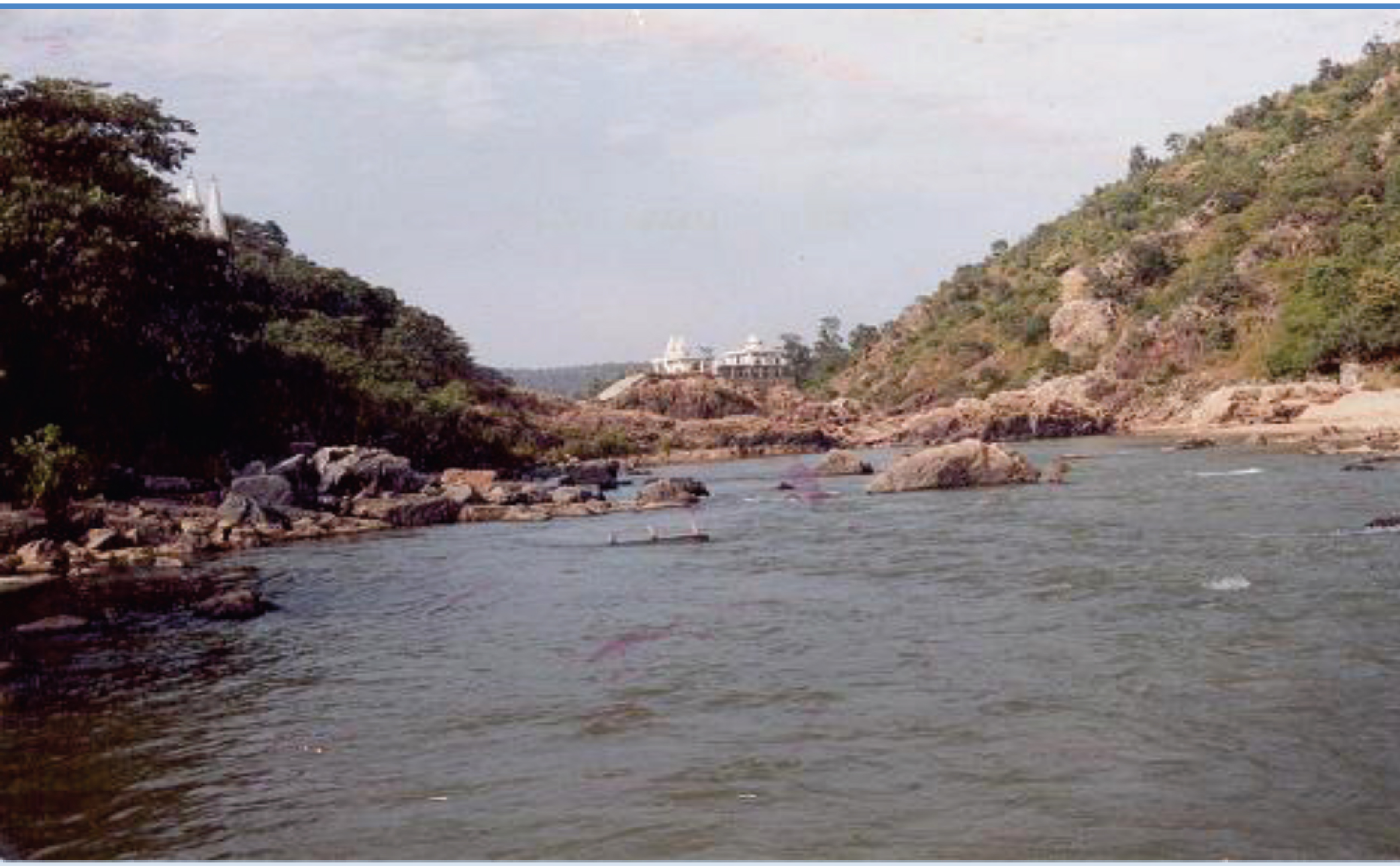
State of India's Rivers

for

India Rivers Week, 2016

JHARKHAND



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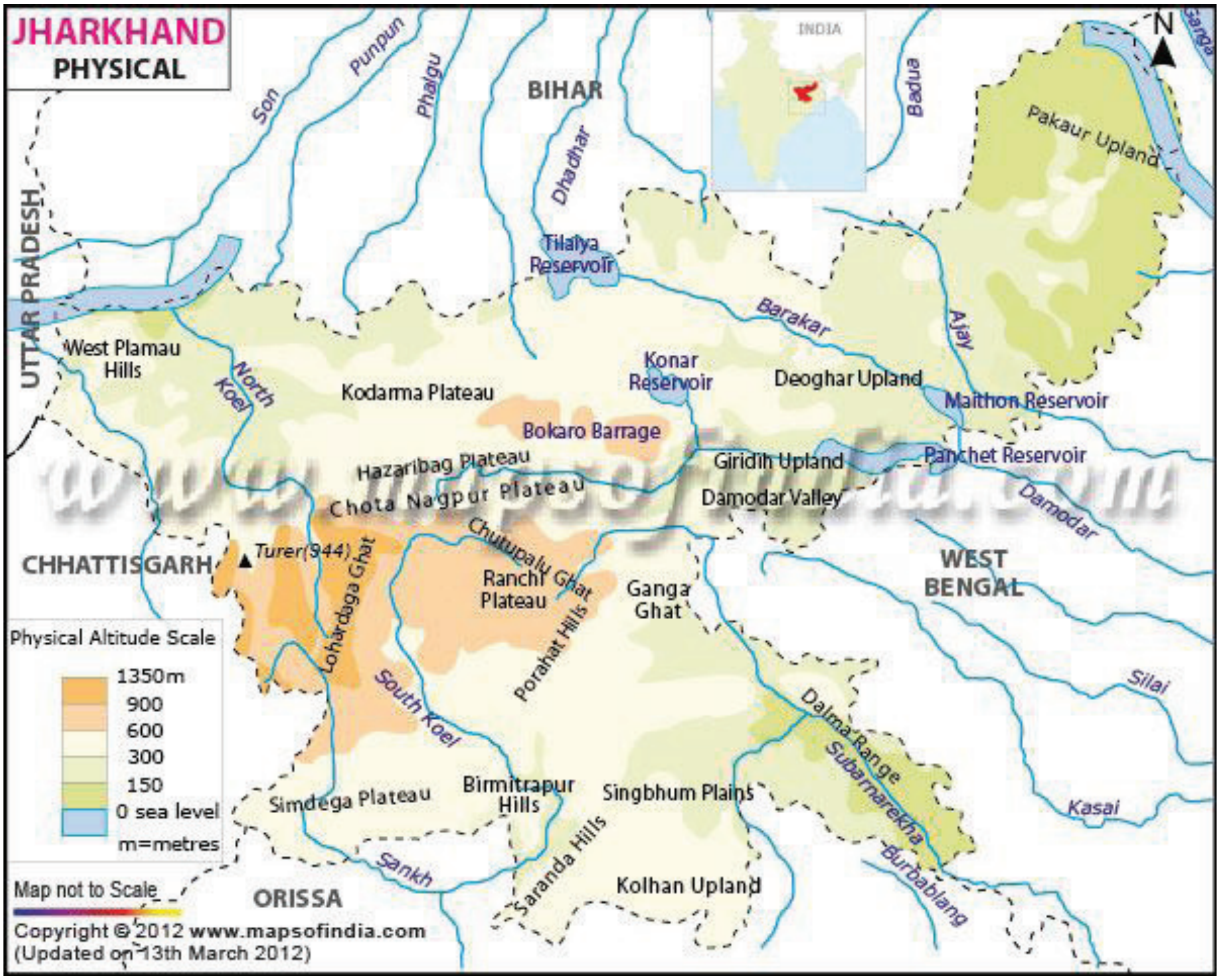


