SR-4/96-97

SOME NEWS REGARDING HYDROLOGICAL PROBLEMS OF THE COUNTRY

आपो हि ष्ठा मयोभुवः

NATIONAL INSTITUTE OF HYDROLOGY
JAL VIGYAN BHAWAN
ROORKEE - 247 667 (U.P.) INDIA

CONTENTS

List of Tables

Table 1: Content Numbers of the News versus specified Hydrological Problems under the State.

S. No.	Topics	Content Numbers
1.	Surface Water Hydrology	A1, V27
2.	Ground Water Hydrology	C2,D3,F3,G1,Q2,T1,V4
3.	Land/soil erosion	B2,B4,U4,U5,V4,V18,V23
4.	Drought Management	L4
5.	Sedimentation in Reservoirs	B3,V23
6.	Flood Hydrology	B1,B3
7.	Water Policy/ Water Management	V2,V5,V6,V12,V15,V19,V21, V26.
8.	Environmental Hydrology.	C1,F4,H1
9.	watershed management	V13
10.	Forest Hydrology	V18,V23,V24
11.	Snow /Mountain Hydrology	I1
12.	Rem.sensing & data collection	V11
13.	Jhumming	O2

14.	Flash flood & Dam safety	B5,F2,T2,V14,V16
15.	Hydrological data networks	L2,V9
16.	Interbasin water transfer	V24
17.	Irrigation	Q1
18.	Potable water/ Water availability	C2,D1,F1,F5,J1,M1,O1,R1,S1,T1,U1,V2,V3, V7,V20,V22
19.	Water Quality /Pollution	C3,D2,G2,H1,K2,L3,P1,U1,U2,U3,V8,V10
20.	Hydrologic Modelling/ Instrumentation	A2,V20
21.	Narmada Project	N1,N2,N3
22.	Waterlogging/ soil salinity	V1,V17

Table 2.: Hydrological Problems of Specific Basins versus Content Positions

S.No.	Specific Basins	Content Positions
1.	Brahmaputra Basin, Assam	B1 , B3, B4, B5
2.	Damodar river Basin, Bihar	C1
3.	Safi River, Bihar	C3
4.	Sabarmati Basin, Gujarat	F1
5.	West Yamuna Basin	G2
6.	Cavery Basin, Karnataka	J1
7.	Chaliyar River, Kerala	K2
8.	Saburi Dam	F4
9.	Upper Ganga Basin	I1, T
10.	Narmada Basin	N1, N2, N3

INTRODUCTION

Dissemination of any news concerning all of us, particularly, the news about water resources is of utmost importance due to the fact that availability of good water has become the most critical factor for any development activity and for stepping into the next millennium with confidence. The various hydrologic problems of India which vary over space and time are by and large known. But, their occurrence, severity, long term and short term impact on our various development processes, environment, and economy, are not always visualised.

The hydrologic events that were occurring across the length and breadth of India are the manifestation of the hydrologic problems and an awareness of the same will definitely be congenial to be the rationa! starting point to mitigate these. With this thing in view, the hydrologic information and news available from the print media and various government agencies mostly for 1996-97 and for other years are collected and compiled in this report state-wise and problemwise and river basin-wise for the whole country.

The major hydrological problems of India have been divided into 20 sub-sections and arranged both statewise and river-basin wise. The news about the Narmada basin and North-Eastern Region have been incorporated in 'N' and 'O' sections separately. Section 'V' caters for the general hydrologic information of the country. Further for the convenience of the readers, a matrix is provided amongst the problem and the position index of the contents provided with respect to the problem in the report (Table-1). Table-2 serves as a matrix to indicate the river basins where the different problems have taken place. States have been arranged in alphabetic order. As such, readers can easily go through the reported hydrologic events according to 20 classified problems statewise and river basin-wise.

It is attempted to cover all the important hydrologic news and events to the extent possible. However, the present report may be taken as an illustrative compilation of the hydrological information and news and be referred.

CONTENTS LAYOUT

States/General arranged by alphabets (A to Z)

Name the State/General

A - ANDHRA PRADESH

Specified category under Hydrological Problems

Content Positions (in state 'A')

News contents from News Paper

Flood Hydrology:

A1). The heavy rains caused by the cyclonic storm battered the coastal and Rayalaseema regions of Andhra Pradesh. The Madampally town of Chittor district was under flood due to incessant rain and breach in the Kutharima tank.

The deep depression in the Bay of Bengal intensified into a cyclonic storm and lay centred 270 kms south of Visakhapatnam. It was likely to move in the northward direction, according to the metereological office.

There had been extensive damage to the crops and human lives due to the cyclonic storm. Many sub-ways and low-lying areas in the city were found to be lying under thick sheets of water. The rivulet between Saidapet and Guindy was overflowing. Meanwhile the power -starved state's hydel reservoirs have reported steady inflow. The hydel reservoirs had a total inflow of 26.37 million units.

(Times of India, 15. June, 1996)

Name of the News-paper

Date of publication

Note: Specified states and other fields against their alphabets have been given in contents.

A - ANDHRA PRADESH

Flood Hydrology:

A1). The heavy rains caused by the cyclonic storm battered the coastal and Rayalaseema regions of Andhra Pradesh. The Madampally town of Chittor district was under flood due to incessant rain and breach in the Kutharima tank.

The deep depression in the Bay of Bengal intensified into a cyclonic storm and lay centred 270 kms south of Visakhapatnam. It was likely to move in the northward direction, according to the metereological office.

There had been extensive damage to the crops and human lives due to the cyclonic storm. Many sub-ways and low-lying areas in the city were found to be lying under thick sheets of water. The rivulet between Saidapet and Guindy was overflowing. Meanwhile the power -starved state's hydel reservoirs have reported steady inflow. The hydel reservoirs had a total inflow of 26.37 million units.

(Times of India, 15. June, 1996)

B - ASSAM

Flood Hydrology:

B1). More than Rs. 50 crore worth of property and foodgrains have been damaged by the first wave of flood in upper Assam. Chief Minister Prafulla Kumar Mahanta, who is in New Delhi, would undertake an aerial survey of the flood-affected areas on Tuesday, official sources here said.

Similarly, the situation at Majuli, the world's biggest river island, continued to be grim with flood waters snapping road communication between Gormur and Kamalabari Satra. An estimated two lakh people in about 100 villages have been affected in Majuli. Altogether more than a million people in nine districts have been under the grip

of this first wave of flood. The districts are Dhemaji, Tinsukia, North Lakhimpur, Dibrugarh, Jorhat, Sibsagar, Darrong, Dhubri and Bongaigaon. About ten lakh people rendered homeless have taken shelter in 97 relief camps opened by the authorities, of which 85 alone are in Dhemaji district.

(Times of India, 8.7.96)

Soil Erosion:

B2). Heavy erosion has been reported from Dhubri and Gopalpara districts of lower Assam as the flood water in the worst affected Dhemaji and north Lakhimpur districts receded. State Flood Control Minister Pramod Gogoi said that the situation in Motichar, Agomoni and Golokganj in Dhubri and Goalpara districts was serious as heavy to very heavy erosion continued since last week. The flood control officials are more concerned about these weak embankments in the districts as they feared that breach of any one of these would submerge vast areas of human habitation.

Mr. Gogoi visited areas where the Brahmaputra had eaten away land at Motichar near Dhubri town and also went around pub Kaldova, Kathaltali and pub Kanuri where river Gangadhar had played havoc. The Secretary, Flood Control and the Deputy Commissioner, Dhubri district, also accompanied the minister.

