar Olivera (Bolivia) discussing strategy to save Ganga

water from the river Ganga to the Sonia Vihar water Plant in Delhi. The project, which has been contracted to Suez-Ondeo Degremont of France by the Government of Delhi, will deprive the richest farmlands of India of irrigation water.

The Sonia Vihar water treatment plant, inaugurated on 21 June 2002 by the Chief Minister of Delhi, is designed for a capacity of 635 million litres a day on a 10 year BOT (Build, Operate and Transfer) basis, at a cost of 1.8 billion rupees (approximately 50 million dollars). The contract between Delhi Jal Board (the Water Supply Department of the Delhi Government) and the French company Ondeo Degremont (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-Degremont plant in Delhi will come from Tehri Dam through the Upper Ganga Canal up to Muradnagar in Western Utter 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 rally at Bhanera village on 9 August 2002 was the culmination of the 300 kilometre-long mobilization drive along the Ganga by the farmers of Garhwal and inhabitants of the devastated city of Tehri to liberate the river from being privatised. The rally was launched 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.

More than 300 people from across the country, representing over a hundred grassroots groups, intellectuals, writers and lawyers joined the rallyists, at the three-day Convention on Earth Democracy – People's Rights to Natural Resources,

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-Degremont 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.

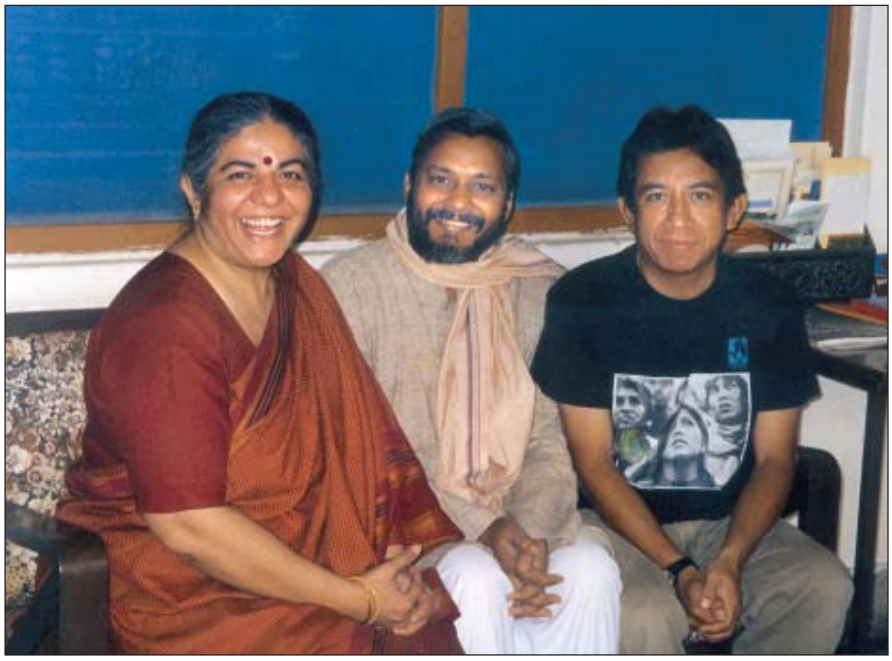
We pledge to conserve and judiciously use our regional water resources to save our environment and ecology, so that we would gift our coming generation a clean and beautiful environment as well as safeguard their right to water resources.

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 organization or a corporation have to take 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 our civilization. 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 rights 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 Degremont.

organized 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.



Dr Vandana Shiva, Rajendra Singh and Oscar Olivera in a festive mood

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

Suez-Degremont Water Plant at Sonia Vihar

Ondeo Degremont, a subsidiary of Suez Lyonnaise des Eaux Water Division, has been awarded a 2 billion rupees contract (almost 50 million US dollars) for the design, building and operation (for 10 years) of a 635 million litres per day Drinking Water Production Plant at Sonia Vihar in New Delhi to cater 3 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 Degremont.

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 the pipeline has been laid.

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 per day from irrigation, farmers are already feeling the impact of corporate greed for profit – the Upper Ganga

Sign Boards showing water diversion from Upper Ganga Canal at Muradnagar to Sonia Vihar in Delhi

Pipeline from Muradnagar to Sonia Vihar

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 organized 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 supply water to Delhi. Instead the government should link the Upper Ganga Canal to the Yamuna Canal through this area to tackle the severe drought."

Being developed on a basis of BOT contract for a fixed period of ten years, the profit of the Sonia Vihar Treatment Plant is guaranteed by the government during the period. In an interview to a national magazine, a senior manager with Degremont said, "right now, we are happy with a profit of Rs. 10 crores per annum. Other companies may be content with managing and operating existing plants owned by individual civic bodies. But we don't want to dabble in that. We have very strict quality control and would like to maintain our image as quality providers to our clients" (Joshi, 2003).

However, the Multinationals like Suez-Degremont are notorious to build poor infrastructure with no compliance to safety norms. On 25 June 2003, five people including one engineer died at the Rithala Sewage Treatment Plant (STP) in Delhi, which is managed by Suez-Degremont (*Hindustan Times* and *Indian Express*, New Delhi, 26 June 2003). According to Sanjay Sharma, union leader of Delhi Jal Board (DJB), this is the fourth incident in six months killing a total of eleven persons. Workers at the site are not provided with even the basic safety gear. There are no gloves, workers are never given gas masks or oxygen cylinders despite the air around the flotation units being foul; they have just rope.

The Rithala plant treats 80 million gallons per day (MGD) of sewage. DJB manages half of the sewage and the other half by Degremont. The Degremont, plant had been inaugurated by the Chief Minister Ms. Sheila Dikshit in October 2002.

With such a poor record of safety and maintenance, the Suez-Degremont Sonia Vihar Plant has no legitimacy or justification.

The pipeline of Suez Degremont to supply water from Upper Ganga Canal (near Muradnagar) to Delhi has been laid through the following villages in Ghaziabad district.

1.	Kushalya	7.	Mehrauli
2.	Masoori	8.	Vijaynagar
3.	Nahal	9.	Duraheda
4.	Kallu Garhi	10.	Chhajarsi
5.	Dasna	11.	Makanpur
6.	Qazipura	12.	Gazipur

After great agitation, the farmers whose land has been acquired are offered meagre amount of Rs.47,000 to Rs.61,000 per bigha, that too in several instalments.

Who is Paying for Corporate Profit?

Privatisation of water has been justified on the ground that full cost must be paid when water giants get water markets, whereas with water privatisation they demand a full price from the people. As the case of the Delhi Water Plant shows, the corporate giants 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, privatisation 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.

A wall writing saying stop water privatization by multinationals and stop the sale of Ganga

Water Requirement and Source of Water in Delhi

Delhi is experiencing increasing pressure to meet demand for its water resources. Growing urbanization, improvements in living standards, exploding population are just some of the contributing factors. The population of Delhi has crossed 15 million by the end of 2003. 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 being raised about both the quality and quantity of groundwater, which has gone down by about eight 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 Degremont. With the demand-supply gap projections for water set to increase in the next ten years, DJB has identified new raw water sources including Tehri, Renukal, and Kishau 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.

A wall writing asking the people to save water

Corruption related to Delhi Jal Board's Suez Degremont Plant

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

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, 28 November 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 more by Rs.30 crores 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 crores, the contract has been awarded for Rs.111.31 crores.

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

V

TEHRI DAM PROJECT

The Geological Survey of India conceived the Tehri project in 1949. The Tehri site was considered suitable, provided that sub-surface investigations did not reveal any adverse factors. However, it was only in 1963 that the detailed investigation was made. The site was finally confirmed, after the visit of the then Union Minister for Irrigation and Power, K. L. Rao in 1965. By 1967, several Indian and foreign experts visited the dam site and recorded their opinions (Paranjpye, 1988).

Apprehension was expressed with regard to the geological vulnerability of the area at and around the site – the unstable hill slopes that would constitute the reservoir run areas and the seismic danger at the site. The preliminary investigations by the Geological Survey of India had revealed a riverbed fault at the dam site and this strengthened the decision to opt for a concrete dam.

Tehri Dam is a gigantic multipurpose project being built on the Ganga at Tehri in the Garhwal Himalaya. The cost of 260.5 metre high dam project which was originally estimated at about Rs.197.29 crores in 1972 has now escalated to Rs.10,000 cores. The dam has been surrounded by controversy since its very inception. The main reasons why the citizens of Tehri Garhwal, several scientists and ecologists have opposed the Tehri dam are the following (Matu-People's Organisation, 2002) :

i) The uprooting of more than one lakh people, directly and indirectly from their homes in Tehri town and surrounding villages.

ii) The high risk of dam failure, whether by an earthquake of higher intensity than what the dam design provides for, or by other factors; in the case of such event the acute threat to dense urban and rural habitations in the downstream area, including the culturally important towns of Dev Prayag, Rishikesh and Haridwar.

iii) The threat of RIS or reservoir induced seismicity, after the creation of the huge new artificial reservoir, to the people living around this reservoir, a threat that arises from the height of the dam and other factors favourable to RIS found at and around the dam site.

iv) The threat of rapid siltation of reservoirs due to the high erosion in the catchment areas. Some experts assess the present life of the reservoir at only 60 years.

v) The project has been steeped in financial waste and corruption. The Comptroller and Auditor General has raised disturbing questions about this project.

vi) Adverse impact on fisheries, other fauna and flora, and various other adverse effects.

The 260.5 m high dam is more than two-thirds the height of the Empire State Building, and is on the

river Bhagirathi, a tributary of the mighty Ganga, India's holiest river. The most worrying feature of this reservoir is that it is being constructed in the Himalayas, one of the most geologically unstable and earthquake prone regions on the earth, as the subcontinent of India continues to slip and grind its way northwards into central Asia. Indeed, it is well known in engineering circles that the massive artificial water bodies created by dams have a tendency to increase the frequency, and perhaps the intensity of earthquakes (Davies and Day, 1998).

The Tehri dam will impound 3.22 million cubic metre of water. The reservoir will extend up to 45 kms in the Bhagirathi valley and 25 kms in the Bhilangana valley with a water spread area of 42.5 sq. kms. The reservoir is expected to irrigate 270,000 hectares of land. The turbines in the powerhouse at Tehri have an installed capacity of 1,000 MW, so that they can operate essentially to satisfy the peak power requirements of Uttar Pradesh Power Grid.

Besides, the Tehri dam is also expected to supply 500 cusec of drinking water to Delhi.

While cost has increased from 200 crores in 1972 to about Rs.10,000 crores, the benefit component will not change in real terms because the height of the dam, and therefore the water available for irrigation will remain constant. Similarly, as there will be no change in the water-head, there can be no change/increase in power generation. This will make the cost benefit ratio even worse.

An important aspect of the Tehri Dam is its proximity to the Chinese border. We cannot ignore the fact that we had war with China and in future if there is war, Tehri dam might be an attractive target for Chinese bombers. It is a well-known fact that during the Second World War, the Allied forces and Nazi Germany busted each other's dams without any qualms. Since then, it has been wisely decided by most countries not to build dams too close to unfriendly borders. A dam at Tehri, barely 100 kms from the border, is strategically vulnerable.

However, the main controversy surrounds the all-important feature of seismicity at the Tehri location. It is feared that if an earthquake of intensity equal to eight or more on the Richter scale were to occur, the dam would collapse, and the catastrophe would lead to consequences that would greatly outweigh the benefits from development.

Galileo (17th century) stated: "I had less difficulty in the discovery of motion of heavenly bodies in spite of their astonishing distances than in the investigation of movement of flowing water before our eyes." The significance of Galileo's statement acquires even greater relevance today when one is dealing with a river like the Bhagirathi, which originates at an attitude of 12,000 ft. from a glacier, which is 26 km long and is fed by some of the highest mountains in the world. The Bhagirathi has a catchment area of 7,511 sq. kms out of which almost one third, i.e., 2,328 sq. kms, is snow bound as it lies above an attitude of 16,000 feet above mean sea level.

In 1969, the project authorities had estimated the rate of sedimentation as 1.7 acre-feet per sq. mile of catchment area per year. At this rate, the life of the dam was estimated as 100 years. However, as empirical data started coming, the annual rate of sedimentation went up substantially, i.e., 2.8 acre-feet per sq. mile by 1980 or 13.5 hectares per 100 sq. kms per year. Subsequently, at this rate of siltation, the expected life of the dam would be reduced to 61.4 years.

In case the Tehri dam collapses, the impact would be as given in table 5.1. As seen in the table, in less than an hour and a half the water would hit Rishikesh and Haridwar and wipe out these two cities. This is certain because the height of the water would be 260 metres and 232 metres respectively. This would result in horrific loss of life and property. In order to assess how this can be minimized and to what extent, a disaster management plan is essential. This plan would also prescribe the communications and personnel networks that would need to be in position and the costs involved in all this. These costs would have to be calculated as a part of the cost benefit analysis of the project (Singh and Banerjee, ed. 2002).

Table 5.1: Impact on cities if the Tehri dam collapses

Place	*Distance from Dam (kms)*	*Arrival Time for Surge (hrs)*	*Depth of Surge (metres)*
Dam	0	Approximate Time of Empting of Reservoir = 22 (minutes)	260.00
Rishikesh	80	0.63	260.00
Haridwar	104	0.80	232.00
Bijnor	179	4.45	17.72
Meerut	214	7.25	9.85
Hapur	246.5	9.50	8.78
Bulandshahar	286.5	12.00	8.50

Source: Singh, Shekhar and Pranab Banerjee *(ed., 2002): Large Dams in India: Environmental, Social and Economic Impacts, Indian Institute of Public Administration, New Delhi.*

It needs to be noted that Tehri Dam Project is only one of the over 40 hydel multipurpose projects, which have been constructed, or being constructed/ investigated in the Garhwal region. These projects include big, medium and small projects (Paranjpye, 1988).

The cost benefit ratio

B/C ratio = Annual Benefits/Annual Costs = 21007.47/37539.31 = 0.56.

The annual benefit per cost rate is calculated as 56 per cent. In other words, for every rupee put on Tehri project, only 56 paise will be recovered (Paranjpye, 1988).

The project has also not made any provisions for rural electrification schemes in the surrounding areas, even though the dam will submerge about 100 villages in two districts of Tehri Garhwal and Uttarkashi. On the other hand, the project will supply enough to large industries and urban areas in the plains of Uttar Pradesh.