Map No 1: Physical Map of Jharkhand

The spatial extent of Jharkhand State is approximately 21° 55' to 25° 35' North Latitude and 83° 20' to 88° 02' East Longitude. The state is land locked and it shares its boundary with Orissa on the southeast, Chattisgarh on the southwest, Bihar on the north, West Bengal on the east and Uttar Pradesh on the northwest. It comprises of the Chotanagpur Plateau, which forms a part of Deccan bio-geographic province. It is a hilly undulating plateau characterized by predominantly tropical forests and tribal settlements. The State is endowed with natural resources that need to be conserved and utilized in a sustainable manner for all-round development of the state in general and the marginalized tribal population in particular. The total geographical area of the State is 79.70 lakh hectares, out of which 23.22 lakh hectares (29.33%) are under forests; 5.66 lakh hectares (7.12%) are barren lands; 7.24 lakh hectares (9.10%) are put to non-agricultural use; 0.90 lakh hectares (1.15%) are under pastures & other grazing lands; 3.07 lakh hectares (3.86%) are cultivable wastelands; 0.88 lakh hectares (1.11%) are under miscellaneous trees and groves; 12.04 lakh hectares (15.14%) are current fallows; 8.45 lakh hectares (10.63%) are under other fallows; and 17.95 lakh hectares (22.58%) are the net sown area. The number of electrified villages is 14667 (45.0 per cent of the total villages). 26.0 per cent (8484) per cent of the total villages are connected by roads.