He assured the erosion affected Dhemaji district, the water has started receding since the last two days but still most of the areas are submerged under water. The district also faced serious food shortage and the situation in some remote parts was worse as almost all the road transport was completely disrupted. More than three lakh people are in the 85 refugee camps opened by the authorities in and around Dhemaji and Dhakuakhana towns. Altogether, more than a million people of eight districts have been affected by the floods.

(Times of India, 9.7.96).

Flood Hydrology / Sedimentation:

B3). Heavy siltation has led to a rise in the level of the Brahmaputra and this

was responsible for recurrent problem of floods in Assam. It is estimated that about one million hectare area is affected by floods in Assam every year and in monetory terms it is staggering loss of Rs. 1,000 crore.(The Times of India, 9.12.96).

Bank Erosion:

B4). Majuli(Assam) - Residents of Majuli river island in upper Assam (Jorhat district) on the river Brahmaputra are making a last-ditch efforts to save the historic island from extinction from the floods. Its area is nearly 800 sq. Km island. Floods eroded one-third of the island, which is home to more than one and a half lakh people. The voluntary organisations have taken up a 2 km. stretch in the river bank to use natural forces to resist the water, pulling back the slope, giving it an inclined position and planting grass and specified plants. Mr. Asif Hussain, a doctoral student has told that there is an almost perpendicular, upright river bank. As the water flows under the bank, gradually forming a sort of overhang- the weight and pressure of that then crash into the river. The South African expert, Mr. E.F.Muller, who had visited the river island several times, recommended the preparation of a comprehensive model of Majuli and the need for mathematical and computer analysis to ascertain as to what could be done to save the world's biggest river island. He said if plastic bags or any such similar commodity was to be placed on the banks, it could possibly control erosion to a certain extent.

(The Statesman, 3.2.1997, and 6.2.97)

Dam safety/Flash flood:

B5). In pursuance of a new policy of the United Front Government that all central sector projects located in States would be supervised by respective State Governments. The State Govenrment would be supervising the authority to set up the Pagladiah dam project, State Irrigation Minister Mr. P.Gogoi said here on Wednesday. The project, to be set up in Nalbari in lower Assam, would involve an expenditure of about Rs. 480 crore. In the Ninth Plan, Rs. 350 crore had been

sanctioned for it, Mr Gogoi said.

The agency, which had drawn up the project and was responsible for its overall execution, was the Brahmaputra Board, but a separate corporation would be set up for its execution, he said. For this, a legislation in Parliament might be necessary. The Pagladiah river has been responsible for recurrent floods in the north bank of the Brahmaputra. The multi- purpose project would help in flood control and irrigation. The rehabilitation plan related to the project has been cleared by the Union Welfare Ministry.

(The Times of India, 6.3.97)

C - BIHAR

Damodar valley/Environment:

C1). The North Karanpura Valley represents the upper watershed of Damodar River, which was the biggest waterway of south Bihar in eastern India. The valley has contains the largest coal reserves being exploited in the nation's Eighth Plan. No less than 37 streams and five big rivers criss-cross the beautiful valley, in which live a large variety of tribes. A thoroughly unscrupulous nexus of coal mining lobby, revenue lobby, contractor lobby and mafia lobby, is geared up to destroy the valley. Tribals constitute 77% of those affected.

Water levels have fallen drastically since Independence in the Damodar Valley which became a coal mine cum industrial heart-land, while the rainfall pattern changed. The sporadic rainfall pattern in the crucial summer months drastically altered owing to loss of green cover affecting precipitation. The mango crop is deprived of rainfall when the flowers blossom, and the summer crops of leguimes, wheat, rice, etc. are destroyed. There is above all a destruction of the tea gardens in Chotanagpur for which summer rain was vital. The real cause of forest destruction is organised revenue hunting by the Government, demand for Saal poles by Coal India, and the systematic mining of mineral reserves beneath the natural forests. The people are made a scapegoat. One should not forget that natural environments once destroyed cannot be rehabilitated in the tropics.

(The Statesman, 6.11.1993).

Ground Water Hydrology/Water availability:

C2). The water problems in Bihar both for drinking and irrigation purposes, has increased during the past four to five years, mainly because of drying up of ground water. The problem is more acute in south Bihar and some places in central Bihar where the land is generally arid. In north Bihar, criss-crossed by several rivers, the crisis is not that acute.

(The Statesman, 20.6.94)

Water Pollution:

C3). The Bihar unit of the Central Pollution Control Board is yet to chalk out a plan to check the "alarming growth" of arsenic and mercury percentage in the Safi river along the north Karnapura coal fields in south Bihar.

The study, carried out by a Ranchi University's geology department research scholar Nitish Priyadarshi said the presence of arsenic, mercury, nickel, chromium, lead and manganese in the samples of the safi were above detectable limits. Metals like arsenic, lead and mercury are absorbed by the atmosphere and they gradually settle down in the river through atmospheric precipitation, it says.

(Times of India, 1996).

D – DELHI

Water Availability:

D1). Delhi's 90-lakh population needs 2840 million litres per day or 1 billion cubic metres. This demand is met through Bhakra dam (680 million litres), Yamuna river (1000 million litres), Ramganga dam (450 million litres) and some from groundwater.

(Indian Express, 20.6.93)

D2). In 1991 per capita rate of 315 litres per day for the 100 million population, the

capital needs 3.150 million litres per day whereas the availability is less than 2.250 mld.

(The Statesman, 20.6.94)

G.W.Hydrology:

D3). A decline of 4 to 8 metre in the level of groundwater has been observed in certain pockets of Delhi during last 15 to 20 years, the Lok Sabha was informed on Dec. 9, 1996. The CGWB has prepared a report "Development and augmentation of groundwater resources in Delhi" and the report is given to Delhi Govt. for taking action.

(The Statesman, 10.12.96)

E - GOA

Drainage / Potable water:

E1). The Union Govt. has allocated Rs. 700 Crore to Goa for providing Sewage drainage and drinking water facilities in the State, it was announced on Dec. 31,1995.

(Down to Earth,Jan 31, 1996).

F - GUJARAT

Potable Water:

F1). The Sabarmati, which is one of the major west-flowing rivers of India, originates in the Aravalli hills in Rajasthan. After travelling a course of 48 Km. it enters Gujarat where it traverses a further 323 Km before draining into the gulf of Cambay. With 13 tributeries it covers 28,036 Km. The river has been subjected to severe pressure due to the fast pace of urban and industrial growth of Ahmedabad's

urban agglomeration, especially after Sabarmati city became the first capital of the newly-formed Gujarat state in 1961. The Ahmedabad Municipal Commissioner, Mr. P.K.Ghosh, said that if the trend continues, then in the next few years, the water of the Sabarmati river which is presently meeting 40% of the potable water demand of Ahmedabad, would no longer remain potable.