Table 5.2: The Tehri Project at a Glance

Location	*Tehri, Uttaranchal*
Catchment Area	7511 km^2
Snowbound area in the catchment	2328 km^2
Average annual rainfall	101.6 cm to 263 cm
Annual run-off on 90 per cent availability	5.59MAF
Maximum Recorded Flood	3800m^3/S
Adopted maximum flood for diversion during monsoon	8120 m^3/S
Type of the dam	Rock fill, clay core
Height of the dam from deepest foundation level	260.5 m
Height of the dam from river-bed level	239.5 m
Installed capacity	1000 MW
Firm Power	346 MW
Area Irrigated	2.7 lakh ha.
Dead-storage capacity above MSL	5 MAF-at 720 m
Outlet for releasing water for irrigation	At 730 m above MSL
Head-Race-Channels for leading water to the turbines	Four tunnels at 720 m above MSL

Source: Paranjpye, Vijay (1988): Evaluating the Tehri Dam: An Extended Cost Benefit Appraisal*, Studies in Ecology and Sustainable Development, Series No. 1, INTACH, New Delhi.*

Jal Yatra Meeting at Bahuguna's Kuteer and excavation work in background

Another controversial aspect is the catchment area management by the Forest Department, which had been entrusted with the planting of trees to build the soil. Though the catchment area is around 7 lakh hectares, the forest department is entrusted with only 52,000 and odd hectares for greening.

The locals are totally alienated from the project. Hence the authorities have foregone the advantage of having first hand knowledge from the people, say the types of trees most beneficial for water retention, their fuel requirements, etc.

There are 12 rare and endangered species which may be disturbed by inundation. They are:

1. Cirrhopetalum hookeri
2. Eulephia hormusjie
3. Gastrodia orobunchoides
4. Herbenasia triflora
5. Listera microgolties
6. Saccolabium olistichum
7. Allium rubellun
8. Gagea preudoreticulsta
9. Tulipa clusians
10. Abgcuia tongleusis
11. Poa rhadiana
12. Preudoduntonia himalaica

The construction of the reservoir would push the fauna to the higher slopes in the area. The flora that was thriving on the facile conditions in the valley would face with a tougher life. The fauna already inhabiting the higher slopes would share scarcer resources and smaller habituating area of the land, which they are not accustomed to. In their fight to survive against new odds, we may find ourselves the losers with many species becoming rare.

Rehabilitation: Human Factor

Involuntary displacement of human population is always traumatic. Irrespective of the causes leading to migration the degree of suffering experienced by such people simply cannot be quantified in

Displaced women by Tehri Dam are worried about their rehabilitation

money values and even in words; it can be described only inadequately. In the case of natural calamities and wars one notices a sense of helplessness because the causes and consequences are so diverse and widespread that compensation and restoration become either intractable or apologetic. However, this need not be the case when the displacement is the consequences of pre-planned developmental projects undertaken by the government or other public authorities. But, unfortunately ousting of people likely to be submerged under irrigation or hydel power dam is a classic case where hardships are imposed on people, in spite of the 'pro-people' laws and policies proclaimed by the government.

The history of this phenomenon in India dates back to 1884 when the British Government passed the Land Acquisition Act, and legitimised the displacement of people whose lands were to be acquired for "public purposes." The Act was based on the general philosophy that the interest and well being of a few could be subsumed by the larger interest of the society, which, in practical terms amounts to the interest of the state.

The Act however was very clear on the point that such displacement does not indeed cause great sacrifice and therefore, such people should be fully compensated for all the losses, and that if such land acquisition is not voluntary, an extra 15 per cent of the total compensation be paid in addition.

Over the years, experience, however have shown that almost all the displaced persons become the refugees in their own country, and end up penniless, landless and homeless.

The Tehri Dam Project has affected around 125 villages including the old Tehri Township. Thirty-nine villages are going to be fully affected and another 86 villages (number may possibly increase) would be partially affected. Wherever less than 75 per cent of the families are in the displaced category and have to be rehabilitated, all those villages have been categorized as partially affected. That means that even where 74 families out of a total population of 100 families are eligible for rehabilitation, they have been classified as belonging to partially affected villages.

According to a new estimate made by the Rehabilitation Directorate, around 5,291 urban and 9,238 rural families would be affected due to construction of Tehri dam. 3,810 rural families have been partially affected by the dam. In reality, however, the number of affected families is much higher. As of now, the number of urban families displaced by the dam has reached 5,500 and the number of rural displaced families is more than 12,000 (Matu-People's Organisation, 2002).

The State Government has deliberately submitted lower figures of the displaced families in the affidavits filed in the Supreme Court of India in 2002 ignoring the ground situation. The Government has not still compiled the aggregate statistics of the affected people. However, if it is assumed that each urban family has roughly five members and each rural family consists of seven members, the total number of affected persons, may in fact, be more than 1 lakh. Even 1,605 families of government employees have been categorized as displaced families (Matu-People's Organisation, 2002).

The report published by Peoples Union for Civil Liberties highlighted rampant corruption and other irregularities prevailing in the Tehri Dam Project. For instance:

- Out of a total outlay of Rs.582 crores for rehabilitation measures, only Rs.94 crores have been earmarked for the displaced people.
- Out of the budget for rehabilitation, residential premises for District Magistrate and the Superintendent of Police were earmarked at a cost of Rs.47 lakhs and Rs.43 lakhs respectively. A sum of Rs.2 crores was earmarked for a field hostel, though no amount was spared for building *Dharamshalas*.
- Sale of residential flats by the rehabilitation authorities like builders.
- Rehabilitation becomes the business of moneybags.

- Lack of clear rehabilitation policy and disregard for Government Orders.
- Significant recommendations of Dr. Hanumantha Rao Committee were not accepted.
- Flawed evaluation of socio-economic structure of the community.
- Exodus of people rather than meaningful rehabilitation is happening in Tehri.

In the rural areas, there are only two categories of displaced families, namely, landowners and landless agricultural labourers; and no estimate is done (table 5.3). Whereas, in the urban areas there are many other categories made for rehabilitation. Even government employees and organisations have been categorized as displaced families.

Table 5.3: Categories of Displaced Families

Townships			*Villages*	
1	Landowners	1,766	1	Farmers with land
2	Tenants	442	2	Landless Agricultural Labourers
3	Benap	384		
4	Employee	1,605		
5	Organisation	653		
6	House on Fathers' Land	140		
7	Three villages displaced by New Tehri	269		
8	Others	32		

Partial Submergence: Unrealistic Demarcation

Eighty-six villages would be partially submerged by the Tehri Dam Project. This includes those villages where 70-75 per cent of families and land are going to be affected. However, eligibility for the status of a fully affected village has been determined as affecting 75 per cent or more families and land. Even those villages, where 25-30 families would remain after submergence, have been affected. Although denomination of villages as partially affected has been done on a mathematical formula (wherever the land of 75 per cent of the families is involved), no estimates have been prepared to take into account the existence of link roads, grazing places, local markets, civic amenities, 'ghats' along the banks of the river drains, and the disintegration of social life. If the people were deprived of all the amenities in villages where only 25 to 30 per cent of the people would be left (in some villages the number is as less as 5-10 families), how are these people be expected to retain their existence and identity as part of the village society?

Cut off Area

Around 80,000 people are going to be indirectly affected by the construction of the dam. The area is in Pratapnagar tehsil. This area has been dependent on Tehri Township for various civic amenities. Due to the construction of the dam and the resultant reservoir, six bridges (two motorable and four pedestrian) on the Bhagirathi and Bhilangana river would be submerged, thereby completely disrupting the roads connecting the district, block, state and national capital and other areas. As a result, the distance to be traversed between these places would increase by 100 to 150 kms. A large part of the cut off area falls in the rim area of the dam and partially submerged area.

Benefits and costs, loss of output on submerged land, loss of output on the land for rehabilitation and comparison of revenue are given in tables 5.4, 5.5, 5.6 and 5.7 respectively.

The Secret Reports of Geological Survey of India

The idea to construct a big Dam in the unstable and geologically sensitive mid-Himalayan region has been mired by innumerable controversies. The government, on the other hand, claims that the dam design has been prepared keeping in view the geological aspects. Yet many questions arise. What would be the impact of the reservoir on the mountain habitations?

The Geological Survey of India has identified as unstable large tracts above the rim area, which may face land slides in future due to the reservoir. Many villages are located in this area. Though the

Table 5.4: Benefits and Costs of the Tehri Dam

Item	*Value calculated by the Tehri dam project authorities*	*Values arrived at after calculations made by us*
Energy generated annually on 90 per cent availability	3,029 x 10^6 kwh	3,029 x 10^6 kwh
Energy available to the final consumer	Not calculated	
Cost of power	35 paise per unit	73 paise per unit
Revenue return (with sale rate of 48 paise)	11.52 per cent	6.89 per cent
Net benefits due to increase in agricultural production	Rs. 15,774 lakhs	Rs. 6,467 lakhs
B/C ratio for agriculture	3.49:1	1.28:1
B/C ratio for the whole project	Not calculated	0.56:1
Forest area lost due to the project	1,600 ha.	4,705 ha.
Number of displaced persons	46,000	85,600
Useful life of the dam	100 yrs.	62 yrs.

Source: Paranjpye, Vijay (1988): Evaluating the Tehri Dam: An Extended Cost Benefit Appraisal, Studies in Ecology and Sustainable Development, Series No. 1, INTACH, New Delhi.

Table 5.5: Loss of output on Land to be submerged

Crop	*Area (ha)*	*Average yield (quintals/ha.)*	*Total Produce (Quintals)*	*Rate/qtl (Rs.)*	*Vale of output (lakh Rs.)*
Rice	443	17.23	7,633	400	30.53
Wheat	603	12.82	7,730	201	15.54
Minor Millets	258	10.33	2,665	150	4.00
Barley	56	6.90	386	149	0.58
Other Kharif	240	8.67	2,081	200	4.16
Total	**1,600**		**20,495**		**54.81**
Total value of output					54.81
Less cost of inputs @ Rs. 1,250 per hectare (1,600 ha x Rs. 1,250/ha.)				- 20.00	
Net Output					**34.81**

Source: Paranjpye, Vijay (1988): Evaluating the Tehri Dam: An Extended Cost Benefit Appraisal, INTACH

Table 5.6: Loss of Output on Land Acquired for Rehabilitation

Crop	*Area (ha)*	*Average yield/ha (in quintals)*	*Total produce (quintals)*	*Rate/qtl (Rs.)*	*Value of output (lakh Rs.)*
Rice	349	17.23	6,013	400	24.05
Minor Millets	204	10.33	2,107	150	3.16
Wheat	476	12.82	6,102	201	12.27
Other Kharif	189	8.67	1,639	200	3.28
Barley	44	6.90	304	149	0.45
Total	**1,262**		**16,165**		**43.21**

Source: Paranjpye, Vijay (1988): Evaluating the Tehri Dam: An Extended Cost Benefit Appraisal, INTACH

Table 5.7: Comparison of Revenue Estimation by TDPA & Experts Estimated in 1988

SN.	*Item*	*TDPA Values*	*Our Values*
1.	Total Working Expenses per year	Rs. 2,143.00 lakhs	Rs. 2,418.19 lakhs
2.	Total annual energy available for sale	3,029.18 $X10^6$ KWH	2,423.16 $X10^6$ KWH
3.	Cost of the power component	Rs. 107,650 lakhs	Rs. 126,431.34 lakhs
4.	Interest charges	Rs. 8,612 lakhs	Rs. 15,171.7 lakhs
5.	Total charges per year (1+4)	Rs. 10,755.0 lakhs	Rs. 17,589.95 lakhs
6.	Cost of generation per KWH	35 paise	73 paise
7.	Gross annual revenue assuming sale rate of 48 paise (0.48 x 2)	Rs. 14,540 lakhs	Rs. 14,540 lakhs
8.	Net Revenue (7-1)	Rs. 12,379.06 Lakhs	Rs. 12,121.81 Lakhs
9.	Revenue Return (8/5)	11.52 per cent	6.89 per cent

Source: Paranjpye, Vijay (1988): Evaluating the Tehri Dam: An Extended Cost Benefit Appraisal, INTACH

report has been classified as secret, many significant issues highlighted by the report have become public.

When subsurface explorations were carried out on advice of the Geological Survey of India in the 1960s, a major fault was found at the dam site that has been fully or partially proved. In the GSI report it has been stated: "in the area encompassing the rock fill dam, the rocks exposed are the massive phyllitic quartzites, the schistose and sheeted phyllites of grade III and IV quality and numerous, cross as well as foliation sheet-zones of grade V quality. These alternative bands of phyllites and quartzites are of the Chandpur series, and at some places up to 20 bands can be counted." And finally, it said, "the riverbed sheet-zone has been proved by drill holes and the true thickness of this zone below the core of the rock fill dam has been established to be 11.6 metres."

About the seismicity, the Geological Survey of India reports that the proposed project site falls between isoseimals VIII and IX of Kangra Earthquake (1905). In the vicinity of the Tehri dam, the following tectonic features exist:

1. The Srinagar Thrust is located about 4 kms from the dam-site, which brings the rocks of the Bharat Series against the Shimla and the Chandpur phyllites.
2. The Gadolia Tear Fault was traced from village Paukhal to village Nelda.
3. The Tehri Tear Fault has been traced near Nandgaon.
4. The Tehri Tear Fault has proved the existence of a fault running along the river course, and it represents the just older branch of the Tehri Tear Fault.
5. The Deul Tear Fault passes through terrace gravel and there is a scarp about 15 m high along its inferred trace.

The GSI Report further states: "The seismicity of the thrust and faults is not known as no seismographic data exists in this connection." And in the Tehri dam detailed project (1983), it is stated that epicentres of 77 earthquakes lay within a radial distance of 320 kms from the proposed dam site. The nearest epicentre was located 35-40 kms northeast from the site. Most of these quakes had a magnitude of 5-7 on the Richter scale.

Tehri (Historical Trihari)

The biggest township, which is going to be submerged in India, is perhaps Tehri. Instead of augmenting its own prosperity after independence, the Tehri township is being devastated in the name of oft-repeated national development. This is an ancient land, which is being submerged and devastated on the pretext of developmental projects.