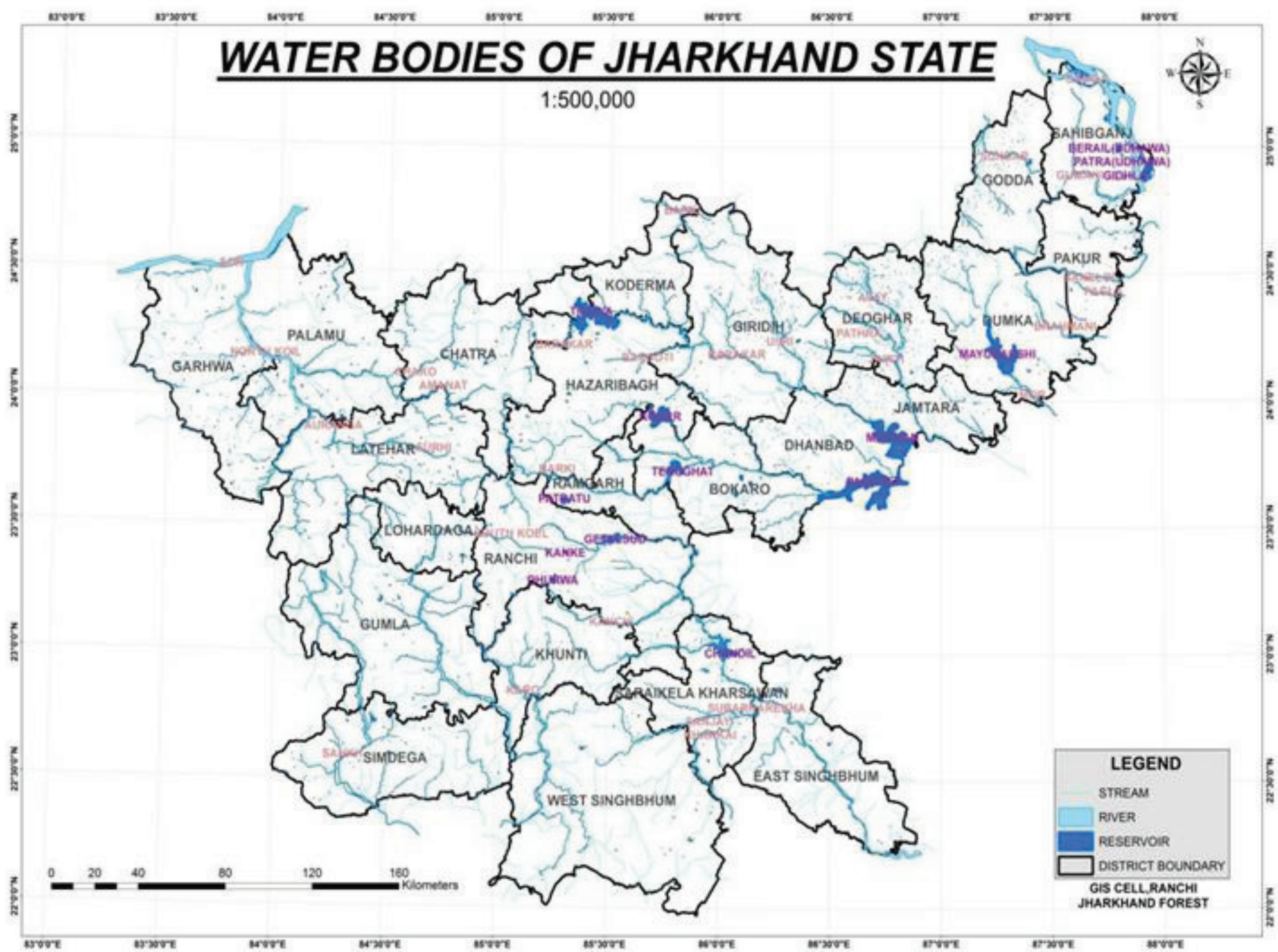
The lengths of the National Highways and the State Highways are 1006 and 4662 kms respectively. The state has different relief because of its physiography as it consists of four series of plateaus of having different heights. The highest plateau lies in the west known as Western or Higher Ranchi Plateau or locally known as the Pat region located at 2500 to 3600 feet above sea level covering northern part of the old Ranchi district and the southern edge of the old Palamu district. The term Pat represents a feature similar to a table with steep edges around and a flat top. It is full of dissected hills having a hill station, Netarhat, at the top. The second plateau is known as Ranchi Plateau having a height of 2000 feet composed of gneisses and granites. It is separated by the Damodar trough from the Hazaribagh Plateau. The next plateau is Lower Chotanagpur Plateau consisting mainly of gneisses and granite and partly of schists and other Dharwar rocks. Page 4 of 28 The other plateaus are the Rajmahal Hills and the Kaimur Plateau. These plateaus are separated by the narrow and steep slopes known as scarps. It is believed that before the Chotanagpur Peneplain was successfully uplifted thrice by the side effect of the three violent Himalayan movements in Tertiary times continued till Pleistocene times resulting in well-known waterfalls like Hundru, Jonha, etc. on the scarps. The first upliftment took place during the Eocene to Oligocene period creating Pat region, the second one during Miocene forming the Ranchi and Hazaribagh Plateau and the third one during Pliocene and Pleistocene period uplifting the outer Chotanagpur Plateau. All plateaus are the parts of the same plain successively uplifted during Tertiary and Pliestocene times.

Marvelous eye catching rare geological/geomorphological features like rejuvenated meandering and deep cutting young rivers like Damodar are the uniqueness in the State. It is rate because of combination of senility with the character of young rivers. The state has the luxuriant forests and lush green rolling seasonal meadows. Magnificent undulating hills and valleys are the special attraction. The golden river ‘Swarnarekha’ adds melody in the pristine environment along the course. A combination of table-top flat lands and the peneplain with dome shaped exfoliating hillocks resembling like inverted Nagara (drum) are spread over the state. Further, the Tors or the balanced diamond shaped rocks are also present wonderful nature of the state.