(The Statesman, 31.10.94)

Dam Safety:

F2). A majority of Indian dams are unsafe by present standards according to a leaked internal World Bank Memo. The author of the memo. William Price of the bank's Asia Technical Division. India's worst dam disaster to date, the failure of the Machhu II dam in 1979, killed at least 2,000 people. Machhu II collapsed during a flood which was over twice as strong as that which the dam was built to contain. Price points out that 'there is no comparison' between the remote area downstream of Machhu II and the highly populated valleys below Hirakud and Gandhi Sagar. Furthermore, Machhu II was a relatively small dam, 26 metres high, Hirakud is 59 metres high and can hold back 8.1 billion cubic metres of water - 80 times as much as Machhu II. Gandhi Sagar is five metres higher than Hirakud and its reservoir is only marginally smaller. The world's worst ever dam disaster in Henan province, China in August 1975 was caused by the failure of two dams with a combined capacity of 600 million cubic metres of water. Between 86,000 and 230,000 people were killed when the dams burst during an exceptionally heavy flood, according to Chinese documents recently translated by Human Rights Watch-Asia. No evacuation plans and no inundation maps showing the areas likely to be affected by dam burst floods exist for Indian dams.

(The Statesman, 7.4.95)

Ground Water Hydrology:

F3). Indiscriminate use of underground water, without taking adequate care to recharge has resulted in severe water stress. If we look at Ahmedabad as an

example, the water level has gone down from 100 feet 30 years ago to 300 feet at present. The condition is worsening throughout the country as about one-third of the total agricultural land is being served by underground water.

(The Statesman, 27.7.96)

Environmental Hydrology:

F4). Company told to pay Rs.2.36 cr for pollution:

In response to public interest litigations regarding alleged pollution in the village and the Saburi dam area adjoining it by the chemical units, the court held that the company's chemical units in Surendranagar were grossly violating pollution control norms. The Gujarat High Court asked Maradia Chemicals to pay Rs.2.36 crore as compensation and also take up steps for the general welfare of Sorimbada village in Surendranagar district affected by pollution. The Bench directed the National Environment Engineering Research Institute (NEERI) to inspect the units again to verify the company's claim regarding improvement in environment conditions.

(The Times of India, 10.12.96).

Water Availability:

F5). The situation in Jamnagar is serious, 10 of the 85 villages in Khambalia taluka have been declared drought-hit and 75 semi drought-hit. In Dwarka where the problem of salinity ingress also persists, 5 villages have been declared semi drought-hit and 38 drought-hit. Around 37 villages in Kalyanpur have been declared drought-hit. Though conditions are slightly better in Junagarh and Rajkot districts, the administration has made arrangements for releasing part of the water, resources for irrigation before a substantial quantity is lost to evaporation.

(Times of India, 16.3.97).

G - HARYANA

Ground Water Hydrology:

G1). Water table in Haryana declining during last two decades. The average water table in the State has declined by 1.90 m whereas in fresh belt areas of the State its average fall is 4.38m. It varies from 0.94m in Yamunanagar district to 12.09m in Mahenergarh district. However, on the other hand, the water table in saline areas has risen during the period ranging from 0.41m in Rohtak to 6.02m in Sirsa district. **(The Statesman, 6.10.94)**

Water Quality:

G2). Delhi and the surrounding areas are fast becoming a toxic paradise. Homicide by Pesticides, a book just released by the New Delhi based Centre for Science and Environment. Haryana, a major green revolution state, used 5,100 tonne of pesticides in 1995-96. Some 85-90 per cent of this quantity dissipated into the environment. In 1994-95, 54 percent of the pesticides used in agriculture and 94 per cent used in public health in India were banned or severely curtailed in the West. The eight Haryana districts through which the Yamuna flows also used 327,000 tonne of chemical fertilisers.

In addition, the towns of Yamunanagar, Karnal, Sonepat and Panipat dump their own industrial and domestic effluents into the river. Ten firms in Yamunanagar and Panipat alone dumped 72 million litres per day of wastewater into the Western Yamuna Canal which brings raw water to the Haiderpur water works in Delhi. Drinking water of Delhi contain all these poisons because the city does not treat the raw river water either for pesticide residues or for industrial contaminants.

A study conducted by the indian Agricultural Research Institute in New Delhi found DDT, aldrin and heptachlor in Yamuna waters-all in excess of recommended levels. The monsoon months are worse because then the runoff from the farms is the highest and the bottom sediments are picked up more by the fast flowing waters. What is worse is that we don't know the exact concentrations of these chemicals.

Five different studies have reported different levels of contamination ranging from 1 to 355 times in the case of DDT, from 1 to 55 in the case of aldrin/dieldrin, and 1 to 115 in the case of BHC. Indian drinking water standards say that pesticide residues should be absent in drinking water.

What Haryana does to Delhi, Delhi then calmly does the same to the cities downstream. After Delhi, the river literally turns into a sewer. In July 1995, Jai Sansthan of Agra dumps in as much chlorine as it can find. The people of Agra have filed a case against the Uttar Pradesh Government for not supplying them clean water.

(Times of India, 7.3.97).

H - HIMACHAL PRADESH

Environment/Ecology/Water Quality:

H1). Himachal Pradesh, has been suffering from indiscriminate deforestation and use of pesticides in the name of development. The rigid growth of population has given rise to resource inadequacy on the one hand and urgency to exploit it further leading to ecological imbalance. Depletion of forest wealth is, to a great extent, caused by this factor. To increase the production and productivity, increased use of chemical fertilizers and pesticides is being made. Against 13.95 thousand tonnes of chemical fertilizers used in 1979-80, 32.71 thousand tonnes were used in 1989-90. Similarly, use of pesticides also has increased. Misapplication of yield increasing inputs cause water logging, salinity and pollution of drinking water and loss of fish. Large scale use of chemicals in agricultural fields, especially in moonsoon rainfed areas, which are carried by the run-off water down stream, ponds and rivers, causes major problems for aquatic eco-system as well.

The phenomenon of increasing number of livestock, particularly grazing cattle has reached far beyond the supporting capacity of adjoining forests and pastures. In the Himalayan environment, on an average 15-20 acres of land is necessary to support a single cattle, whereas the per-capita grazing area available is only 0.8 to 1.5 acres. The situation of increasing pressure of cattle on pastures and forests had led to

extensive damage to ecosystem. (Development and Environment Preservation in Himachal Pradesh -Dr. H.S. Parmar, Deptt. of Economics, Shimla)
(Yojana, 30.11.93)

I - HIMALAYAN STATES

Snow and Ice:

I1). Mr. Sunderlal Bahuguna, has called for measures to protect the country's glaciers. In a paper "Plan priorities -a grass root approach " presented to the Planning Commission, he suggested banning trekking on glaciers. Glaciers are receding due to global warming. The Gangotri glacier, from which the river Ganga springs, has receded at an alarming rate of 20 metres per annum since 1990. Mr. Bahuguna has also proposed a ban on felling of trees in the Himalayan region to protect catchment areas. The paper describes scientific forest management as contributing to deforestation. Natural forests are giving way to mono-culture areas, which accelerate depletion of water resources. Calling for a review of export of agricultural and horticultural products, which consume an enormous amount of water, the paper says India must explore alternatives to the present system of water management. Collection of rain water will help augment water resources, and all buildings should be asked to construct rain water tanks. Afforestation has to be increased in hilly areas. Community control over forests should be restored.
(The Statesman, 18.11.96)

J - KARNATAKA

Water Availability:

J1). Banglore gets water from Cauvery and Arkavathi rivers with the Cauvery contributing 432 million litre/ day and Arkavathi's share being 130 million litres, while this caters to 4.5 million people of the city with an average per capita of 100 litres,

the projected per capita consumption is 140 to 200 litres.
(The Statesman, 20.6.94)

K – KERALA

Potable Water:

K1). A recent report by the Washington-based Worldwatch Institute has concluded, " One of the first and the foremost basic changes that lengthens life-expectancy is the supply of clean water". It adds that this perhaps is the reason why the average Indian's life-expectancy today has increased by about 20 years during the last 45 years.
For the people of Kerala too, availability of safe drinking water has been responsible for a much higher average life-expectancy- 73 years of men & 67.5 years for women.
(The Statesman, 1.4.95)

Water Quality:

K2). A Save Chaliyar Movement(SCM) has sprung up in Kerala to draw attention to the pollution of river Chaliyar. The SCM claims that the Grasim industries factory in Mavoor village, near Kozhikode, has been polluting the river with its effluents for 35 years now, leading to declining fish populations and decimated agricultural lands.
(Down To Earth, 30.11.1995)

L – MAHARASHTRA

Potable Water:

L1). As per the mid-term appraisal of the seventh plan, out of 40,760 villages in Maharashtra. 23,639 had a drinking water problem.
(The Statesman, 20.6.94)

Hydrologic Data Network:

L2). Groundwater Survey Development Agency is gearing up to undertake the Rs. 21 crore World Bank aided National Hydrological Project, for generating data base on rain water for future planning and management. Maharashtra is one of the eight States. $159 million project, the first of its kind in the country. Pune-based private firm is being contracted for their supply and the metres would be evaluated through the recording of data in the following months, before the five year project actually takes off from April next year.

(The Statesman, 21.9.94).

Water Quality:

L3) The Nagpur-based National Environmental Engineering Research Institute (NEERI) has scientifically established that the seeds of the Nirmali tree cleanses muddy water by coagulating the suspended impurities. Similarly, Cardamon leaves, drumstick (Moringa olifera) seeds and many other herbs and roots, which are locally available, have been traditionally in use for ages.

(The Statesman, 1.4.95)

Drought Management:

L4). Maharashtra may be hit by drought if rains fail:

The spectre of water scarcity looms large in Maharashtra as only five out of the 29 districts have received average rainfall so far while water levels in several major reservoirs in the State have dipped to alarmingly low levels, according to statistics available for the month of June. At least 16 major dams in the State are already showing zero storage levels, according tc available reports.

(The Times of India, 6.7.1996).

M– MEGHALAYA

Water Crisis:

M1) Cherrapunji, the world's wettest place with 1100 cm of annual rainfall (it was 2250 cm a decade ago), is facing a water crisis because the population has shot up while the water retaining capacity of the land has declined.
(Indian Express, 20.6.93)

N – NARMADA PROJECT

Irrigation/ cost:

N1). The project envisages no less than 30 major dams, 135 medium dams and 3,000 small dams. It aims to create 2,450 MW of hydel capacity, irrigate up to five million hectares, and provide drinking water to thousands of cities and villages. The benefits look fabulous. But at what cost? The two biggest dams - Sardar Sarovar and Narmada Sagar - are estimated to cost Rs. 16,000 crore, and the whole project should cost twice as much. Besides, experience shows that the benefits of such projects are always exaggerated and the costs understated (especially environmental ones). That helps explain why 32 major irrigation projects have suffered cost overruns of more than 500 percent. The environmental costs of the project have not been properly assessed. Currently, the cost of providing irrigation is estimated at over Rs. 30,000 per acre. By contrast, unirrigated land in Gujarat generally costs no more than Rs. 5,000 an acre. It is very difficult to justify such high-cost irrigation. Besides, projects like Tawa and Barna in the Narmada valley have led to widespread waterlogging in the heavy black soils of Madhya Pradesh. Indeed, eminent agricultural scientists like Dr. M.S. Swaminathan, have wondered whether we really know how to handle irrigation in such soils. .
(Indian express, 12.4.89)

Sardar Sarover Dam:

N2). On Dec. 8, 1996 (in Indore), The prime minister Mr. H.D.Deve Gowda, today said the height of the Sardar Sarover Dam, recommended by the Narmada Tribunal, was not final and the centre would take a decision on it in consultation with the affected states. The Narmada Tribunal award had recommended the height of the dam as 436 feet.

(The Statesman, 8.12.1996)

Sardar Sarover Dam:

N3). The recent announcement made by the Gujarat Chief Minister, Mr. Shankarsinh Veghela,that the work to raise the height of the dam from the current 80.3 to 110 metres during 1996-97 will commence from December,15 despite the objection raised by Mr. Digvijay Singh - has only rubbed salt on Madhya Pradesh's injury. The Madhya Pradesh Government is also likely to register its complaint with the Government of India demanding that the provisions of the Narmada Water Dispute Tribunal Award pertaining to the height of the dam be reviewed in view of the present hydrology of the reduced flow of water in Narmada (currently 22.5 MAF as against 27 MAF adopted by the tribunal). Gujarat has not been able to implement the resettlement and rehabilitation (R&R) of 236 project- affected families (PAFs) at the current height of 80.3 m even after two years though as per the provisions of the NWDT Award and the Supreme Court ruling the R&R of the PAFs has to be completed six months before the actual submergence of the area.

If the height is raised to 110m. about 8.000 PAFs will have to be resettled in Gujarat for which about 16,000 hectares of cultivable land is needed but suitable land in Gujarat is available only to the extent of 526 hectares, according to Madhya Pradesh Government's estimates.

(The Statesman, 10.12.1996).

O - NORTH EAST REGION

Potable Water:

O1). In many hilly regions, including Cherrapunji in the North-East- the wettest spot in the country- drinking water is scarce though rainfall is abundant. Poor ground water recharging, increased runoff due to deforestation and lack of structures to prevent the runoff have resulted in a plethora of anomalous situations.

India runs the largest rural water supply programme in the world in physical and financial terms. In recent years, the financial outlay for this sector has averaged Rs. 10,000 million annually.

(Indian Express, 16.9.90)

Jhumming:

O2). According to various estimates, the region accounts for a major share of the 2.75 million hectares of land in India that is under jhumming. Half a million families are already dependent on it. By 2000, the number could touch one million. In effect, the pressure on land and ecology will rise manifold.

(The Statesman, 3.9.94)

P - ORISSA

Water Quality:

P1). Remote and inaccessible tribal areas of Kalahandi are once again reeling under an outbreak of gastroenteritis which has claimed 140 lives in last two months. The non availability of safe drinking water in these areas coupled with the habit of using water from the nala or chuha had resulted in the epidemic level. The tribal villages of Thuamul Rampur block alone account for as many as 92 deaths. Even in places, the tubewell water is available the tribals do not like the tubewell water because of

high iron content in it.

(The Statesman, 17.9.96)

Q - PUNJAB

Irrigation:

Q1). Agricultural experts in Punjab have expressed concern over the receding water table owing to extensive paddy crop, eucalyptus plantations and large-scale sinking of deep tubewells. In the 'cotten belt' districts of Bhatinda, Firozpur and Faridkot, there is acute shortage of irrigation water especially during summer.

(The Statesman, 20.6.94)

Ground Water Hydrology:

Q2). S.C. Sharma, director and secretary of the Central Ground Water Board, points out that 50 per cent of the irrigation in the country is from ground water. This has led to ground water dropping seven metres in 15 years in those parts of Punjab where every farmer has his own tubewell and is growing water-intensive paddy. The demand for irrigation from ground water is so high that barely 20 per cent of the resource is available for drinking.

R - RAJASTHAN

Potable Water:

R1). Drinking water shortage in Rajasthan is such that in many areas, like Beawar subdivision in Ajmer district. Water is supplied for a brief period twice a week only.