The place where Tehri Dam is being constructed, finds a mention as 'Dhanushtirth' in the 'Skandha Puran.' The confluence of Bhagirathi and Bhilangana rivers is just 500 m from the main gate of the dam. This confluence is known as 'Ganesh Prayag,' also known as Trihari – the confluence of three rivers and later called Tehri. Swami Ramtirth, the founder of 'Practical Vedanta,' adopted Trihari as an abode of meditation and 'nirvana.'

The king of Garhwal, Sudarshan Shah belonging to Panwar dynasty, built Tehri township as the new capital of the state in 1815 AD. Prior to this, the capital was Srinagar Garhwal, which had been captured by the East India Company. The capital Tehri built by King Sudarshan Shah witnessed royal grandeur for almost 133 years.

The Garhwal state however witnessed decline after the reign of the sixth king. Till the state's decline, Tehri continued to be the capital. Being the capital, Tehri became the hub of education, literature, culture and politics. Even after independence, Tehri retained its importance. It was the centre of peoples' movements. Chipko, Prohibition and Uttarakhand movements reverberated in the streets and markets of Tehri and chronicle the grandeur of the township.

Shri Dev Sumar had undertaken a marathon 84-day old hunger strike, which is only second in duration in the world history. The fast had been undertaken to gain freedom from the royal rule. After 84 days, Shri Dev Suman passed away and became a martyr.

After visiting Yamunotri and Gangotri, most of the pilgrims heading for Kedarnath and Badrinath have to pass through Tehri. Even when there was no motorable road, Tehri was the traditional route of the pilgrims.

Unlike in other places, where construction of dams has taken place, the displaced belong to highly educated middle class families. According to the 1992 statistics of the National Literacy Mission, the literacy rate in Tehri had reached 98 per cent.

Besides education and literacy, the economic condition in the township was admirable. Only 5.54 per cent of the houses were thatched. Although Narendranagar was the district headquarters, more than 40 government offices were located there including the District Court. All civic amenities were available for the residents at a distance of 2-3 kms. Since Tehri was the central point and the nearest market for the adjoining 200 villages, there was lots of hustle bustle and the place used to be quite crowded.

The Historical and Cultural Heritage of Tehri Region

In Tehri, there are religious, cultural and archaeological places and monuments of importance, which require conservation efforts. However, there is no plan for conserving the heritage in the submergence area of the reservoir.

In fact, some Dharamshalas (places of residence for the pilgrims), rock scriptures, and unique craftsmanship on wood and stone still exist in the precincts of Badrinath Temple complex. Nearby, the staircases of ghats reaching the innermost depths of the confluence of Bhagirathi and Bhilangana rivers still exist.

The Badrinath complex consists of a large number of intricate high-domed mosque like temple structures having unique, expansive metal sculptures of presiding deities like 'Satteshwar Shivling,' 'Bhairav Panchmukhi Hanuman,' 'Raj Rajeshwari,' 'Laxmi Narayan,' 'Ranganath,' 'Ganga Dakshin Kali,' 'Shitala Mata' – all these still exist.

The 'Ashtavakra Rishi Shilas,' 'Gopeshwari Ling' and 'Raktavarna Ganesh Shila' on the confluence of Bhagirathi and Bhilangana rivers including the 'Shish Mahal' in Simalsu have already been submerged under the spate of water and sand.

In one of the Hindu Hymns, "Kedarkhand,' Tehri and the important adjoining places find mention, and these places are tragically in the submergence area of the Dam.

Legend has it that Aadi Sankaracharya had been responsible for building the ancient temple in Malidewal village of Bhagirathi valley.

New Tehri

As the entire Tehri township was going to be submerged once the Tehri Dam was constructed. The idea of New Tehri Township took shape in order to settle the residents of the area. Table 5.8 shows the population of old and new Tehri towns.

It was designed to build New Tehri Township below Bauradi (which is 1950 m above sea level), but now it is being built in the area above Bauradi. As compared to Tehri, there is a marked difference in terms of climate and weather conditions here. There is also a marked difference in the geo-morphological make up. Bauradi village is situated on the elevated southwest side of Tehri at a distance of 25 kms.

Table 5.8: Population Figures – Tehri and New Tehri

Year	*Tehri*	*New Tehri*
1991	15,730	4,496
2001	14,954	10,471

Hydel and multipurpose projects in Ganga Yamuna Valleys, Garhwal

Following are the hydel and multipurpose projects being built and/or proposed in Garhwal region (Bharat Dogra, "Dams, Barrages and Future of Garhwal," in Friends of Chipko, undated, *Ignoring Reason, Inviting Disaster: Threat to Ganga-Himalaya*, New Delhi).

A. Bhagirathi river projects

1. Bhairon Ghati Hydel Scheme I
2. Bhairon Ghati Scheme II
3. Loharinag Hydel Scheme
4. Pala Maneri Scheme
5. Maneri Bhali Hydel Scheme I
6. Maneri Bhali Hydel Scheme II
7. Tehri Dam Project
8. Koteshwar Dam Project

B. Alaknanda River projects

9. Rishi Ganga Scheme
10. Lata Tapovan Scheme
11. Markur Lata Scheme
12. Tapovan Vishnu Gad Scheme
13. Vishnuprayag Scheme
14. Vishnu Gad Pipalkoti Scheme
15. Bovla Nandprayag Scheme
16. Karnaprayag Dam Project
17. Utyasu Dam Project
18. Srinagar Dam Project
19. Bhagoli Dam Project
20. Padli Dam Project

C. Ganga River Projects

21. Kotlibhel Dam Project
22. Rishikesh Chilla Scheme

D. Projects on Yamuna, Tons and Tributaries

23. Hanuman Chatti – Saina Chatti hydel scheme
24. Saina Chatti – Gangnani Scheme
25. Barkot – Kuwa Hydel Scheme
26. Kuwa Damta Hydel Scheme
27. Lakhwar Dam Project
28. Vyasi Dam Project
29. Kala Pathar Scheme
30. Karkot Tuni Hydel Scheme
31. Hanol Tuni Scheme
32. Tuni Palasu Scheme
33. Kishau Dam Project
34. Devara – Mori Hydel Scheme
35. Sidri Dewara Hydel
36. Taluka Sinkri Scheme
37. Jokhol Sikri Scheme
38. Ichari Dam Project or Yamuna Hydel Scheme II
39. Dakpathar Project or Yamuna Hydel Scheme I
40. Asan Scheme or Yamuna Hydel Scheme Part IV
41. Kahara Hydel Project

The Tehri Dam Project: A Chronology

Following are some of the important dates in the Tehri dam project (Matu-People's Organisation, 2002; Bharat Dogra, "Dams, Barrages and Future

of Garhwal," in Friends of Chipko, undated, *Ignoring Reason, Inviting Disaster: Threat to Ganga-Himalaya*, New Delhi).

1972 Rs.197.29 crores dam at Tehri to generate 600 mega watts of power mooted. N. D. Tiwari, the then UP Chief Minister, pressurises the Planning Commission and gets the project cleared.

1978 People of Tehri go to the Petitions Committee of Parliament against the dam. Tehri Bandh Virodhi Sangharsh Samiti formed.

1980 Mrs. Gandhi asks the Department of Science and Technology to review the project. Mr. Sunil Roy appointed the Chairman.

1986 Mr. Roy submits report and says that seismic risk too great and Dam should not be constructed. The Environment and Forest Ministry refuses clearance. Yet, the government enlarges the project to Rs.3,000 cores scheme for generating 1,000 mega watts in phase one and another 1,400 mega watts in phase two. Construction continues without clearance. On his visit to India, Mr. Mikhail Gorbachev grants assistance to the fund starved Tehri project, but not before the Committee of Secretaries directs the Central Water Commission to convene a meeting of experts to report on the dam's safety.

Oct. 1986 Clearance granted. The report says a dam in this region could withstand an earthquake of magnitude 5.9 and peak ground acceleration of 0.25 g. Environmentalists do not give credence to the report, as it was not based on field studies by seismologists.

Aug. 1989 Project submitted to Public Investment Board, Planning Commission. The Standing Environment Committee under Dr. D. R. Bhurmal rejects Tehri proposal on all counts. Says there is evidence of an earthquake of over 8 points on the Richter scale in the lifetime of the dam. Subverting this report, the committee of secretaries sets up a high-level panel, headed by Dr. D. Daundyal, to look into the seismicity. Another member, Dr. V. K. Gaur, Secretary, Department of Ocean Development asks for a review.

June 1990 The Committee defers decision on clearing the project, following objections raised by Dr. Gaur. At the same time, newspapers report the on-schedule completion of preliminary construction of the dam.

July 1990 The Ministry of Environment clears project while stipulating that the project authorities must get safety aspects approved by an expert committee. Leading environmentalists assail clearance.

Jan. 1991 The Central Government gives go-ahead signal and says it would not allow further delay in the project's completion.

July 1991 The Indian National Trust for Art and Cultural Heritage (INTACH) urges not signing the dam due to possible earthquake of 8.5 magnitude.

Aug. 1991 The Union Ministry of Environment lays down stringent conditions while issuing clearance, following warning by an experts committee on the "environmental appraisal" of the project that dam site is located in 'seismic gaps,' where a major earthquake could be imminent.

Oct. 1991 Disaster strikes, bringing the simmering controversy to a boil. 'Greater disaster in store,' say experts.

Sept. 1996 A twelve member Expert Committee under the Chairmanship of Dr. Hanumantha Rao was constituted to study the environmental and rehabilitation aspects of the project.

Nov. 1997 Dr. Hanumantha Rao Committee submits its report to the Central Government.

Dec. 1998 The Central Government takes decision on the Group of Experts Committee report. The Government accepted the recommendation regarding safety of the dam design, but it rejected two other recommendations.

2001 A Committee was constituted under the Chairmanship of Dr. Murli Manohar Joshi to study the safety of the dam and the importance of Ganga water in the aftermath of Bhuj earthquake.

Dec. 2001 Diversion Tunnels T3 and T4 of the dam closed down. Dr. Joshi Committee is yet to submit its report.

VI

THE UPPER GANGA CANAL

Since the days of its construction, Upper Ganga Canal had been known as the backbone of agriculture in North Western Provinces (mainly Western UP of present day). Today the agricultural prosperity in Western UP is largely attributed to Upper Ganga Canal.

The vulnerability of indigenous agriculture has occupied the greater part of attention of the revenue administration since the famine of 1837-38, and its heavy toll of relief, remission and suspensions had pointed out the need for remedial action. Massive assistance was believed to be the solution through the application of the latest principles of British Civil Engineering to tap the neglected resources of the Ganga and Yamuna for a gigantic network of canals to irrigate the thirsty soil of the traditionally highly productive Doab and provide navigation channels for the speedier distribution of its greatly increased produce.

In a little over twenty years from the opening of the pioneer Ganga Canal in 1854, the second largest canal system in India and the world, some 5,601 miles of main lines and distributaries had been constructed, commanding an estimated irrigated area, in 1877-78 of nearly 1,500,000 acres in the western districts at a capital cost of nearly 4,500,000 pounds sterling (Whitecomb, 1971).

Local reaction to the introduction of the canals symbolized their benefits. Al least, one folk poem, still current a few decades ago in Aligarh district raised Sir Proby Cautley, the master designer of the Ganga system to divine status in a variant on the myth of Bhagirath. The story is told how the peasants had initially opposed all interference with the sacred river, but turned to keeping praises on Cautley's head as he led the waters of the Ganga down into the parched fields of their neighbourhood. It was common usage along the West Yamuna Canal in nearby Punjab, for example, to refer to the subordinate, local official of the canal administration as 'Naib-Khuda' or 'Deputy God.'

Irrigation in the grand manner began, with the Ganga Canal. Water was admitted into the canal in 1854, and irrigation commenced the following year. In 1861-62, the area irrigated by the canals was officially set at 372,000 acres; the area contracted to 350,000 acres in 1864-65. By 1864-65, the canals as completed comprised its main line (181 miles), the Fatehgarh Branch (82.5 miles), the Bulandshahar Branch (45 miles), the Kanpur Branch (170 miles), and the Etawah Branch (170 miles) – a total length of 648.5 miles with 2,266 miles of distributaries.

Initial discharge of water in the canal was 6,750 cusecs. In 1951, after some modification the capacity was increased to 10,500 cusecs. Today the canal irrigates about 9.24 lakh hectares of land in following districts:

• Haridwar • Roorkee • Shaharanpur • Muzaffarnagar • Meerut • Ghaziabad • Gautam Buddh Nagar • Bulandshahar • Aligarh • Mathura • Hathras • Mainpuri • Etah

At Nanu (Aligarh) the canal is bifurcated into two branches. One goes to Kanpur and the other to Etah. From Nanu, it functions as a supply channel. By the time it reaches to Kanpur, it becomes abundant.

Some other facts regarding Upper Ganga Canal

The data based information pertaining to Upper Ganga Canal in respect of some districts is given in tables 6.1 to 6.6.

Table 6.1: Land and irrigation data (GHAZIABAD)

Particulars	***Hectares/No.***
Total Land Area	201,005
Total Sown Area	142,113
Total Irrigated Area	141,986
Total Forest Area	2,470
Total Barren Land	3,703
Total Waste Land Area	9,089
Total Non-Agricultural Area	5,489
Total number of Villages	556

Table 6.2: Block level data on canals and tube wells (GHAZIABAD)

Name of Block	***Length of the Canal (kms)***	***No. of Tube wells***
Bhojpur	111	23
Muradnagar	156	25
Rajapur	56	21
Loni	53	20
Dhaulana	24	24
Hapur	12	50
Simbhaoli	12	20
Garhmukteshwar	72	42
Total in Rural Area	496	225
Total in Urban Area	100	—
Total	596	225

Table 6.3: Block level data on canal-irrigated land (GHAZIABAD)

Name of Block	*Net Irrigated Area (Hectares)*
Bhojpur	3,101
Muradnagar	4,308
Rajapur	1,499
Loni	213
Dhaulana	4,983
Hapur	281
Simbhaoli	2,048
Garhmukteshwar	4,271

Table 6.4: Data on well-irrigation (GHAZIABAD)

Particulars	***Net Irrigated Area (Hectares)***
State Owned Tube wells	15,812
Private (Individually owned) Tube well	99,428
Wells	4,897
Ponds	Nil

Table 6.5: Land and irrigation data (MUZAFFARNAGAR)

Total number of Villages Irrigated by Ganga Canal	350
Total Irrigated Land Area (Hectares)	71,440 Hectares
Total Length of Ganga Canal in the District	23,792 Kms
Major Distributaries	41,015 Kms
Rajvahi	68,111 Kms
Minor	112,449 Kms
Total Length of Distributaries	55,676 Kms

Table 6.6: Land and irrigation data (MEERUT)

Total number of Blocks irrigated by Ganga Canal	10
Total number of Villages irrigated by Ganga Canal	427
Total Irrigated Land Area (Hectares)	24,259
Total Irrigated Land Area during Rabi Crop (Hectares)	19,270
Total Amount of Water Used for Irrigation during Rabi Crop (Cusecs)	50,934

Impact of fortnightly closure of Ganga canal

The upper Ganga Canal is a boon for all those villages, which are dependent on it for irrigation throughout the year. Sudden closure of the canal in the last fortnight of April 2003 was a matter of great controversy among the villagers who faced the consequences. Some of the major impacts of temporary closure of the canal are summarized below.