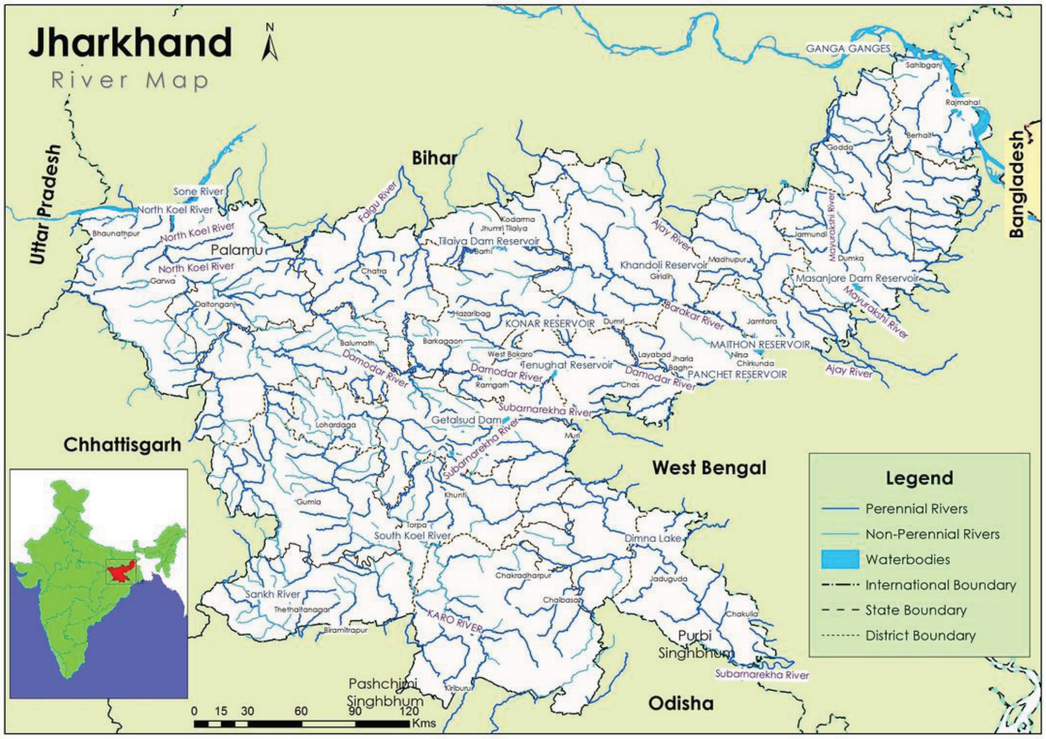
Climate, temperature and Rainfall

The state falls under the Tropical Monsoon climatic region. The Tropic of Cancer cuts across the state passing through the middle of the Ranchi City. The average temperature of the state is 25° C, which varies greatly because of varying heights of different plateaus mentioned above. The average temperature of the Pat region is below 23° C while rest of the state records average annual temperature between 23 and 26° C except the eastern part of Santhal Pargana region, East Singhbhum, Garhwa, Palamu and the northern part of Chatra districts where it is above 26° C. There are extremities in climate in the state in two seasons- summer and winter. The hottest areas are found towards the north western part of the state (Daltonganj), around Jamshedpur and Dhanbad cities having more than 40° C temperatures. Similarly, the state gets affected by the cold waves with less than 5° C temperature and reeling cold. The average annual rainfall in the state is 1400 mm with more than 4/5th rainfall between June to September. It also gets rainfall from the branch of monsoon from the Arabian Sea. There are also variations in rainfall varying from below 1200 mm to 1800 mm. There are five climatic regions in the state. One, North Eastern and North Central Plateau Region (Western part of Santhal Pargana region, Giridih, Kodarma and Northern Hazaribagh); two, Upper Chotanagpur region (Pat region, Ranchi Plateau, Gumla and the plateau region of outer Chotanagpur spread in Simdega); three, South Eastern Region (East Singhbhum, Saraikela and West Singhbhum); four , Eastern Region (Sahibganj, Pakur, eastern Deoghar, eastern Jamtara and north eastern part of Saraikela); and five, North Western Lower Plateau Region (Garhwa and Palamu).

2. RIVER BASINS OF JHARKHAND:



Map No 2: Water Bodies of Jharkhand



Map No 3: River Map of JKharkhand

Table 1: Basin & Sub-basin of Jharkhand

S.N.	NAME OF RIVER BASIN/ SUB-RIVER BASIN
1	Subernarekha River Basin
2	i River Sub- Basin
3	South Koel River Basin
4	r River Sub-Basin
5	Damodar River Basin
6	Sankh River Basin
7	North Koel River basin
8	Punpun River Basin
9	Sone(Stem)- Kanhar and Kao-Gangi River Composite Basin
10	Mayurakshi River Basin
11	Ajay River Basin
12	Ganga Stem Basin
13	Gumani and Koa- Bhena basin
14	Belsai Chandan Chir River basin
15	Harohar River Basin

Source: Govt. of Jharkhand (Water Resources Department)

Table 2: River Basin Wise Ongoing Major & Medium Schemes

Sl.	Name of the Projects	Ultimate Irrigation Potential (in th. ha.)	District
1	2	3	4
1	(A) Ongoing Major Irrigation Project.		
SUBARNAREKHA RIVER BASIN			
1	Subernarekha Multipurpose Project.	265.000	East Singhbhum, West Singhbhum, Saraikela - Kharsawan
	(i) Chandil Dam, Main Canal & its Distributaries		
	(ii) Icha Dam, Main Canal & Distributaries		
	(iii) Galudih Barrage & Right Main Canal		
	(iv) Kharkai Barrage, Main Canal & Distributaries		
AJAY RIVER BASIN			
2	Ajay Barrage Project	40.150	Deoghar/Jamtara
3	Punasi Res. Project	24.290	Deoghar
GUMANI AND KOA - BHENA BASIN			
4	Gumani Barrage Project	16.190	Sahebganj/Pakur
NORTH KOEL RIVER BASIN			
5	Amanat Barrage Project	25.000	Palamu
6	North Koel Res. Project	19.740	Palamu
DAMODAR RIVER BASIN			Deoghar/Jamtara
7	Konar Res. Project	62.790	Giridih
GANGA STEM BASIN			
8	Bateshwar Sthan Pump Canal Project	8.600	Godda
	Sub-Total	461.760	
	(B) Ongoing Medium Irrigation Project		
SOUTH KOEL RIVER BASIN			
1	Dhansinghtoli Res. Project	2.990	Gumla
2	Katri Res. Project	5.060	Gumla
3	Kans Res. Scheme	2.480	Ranchi
4	Sukari Reservoir Scheme	0.440	Lohardaga
5	Latratu Reservoir	9.900	Ranchi
6	Tapkara Reservoir	1.860	Gumla/ Simdega
7	Kanti Reservoir Scheme	4.370	Ranchi
8	Satpotka Res. Scheme	2.360	West Singhbhum

SUBARNAREKHA RIVER BASIN			
9	Surangi Res. Project	2.601	Ranchi
10	Tajna Reservoir Scheme	5.670	Khunti
KHARKAI RIVER SUB-BASIN			Chatra
11	Sonua Res.Project	8.008	West Singhbhum
12	Suru Res. Project	4.440	Saraikela-Kharsawan
13	Nakti Res. Project	2.250	West Singhbhum
14	Jharjhara Res. Project	4.860	West Singhbhum
DAMODAR RIVER BASIN			
15	Garhi Res. Project		Chatra
16	Bhairwa Res. Project	4.800	Hazaribagh
BARAKAR RIVER SUB-BASIN			
17	Salaiya Res. Scheme	2.670	Hazaribagh
18	Panchkhero Res. Project	3.085	Hazaribagh/ Koderma
19	Kesho Res. Project	3.560	
PUNPUN RIVER BASIN			
20	Batane Res. Project	1.660	Palamu
MAYURAKCHI RIVER BASIN			
21	Torai Res. Scheme	8.000	Godda
SANKH RIVER BASIN			
22	Upper Sankh Res. Project	7.070	Gumla
23	Ramrekha Res. Project	4.390	Gumla/ Simdega
24	Kansjore Res.Project	6.260	Gumla
	Sub-Total	98.78	
	GRAND TOTAL	560.54	

3. INTER BASIN TRANSFER OF WATER FROM SOUTH KOEL BASIN TO SUBERNAREKHA BASIN

It has been proposed to transfer additional and unused 1281 MCM of water available at Manoharpur Block of South Koel Basin into Subernarekha Basin through Tajna river to Chandil Dam via Kharkai river. The second identified site for transfer of water from South Koel Basin has been proposed through Tajna River at d/s of Murmu site located at Latitude 22028' and Longitude 85028' into Kharkai river via river Sanjay. The proposed location of water transfer sites in South Koel basin is lying at Latitude 22035' and Longitude 85015'

3.1 Inter Basin Transfer of Water from Damodar – Barakar river Basin to Subernarekha Basin.

The additional unused surplus water from Barakar river through river through the proposed Balpahari Dam, which currently being investigated by CWC at the instance of DVC unassessed available water of 4.0 Lakh Acre ft(493.4 MCM) lying under Jharkhand share in Damodar Basin has been proposed to transfer into Subernarekha Basin by establishing proposed link connecting Balpahari site of barakar river near Tundi to Subernarekha river at Muri & also connecting Damodar river near Bermo.