(The Statesman, 20.6.94)

Hydrological Instrumentation:

R2). The Central Electronics Engineering Research Institute, at Pilani in Rajasthan, has developed a microprocessor based drip irrigation system that continuously monitors soil moisture and maintain it within desired limits.
(The Statesman, 29.9.94)

S - TAMIL NADU

Potable Water:

S1). Situation in Tamil Nadu has worsened over the years and the limited resources of the state, which is dependent on monsoon for drinking water, are under the threat of drying up. In Madras, acute shortage last year forced authorities to take measures on a warfooting to meet the crisis that started with alternate day supply that could not be maintained and was replaced by street supplies through tankers. Water was brought by road and rail from far off places like Neyveli.
(The Statesman, 20.6.94)

T - UTTAR PRADESH

Ground Water Hydrology/Potable Water:

T1). In U.P., the water shortage is mainly due to the leakage and wastage of water. Instead of conserving water, people rather install "water pumps" which only results in drying up of pipelines and causes choking thereby reducing the supply. Water table over the years has gone down by three to five metres on an average throughout the state. While 4,000 villages have been identified as having " no source of safe water", in Lucknow.
(The Statesman, 20.6.94)

Dam safety/Flash flood:

T2) Rishikesh will be awash in 63 minutes if Tehri dam bursts: The 260.5 metre Tehri dam project in the Garhwal Himalayas stands as a grave testimony of the disastrous effects that will follow, in case it bursts. Despite authentic, well-researched facts against its construction, work has not been stopped on the multi-purpose hydro-electric power project. The dam, the world's sixth highest and Asia's highest, is being built in one of the world's most earthquake-prone zones. If the dam bursts, in the wake of an earthquake, a 260-metre high column of water would wash away Rishikesh in just 63 minutes and 17 minutes later, Hardwar would be washed away, warns renowned environmentalist Sunderlal Bahuguna. Mr. Bahuguna's endless fight against the Tehri dam has not resulted in a positive response from the authorities concerned. The promise of an additional 2,400 MW of power to the north-emgrid is a major attraction of the project. Delhi and adjacent dry lands also stand to gain both irrigation and drinking water from the 30-mile long reservoir behind the dam.

(Times of India, 31.8.1996)

U – WEST BENGAL

Water Quality/ Potable Water:

U1). CGWB said that drinking water was scarce in Birbhum district's western part, including Nalhati, Dubrajpur, Mohammadbazzar besides the industrial zone of Burdwan, western part of Puruila and Bankura - the two arid zones. Drinking water needs of Darjeeling have not been solved as yet and arsenic contamination in south and north-24 Parganas, Nadia, Malda, Birbhum and Burdwan districts remains a cause of concern for the State Governament.

(The Statesman, 20.6.94)

Water Quality:

U2). A Calcutta report says water scarcity in four West Bengal district is a perennial problem particularly owing to hard rock soil and lowering of ground water table, while arsenic contamination in eight districts - Malda, Murshidabad, Nadia, South and North 24 Parganas (worse affected),Burdwan , Hoogly and Howrah, accentuated the problem. A task force under the aegis of the State Government has prepared a perspective plan entailing an investment of Rs. 750 cr to tackle the problem.

(The Statesman, 5.2.97)

U3) A recent study shows in Calcutta that the solid waste generated everyday is about 100 tons per million, which means that half a million tons of waste is accumulated every year, half of which is not even collected, let alone recycled.

Land/Soil Erosion:

U4) Beach resort in Bengal may be lost to sea: According to experts who conducted a survey on behalf of the Centre of Study for Man and Environment, the entire Digha township is under the threat of being submerged in not too distant future if the steady erosion of the coastline is not stopped. The sea has been advancing inland since 1934 due to the special topographical features of the area, according to the experts. The casurina trees were, in fact, planted in the early days to check erosion. The protective wall of black stone boulders, completed in 1988 in three phases, is showing cracks. Debasish Maiti, administrator, Digha development scheme, said casurina trees, the planting of which was one of the major recommendations by two survey reports, were slowly dying because of the extreme salinity of the soil. The expert committee had suggested construction of a 500-metre-wide buffer zone where extensive plantation of casurina trees would considerably reduce the wind intensity and serve as a natural warning system against land degradation. This was not considered.

(Times of India, 10.12.1996).

Soil Erosion:

U5). The experts committee has warned that any adhoc approach will only aggravate the problem and can lead to diversion of the erosion towards Shankarpur, about 40 km from Digha, where the State Government has set up a fishing harbour. **(Times of India, 1996)**

V - GENERAL INFORMATION

Water logging and Salinization:

V1). The seriousness of the threat of waterlogging and salinisation to irrigated agriculture is not adequately appreciated. In the world as a whole as much land goes out of production every year on account of this form of land degradation as is brought under fresh irrigation.

The genesis of the problem lies in the rise of the water table usually a result of poor drainage in canal irrigated areas - till it reaches the root zones of crops, which get saturated with water and begin to suffer from lack of oxygen. In arid climates, evaporation stimulates the movement of salts, dissolved in this rising water table, to the surface through capillary action, causing the land to become saline or alkaline and ultimately unfit for production.

According to the Report of a Working Group set up in 1988 by the Planning Commission to formulate proposals for dealing with degraded lands in the Eighth Plan, the extent of lands affected by waterlogging and salinisation rose from 14 million hectares in 1980-81 to 17.61 million hecatares in 1984-85 or by 3.6 million hactares in four years. This represents a rate of growth of 6.4 per cent per annum. Worldwatch Institute of Washington estimated in 1990 that "In India salinity reduces yields on some 20 million hectares, and an additional 7 million hectares have been abandoned as salty waste land" Total net area irrigated from all sources in 1990 is estimated to be only around 46 million hectares. In other words, an area equivalent to fully 50 per cent of our irrigated area may already have been degraded to some extent or the other by waterlogging and salinisation. It is clear that the problem of

waterlogging and salinisation has reached dimensions that the country can no longer ignore.

(Indian Express, 14.12.1991).

Water availability and Water management:

V2). With population growing at the rate of 18 million a year, worse is in store as we cross into the 21st century. Fights for water are likely to become a feature of our life. Eighty per cent of the water needs of the rural areas are met from ground water. 80% of the people's needs are met from surface water and 20% from ground water. There is no shortage of water, says Mr. Reddy. What is difficult is access to it. Of the water potential of 4000 billion cu metres, 1700 billion cu metres is available and the rest is lost through evaporation, runoff etc. Mr. Reddy says at least 10 percent of the available, treated drinking water is wasted during distribution due to pipeline leakages, defective washers and unshut taps. Another 10 per cent is lost during conversion from waste to pure water. This means on a conservative estimate between 3 to 4 billion cu metres of water - the needs of four cities like Delhi - is wasted. Mr Reddy says the only way to meet the country's increasing demand for water is by storing rain water in dams Catchment development, water harvesting has to be part of the package.