- Delay in sowing of crops like sugarcane, fodder related crops, and maize
- Scarcity of water for livestock in these villages
- Temporary Drought conditions due to non-availability of water for irrigation
- Production of seasonal vegetables is affected
- Price hike in seasonal vegetables

In Meerut, the richest of the Doab districts, irrigation prior to the introduction of canals had naturally coincided very much with the character of the soils. As a general conclusion from the Pragna reports, it was clear that wells could be dug more easily and lasted longer, in proportion to their distance from the great natural drainage lines, as "the best well tracts were on watersheds." It was precisely these tracts, which the new canals covered most extensively.

The main line of the Ganga Canal was opened in 1855 and ran through the centre level tract between the Hindon and Kalinadi, while its Anupshahar Branch was opened five years later, and the latter fed the comparatively narrow but fertile strip between the Kalinadi and the Ganga. The division between areas with high proportions of better soil and the poorer tracts intensified. The extensions of irrigation through the naturally fertile areas, for example, the central tracts of pragna Jalalbad and Baghpat, were reported by the end of 1860s to have produced immediate and extraordinary increase in production. The suppression of well by the canals, which immediately commanded a much greater area was said to have saved Kotana and neighbouring pragnas, the core of the opulent Estate of Begum Sumroo from the ravages of famine in 1860-61. Indeed, the proprietor made enormous profits from the grain trade. In the south, pragna "Dasna" benefited similarly from the Ganga Canal.

Elsewhere, however disadvantages and even deleterious effects of the canals were already becoming noticeable by the end of 1860s. For example, in Chhaprauli, which used to be the finest in the district, the inroads of canals had left most wells in disuse and the well maintenance was almost entirely abandoned. The canal enabled Sardhana pragna to grow sugarcane and other cash crops in abundance.

The immediate impact on ecological conditions was more disturbing. The burden on the land through persistent heavy cropping under the stimulus to cultivate the 'valuable' produce increased the threat of deterioration in fertility, noticeable earlier in the century wherever the intensification of agriculture, particularly in mid-Doab regions, had brought over-cropping in its wake. Most serious of all, however was the effect of the canals on the delicate mechanism of the hydrological cycle.

Cropping patterns of staples followed the natural conditions of each locality. In this respect, the observation reported from Mathura district in 1879 can be taken as representative of the provinces as a whole. It is clear how the variety of the soils and the extent to which irrigation was readily available determined the basic patterns of agricultural production. Following patterns were found common.

1. Where water was far from the surface and irrigation consequently difficult, Kharif crops outnumbered the Rabi; a small area only was sown with wheat, a corresponding large area was sown with grain.
2. Where the natural soil conditions were good, of the staple Kharif millets jawar was grown extensively and bajra only nominally.
3. Where no jheels (lakes formed by rainfall collecting in hollows in the ground) existed and the climate was generally dry, paddy was not grown.

4. Where water available for irrigation was brackish, sugarcane was rarely grown.

For the successful exploitation of the above said conditions, one fact was paramount: the farmers depended on an adequate and timely rainfall to secure a full return on the season's sowings. Unevenness in the rains brought sudden and drastic changes; scarcity could follow abundance within the space of a season.

The great nineteenth century developments in canal engineering were concentrated in the Doab. They began early in the 1820s, with the build of East Yamuna canal. This system, a radical research-development on an old Mughal canal lane, was opened in 1830. It irrigated tracts in the Saharanpur, Muzaffarnagar and Meerut districts. By 1878, its main and branch channels together with distributaries totalled 748 miles and irrigated 206,732 acres (as against the average of the preceding five years, 188,678). The cost of the works, excluding interest, came to pounds sterling 126,235. Being one of the most remunerative canals of British India, it paid nearly 23 per cent on the capital expended on it by Government.

In 1868, the construction of a Lower Ganga Canal began, together with the modification in the completed channels. By 1877-78, the area actually irrigated by the whole complex was set at 1,045,013 acres. Some 593 miles of main and branch lines had been completed in the upper and central Doab. With another 3,417 miles of distributaries, the total length of the channels constructed ran into 4,010 miles and the cost, excluding interest, stood at pounds sterling 3,055,015.

In 1868, the first work sanctioned for the purpose of famine relief began on the Agra canal. In March 1874, the canal was formally opened and irrigation began the following Rabi season. By 1877-78, it commanded an area of 375,800 acres; altogether 114,200 acres in Mathura district and a further 113,100 acres in Agra made the proportion of irrigated lands in Western UP higher. Smaller works in Bijnaur, fed by a stream in Moradabad district, covered an area of 4,000 to 5,000 acres. In Bareilly, a further group of some four channels, totalling 256 miles in length and known collectively as the Rohilkhand canals, irrigated a belt of country along the terai, where rice was grown extensively.

Canal development was concentrated in those areas where facilities existed for it, that is, the districts of the North Western Provinces – NWP (today's Western UP). Those districts had a long established and sophisticated patterns of farming in which well irrigation particularly played a large part.

It was estimated that in 1848-49 the number of pakka (masonry) wells in the NWP came to 137,337 of which 72,523 were in the Doab. Devastation during the "mutiny" brought the number of wells in Doab down to close 7,000, with each well having an irrigating capacity of approximately 4.5 acres per season. The corresponding number of the more common Kachche (temporary) wells was estimated at 280,000, each with an irrigating capacity of 1.5 acres per season. From this, it was estimated that about 1,470,000 acres in the Doab were irrigated by the wells.

Astronomical cost of constructing Upper Ganga Canal in Today's value

Water from the Ganga was released in the Canal in 1854. The canal was constructed at the estimated cost of £ 4.5 million. In today's value the construction of the canal would have cost minimum Rs.73,728 crores in 1994 and Rs.147,456 crores in 2004. Surprise, just see how?

Let us assume that one rupee, was put in the 'Fixed Deposit' in 1854. If one were to consider doubling of a deposit in a bank after every 10 years, one rupee of 1854 would be equivalent to Rs.16,384 in 1994 and Rs.32,768 in 2004 as illustrated below:

Decade	Year	Amount (Rs.)
0	(1854)	1
10	(1864)	2
20	(1874)	4
30	(1884)	8

40	(1894)	16
50	(1904)	32
60	(1914)	64
70	(1924)	128
80	(1934)	256
90	(1944)	512
100	(1954)	1,024
110	(1964)	2,048
120	(1974)	4,096
130	(1984)	8,192
140	(1994)	16,384
150	(2004)	32,768

In the 1854s, a rupee was worth about one tenth of a pound (www.copseyfamily.org). Hence, if we calculate the in terms of pounds, 4.5 million pound sterling of 1854 would be:

= Rs.16,384 x 4.5 x 10 million = Rs.16,384 x 4.5 crores

= Rs.73,728 crores in 1994, or Rs.147,456 crores in 2004.

(Incidentally, Lord Dalhousie, Governor General of East India Company in 1855 offered a pension of £ 6000 or Rs.60,000 per annum to Laxmibai Rani of Jhansi, which she refused. In today's value it will become approximately Rs.96 crores in 1994 and Rs.192 crores in 2004.)

VII

WATER PRIVATISATION

Water Privatisation has suddenly come to mean big bucks in India. With water resources in the country fast depleting and the government throwing up its hands, at least five global Corporates are ready to tap the market of over $ 2,000 million. They have already set up shops in several States and are confident of seeing their projects approved, with the central government literally rolling the red carpet to welcome them.

To facilitate "private partnerships," the ministry of urban development in May 2003 released a set of guidelines to State governments for creating a "welcoming atmosphere" in the drinking water sector.

Neither the guidelines nor the National Water Policy, 2002, which advocates more private involvement in the water sector bother to see the result of such corporatization elsewhere in the world. As in Bolivia, where riots broke out in the city of Cochabamba after a 35 per cent increase in water bills, such experiment have been contentious almost everywhere. According to a study compiled by David Hall, director of the Public Services International Research Unit at the University of Greenwich, privatisation of water of the Philippines, Germany, Brazil, Nairobi and Argentina have led to a tremendous increase in water prices, triggering public outrage. Making profit on people's most basic needs is the dream of many corporate executives.

Global players are keenly watching the developments in India and are slowly seeping into the sector. Degremont, a subsidiary of France's Suez, has projects in six cities of India and has plans for further expansion. The company is dealing in treatment of water exclusively. Future expansion will depend on the kind of trade environment the government creates.

Degremont has a project in Delhi; the Sonia Vihar treatment plant is being developed by the company on a Build Operate and Transfer (BOT) contract for a fixed period of seven to ten years during which its profits are guaranteed by the government.

While private companies like Degremont have the government subsidizing their profits, other international agencies are looking forward to the civic bodies reforming their tariff structure to pay back loans.

It perceives water not as a fundamental right of the people, but as a commodity the government can no longer afford to make available to its people free of cost or at subsidised price. This approach, according to Himanshu Thakkar of the South Asia Network on Dams, River and People (SANDRP), is fundamentally flawed. "Water is a natural resource and the government owns it only because it promises to make it available to people. On what basis has the government made water a commercial product? On what basis are the private companies selling bottled water to people?

Who has allowed them to make profit out of this natural resource (Joshi, 2003)?

The answer to shrinking water resources and growing needs, according to Thakkar, does not lie in privatisation but in community participation and transparency on the part of the distributing agencies. Conservation efforts in India have been pioneered not by the government but by the community leaders like Anna Hazare and Rajender Singh. The irony, say Thakkar, is that while the government claims that it does not have any money to make infrastructure improvements in the existing maintenance and distribution system, it is willing to subsidise profits for the foreign trade companies in the water sector.

It is like privatising national assets and nationalizing private losses. The country is being sold and nobody has the courage to speak out. Why would a multinational invest in water without expecting you to pay back several timed the amount?

Nevertheless, Indian policy-makers justify privatisation as a necessary step for reforms in the water sector. "Everyone looks at it as a natural resource for which nobody should be asked to pay. The problem is that the water, which reaches your house has to be first taken to the treatment plants, has to be treated and then piped to homes. All this costs money. Where is that going to come from?" says Planning Commission (Joshi, 2003).

Access to a fair share of clean, healthy water is a basic human right and indeed the basis of our existence. According to the World Health Organization, 60 per cent (3.6 billion) of the world's population lacks access to essential sanitation facilities. It is estimated that in the next quarter of the century, the proportion of the world's population living in countries with significant water-stress could rise from 34 per cent (1995 figures) to 63 per cent. This would mean that water related conflicts would increase, as communities try to fulfil their basic needs.

Although, less than ten per cent of the world's water systems are currently under private control, at the present rate it is possible that the top three MNCs, i.e., Suez and Vivendi of France and RWE-AG of Germany, alone will control over seventy per cent of the water system in Europe and North America in a decade.

Vivendi that earned $ 5 billion a decade ago in its water related revenues had increased its profits to over $ 12 billion by 2002. RWE, which moved into the world market, with its acquisition of Britain's Thames Water, increased its water revenue by a whopping 9,786 per cent in ten years. All three are among the top one hundred corporations in the world. Together, their annual revenue in 2001 was almost $ 160 billion, and is growing at ten per cent a year – outpacing the economies of many countries in which they operate. They also employ more staff than most of the governments (Barlow, 2003).

The state has a great duty vis-à-vis distribution of drinking water. Our rivers are sacred, so too our lakes and dams, which serve several social uses. Aqua robbery by corporates is becoming common. The core principle of the public law is that the state is a trustee of all natural resources and is under a legal duty to protect them. These are resources and are meant for public use and cannot be converted into private ownership (Iyer, 2003).

The ancient Roman Empire developed a legal theory known as the "Doctrine of Public Trust." The public trust doctrine primarily rests on the principle that certain resources like air, sea, water and the forest have such a great importance to the people as a whole that it would be wholly unjustified to make them a subject of private ownership. The said resources being a gift of nature, they should be made freely available to every one irrespective of the status of life. The doctrine enjoins upon the government to protect the resources for the enjoyment of the general public rather than to permit the use for private ownership or commercial purpose.

The Ganga or Narmada belongs to the people and the state cannot abandon its fiduciary obligation. It is unconstitutional, unethical and violative of

human rights to sell or negotiate disposal of publicly owned water resources for mineral water rackets by industrial giants. Equally dangerous, mischievous and mala fide are permissions granted to macro corporates to dig dam to the bowels of earth, pump up waters in enormous quantities and leave the lakes and neighbouring wells deprived of the blessing of nature.

Serious questions are raised when the public properties are given to the corporations. Public funds bear the burden of public accountability (Dhawan, 2003).

Water and international financial institutions (IFIs) like the World Bank, Asian Development Bank and IMF have required developing countries to open up their water distribution to private sector investment and foreign companies as a condition of rescheduling debt. Bolivia, for example, had to accept comprehensive water privatisation as a condition of receiving new loans. And it doesn't start or end with just drinking water. Large dams are mostly built with the support (or pressure) of IFIs like Asian Development Bank, affecting not only drinking water but also the livelihoods and homes of hundreds of thousands of people.

The IMF and the World Bank, along with other financial institutions, support a 'full cost-recovery' principle. Financing criteria favour multi-utility service providers from many development providers, and this is also influencing the development of the water multinationals taking over other sectors.