3.2 Inter Basin Transfer of water from Sankh Basin to South Koel Basin.

It has been proposed to transfer around 403 MCM of water available from the proposed hydel Power sites in Sankh Basin to South Koel Basin near Gumla. The water may in turn may be collected in the main stream of South Koel river at the site located at Latitude 22035' and Longitude 85015'. This water may also be transferred through the same inter river links as proposed for South Koel Basin water into Subernarekha Basin.

4. MAJOR RIVERS FLOWING IN JHARKHAND:

4.1 The North Karo River:

The North Karo River drains the Indian state ofJharkhand. It originates on the Ranchi Plateau. It forms a 17-metre (56 ft) high scarp falls, Pheruaghaugh, at the southern margin of the Ranchi plateau. It drains the Gumla, Ranchi and West Singhbhum districts. It joins the South Koel near Serengda. The meandering valley of the Karo river, downstream from Pheruaghaugh falls is a typical example of an incised meander.

4.2 The South Karo River:

The south Karo river flows through Sundergarh and Keonjhar districts and West Singhbhum in the Indian states of Odisha and Jharkhand respectively. The river flows through industrial and iron ore mining areas and Saranda forest before joining the South Koel River in Goilkera block of West Singhbhum district. As a result of its passage through the industrial and mining area the river water gets polluted.

4.3 The Barakar River:

The Barakar River is the prime tributary of Damodar River. It is also the only tributary of Damodar. The river begins near Padma in Hazaribagh district of Jharkhand, flows for 225 km across the northern part of the Chota Nagpur plateau, mostly in a west to east direction, and finally joins the Damodar near Dishergarh in Bardhaman district of West Bengal. It has a catchment area of around 6159 kmÂ². The Barakar River flows in the boundary of the northern portion of Parashanth Hill at an elevation of 1350 m/4470 ft. The highest hill in the region is located in Giridih district of Jharkhand and a centre of Jain pilgrimage.

4.4 The Sankh River:

The Sankh River flows across Jharkhand, Chhattisgarh and Odisha states inIndia. The river flows for 240 kilometres (150 mi) before it meets the Koel River in Odisha.

The river starts 1,000 metres (3,300 ft) above sea level in Lupungpat village in Gumla district in Jharkhand and flows 67.5 kilometres (41.9 mi) in the state before entering Chhattisgarh.

4.5 The North Koel River:

The North Koel rises on the Ranchi plateau and enters Palamau division, below Netarhat near Rud. After flowing nearly due west for about 32 kilometres (20 mi), it turns north at an almost complete right angle through a gorge at Kutku, and flows through the centre of the district until it falls into the Son a few miles north-west of Haidarnagar. The principal tributaries are the Auranga and the Amanat, both of which join it from the east, the former at Kechki, 16 kilometres (10 mi) south and the latter 8 kilometres (5 mi) north of Daltonganj.

4.6 The Damodar River:

Chandwa, Latehar in Jharkhand are recognized as the sources of Damodar River. Barakar, Konar, Bokaro, Haharo, Jamunia, Ghari, Guaia, Khadia and Bhera are the different tributaries and sub tributaries of

Damodar River. Out of these set of tributaries, the Barakar is considered to be the biggest tributary of the Damodar. The Damodar River banks are known to be rich in mineral resources. Thus, it could be exploited by industrialists. As a result, a number of coal-oriented industries came up over the Damodar basin. Most of them are government-owned coke oven plants, coal washeries, iron and steel plants, glass, zinc, cement plants and thermal power plants. Contamination thus commenced due to excessive and defective excavation, outmoded processing activities, oil, fly ash, poisonous metals and coal dust. The problem was aggravated due to improper management, an ineffective state pollution control board, which did not take adequate pollution check measures. Damodar and its tributaries were the only source of drinking water for the people in the vicinity. These people were gradually affected by the contaminated water.

Several dams have been constructed in the valley, for the generation of hydroelectric power. The valley is called “the Ruhr of India”. Damodar Valley Corporation, popularly known as DVC, came into being on July 7, 1948, by an Act of the Constituent Assembly of India (Act No. XIV of 1948) as the first multipurpose river valley project of independent India. It is modeled on the Tennessee Valley Authority of the United States.

4.7 The Subarnarekha River:

After originating near piska nagri, near Ranchi, the capital of Jharkhand, the Subarnarekha traverses a long distance through Ranchi Seraikela Kharsawan and East Singhbhum districts in the state. Thereafter, it flows for shorter distances through Paschim Medinipur district in West Bengal for 83 kilometres (52 mi) and Balasore district of Odisha. There, it flows for 79 kilometres (49 mi) and joins the Bay of Bengal near Talsari. The total length of the river is 395 kilometres (245 mi).

The basin of the Subarnarekha is smaller than most multi-state river basins in India. The rain-fed river covers a drainage area of 18,951 square kilometres (7,317 sq mi). The prominent tributaries of the Subarnarekha are Kharkai, Roro, Kanchi, Harmu Nadi, Damra, Karru, Chinguru, Karakari, Gurma, Garra, Singaduba, Kodia, Dulunga and Khaijori.The Kharkai meets the Subarnarekha at Sonari (Domuhani), a neighborhood of Jamshedpur.