(Indian Express, 20.6.93)

Water Availability:

V3). The situation defines logic considering a food and Agricultural Organization report, saying that properly managed water resources in India could sustain 2.6 billion people, or over three times our present population.Over 70% of total river flow goes wastefully into the seas and of the estimated 80 MAF(million acre feet) ground water resources, over half are unutilized. The problem is typical of a metropolis where the per capita demand shot up from 108 litres a day in 1941 to over 315 litres a day today due mainly to wastage in washing of cars & scooters, and in hotriculture &

coolers. **(The Statesman, 20,6,94)**

Ground Water Hydrology/ Soil:

V4) Out of 330 million hectares of landmass of the country, about 130 million hectare is degraded. (Source: Advertisement by Dept. of Wastelands Development, Min. of Rural Dev.,GOI, while celebrating 3rd formation day of the Department).
(The Statesman, 2.7.94)

Water Policy:

V5). A draft national policy for water allocation of inter-State rivers has been formulated by the Centre, in a bid to facilitate early resolution of inter-State water disputes. The draft policy, which is in the form of guidelines, has been prepared by the Union Water Resources Ministry after detailed discussions with the States.
(The Statesman, 1.8.94).

Water Bills/ Water Policy:

V6). The Minister of State for Water Resources, Mr. P.V. Rangayya naidu told in a written reply today that there was a proposal to legislate a Water Information Bill. The draft Bill broadly deals with collection of statistics, publication of statistics, appointment of statistics authorities by the Central/State Governments and their power to call for information as also their right to access to records, information and restricted data. An important feature of the bill is that it will allow the Central Government to have access to the relevant statistical information collected under the Act by a State Government and vice versa. This will ensure easy availability and transparency in respect of data including hydrological data or data on operation and performance of developmental schemes.
(The Statesman, 31.3.95).

Ecology/ Potable Water:

V7) The Ministry of Human Resource Development has in a report in 1993 correlated the upward trend in length of life with water-improvement programmes. In communities without safe drinking water, proper latrines and appropriate refuse disposal, it is not possible to check the spread of disease. Diarrhoea for instance, kill one and a half million children annually in India.
(The Statesman, 1.4.95)

Water Quality:

V8). The Ministry of Human Resourace Development has in a report in 1993 correlated the upward trend in length of life with water-improvement programmes. The life expectancy in the year 2001 will be 64.9 years. NEERI has established that the seeds of the nirmali tree cleanses muddy water by coagulating the suspended impurities. Similarly, cardamon leaves, drumstick seeds and many other herbs and roots, which are locally available, have been traditionally in use for ages. Diarrhoea, for instance, kills one and a half million children annually in India.
(The Statesman, 1.4.95).

W.H.O. Data:

V9) Water, Sanitation problems far from solved in Asia:
In the latest report on "Community Water Supply and Sanitation in South-East Asia Region" by the World Health Organization, and "Water utilities data book on Asia & Pacific Region" by the Asian Development Bank, the relationship between water supply and sanitation to waterborne diseases has been doubly underscored. India was successful in water supply coverage but has so far done extremely poorly in sanitation. A statistical account of the percentage of population covered by official water supply and sanitation in the urban and rural areas of five countries, and the

comparative water availability figures per day, for various cities has been given below to illustrate the progress, or lack of it, that we have made in the decade of International Drinking Water Supply and Sanitation Decade (IDWSSD) (All the following figures are a percentage of the population covered).

** Water supply coverage (urban): Bangladesh-37%, India-84%, Indonesia-65%, Myanmar-42%, Sri Lanka-86% and Thailand-75%

** Sanitation coverage (urban): Bangladesh-39%, India-47%, Indonesia-42%, Myanmar-39%, Sri Lanka-81% and Thailand 96%

** Water supply coverage (rural): Bangladesh-68%, India-74%, Indonesia-33%, Myanmar-29%, Sri Lankda-64% and Thailand-87%

** Sanitation coverage (rural): Bandladesh-6%, India-3%, Indonesia-30%, Myanmar-34%, Sri Lanka-70% and Thailand-71%

** Water availability under pressure (hours/day): Guangzhou, Shanghai (China)24, Suva-24, Hong Kong-24, Bombay-5, Calcutta-10, Delhi-7, Madras-3, Jakarta-19, Seoul-24, Kuala Lampur-24, Karachi-5, Lahore-20, Manila-16 and Singapore-24.

(The Statesman, 29.6.95).

Water Purification:

V10). UV TECHNOLOGY HELPS PURIFY WATER IN TANZANIA:

UK, leader in water disinfection, Ultraviolet Technology, has just supplied a system for use at the Bethany Project in Tanzania. Ultraviolet Technology were asked to address the problem of providing adequate supplies of safe drinking water at minimum cost. The system they recommended - which uses ultraviolet light will eliminate bacteria in the water with a kill rate of 99.9%.

This has been achieved by using a well proven ultra violet technology in a revolutionary new way - and without the use of chemicals. The water to be treated is exposed to ultraviolet light from special low pressure mercury lamps. These generate ultraviolet light at 254 namometers which provides optimum kill rate of micro organisms. A unique flow path ensures that unabsorbed UV light is re-reflected into the water to ensure maximum water disinfection. Mr. Graham

Pountain speaking on behalf of the Bethany Project said "We are extremely happy with the unit. Before our use of ultraviolet light it cost us 12p to purify one gallon, we are now able to purify 422 gallons for the same cost".

(Arab Water World, October-November, 1995.)

Remote Sensing:

V11). A setellite IRS-1C was launched into the Russian Molniya rocket from the Baikonur cosmodrome in Kazakhstan on Dec. 28, 1995. The launch was marked by clockwork precision with the 1,250 Kg. satellite entering the sun-synchronous orbit at 807 Km. from the surface of the earth. Belonging to the second generation of satellite, IRS-1C scores over its predecessors, the IRS-1C and IRS-1B. Its high resolution will lead to greater accuracy of maps of the earth. The satellite's remote sensing capabilities will generate data on crop acreage and yield estimation, drought monitoring and assessment, monitoring the occurence of floods, land use, wasteland and urban mapping and also a survey of forest resources. Following its footsteps would be the IRS-1D similar to IRS-1C- to be shot into space sometime in 1998.

(Down to Earth, 31.1.1996)

Water Management:

V12). About 590 of the available 1142 billion cubic metres of water in India, remains unused for want of infrastructure to distribute the surplus water in drought prone areas, disclosed Mr. B.U. Nayak, director of the Centre Water and Power Research Centre. Elaborating his point, Mr. Nayak said that with the available infrastructure we can utilise only 550 billion cubic metre of water in the country. The increasing demand of water with the exploding population is likely to create social tension and more problems like the Narmada and the Cauvery disputes, he said. He urged for efficient management of available water and its conservation.

(Maharashtra Herald, 20.2.1996).

Watershed Management:

V13) 'FOUR WATERS' CONCEPT IN WATERSHED MANAGEMENT

Termed as 'Four waters' concept, its objective is to produce two crops per year, over a largest possible area of the watershed with limited use of surface-water and groundwater. The basic innovation is the dynamic control of the aquifer by collective participation of farmers' group.

Adequate recharge works would be the answer of deep water Table due to drilled bore wells. Increasing the number of wells of drilling deeper bores would not be a solution. This aspect is considered in the four waters concept. In addition to adding organic carbon and nitrogen into the soil the organic matters improves the soil's water-holding capacity, nutrient content and pH.

(The Hindu, 28.3.1996.)

Dam Construction:

V14). India and Bhutan have agreed to build a 1020 MW hydroelectric project on the Wangchu river basin in Bhutan, say reports from New Delhi. Surplus power from the Rs. 14bn (US$400M) project will be sold to India, which will finance 60% of the cost through a grant and the balance through a loan. The dam will be handed over to the Bhutan Government two years after completion. Preliminary work will include constructing a road from the site at Nganglam in eastern Bhutan, with the nearest highway. The area, near the Chinese border, is a popular refuge for Indian anti-government rebels and terrorists.