As no one can survive without water, the multinational water companies have discovered a profitable market. The biggest multinational water companies come from Europe – Vivendi, Suez-Lyonnaise, Thames Water.

These companies have a record of corruption and bribery, pollution, and ignorance for the health and safety of both their employers and their customers. Extensive interlinks exist between executives from major water companies, the government and other sectors, mainly banking and international finance.

Vivendi is the world's largest water service provider through its subsidiary, Generale des Eux, and operates in 90 countries. Suez Lyonnaise des Eaux has operations in 120 countries, supplying water to 72 million people. The water industry is expanding rapidly the range of their activities and the geographic reach of their services.

Main strategies of entry

- Entering into public-private partnership or joint venture with an institution on the desired region. For example, Vivendi and RWE Group became major parties in 1999 in a consortium covering 49.9 per cent privatisation of Berliner Wasserbetriebe, resulting in the largest water sector privatisation company.
- Buying a share in an existing entity in desired region and eventually turning it into a wholly owned subsidiary. Vivendi has made it very clear that it wants to acquire other water companies' assets and operate them.
- Buying smaller operations that have established a presence in a geographic region or have developed new technologies.

Target areas within the water sector

The corporations are targeting four areas within the water sector. They are:

Water and waste,

Water services,

Water treatment, water-related construction and engineering,

Innovative technologies.

This can be targeted in several ways, such as developing internal capacity by acquiring subsidiaries with expertise; developing formal partnerships with other multinationals in other sectors; and entering joint ventures or one-contract partnerships with corporations in other sectors to work on individual projects.

Because of the management complications of big companies, many a times regional governments

maintain ownership because of the corporation's lack of necessary regional knowledge and wish to retain involvement in the former public sector projects. But more often, exclusive control is given to the corporation. Virtually, all successful international efforts to privatise water have focused on privatising the ownership of the existing infrastructure; a growing trend is to attain rights to water access.

WTO and Water

Water is treated as a service, under the General Agreement on Trade in Services (GATS) under WTO – water distribution and collection, waste water and so on. Under the WTO, water would be merely a tradable service. Among other problems arising, water is an essential part of agriculture, but not discussed within that framework. Instead of ministries and other bodies working with agriculture, rural development and so on, trade negotiators and multinational corporations formulate water regulations. MNCs are not interested in water availability for small farmers and communities but simply of making more profits, selling their services as the solution to the world's water problems.

By subjecting water access to market trends and WTO decision-making processes, an agreement like GATS is likely to exacerbate the world's water problems. Minority interests – mostly those of global corporations and foreign investors – would take precedence, with potentially devastating implications for fragile ecosystems and the poor communities.

Water as such is not a part of the current GATS agreement. The European Commission (EC) has now introduced a clause on "environmental service" with dead-end environmental services to whisk problems under the carpet instead of taking precautionary measures. The forces behind this are as described before, water MNCs lobbying behind the scenes in the European Commission and also USA. Key players are the likes of European Services Forum and US Coalitions of Service Industry that almost dictate the trade policy according to their needs.

European Commission

Leaked documents from the European Commission revealed an ambitious agenda for services liberation. EC is requesting WTO Members to open up a whole of sectors, including water as 'environmental service.'

Requests concerning the water sector made to SAARC countries including India, Indonesia, Malaysia, Pakistan, Philippines and Thailand all dealt with water collection, purification and distribution services through mains, except steam and hot water; wastewater services and treatment, remediation of contaminated/polluted water.

Most Favoured Nation treatment

National treatment is one of the core principles in the World Trade Organization. It means that domestic and foreign companies should be given equal treatment, i.e., the same benefits. Conditions of competition should not be in favour of Member's domestic services industry. Another core principle is the Most Favoured Nation (MFN) treatment, which means that members must give other members' "treatment no less favourable than that accorded to like service and service suppliers of any other country." MFN treatment prohibits preferential arrangement among groups of Member States in certain sectors or of reciprocity provisions, which confine access benefits to trading partners granting similar treatment.

Thirsting for Profits

The Global Corporates are thirsty for profit as shown by the following examples (INSAF, 2002):

- The World Bank estimates the global market for water to be worth $ 800 billion.
- The price of one litre bottled water could deliver 3,000 litres of tap water to homes.
- Ten corporate giants are vying for control, including French based corporation Vivendi, Suez-Lyonnaise des Eaux and Bouygues (Saur); US based Enron (Azurix); German based RWE Group; and UK based companies Thames water, United Utilities, Severn Trent, Anglian Water, and the Kelda Group.

- Four of the top 10 water companies are ranked among the 100 largest corporations in the world by the Global Fortune 500: the RWE Group (no. 63), Vivendi (no. 69), Suez-Lyonnaise (no. 70) and Enron (no. 85).
- Vivendi and Suez-Lyonnaise are considered the General Motors and Ford Motor in the global water industry. Suez operates in 120 countries and Vivendi in 90 countries around. Together, US $ 10 billion out of their combined revenues of US $ 70 billion comes from water service alone.
- The global water industry is going through constant rapid changes. Between 1994 and 1998, there were no less than 139 water related mergers and acquisitions. In 1999, the rate of acquisitions and mergers reached record levels, including the acquisition by Vivendi of the US Filter Co., valued at over US $6 billion.

Externally Aided Projects in Urban Water Supply and Sanitation in India

So far, 15 projects have been implemented with World Bank/French assistance. The Ministry of Urban Development also supports external aided projects in the water supply and sanitation sector (Website of Ministry of Urban Development and Poverty Alleviation, Government of India, 26 December 2002). Currently, 19 projects are in different stages of Implementation. The details are in tables 7.1 and 7.2.

Some Myths and Reality

World Over, WTO and the World Bank have been pushing for privatisation of water, as in other sectors. In India too, there is a strong push in that direction. For example, in States like UP, Karnataka, Maharashtra and Rajasthan, various World Bank Projects are pushing in this direction. In States like Gujarat, Madhya Pradesh, and Chhattisgarh, Asian Development Bank is pushing in this direction.

Following are some examples (of course, there can be more such instances) to show the reality as against the myths propagated in support of water sector in WTO agenda (A dossier by South Asia Network on Dams, Rivers and People, Delhi).

Myth 1: New Policies (NP) would increase investments in the sector.

Reality: The Portuguese government financed the building of a new water treatment plant in Matsulu, Nelspruit. The South African Government constructed it, and operated it for one year. After this it was given as a gift to the water multinational, Biwater as per the understanding. The MNC is currently increasing prices in Nelspruit, even through this company contributed nothing to the project.

Myth 2: NP would lead to more efficient Water Sector.

Reality: The people of Nairobi, Kenya, for example, were forced to fork out over R (Rands) 160 million when Nairobi's water was privatised to French multinational, Generales Des Eaux. Soon after the company, they decided to install a new (but not budgeted for) R 1.5 billion billing and revenue collection service. Although the Mayor complained, the company proceeded and put water prices up by 40 per cent in order to pay for the new system. During this time, 3,500 municipal workers were replaced by 45 foreign staff who earned massive salaries from a total R 13.6 million in the second year of the contract, rising to R 31.2 million per year by the end of the contract.

Privatisation of water was also found bad for the poor of Guinea. Before privatisation in 1989, fewer than 40 per cent of the urban population had access to piped water. The Government was short of funds and needed donor finance. Private participation was a condition of World Bank lending. The work force was cut almost in half form 504 employees to 290 and right after privatisation, water prices were increased. The connection rate rose only by 9 per cent by 7 years leaving over 30 per cent of Guineans still without water. The high price of water meant people could not afford to get connected; it was difficult for even wealthy people to pay.

Myth 3: NP would provide clean water.

Reality: The most recent example is the World Bank' role in creating the conditions that caused

Table 7.1: Projects Implemented

SN. Name of Scheme	*Cost (Rs. Crores)*	*External Assistance (US$M)*	*Agency*	*Year of Completion*
1 Bombay Water Supply & Sanitation Project Phase-I	185.00	55.00	World Bank	1981
2 Maharashtra Water Supply & Sanitation Project	86.00	48.00	World Bank	1985
3. Punjab Water Supply & Sanitation Project	67.00	38.00	World Bank	1988
4. UP Water Supply & Sanitation Project	60.00	40.00	World Bank	1983
5. II Bombay Water Supply & Sanitation Project	640.00	196.00	World Bank	1988
6. Rajasthan Water Supply & Sanitation Project	137.76	80.00	World Bank	1988
7. Gujarat Water Supply & Sanitation Project	207.33	72.00	World Bank	1991
8. Tamil Nadu Water Supply & Sanitation Project	321.66	73.00	World Bank	1994
9. Kerala Water Supply & Sanitation Project	127.88	30.11	World Bank	1994
10. Madras Water Supply & Sanitation Project	255.95	69.00	World Bank	1996
11. III Bombay WS & S Project	915.00	145.00	WB	1996
12. Gujarat Urban Development WS Project	208.00	62.00	WB	1995
13. U.P Urban Development	463.86	150.00	WB	1996
14. Hyderabad WS & S Project	337.8	311.5	WB	1998
15. Integrated Packed Water Treatment kiosk for high grade drinking water at Kangchup, Imphal, Manipur	4.75	FF 7.145	French Assistance	1998

Source: Website of Ministry of Urban Development and Poverty Alleviation, Government of India, 26 December 2002

Table 7.2: Projects under Implementation

SN Project crores)	*Cost (Rs. Assistance*	*External Expenditure (Million/Agency)*	*Cumulative Disbursement (Rs. Crores)*	*Cumulative (in Million)*
1. II Chennai WS & Sanitation	78.79	US $ 86.5 WB	623.50	US $ 66.66
2. Functional Improvement to WS & Sewerage in Chennai	598.70	Yen 17,098 JBIC (Japan)		Yen 1,211.192
3. Bombay Sewage Disposal	1,131.57	US $ 192 WB	759.82	US $ 127.75
4. Bangalore WS & Sewage	1,100.00	Yen 28,452 JBIC		Yen 11,738
5. WS & S of Bangalore city	98.76	FF 50 French		FF 8.969
6. Preparation of WS & Environmental Sanitation	19.00	A $ 6.7 Aus aid		-
7. WS Thiruvananthapuram, Kozikode, Pattuvam, Meenad, Cherthala and Adjoining areas	901.15	Yen 11,997 JBIC (Japan)		Nil
8. Shimla Sewerage Project	54.80	US $ 10 OPEC	7.97	US $ 2.99
9. Sewage Plant at Rithala	81.127	FF 45 French		FF 40.05
10. Upgradation & Augmentation of Kangchup water	40.50	FF 31.65 French	40.25	FF 32.66
11. Study if evaluation of losses & leakages in the water distribution system of Jaipur	—	FF 13.686 French		FF 8.663
12. Feasibility Study of water and sanitation of Jaipur	-	FF 11.8 French		FF 8.26
13. Artificial groundwater recharge and wastewater reuse for Jaipur	-	FF 4.945 French		FF 0.88
14. Improvement of WS Distr. Management in Calcutta	32.05	FF 36.00 French	8.5	FF 8.84
15. Prep. of Kolkata WS & S	—	US $ 2.5 WB	—	US $ 0.58
16. Preparation of Gangtok Urban W Supply & Sanitation	—	USAID $ 23.43 (Stage I)		—
17. Preparation of Shillong Urban Water Supply & Sanitation	—	AUSAID A $ 6.00 (Stage I)		—
18. Integrated WS & Sewerage Scheme for Vishakhapatnam	65.70	FF 98 M French		—

the current cholera epidemic in South Africa.

Myth 4: NP would provide equitable access to water.

Reality: The World Bank's insistence on full cost recovery service cut-offs to those unable to pay forced a number of communities to access unclean water sources in South Africa recently.

The World Bank has funded some rural water schemes in Ghana. These have failed because the Bank demanded that rural communities pay upfront cash amount towards constructing the water system. "The policy has resulted in excluding poor communities incapable of paying from enjoying their right to consume potable water," says the CAP-Ghana of Water.

Myth 5: NP would provide sustainable water services.

Reality: Biwater, which privatised Nelspruit's water, withdrew from a Zimbabwean water privatisation project when it became clear that citizens could not pay the tariffs that would be required for Biwater to make a profit.

Myth 6: NP would mean less corruption.

Reality: The World Bank's preference for massive projects led to the exceedingly and unnecessary expensive (and fatally corrupt) Lesotho Highlands dam project, which caused water price to jump, forcing even more communities to be a cut off. Twelve multinationals are being prosecuted for paying bribes in connection with huge water engineering contracts for the water supply scheme. [The trial began in Lesotho Government for what is expected to be a very complex and costly trial.]

In France, the home of 'delegated management' (the World Bank's favourite form of privatisation), the major multinationals have been convicted of bribery. In Milan, in neighbouring Italy, police are investigating politicians' alleged role to have received bribes from a private company for a concession to build a new sanitation plant.

In Indonesia (during the infamous Suharto's regime), Jakarta's water was privatised through a French and a British consortium: both were in partnership with companies owned by Suharto's relatives and cronies.

Some of the World Bank Researchers note: "Our empirical research provides clear evidence of the importance of public procurement corruption, defined as efforts to secure public contracts through payment of kickbacks to officials, as an oft-used channel of influence as well ….the extent to which firms with foreign direct investment and transnationals are also involved in playing public procurement kickbacks and engaged in other forms of corruption. ...Conventional recommendations of economic and trade liberalization advocated to address administrative corruption will not suffice."

The two dominant water multinationals, Suez-Lyonnaise and Vivendi, are convicted in corruption cases.

Myth 7: NP would make water sector economically viable.

Reality: The World Bank's preference for massive projects led to the exceedingly and unnecessary expensive (and fatally corrupt) Lesotho Highlands dam projects, which caused water prices to jump, forcing even more communities to be cut off.

Myth 8: NP will create competitive market, to the advantage of consumers.

Reality: Water and Sanitation sectors by their very nature create monopolies in their respective service areas.

There are only four European multinationals that have the monopoly worldwide on water for profit. One of these, French Vivendi, has recently started raising water prices in the poorest countries of the world because they need extra cash to inject into a Hollywood studio they acquired recently.

Myth 8: NP has been successful elsewhere.

Reality: In Europe, water privatisation has been failing for decades, and in several towns water has been "re-municipalised" or taken back from whichever multinational messed up the service.

In Africa, recent research conducted by London-based Greenwich University's Public Service International Research Unit uncovered that where water was privatised, it was as disastrous as the European experience.