The Subarnarekha passes through areas with extensive mining of copper and uranium ores. As a result of the unplanned mining activities, the river is polluted. The Subarnarekha has been the lifeline of tribal communities inhabiting the Chhotanagpur region and water pollution affects their livelihood.

5. POLLUTION IN JHARKHAND RIVERS:

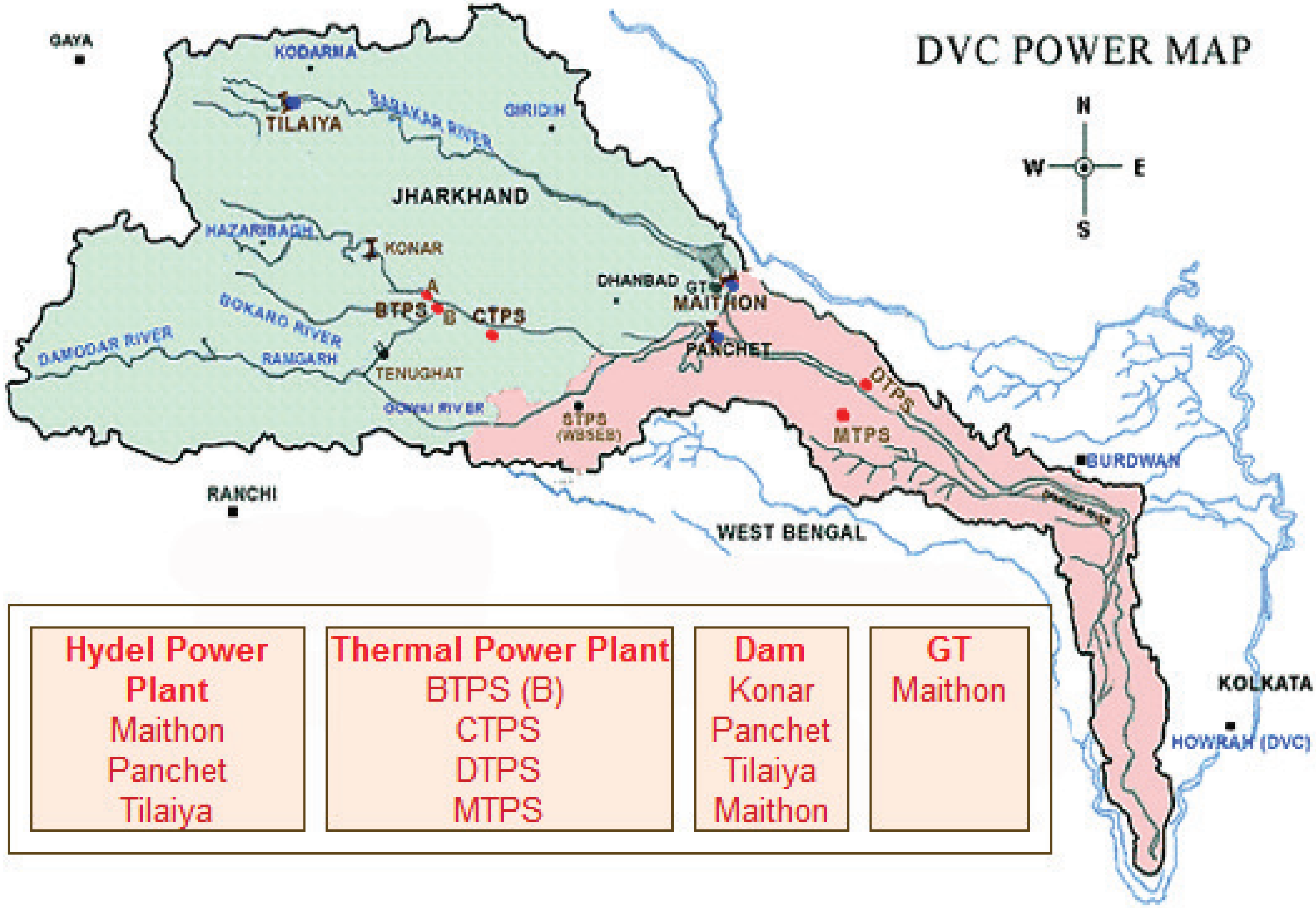
The large scale mining operations going on in the region have adversely affected groundwater table in many areas with the result that yield of water from the wells of adjoining villages has drastically reduced. Further, effluents discharged from mine sites have seriously polluted the streams and under groundwater of the area. Acid mine drainage, liquid effluents from coal handling plants, colliery workshops and mine sites and suspended solids from coal washeries have caused serious water pollution in the region, adversely affecting fish and aquatic life.

Damodar and Subernrekha river valley are the cradle of industrialization in Chotanagpur plateau region. Damodar is the most polluted amongst Indian rivers and ironically almost all polluting industries are government owned. About 130 million litre of industrial effluents and 65 million litre of untreated domestic water finds way to Damodar drainage system every day. A study of the area showed that one coal washery alone was discharging about 45 tonnes of fine coal into the Damodar every day and there are as many as eleven coal washeries in the region with an installed capacity of 20.52 million tones annually.

Today the picture of Damodar or Damuda, considered a sacred river by the local tribals, is quite like a sewage canal shrunken and filled with filth and rubbish, emanating obnoxious odors. Other major rivers of the region are also seriously polluted. The Karo river in the West Singhbhum is polluted with red oxide from the iron ore mines of Noamundi, Gua and Chiria. The Subernrekha shows a different type of pollution which is even more hazardous in nature. Metallic and dissolved toxic wastes from TISCO, Jamshedpur and HCL Ghatsila and radioactive wastes from the uranium mill and tailings ponds of the uranium corporation of India limited at Jaduguda flow into Subernrekha and its tributaries.