(International Water Power & Dam Construction - April 1996).

Water Policy:

V15). Some parts of the country are perennially drought prone such as parts of Gujarat, Rajasthan, southern Tamil Nadu and Western Andhra Pradesh. The reasons are not far to seek, under-development, extensive deforestation, increasing

population and unplanned water management. Innumerable conferences and seminars are held to discuss this vital matter and to take decisions which mostly remain on paper. India, like some other parts of the world-Central Africa and Central and South America - is one of the wettest countries in the world. India has about 3.5 per cent of fresh water out of its total availability as against 2.5 per cent of the world. India is faced with twin problems, that is, non-availability of water because of run off into the sea and evaporation and concentration of physio-chemical salts in the water sheds because of silting. The water bodies become shallow and are subject to severe evaporation Reckless exploitation of ground water causes the ingress of sea water in the coastal areas. Against this background the need to formulate a national water policy becomes imperative. The country, on the whole, is perpetually afflicted with water shortage. The population is likely to touch the one billion mark by 2000 AD and the evolution of a national policy will help economic development.

(The Hindu - 14.5.1996).

Dam Construction:

V16). The Punjab government has signed an agreement with the World Bank under its phase-II "Punjab irrigation and drainage project" for constructing nine low dams and preparing designs of four more dams at the cost of Rs. 71 crore. The construction of nine such dams would create an irrigation potential 8800 ha. Three dams, Dholbaha, Maili and Jana Uri, had earlier been constructed at a cost of Rs. 31.5 crore.

(Times of India - 16.6.1996).

Water Logging:

V17). Almost 40% of the Gangetic plain- the cradle of Indian agro-based civilization- today suffers from acute salinity due to water logging, use of chemical fertilizer and inadequate drainage. Satellite pictures have shown that about 100 million hectare of porous land in the country, out of a total of 160 million hectares,

has degraded and is fast becoming unproductive. India's agricultural productivity is one of the lowest at 1.6 tons a hectare against a global average of 2.6 tons a hectare and over 5 tons a hectare in developed countries. The green revolution has been an ecological disaster for India. As a direct fallout of the Green Revolution, combined with rapid urbanization, the country is depleting its forest cover and water reservoirs. **(The Statesman, 27.7. 1996)**

Soil Erosion/ Forest Hydrology:

V18). The rate of soil erosion in deforested area is between 10 to 50 times higher than areas having forest cover. Deforestation has resulted in Ganga and Brahmaputra sedimenting 1,500 million tons annually, making them the largest dumping rivers anywhere in the world.
(The Statesman, 27.7.96)

Water Plan:

V19) Centre plans to set up yet another water panel:
The Union Government announced the setting up of yet another commission for preparing an integrated water plan for the country, with octogenarian former Planning Commission Member and a renowned authority on the subject, G.V.K. Rao as its chairman. Doubts have, however, been cast in political circles whether the exercise is aimed at deflecting public attention from the raging controversy over sharing of the Cauvery waters. "It may be a noble idea, but Mr. Rao's appointment to head the committee would suggest that the body might arrive at conclusions that would not harm the interests of Karnataka", said an Andhra Pradesh member of Parliament who did not wish to be named. While politicians are apt to attribute political motives for an initiative that is being credited to Prime Minister H. D. Deve Gowda, experts point to the multiplicity of the exercise that has already been undertaken in one form or the other over the years.
They wonder whether it is a "Yes -Minister approach of appointing a committee to solve a problem". The idea is not new. An official announcement acknowledged this,

stating, "the formation of the commission is the culmination of atleast decades of debate on the linkling of river waters in India" Commenting on the announcement, R. Rangachari, a retired engineer who has held several senior positions in the Ministry of Water Resources, said, "the idea of inter-linking of rivers is not new. We have been studying and investigating, at least since 1970. It is time we started acting on at least some of the specific schemes in an integrated manner, considering the rising costs and wastage of water resources". The first idea of linking rivers to transfer water from surplus areas to shortage areas was mooted by Sir C.P Ramaswamy Aiyar. K.L. Rao, an engineer who rose to be the country's irrigation Minister mooted the Ganga-Cauvery link canal. Although considered feasible from many angles, it envisaged pumping of the Ganga water across the Vindhyas, which meant raising it at a height of a few hundred feet. The power required for this exercise was so huge that it would have meant a sizeable portion of the power generation capacity of the day. Then came the 'Dastoor Plan' of aviator-engineer M. N. Dastoor, known as the "garland canal". The Planning Commission had set up a committee in 1977-78 at the instance of the then prime minister Morarji Desai. It had sought the advice of the United Nations Development Programme (UNDP) and the latter had sought specific proposals. Both the Rao plan and the Dastoor Plan came to be extensively discussed by a committee in the irrigation Ministry headed by Mr. C. C. Patel, then an additional secretary in the ministry.

The 10-member body has been given two years' time to work out not only a perspective plan, but also operational planning with specific proposals and strategies to raise financial and other resources to implement them. It would recommend measures for the development of water resources for drinking, irrigation, industrial, flood control and other uses. The other members of the commission include Mr. S. R. Hashim (member Planning Commission). Mr.V. Ramachandran, Mr.V. S. Vyas (Director IDS Jaipur), Mr.D.N.Tiwari, Mr. S.Pradash, former Secretary, Ministry of water resources Mr.C. C. Patel, Dr. Bharat Singh, former vice Chancellor Roorkee University, Mr. S. P. Caprihans and Director General National Water Development Authority. The NWDA, established in the early 1980s, has been studying specific subjects this year. The theme for 1996 for the experts' team, which included Mr.

Rangachari, Mr. Patel and writer B George Verghese was inter-linking of river waters. The G.V.K. Rao commission may thus have the latest position paper in the form of this theme paper to begin its exercise. Unlike the NWDA exercise, which adopted a two-pronged approach, one of them being seeking cooperation of the neighbours, including Bangladesh, Nepal and Bhutan, the G V K Rao body would be confining itself to optimising the use of the domestic rivers. It would, however, have to contend with opposition from various states where political leaderships cry "wolf" at the very idea of having to share water with others. It would require strong political will to implement even a part of the plan being envisaged to maximise the use of water resources and minimise their flowing into the sea, as has been the case for the ages, experts said.

(The Times of India, 19.9.96).

Potable Water/ Hydrological Instrumentation:

V20). Sufficient, safe, clean, and potable water can be produced daily from contaminated sources through a portable solar-powered water purifier developed by a British company. The stand-alone Solarwater-5 from Kestrel Solar Technology can be set up easily by one person and will operate for long periods in remote areas and under harsh conditions. Four high efficiency solar panels generate power for the system's pump. In bad weather, the system can be connected to a 12V electricity supply, or can be operated manually by a built-in hand pump. An optional outlet filter is available to remove residual iodine from the treated water as a separate stage of filtration. A capacity of 4-6 litres of water per minute means that in six hours of sunlight the purifier can produce approximately 2200 litres of treated water. At an average of 20 litres per person per day, for drinking, cooking, and cleansing purposes, this is sufficient water for groups of up to 100 people. A water metre is fitted to the unit to monitor throughput. System maintenance is simple, and replaceable cartridges for filtration and disinfection are changed quickly and easily Cartridge housings are made with tough polypropylene, and all connections are made with PVC fittings approved for potable water. The Solarwater-5 has the capacity to treat 5000 litres of water between cartridge changes. The solar panels

unfold from the unit's strong, corrosion-proof and easily transportable tubular frame. For further information contact: Kestrel Solar Technology Ltd, 28 Morton Street, London SW1V 2PE, United Kingdom, Fax: 171 8285741
(Spectrum, Sept.-Oct., 1996, p.2.).