Elements of Water Supply Privatisation

Privatisation of water supply can involve any or all components from the source of water (say a dam), filtration and distribution, to the collection, treatment and disposal of wastewater and sewage. Hence the term normally used is Water Supply and Sanitation (WSS). The privatisation itself can be at various levels and of various types. A brief summary is given below (Dharmadhikary, 2002):

Service Contracts – Involves short-term contracts for provision of specific services. For example, metre reading and billing. No financial risks are involved, and also there is no direct legal relationship with the consumer.

Lease / Management Contract – As the name suggests, either the private company leases out of the facility from the civil authority, or the latter appoints the company for managing the facility. In either case, the ownership remains public; private company is normally not responsible for new investments or expansion. Some commercial risk is involved in so far as day-to-day operations are concerned.

BOOT Contracts – Build, Own, Operate and Transfer Contract in which the private company builds some part of the infrastructure - say the treatment plant, or filtration plant – and runs it for a regular charge on the system. Normally, these would be long-term contract, with a purchase agreement that would guarantee a minimum demand (the equivalent of the "take-or-pay" clause of Power Purchase Agreement (PPAs) in the power sector).

Concessions – Long term contracts in which the private company takes full charge of the system, takes responsibility for the provision of the service and is also responsible for expansion, new investment, recover of bills, etc.

Divestures – Where the Government divests its equity in a utility that is then bought off by a private company. This may be full or part divesture.

In most cases, the establishment of an independent regulator, whose functions normally include setting the tariffs, is a part and parcel of privatisation.

While the private sector participation in water supply is just beginning in India, it has been extensive in Latin America and Southeast Asia. What are the implications of the privatisation of water supply? To understand this, we need to look also at the experience of water privatisation in other countries.

Bolivian Experience in Water Privatisation

It is unlikely that many would have heard of Cochabamba before 1999. Till this time, the city was probably best known for the El Cristo de la Concordia, an immense statute of Jesus Christ, higher than the Cristo del Corcovado in Rio de Janeiro in Brazil. The beautiful Andean city of Cochabamba in Bolivia lies in a fertile valley at 2,558 metres above sea level, surrounded by the Tunari hill, the Alalay lagoon and the San Sebastian hill (Dharmadhikary, 2002).

In 1999 began the story that was to bring a different sort of notoriety to Cochabamba. In 1999, the whole system of water supply for this city was handed over to a consortium of private companies called *Aguas Del Tunari*, led by the American corporation *Bechtel*. The water supply system in the city was in a mess, plagued by chronic shortages, and most of the poorest neighbourhoods did not have access to piped supply. Privatisation of water supply was projected as the only solution to solve its many problems. Brought in with the intention of improving the water supply in the city, *Aguas Del Tunari* was given extraordinary special considerations to attract it to invest in the city.

The Rs.12,500 crores concession (contract) was for 40 years, and assured the company a rate of return on investment of 15 per cent, linked to the

consumer price index of the USA. It also gave the company full rights to all the water in the district. The immediate result was that the water charges were doubled, and then trebled. On the outskirts of the city, some of the communities had built their own cooperative water supply systems based on common tube wells and distribution networks about 5 years before the concession was signed. *Aguas Del Tunari* was given the right to install metres on the wells of these community systems, and not only that, charge the people for the metres too. The rapidly rising prices resulted in the average worker being charged about 25 per cent of his/her salary as the monthly water bill As the prices rose, the company declared – without any hesitation or remorse – that it would disconnect all those who could not pay for the water.

As the anger spread, the people took to the streets. The crowd captured the central plaza in the city. Instead of mediating between the people and the company, the Government brought in the army to suppress the people. The main leaders of the movement were arrested. The struggle became more intense – people started calling it la Guerra del aqua – the Water Wars. One day in April 2000, as the army confronted the people, a 17 year-old boy, *Victor Hugo Daza* was killed. This was the turning point in the struggle. There was no looking back after this, and the company finally had to leave the country.

A Jolt and a Wake Up Call

Cochabamba came as a huge shock to those advocating privatisation of water supply. Since about a decade and a half, the winds of privatisation and globalisation have been blowing all over the world. Around the globe, sectors that have traditionally been in the public domain are being privatised. These include power, transport, railways, insurance, and water.

The company has now filed an arbitration proceeding in the International Centre for the Resolution of Investment Disputes (ICSID), a dispute resolution mechanism created by and located in the World Bank. Aguas Del Tunari / Bechtel is suing Bolivia for 25 million US dollars (Rs.120 crores) for losses. The proceedings in this Centre are carried out in total secrecy and the common people, including people affected/to be affected by its decision have no say. Further, Bechtel has resorted to fudging to take its claims to this centre. It has claimed itself to be a Dutch Company to take advantage of a Bolivia-Dutch treaty, which invokes the ICSID in case of any trade dispute. Bechtel shifted its registration to Holland only after the Cochabamba concession was signed. In early September 2002, several hundred organisations from all over the world wrote to the World Bank to conduct the proceedings of this arbitration in public, and allow the people of Bolivia to become parties to the proceedings.

Structural adjustment programmes have forced country after country to adopt the programme of LPG – Liberalisation, Privatisation and Globalisation. It is being argued that LPG is the only path to economic development. The reasoning given for this is that the Governments no longer have the funds required for the huge investments necessary in these sectors. Further, Governments have proved to be inefficient, corrupt and must make way for the more efficient private sector.

Since water is such a vital part of the economy and infrastructure, it is not surprising that there has been an enormous push for the privatisation of water services. As a result, in many parts of the world, the water sector has seen large-scale privatisation. The events in Cochabamba came as hard reminder that the rosy picture of privatisation of water services also had plenty of thorns. And Cochabamba is not an isolated case. As it happened in Cochabamba, it also helped focus the world's attention on many similar, albeit not so dramatic, cases.

Past few years have seen growing push in India for bringing in private companies in a big way in the water sector. This privatisation of the sector raises a large number of issues. It is necessary that this be preceded by intense debates, discussions and in-depth examination. Otherwise, who knows how many Cochabambas may take place in India?

Failure of Water Privatisation in Manila

The privatisation six years ago of Manila's 120 years old Metropolitan Waterworks and Sewerage System (MWSS) was the world's first and largest such effort. International funding agencies have since upheld the Manila System as a success story urging other Asian countries to adopt the model.

But if the Philippine NGOs like Freedom from Debt Coalition and the Institute for Popular Democracy are to be believed, Manila is a basket case of privatisation's failure. While the water supply has improved for the city's wealthy, tariffs have skyrocketed 150 per cent. Many communities do not have water connection. The private companies are not concerned about water conservation and have reneged on their commitments (Chinai, 2002).

The privatisation of MWSS was carried out, notwithstanding opposition from civil society groups, among them the Freedom from Debt Coalition (FDC). Among the issues raised by FDC was the nature of water as a service, not a source of money. FDC views water as too important a resource to risk giving its provisioning to corporations whose primary motive is profit. This is further exacerbated by the Philippine government's lack of a credible regulatory capacity and its political system's malleability and being open to capture by vested interests.

The people's wariness against the turning over of water provisioning to private hands was drowned out when the results of the bid were announced. Maynilad submitted a bid of P 4.96/cum while Manila Water submitted P 2.32. The pre-privatisation rate of MWSS is P 8.78 per cubic metre of water. Promoters of privatisation were blowing their trumpets, proclaiming to the world the merits of privatisation (Freedom from DEBT Coalition).

MWSS five years later

Did privatisation succeed in bringing water to the people of Manila? Less than five years after the privatisation of MWSS, the failure of privatisation was for all to see.

Not even five years has passed after MWSS was privatised, the only tangible gain brought about by privatisation, low water rates, went in tatters. Maynilad, from its P 4.96 bid, is now charging its customers P 15.46 per cubic metre. How was this possible? The Lopez-owned Maynilad was able to ally itself with the MWSS Regulatory Office's Chief Regulator himself to push for an amendment to the contract to allow them to increase tariff rates through an automatic currency exchange rate adjustment (auto-CERA) mechanism. This was despite the fact that the auto-CERA mechanism has no basis in the concession agreement.

Although the increases were not enough to cause riots, subsequent increases might. At an ongoing rate of raising process at MWSS, Maynilad is asking for a P 30.92 per cubic metre of water.

ADB and Maynilad

The Asian Development Bank (ADB), lender of almost half of the loans assumed by Maynilad when MWSS was privatised, pushed for the contract revision, which will allow Maynilad to increase water tariffs. It argued that the increases were necessary to make Maynilad viable. The contract was amended, tariffs increased, and people's lives became harder, but Maynilad still wants more rise in tariff rates.

Maynilad did not become viable. And ADB knows it. The Bank now wants Maynilad to secure a sovereign guarantee from the Philippine government before it will release a $ 350 million term loan to the ailing water firm. What in effect has happened is that the profits were privatised while the risks remained with government and ultimately, in taxpayers' hands.

Private is not always better than public sector

When government privatised MWSS, it was with the steadfast belief that the private sector can do wonders for the water sector because it will make the MWSS run efficiently.

In the view of Maynilad, the company should have registered profits starting 1999. Instead, Maynilad

is losing, and losing big. In the year 2000, they were supposed to earn P 604 million but actually incurred P 2.4 billion in losses. In 2001, instead of earning P 477 million, they lost P 1.037 billion.

Why? Because of high non-revenue water (NRW). According to their targets, NRW should have been decreased to around 30 per cent by 2001 from 57 per cent in 1997. Instead, NRW ballooned to almost 66 per cent. Maynilad is also losing big bucks because of the firm's inability to efficiently collect water tariffs.

Worse, Maynilad is squandering its money not on capital expenditures such as laying pipes but on the salaries of its pampered executives, both foreign and local alike. It has also incurred very high advertising costs.

Indian Experience: Agitation in Sivaganga

People in Sivaganga in Tamil Nadu are agitating against a soft drink maker's plans to exploit large amount of water from the region, which is already facing water scarcity. On 28 April 2003, more than 7,000 people participated in a rally against Sakthi Sugar Mills at Padmathur. The sugar mill has entered into a contract with the soft drink maker to prepare and package some of its products, using its groundwater resources, 75,000 litres a day. Unlike at Plachimada in Kerala where the resentment among the local people manifested as an angry protest only three years after the bottling plant began operation, the agitation in Sivaganga is a pre-emptive one (Viswanathan, 2003).

The plant will have a production capacity of 600 bottles per minutes; the packaging units might resort to indiscriminate exploitation of groundwater, which would lead to scarcity of water for drinking and irrigation purposes. The unit had plans to dig bore wells up to a depths of 3000 ft. on the Vaigai river bed, besides using the unutilised part of the quantum of water permitted specifically for industrial use by sugar mill, which is 49 lakhs litres a day.

The plant would affect the water supply to Sivaganga, Manamudari, and Thiruppuvanam towns and about 80 villages. The effluents let into a canal during actual run of the unit caused the death of couple of cows and some sheep in a village close to the factory.

In the Thiruppuvanam panchayat union, where the wells of the Sugar mills are located, the groundwater reserves have fallen significantly from 13,351 hectares metre in 1985 to 7,463 hectares metre in 1992. The intensity of ground water extraction has increased rapidly. The quantum of water, drawn as a proportion of the water remaining underground, increased from three per cent in 1985 to six per cent in 1992.

Water Privatisation in Palakkad District of Kerala

Coca-Cola and Pepsi, arch-rival and thirst-busters for millions worldwide, have found common cause in Kerala against protest groups agitating against the way the bottling units of the two multinationals are depleting and polluting groundwater resources to the detriment of people in the drought-prone district of Palakkad (Kumar, 2003).

Within two years of its inauguration, and especially since April 2002, protests had become a regular feature in front of the Coca-Cola unit in Plachimada, as several places in Chittur taluk, including 10 colonies of Dalits and tribal people, began to experience a severe drinking water shortage. Despite the company's claims that the unit is a "greenfield soft-drink bottling factory," where a major share of the water not bottled, is recycled and used to recharge the groundwater, residents of surrounding villages continued to complain that indiscriminate extraction of groundwater had dried up many wells and polluted several others.

The company's initial attempts to provide water in truckloads to some of the affected villages was not appreciated, and the agitators continued to demand that it should take steps to restore groundwater aquifers and ensure continuous water supply in the affected villages, or face the prospect of closure.

Ironically, the bottling unit was established in 2000 on 38 acres (15.2 hectares) of mostly multi-cropped agricultural land, barely 2 kms away from the river Chitturpuzha and near a number of reservoirs and irrigation canals. Until recently, according to the protesters, every day the company drew nearly 1.5 million litres of groundwater and about 85 truckloads of products left the factory premises.

A study conducted by some well-known environmentalists, and members of the Kerala Sastra Sahitya Parishad (KSSP), too had warned that the extraction of groundwater by Coca-Cola at the current rate would stem the possibility of groundwater recharge and lead to deficient rainfall pattern of the region. The report also warned of deterioration in the quality of groundwater as a result of over-exploitation. The State government had refused to take note of the plight of the villagers or to ask the company to curtail the extraction of groundwater.

The Pudusseri Panchayat has cancelled the license of Pepsi unit, because the people of the village and surrounding areas had experienced one of the worst instances of water scarcity this year. There was a severe shortage of drinking water. While earlier there was enough water to operate the pumps for four to five hours a day, this year the pumping had to stop in less than an hour. The panchayat had examined these factors in detail and found that the Pepsi unit had been indulging in over-exploitation of groundwater sources, given the general drought situation prevailing in the area.

Privatisation of Water: The Tiruppur Case

Tiruppur has entered into the global map by virtue of the fact that the knitwear industries located in this town contribute to Rs.4,500 crores every year by way of foreign exchange. Tiruppur, the largest producer of knitwear products in India, is located in Coimbatore district in western Tamil Nadu. The population of this town is about 255,000. This town however starves due to inadequate water for both industries as well as for domestic uses. Agriculture is also badly affected and stressed due to lack of water. This region does not have any perennial water supply from surface sources. The groundwater is depleted with water dropping up to 1,200 feet in many parts of the district.