The release of different toxic metals like arsenic, mercury, chromium, nickel etc. from the coals and mine spoil heaps in Damodar and its tributaries have caused severe damage to water quality. Continuous dewatering by underground mines also affects water resources. These mines annually pump out millions of litres to drain mine galleries and release it into nearby water courses. This has caused flooding, silting, water logging and pollution in the mining areas of Jharkhand. They have also reduced the surrounding water table, and also reduced the available groundwater.

5.1 Damodar River:



Map No 4: DVC Power Map

Figure 1: Damodar River filled with coal dust and mine waste.

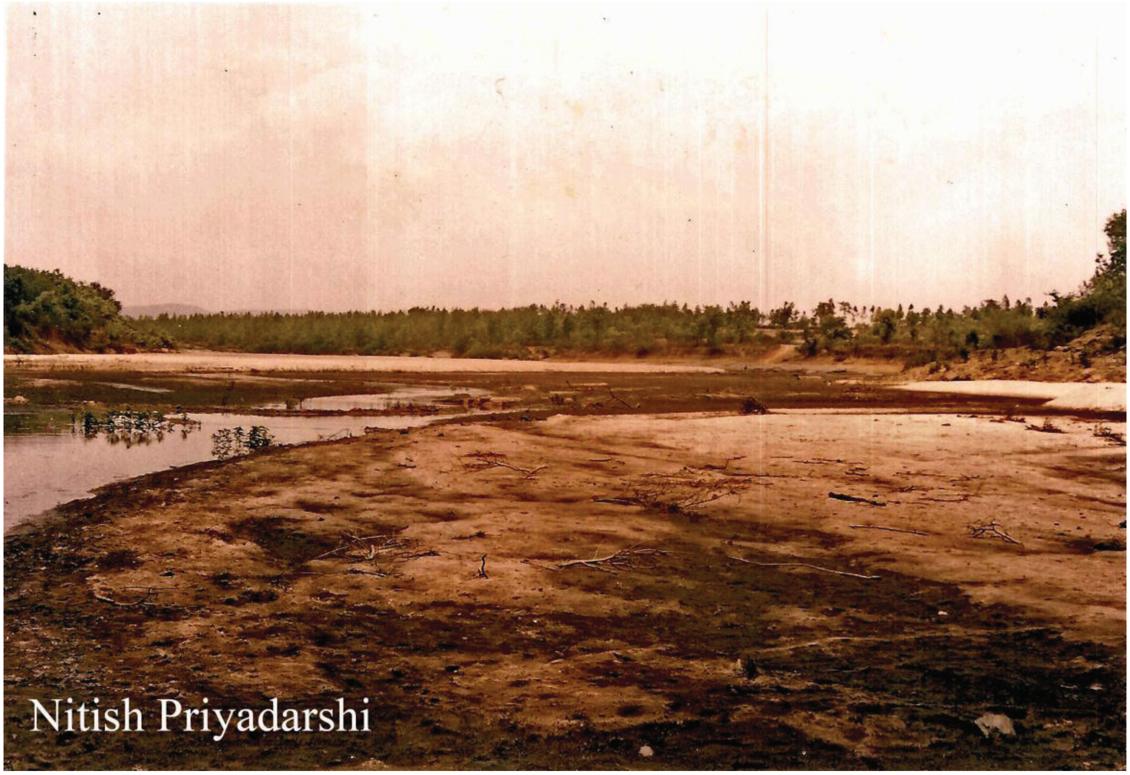


Figure 2: Fine coal dust deposited on the bed of Damodar River.

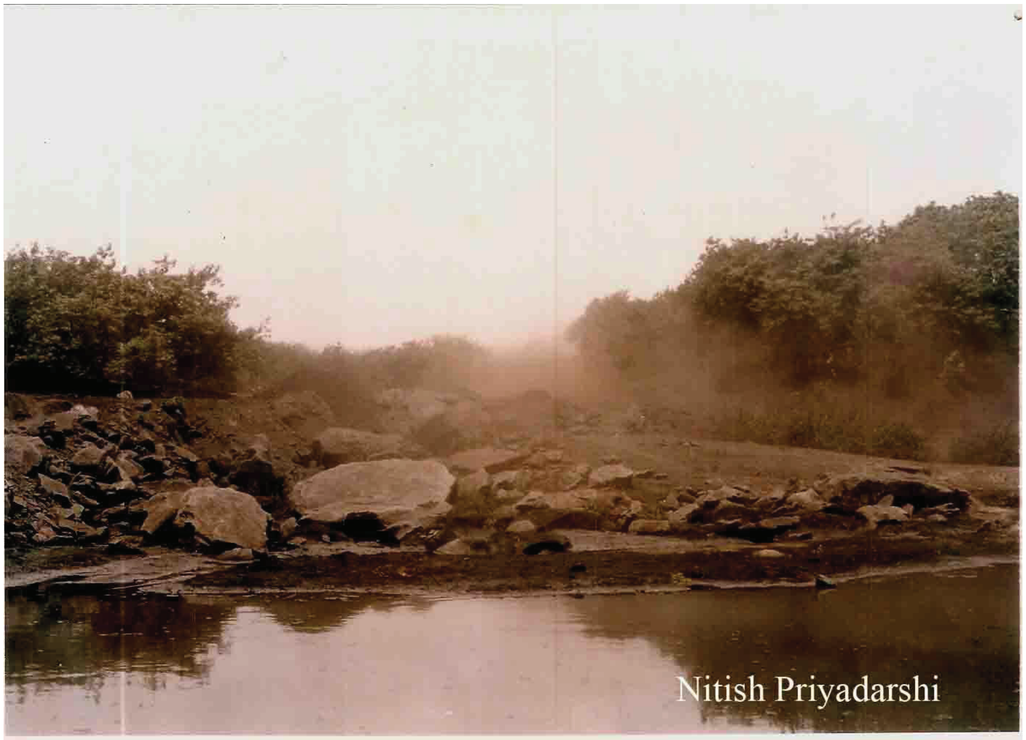


Figure 3: Dust pollution on Damodar River.