Water Management:

V21). In a workshop "Water Management in Urbanizing regions" conducted by the International Development research centre with IDS in New Delhi' the experts felt that about 5% diversion of irrigation water can take care of the worsening shortage of the commodity in urban areas.
(Times of India , 13 Jan. 1997).

Water Availability:

V22) The International Rice Research Institute, based in the Philippines, warned last year that competition for water between agriculture and industry could lead to social unrest. "Projections suggest that most Asian countries will have severe water problems by the year 2025," the institute said. The proliferation of wells could dry up underground water sources in Bangladesh, India and Pakistan, it added. Mr. Wally N'Dow, secretary-general of the UN Conference on Human Settlements held in June 1996 suspect that in the next 50 years, we will see a shift from oil to water as a cause of great conflicts between nations and peoples". In Singapore, about half of the total land area is set aside for water catchment, and there is no more room for building additional reservoirs. Singhapore now buys most of its water from Malaysia.
(Times of India , 20.1.97).

Soil Erosion & Sedimentation:

V23). In the 20 big and medium rivers of our country, the rate of land erosion is between 10 MT and 799 MT per square Km while the rate of chemical erosion is

between 22 MT and 110 MT per square Km. About 370 million MT of Chemical sediments flow into the Bay of Bengal every year from these rivers. During last few years due to deposition of sediments in the Nizam Sagar Dam, its capacity has gone down to almost half. Every year about 330 MT of sediments deposit in the Bhakra Nangal Dam and this can be highly dangerous. In July 1970, the initial 12 km of upper Ganga canal at Hardwar was thoroughly filled up with the sediments which could only be cleaned in six months at the expense of Rs. 10 million. The East Kosi Canal in Bihar remains under utilised because of sediments.
(Indian Express, 14.12.1990)

Forest Hydrology:

V24). Scientists here are trying to recreate the original rain forest in Western Ghats in a unique effort to restore India's lost biological diversity. Trees, plants and medicinal herbs which once adorned the hills of Kerala - before they were replaced by rubber, cashew, teak plantations - are being brought back and planted here. "About 500 of the lost species have already started growing and 3000 is our goal", said Dr. Palupu Pushpagadan, director of the Tropical Botanical Garden and Research Institute (TBGRI) here.
(Hindustan Times, 10.7.96).

Interbasin Water Transfer:

V25). India, Bangla, Bhutan will share water, power:
The king of Bhutan has agreed to join a sub-regional plan for sharing river water and power with India and Bangladesh, external affairs minister I K Gujral has said. It is envisaged under the plan that Bhutan divert 12,000 cusec of water from the Sankosh river, discharging it to Teesta and from Teesta to the Ganga at Farakka to be shared by India and Bangladesh that have just concluded a treaty on sharing of the Ganga water. The Sankosh river water could ease the situation at Farakka, where the treaty provides for equitable sharing of water, particularly during the lean season when it has been problematic to prevent Calcutta port from being silted and to irrigate cultivation

in parts of Bangladesh.

The plan also envisages India purchasing power from Bhutan. Four thousand megawatts are proposed to be added to the national grid for the benefit of the north eastern region.

Mr Gujral told journalists that a high level team would visit Thimpu shortly to work out details of the proposed plan that would be a boon for Nepal. Bhutan, Bangladesh and the Indian north-east, which form a single geo-physical entity and thus a trade zone. Once accepted by Bhutan, the sub-regional plan would become an integral part of the Indian ninth Plan.

With the Indo-Bangladesh water sharing treaty in force, Mr. Gujral said India has entered "a friendly phase in South Asia", having forged good relations with all nations with the exception of Pakistan.

Explaining some aspects of the treaty. Mr Gujral said unlike the earlier pacts, this was concluded on a shared approach with jointly compiled data. The treaty was long-term to give Bangladesh "a sense of security". There was no arbitration clause "because India believes in settling things bilaterally".

Mr. Gujral recalled the "cynicism" on the part of the Bangladesh leadership when he had expressed the hope that given the political will, a treaty could be concluded before the end of this year.

It was not for India to take up the question of augmenting availability of water from other rivers that flow into Bangladesh. Having got what it wanted from the Ganga, Bangladesh would itself feel the need to take measures to harness Brahmaputra for the other parts of the country that face serious floods year after year., Mr. Gujral said.

(Times of India, 1996)

Water Policy/ Water Management:

V26). Draft Technology policy of 1993 has been brought out. There are 13 thrust areas mentioned in the draft technology policy. Some of them are a repetition of those given in S & T plan 1973. Two new areas introduced are those relating to ocean resources and software development. A new orientation for some existing items have

been indicated, such as water management, new material development, automation for quality improvement, etc.

The Research Development and Engineering (R , D & E) establishment will have to play a prominent role in this. The R, D & E institutions are proposed to be oriented. The R, D & E expenditure has steadily increased over the years -0.05 per cent of GNP in 1950-51 to 0.9 per cent in 1992-93. The draft technology policy envisages the attainment of 2 % of GNP by 2000. In absolute terms, India's R, D & E expenditure is over Rs. 1500 crores per annum. More than 80 % of it is funded by the centre. Though output from large-scale industries is around Rs. 8000 crores, their contribution towards R, D & E has been meagre.

(The Statesman, 7 October, 1994)

Surface Water Hydrology:

V27). Drip irrigation is being projected as the master key to transforming Indian agriculture, which remains so heavily dependent on the bounty of the monsoon. Since it reduces by almost 50% the quantum of water required by the crops, it can mean a doubling of the area under agriculture though that would be a simplistic way of assessing things. Soil quality is preserved, less chance of it become saline as is happening in Punjab, Haryana and parts of Rajasthan as a result of over use of the water available through the canal systems. But what impresses the farmer's most is the increase in production.

(The Statesman, 19.2.94)

Concluding Remarks

Though India is endowed with a vast water resources, the available reports indicate that India may come under the water-stressed zone in near future and could be a water scarcity country by 2050. On the contrary, one of the FAO study indicates that properly managed water resources in India could sustain about 2.6 billion population, i.e., almost three times the present population. The hydrologic events that occur round the year in the country essentially reflect and speak volume about the problems that India is facing in the water -sector. The problems are many and vary over space and time. As such, an attempt has been made herein to highlight some of the major hydrologic events in India to the extent possible to disseminate, propagate and to create an awareness about these problems among hydrologists, managers and planners of water resources so that they can reap benefit out of it to formulate scientifically-sound strategies to solve, mitigate or eliminate these problems for the society at large. Recurrence of flood and drought, soil erosion, receding ground water table, drainage-congestion reservoir sedimentation, pollution of water resources are observed to be some of the major problems of water sector in India. The fury and extent of these hydrolgic problems can be lessened and mitigated, if not eliminated totally, by proper planning and management strategies based on appropriate hydrologic principles.

Director	S M SETH
Divisional Head	A K BHAR

STUDY GROUP

RAMA DEVI MEHTA

A. K. BHAR