New Tiruppur Area Development Corporation Ltd. (NTADCL), a company is initiated to supply water to the industries of Tiruppur town and to the domestic users. This is a project in which many agents are participating. They are Tamil Nadu Government, Tiruppur Exporters' Association (TEA), Tiruppur Municipality, Infrastructure Leasing and Financial Services Ltd. (IL & FS), the Tamil Nadu Corporation for Industrial Infrastructure Development Ltd. (TACID), NTADCL and Indo-US Financial Institutions Reform and Expansion (FIRE) Project. This project aims to supply 185 million litres of water per day from Bhavani river to cater to the needs of about 100 dyeing and bleaching units located in this area as well as to supply water to 1.6 million people located in the Tiruppur municipality and the adjacent Panchayats. The detailed project components are the following (Janakrajan, 2003):

- Treated piped water supply of 60 million litres per day (MLD) to Tiruppur municipality and 21 adjoining towns and village panchayats.
- Treated water supply of 100 MLD to over 700 dyeing and bleaching industries within the Tiruppur Planning Area.
- A sewerage system for Tiruppur.
- Onsite sanitation facilities for 88 designated slum areas within Tiruppur municipality.

NTADCL will be responsible for transmission, treatment of water supply, distribution of water outside municipal limits where most of the industry is located, treatment of the collected sewage and maintenance of the sewage treatment plants.

Resource mobilization of the project: Basically, TEA, TACID and IL & FS together are responsible to design and execute the project. Therefore, a public limited company called New Tiruppur Area Development Corporation (NTADCL) was

formed in 1995 to see through the project. The NTADCL will contract out the construction and maintenance of the system to a Build, Operate and Transfer (BOT) consortium, which is the Mahindra Consortium (Mahindra & Mahindra, United International, North West Water, and Bechtel). USAID has provided long term (30 years) loan guarantees for US $ 25 million with IL & FS to help finance this project. Total estimated cost of the project is Rs.12 billion of which equity share of Rs.3.9 billion will be contributed by the Union Government, IL & FS, the Tamil Nadu Corporation for Industrial Infrastructure Development, the Tiruppur Exporters Association and the Mahindra-led consortium. The project has a debt component of Rs.6.98 billion and a subordinate debt of Rs.750 million.

The project is supposed to be in full operation within six years. It is boasted that this is the first public-private partnership project to access commercial funds for the water sector in India. The Tiruppur experiment is going to be the benchmark for private initiatives in the sector and it will build a strong case for private financing of water projects in India in the future.

Treatment of effluent generated by the industries is not taken care of by the company. One of the important processes in the making of knitwear products is dyeing and bleaching. This particular process not only consumes enormous quantity of water, but almost the same quantity of water is discharged as effluent. The major part of effluent is discharged into the Noyyal river and to a significant extent in other small streams such as Nallar and Jamunai rivers. The available evidence confirms that the effluents discharged by these units are quite hazardous causing serious health problems. This is evident from the type and extent of chemicals used in the bleaching and dyeing processes. The estimated water requirements of the bleaching and dyeing units in Tiruppur is about 120 million litres per day (mld) of which about 60 per cent is met by groundwater as transported by the tanker-trucks from the rural neighbourhood. What is really disturbing is the fact that a comparable quantity of water is let out as effluent in the Noyyal river and other streams, which has already caused permanent damage to the river, top soil and most important of all, the groundwater.

Even 30 years earlier, the local textile operators have confirmed that groundwater is contaminated around the areas where dyeing and bleaching units discharge their effluents. In the absence of any perennial source of surface water, the villages around Tiruppur entirely depend upon groundwater for agriculture. As groundwater is contaminated, agriculture as the key occupation seems to have been abandoned in many villages.

The Government of Tamil Nadu has constructed a dam across this river (called Orathapalayam dam) in the year 1992, about 10 kms below the Tiruppur town, with a view to provide irrigation for 8,000 hectares. This dam's catchment area is 2,245 sq. kms, which includes most of the area in which the dyeing and bleaching units are located. The construction of this dam has turned out to be a mockery and has resulted in the wastage of public resources. This is simply because a large quantity of water (about 120 mld) consumed by the Tiruppur dyeing and bleaching units is conveniently led into the Noyyal river (in the form of untreated trade effluent), contributing thereby to the 'additional storage level' of the dam. Thus, the dam effectively performs the role of a storage reservoir for the contaminated water, contributing quite significantly to the pollution of environment, in particular, groundwater. Unless 20,000 cusecs of water is released into the river Cauvery, a major river into which Noyyal joins in the downstream. The release of water from the Orathapalayam dam would be extremely harmful to the crops, soil, animals and groundwater.

In February 1997 when there was no appreciable flow in the river Cauvery, the water from the Orathapalayam dam was released with a view to minimize the damage to the villages around the dam. Since the dam was opened without any prior public notice, it resulted in a great havoc to crops, animals, soil and groundwater. This polluted water of the Noyyal river joined

Cauvery 32 kms down the Orathapalayam dam. It is reported that the water quality remains bad even at 300 feet depth, rendering it unfit even for irrigation.

If the new water company in Tiruppur brings additional water (185 million litres per day), the pollution threat is going to escalate further. The existing common effluent treatment plants (CETPs), a total of eight, hardly function but satisfy the Supreme Court order. Further, these CETPs are not designed to treat the TDS, which is the biggest pollutant. Since the treatment system is very expensive, no industry is willing to treat the effluent. Therefore, the new company will pose additional problem by bringing more water to the town.

The other problem related to the Water Company is fixing of the price of water for the domestic users. The rates are not decided so far but it goes without saying that the new rates for water is going to adversely affect the common man in the region.

VIII

A PUBLIC FULL COST RECOVERY CAMPAIGN: THE DEBT SUEZ OWES THE PEOPLE OF INDIA

Privatisation is based on the logic of full cost recovery. This means the introduction of fees for the service of the end-user, which the state can subsidise if it can afford to, and liberalization of markets, removing trade barriers and tariffs, and invariably resulting in increased privatisation (*Dossier* by South Asia Network on Dams, Rivers and People, Delhi). This also means that they should recover full cost invested in the infrastructure, payment of the salaries to the staff, costs involved in the maintenance and the huge profits. These corporates are never tired of preaching the principle of "full cost recovery" over the investment. These corporates should search their conscience before preaching the poor customers to pay the full cost of their investment.

"The Ganga, which is our mother, has become our graveyard," laments the people. Privatisation of water denies local communities their water rights and access to water in two ways. Firstly, the scarce and limited water resources are diverted, from the poor to the rich, from the countryside to towns, from agriculture to industry leading to water famines where people have no purchasing power, and providing water to those who have destroyed water resources through waste and pollution. Secondly, the state itself shifts from its function in providing welfare to the needy and most marginalized communities to the new function of providing public subsidies for private profits. Scarce and limited public finances are diverted to MNCs like Suez and corporations like JP, which is building the Tehri dam. Small decentralized rural schemes are starved of both water resources and financial resources.

The citizens of India are paying Suez either through high prices or through government guarantees. Suez owes the people of India a financial debt and a social debt. The financial debt owed by Suez to the Indian people includes the public investment in the Tehri dam and the Upper Ganga Canal of which Suez will become the sole beneficiary if the privatisation of Ganga water takes place. Suez would also owe the compensation to the farmers for annual production losses they will suffer.

In addition, the privatisation will cost social and ecological destruction whose costs are impossible to quantify and hence the social and ecological debt is unpayable.

As said earlier, the 635 million litres per day (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 last 150 years.

Suez is not bringing in private foreign investment. It is appropriating public financial investment. Public-private partnerships are in effect private appropriation of public investment. But the financial costs are not the only cost; there are other social and ecological costs as well.

Suez-Degremont should pay Rs.158,149.31 crores of non-recurring money (one time amount) and should pay about Rs.70,425 crores as non-recurring amount for the guaranteed period of ten years to the farmers and other affected persons, as illustrated below:

A. Non-recurring Cost

i. Cost of constructing Upper Ganga Canal in 2004 (as explained in chapter IV)
= Rs. 147,456 crores

ii. Suez Degremont is the direct beneficiary of Tehri dam. Therefore, Suez Degremont owes the responsibility to pay the full cost invested in the construction of Tehri dam as well as the rehabilitation cost of displaced persons. Suez Degremont should pay Rs.10,582 crores to the people of Tehri as explained below:

Cost of constructing Tehri Dam
= Rs.10,000 crores

Rehabilitation Cost of the people displaced by Tehri Dam
= Rs.582 crores

TOTAL (ii) = Rs.10,582 crores

iii. The cost of laying pipelines from Muradnagar to Sonia Vihar (to be borne by the Public) = Rs.111.31 crores

Total non-recurring cost (A) = i + ii + iii = i.e., Rs.147,456 + 10,582 + 111.31
= Rs.158,149.31 crores

B. Recurring Cost

i. Upper Ganga Canal irrigates 924,000 hectares in 13 districts in western UP. As one hectare is 12.5 bighas, it irrigates 924,000 x 12.5 = 11,550,000 bighas.

At an estimate, the per bigha income per year = Rs.3,500

So, the total agricultural income from Upper Ganga Canal
= 11,550,000 x 3500 = 40,425,000,000 = 4,042.5 crores per year

ii. In the rural areas the farmers, particularly marginal, small and medium farmers also do cattle rearing which is closely linked with the agriculture development. In all 13 districts where the land is irrigated by Upper Ganga Canal, the earning from the cattle rearing is around 2,000 crores per annum.

iii. Besides, there are a large number of people like Blacksmiths, Carpenters and others, whose survival depends upon agricultural activities. There is also large number of landless labourers employed or hired by the farmers. It can be safely assumed that the total earning of these people is around 1,000 crores per annum.

Total recurring cost, i.e., annual income from agriculture, cattle rearing, by artisans and landless labourers (i + ii + iii) = i.e., 4,042.5 + 2,000 + 1,000 = 7,042.5 crores

For the guaranteed period of ten years the amount is Rs.7,042.5 crores x 10 = 70,425 crores

This is the basis of the full public cost recovery campaign by the people of India against the privatisation of Ganga by Suez.

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Appendices

Statistics on Water

Table 10.1 : Utilisable Water - Requirement and Return Flow (BCM)

SN	*Particulars*	*Year*	*Year 2010*		*Year 2025*		*Year 2050*	
		1997-98	Low Demand	High Demand	Low Demand	High Demand	Low Demand	High Demand
1	Utilisable Water							
a)	Utilisable surface water	690	690	690	690	690	690	690
b)	Utilisable Ground Water	396	396	396	396	396	396	396
c)	Existing Augmentation from Canal Irrigation	90	90	90	90	90	90	90
	Total (a+b)	1,086	1,086	1,086	1,086	1,086	1,086	1,086
2	Total Water Requirement							
	Surface Water	399	447	458	497	545	641	752
	Ground Water	230	247	252	287	298	332	428
	Total	629	694	710	784	843	973	1,180
3	Return Flow							
	Surface Water	43	52	52	70	74	91	104
	Ground Water	143	144	148	127	141	122	155
	Total	186	196	200	197	215	213	259
4	Residual Utilisable Water (4=1-1(c)-2+3) Balance							
	Surface Water	33,443	295	284	263	219	140	42
	Ground Water	219	203	202	146	149	96	33
	Total	553	498	486	409	368	236	75

Source: Background Paper, National Conference on Water Management: Public-Private Partnership, 27 May 2003, CII and Ministry of Water Resource, New Delhi.

Table 10.2 : Water Requirement for Different Users (BCM)

Particulars	*Year*	*Year 2010*			*Year 2025*			*Year 2050*		
	1997-98	Low	High	%	Low	High	%	Low	High	%
Surface Water										
Irrigation	318	330	339	48	325	366	43	375	463	39
Domestic	17	23	24	3	30	36	5	48	65	6
Industries	21	26	26	4	47	47	6	57	57	5
Power	7	14	15	2	25	26	3	50	56	5
Inland Navigation		7	7	1	10	10	1	15	15	1
Flood Control		-	-	0	-	-	0	-	-	0
Env. (1) Afforestation		-	-	0	-	-	0	-	-	0
Env. (2) Ecology		5	5	1	10	10	1	20	20	2
Evaporation Losses	36	42	42	6	50	50	6	76	76	6
Total	**399**	**447**	**458**	**65**	**497**	**545**	**65**	**641**	**752**	**64**
Ground Water										
Irrigation	206	213	218	31	236	245	29	253	344	29
Domestic & Municipal	13	19	19	2	25	26	3	42	46	4
Industries	9	11	11	1	20	20	2	24	24	2
Power	2	4	4	1	6	7	1	13	14	1
Total	**230**	**247**	**252**	**35**	**287**	**298**	**35**	**332**	**428**	**36**
Grand Total	**629**	**694**	**710**	**100**	**784**	**843**	**100**	**973**	**1180**	**100**
Total Water Use										
Irrigation	524	543	557	78	561	611	72	628	817	68
Domestic	30	42	43	6	55	62	7	90	111	9
Industries	30	37	37	5	67	67	8	81	81	7
Power	9	18	19	3	31	33	4	63	70	6
Inland Navigation	0	7	7	1	10	10	1	15	15	1
Flood Control	0	0	0	0	0	0	0	0	0	0
Env. (1) Afforestation	0	0	0	0	0	0	0	0	0	0
Env. (2) Ecology	0	5	5	1	10	10	1	20	20	2
Evaporation Losses	36	42	42	6	50	50	6	76	76	7
Total	**629**	**694**	**710**	**100**	**784**	**843**	**100**	**973**	**1180**	**100**

Source: Background Paper, CII and Ministry of Water Resources

Table 10.3 : Future Drinking Demand

Year	*Total Water Demand**		*BCM/Year*		*BCM/Year*
	Based on Past Census	*Based on UN Projection*	*Based on Past Census*	*Based on UN Projection*	*Total water requirement for domestic use for urban and rural*
1991	31,465		11.48		
2001	43,065	49,935	15.72	16.03	
2011	54,810	63,555	20.00	23.20	42
2021	66,555	83,375	24.29	30.43	NA
2025	71,340	91,350	26.04	33.34	55
2050	100,755	140,650	36.77	51.33	90

** The water demand has been worked out @ 170 lpcd for 65% of the urban population presumed to be living in class I cities and @ 100 lpcd for balance 35% of the urban population living in class I cities (Report of the National Commission for Integrated Water Resource Development Plan)*

Table 10.4 : Share of water Management in States' Total Expenditure Declines from 8.21% in 1995-96 to 5.55% in 2002-03

State	*Expenditure on Irrigation, flood control and soil and water conservation (Revenue+capital expenditure in Rs. Crore)*								*Change over the previous year (%)*						
	2002-03	2001-02	2000-01	1999-00	1998-99	1997-98	1996-97	1995-96	02-03	01-02	00-01	99-00	98-99	97-98	96-97
Andhra Pradesh	3547.12	2966.87	2612.05	2298.64	2053.61	1852.40	1586.14	1491.22	19.6	13.6	13.6	11.9	10.9	16.8	6.4
Arunachal Pradesh	42.32	83.28	62.87	33.44	33.18	35.84	33.59	32.04	49.2	32.5	88.0	0.8	-7.4	6.7	4.8
Assam	342.22	379.47	311.07	303.76	235.73	237.11	178.40	157.16	-9.8	22.0	2.4	28.9	-0.6	32.9	13.5
Bihar	1023.90	803.16	878.85	1335.59	525.66	321.86	55.30	460.20	27.5	-8.6	-34.2	154.1	63.3	-41.5	19.6
Chhattisgarh	481.47	282.75	109.67	0.00	0.00	0.00	0.00	0.00	70.3	157.8					
Goa	103.48	99.98	71.66	42.90	41.44	39.60	42.41	42.47	3.5	39.5	67.0	3.5	4.6	-6.6	-0.1
Gujarat	2776.96	2476.22	3195.99	3287.79	2966.25	2460.90	2016.37	1654.74	12.1	-22.5	-2.8	10.8	20.5	22.0	21.9
Haryana	817.09	774.04	680.53	648.12	628.27	580.09	513.06	427.51	5.6	13.7	5.0	3.2	8.3	13.1	20.0
Himachal Pradesh	157.02	128.01	124.85	122.33	114.65	100.02	80.25	65.22	22.7	2.5	2.1	6.7	14.6	24.6	23.0
Jammu & Kashmir	359.25	323.44	224.52	187.11	187.62	154.23	137.02	133.12	11.1	44.1	20.0	-0.3	21.6	12.6	2.9
Jharkhand	454.07	432.34	0.00	0.00	0.00	0.00	0.00	0.00	5.0	-	-	-	-	-	-
Karnataka	2472.60	1439.98	2058.56	1876.32	1655.73	1479.53	1479.39	1267.51	71.7	-30.0	9.7	13.3	11.9	0.0	16.7
Kerala	325.89	373.43	319.44	350.81	343.71	313.72	320.35	305.51	-12.7	16.9	-8.9	2.1	9.6	-2.1	4.9
Madhya Pradesh	1102.76	1037.45	880.88	788.59	819.82	749.34	718.62	671.11	6.3	17.8	11.7	-3.8	9.4	4.3	7.1
Maharashtra	2317.61	2407.63	3040.33	3666.18	3207.35	3687.02	2998.58	3132.96	-3.7	-20.8	-17.1	14.3	-13.0	23.0	-4.3
Manipur	103.14	137.13	49.82	85.08	60.30	71.35	70.43	63.22	-24.8	175.3	-41.4	41.1	-15.5	1.3	11.4
Meghalaya	49.51	52.98	38.42	33.43	34.74	31.61	28.01	33.23	-6.5	27.9	14.9	-3.8	9.9	12.9	-15.7
Mizoram	12.93	15.25	11.75	16.69	7.10	7.71	11.71	7.85	-15.2	29.8	-29.6	135.1	-7.9	-34.2	49.2
Nagaland	27.72	26.13	25.00	24.47	23.90	21.79	23.25	14.64	6.1	4.5	2.2	2.4	9.7	-6.3	58.8
Orissa	740.55	714.40	679.54	743.83	825.10	779.41	619.03	423.68	3.7	5.1	-8.6	-9.8	5.9	25.9	46.1
Punjab	994.12	927.06	783.84	683.30	925.83	846.24	352.00	681.38	7.2	18.3	14.7	-26.2	9.4	140.4	-48.3
Rajasthan	1390.16	1257.37	1172.20	1254.39	1340.25	118.79	1066.41	1039.77	10.6	7.3	-6.6	-6.4	19.8	4.9	2.6
Sikkim	18.71	26.35	22.81	10.23	10.67	7.24	10.56	6.66	-29.0	15.5	123.0	-4.1	47.4	-31.4	58.6
Tamil Nadu	778.65	782.14	775.89	811.68	675.89	428.78	313.87	314.51	-0.4	0.8	-4.4	20.1	57.6	36.6	-0.2
Tirupura	80.62	85.74	56.79	48.04	39.24	34.76	26.06	18.71	-6.0	51.0	18.2	22.4	12.9	33.4	39.3
Uttaranchal	196.43	198.61	35.52	0.00	0.00	0.00	0.00	0.00	-1.1	459.1	-	-	-	-	-
Uttar Pradesh	2169.34	227.43	2421.28	2146.76	2028.11	1957.43	2122.30	1694.91	-2.6	-8.0	12.8	5.9	3.6	-7.8	25.2
West Bengal	985.26	1002.50	962.41	766.79	625.87	499.45	513.97	422.05	-1.7	4.2	25.5	22.5	25.3	-2.8	21.8
New Delhi	66.27	65.33	56.75	51.15	44.53	38.11	32.14	15.45	1.4	15.1	10.9	14.9	16.8	18.6	108.0
All States	**23937.17**	**21526.47**	**21663.29**	**21617.42**	**19454.55**	**17854.33**	**15844.22**	**14576.83**	**11.2**	**-0.6**	**0.2**	**11.1**	**9.0**	**12.7**	**8.7**

Source: Tushar K. Mohanti (2003): "Water Crisis...," Economic Times, New Delhi, 9 June 2003

Table 10.5 : Percentage Share of Expenditure on Irrigation, Flood Control and Soil and Water Conservation in State's Total Budgetary Outlay

State	*(Revenue + Capital) Percentage share in Rs. crore*							
	2002-03	2001-02	2000-01	1999-00	1998-99	1997-98	1996-97	1995-96
Andhra Pradesh	10.01	9.48	9.29	10.10	9.35	10.44	9.75	10.43
Arunachal Pradesh	3.09	5.47	5.21	3.05	3.31	3.69	3.77	3.99
Assam	3.26	3.66	4.08	4.29	4.53	4.72	4.18	3.58
Bihar	6.25	5.40	5.19	6.83	4.32	3.15	5.85	4.89
Chhattisgarh	6.82	4.71	5.72	-	-	-	-	-
Goa	3.65	3.91	3.65	2.66	2.84	3.12	4.48	4.50
Gujarat	9.50	8.20	11.76	15.32	15.47	16.54	16.03	15.31
Haryana	6.83	7.05	7.43	7.75	7.32	7.43	6.55	6.97
Himachal Pradesh	2.61	2.35	2.35	2.60	2.75	2.90	3.05	2.78
Jammu & Kashmir	4.22	4.02	2.87	2.63	3.21	3.15	3.41	3.73
Jharkhand	4.83	5.45	-	-	-	-	-	-
Karnataka	9.62	6.56	10.47	10.53	11.12	11.74	12.35	12.18
Kerala	2.12	2.74	2.43	2.72	3.24	3.20	4.03	4.41
Madhya Pradesh	6.08	5.26	5.20	4.39	5.13	5.27	5.49	6.34
Maharashtra	5.10	5.49	7.20	9.59	10.58	13.32	11.99	14.66
Manipur	5.13	6.27	3.61	4.78	5.40	6.30	6.95	7.80
Meghalaya	2.69	3.03	2.70	2.80	3.45	3.72	3.57	4.27
Mizoram	1.06	1.09	0.91	1.44	0.79	0.89	1.45	1.10
Nagaland	1.41	1.29	1.36	1.64	1.60	1.77	2.12	1.41
Orissa	5.23	5.68	6.15	7.35	9.55	11.37	9.81	7.62
Punjab	5.18	5.52	5.55	5.70	8.45	8.93	4.66	9.73
Rajasthan	6.20	6.44	6.70	7.72	9.36	8.82	9.73	9.53
Sikkim	0.94	2.33	2.41	0.63	0.66	0.52	0.85	0.67
Tamil Nadu	2.53	3.01	3.18	3.59	3.40	2.47	2.04	2.51
Tirupura	2.95	3.21	2.66	2.71	2.56	2.57	2.21	1.89
Uttaranchal	3.68	4.15	3.20	-	-	-	-	-
Uttar Pradesh	4.93	5.21	6.60	6.20	6.45	7.35	9.22	8.15
West Bengal	3.17	3.32	3.60	3.38	3.65	3.68	3.94	4.02
New Delhi	0.75	0.70	0.77	0.87	0.90	0.91	0.91	0.52
All States	**5.55**	**5.36**	**6.24**	**6.89**	**7.30**	**7.83**	**7.81**	**8.21**

Source: Tushar K. Mohanti (2003): "Water Crisis...," Economic Times, New Delhi, 9 June 2003

Table 10.6: Medicinal Plants in Ganga-Shiwalik Region

SN.	*Plant Family*	*Name of Species*
1.	Acanthaceae	Adhatoda vasica, Barleria prionitis, B. cristata, Peristrophe bicalyculata, Reullia tuberosa, Rungia parviflora.
2.	Adiantaceae	Adiantum sp.
3.	Aizoeceae	Trianthema sp.
4.	Amaranthaceae	Achyranthes aspera
5.	Apiaceae	Centella asiatica
6.	Anacardiaceae	Spondias pinnata, Buchnania Iatifolia, Mangifera indica
7.	Araceae	Acorus calamus
8.	Apocynaceae	Holarrhena antidysenterica, lchnocarpus frutescens, Catharanthus roseus, Nerium odorum, Plumeria acutifolia, Rauwolfia serpentina, Tabernaemontana coronaria, Thevetia nerifolia
9.	Asclepiadaceae	Asclepias curassavica, Calotropis gigentia, C. procera, Leptadenia reticulata, Tylophora indica.
10.	Asteraceae	Artemisia sp., Calendula officinalis, Eclipta alba, Tridax procumbens, Vernonia anthelomintica.
11.	Averrhoaceae	Averrhoa carambola
12.	Barringtoniaceae	Barringtonia acutangula
13.	Bignoniaceae	Stereospermum suaveolens, Tecomella undulata
14.	Bombaceae	Salmelia malabarica
15.	Boraginaceae	Cynoglossum sp., Heliotropiu sp., H. indicum
16.	Caesalpiniaceae	Bauhina variegata, Caesalpinia, C.sophera, C. tora, Saraca indica.
17.	Cannabinaceae	Cannabis sativa
18.	Capparaceae	Crataeva nervula
19.	Caryophyllaceae	Stellaria media
20.	Celastraceae	Celastrus paniculata
21.	Chenopodiaceae	Chenopodium ambrosoides
22.	Cochlospermaceae	Cochlospermum gossypium
23.	Combretaceae	Angeissus latifolia, Terminalia arjuna, Terminalia bellerica, T. chebula, T. tomentosa, Convolvulus pluricaulis, Evolvulus, alsinoides Ipomoea turpethum.
24.	Cucurbitaceae	Bryonopsis laciniata, Citrullus, colocythus, Momordica balsamina
25.	Cupressaceae	Thuja occidentalis.
26.	Dioscoreaceae	Dioscorea bulbiflora, D.deltoidea.
27.	Euphorbiaceae	Baliospermum montanum, Bridelia sp., Emblica officinalis, Euphorbia hirta, E. nerifolia, E. thymifolia, Phyllanthus niruri, Ricinus communis.
28.	Fagaceae	Querus leucotrichophora
29.	Flacourtiaceae	Flacourtia sp. Casearia tomentosa
30.	Lamiaceae	Hyptis suaveolens, Mentha piperata, Ocimum sp.
31.	Leeaceae	Leea aspera
32.	Lythraceae	Lawsonia inerims
33.	Liliaceae	Asparagus sp. Gloriosa superba, Urginea indica

SN.	Plant Family	Name of Species
34.	Malvaceae	Hibiscus abelmoschus, H. rosasinensis, Malvastrum coromandalicum, Abutilon indicum, Sida cordata, S. cordfifolia, S.obovata, S. rhombifolia
35.	Meliaceae	Azadirachta indica, Amoora rohituka, Cedrela toona
36.	Mimosaceae	Acacia nilotica, Albizzia lebbeck, A. odoratissima, A procera.
37.	Menispermaceae	Cissampelos pareria, Tinospora cordifolia
38.	Moraceae	Ficus religiosa
39.	Moringaceae	Moringa oleifera
40.	Myrtaceae	Syzigium cumini
41.	Nyctaginaceae	Boerhavia diffusa
42.	Nyctanthaceae	Nyctanthes arbortristis
43.	Oxalidaceae	Oxalis corniculata
44.	Papaveraceae	Argemone mexicana
45.	Papilionaceae	Abrus pictorius, Butea frondosa, Desmodium gangeticum, Dolichos biflorus, Medicago sativa, Melilotus philipnensis, Pongamia glabra, Psoralea corylifolia, Pueraria tuberosa, Trigonella foenumgraecum, Uraria picta.
46.	Pedaliaceae	Pedalium foetida
47.	Periplocaceae	Hemidesmus indicus
48.	Piperaceae	Piper longum
49.	Plumbaginaceae	Plumbago zeylanica
50.	Poaceae	Arundo donax, Cymbopogon sp., Cyndon dactylon
51.	Polygonaceae	Polygonum viviparum
52.	Puniceaceae	Punica granatum
53.	Rhamanaceae	Zizyphus mauritiana
54.	Rubiaceae	Adina cordifolia Gardenia gummifera
55.	Sapotaceae	Bassia latifolia, Madhuca indica
56.	Smilacaceae	Smilax aspera
57.	Solanaceae	Datura fastuosa, D. stramonium, Solanum indicum, S. nigrum, S. torvum, S. verbascifolium, Withania somnifera.
58.	Tiliaceae	Grewia oppositifolia
59.	Verbenaceae	Gmelina arborea, Vitex negundo
60.	Scrophulariaceae	Bacopa monnieri
61.	Zingiberaceae	Costus sp., Curcuma longa, Hedychium spicatum, Zingiber officinale
62.	Zygophyllaceae	Tribulus terrestris.

Source: S. Kumar (2001): Plant Diversity Along River Ganga (Dehradun: Sai Publishers), pp 10-13