Figure 4: Polluted Damodar river flowing through North Karanpura Coal field.

River Damodar is a rain fed torrential river.Nearly 70% of the river course is in the valley. The river catchment is characterised by a prolonged dry season followed by turbulent monsoon with the annual run off, 11,385 million m3 of water. The brief monsoon spell lasts just three months that contributes 90% of the total precipitation.

Poor land management, denuded catchment, with favourable contour, high intensity of down pour and unrestrained industrial discharges are all together fast stressing the river, both physically and hydro biologically.

Today the picture of Damodar or Damuda, considered a sacred river by the local tribals,in Jharkhand State of India is quite like a sewage canal shrunken and filled with filth and rubbish, emanating obnoxious odours. It is also contaminated with toxic metals like arsenic, mercury, flouride, and lead. The excessively high rate of sedimentation is fast reducing the carrying capacity of the river. The disposition of fly ash has further deteriorated the condition.

The Damodar river basin is a repository of approximately 46% of the Indian coal reserves. A high demographic and industrial expansion has taken place in last three decades in the region. Exploitation of coal by underground and open cast mining has lead to a great environmental threat in this area. Besides mining, coal based industries like coal washeries, coke oven plants, coal fired thermal power plants, steel plants and other related industries in the region also greatly impart towards degradation of the environmental quality vis-a-vis human health.

It is a small rainfed river (541 km long) originating from the Khamerpet hill (1068 m), near the trijunction of Palamau, Ranchi, and Hazaribag districts of Jharkhand. It flows through the cities Ramgarh, Dhanbad, Asansol, Durgapur, Bardwan and Howrah before ultimately joining the lower Ganga (Hooghly estuary) at Shayampur, 55 Km downstram of Howrah. The river is fed by a number of tributaries at different reaches, the principal ones being Jamunia, Bokaro, Konar, Safi, Bhera, Nalkari and Barakar. The total catchment area of the basin is about 23,170 km^2; of this, three-fourths of the basin lies in Jharkhand and one-fourth in West Bengal. The major part of the rainfall (82%) occurs during the monsoon season with a few sporadic rains in winter. Damodar basin is an important coal bearing area and at least seven coal fields are located in this region.

High increase in the population i.e. from 5.0 million (1951) to 14.6 million (1991) has been observed during the last four decades which is the outcome of the heavy industrialization in this basin mainly in coal sector.

Due to easy availability of coal and prime coking coal, several thermal power plants, steel plants have grown up. Discharge of uncontrolled and untreated industrial wastewater, often containing highly toxic metals is the major source of pollution of Damodar River.

Mine water and runoff through overburden material of open cast mines also contribute towards pollution of nearby water resources of the area. Huge amount of overburden materials has been dumped on the bank of the river and its tributaries, which finally get spread in the rivers especially in the rainy season. These activities have resulted in the visible deterioration of the quality of the river water.

The large scale mining operations going on this region have also adversely affected ground water table in many areas with the result that yield of water from the wells of adjoining villages has drastically reduced. Further, effluents discharged from the mine sites have also seriously polluted the underground waters of the area.

Mine waters does not have acid mine drainage problem. It may be due to the fact that coal deposits of this basin are associated with minor amounts of pyrites and contain low sulfur. Iron content in these waters are found in the range of 1 to 6 mg/l. Though it is not alarming but it may be toxic to some aquatic species. Mine waters are generally bacterially contaminated which is clear from the value lying in the range of 100 to 2500.

Heavy metals like manganese, chromium, lead, arsenic, mercury, floride, cadmium, and copper are also found in the sediments and water of Damodar River and its tributaries like Safi, Nalkari, Bhera Rivers etc. Permian coal of this area contains all these toxic elements in considerable amount. Presence of lead is high above the alarming level i.e. 300 ppm (parts per million) in the coals of North Karanpura coal field.

The study warned that long term exposure to the lead present in that area might result in general weakness, anorexia, dyspepsia, metallic taste in the mouth, headache, drowsiness, high blood pressure and anaemia etc.

The Damodar sediments are deficient in calcium and magnesium and rich in potassium concentration. Titanium and iron are the dominant heavy metals followed by manganese, zinc, copper, chromium, lead, arsenic, and mercury. Other heavy metal like strontium shows more or less uniform concentration throughout the basin. Average concentration of strontium in the sediments of the river is 130 ppm. Silica is also high in the sediments of Damodar River and its tributary. The value is 28ppm. Arsenic in the water ranges from 0.001 to 0.006 mg/l, mercury ranges from 0.0002 to 0.0004 mg/l, floride ranges from 1 to 3 mg/l.

The total toxic load that the coal mines water contributes to the river has been computed to be 16-20 tons/day and 0.05-0.60 tons per day of heavy metals. The average composition of heavy metals (mg/l) in mine water as registered were:

Cu-0.23 to 0.72, Mn-0.25 to l.12, Fe-0.38 to 1.16, Ni-0.10 to 0.23, Zn-6.30 to7.41, Co-O.08 to 0.12.Pb-0.97 to 1.19,Cd-0.41 to 0.56 and Cr-0.16 to 0.19.

The huge quantum of washery effluent brings severe ecological changes in the river water, specially during the lean period. It imparts brownish black colour to the river water and then transparency comes down below 10 mm due to high concentration of coal dust present in the effluxion. The ecology of the stretch between Rajarappa and Panchet reservoir of the Damodar river is under serious threat due to the influx of the washery effluents.

The Sindri fertilizer plant adds considerable toxic load to the river through its 21,000 Kl/d discharge with 788.0 mg/l suspended solids and 290 mg/l ammonia nitrogen.

The seven thermal power plants in the Damodar valley (three of which, with a combined installed capacity of about 1,800 mw, belong to the DVC) consume between 3,000 and 8,000 tonnes of coal a day and as much as 50 per cent of the total solids generated is in the form of flyash. Yet, there is little effort to manage the waste. This is obvious from the fact that very few DVC units, which are better managed than those run by the state electricity boards, have electrostatic precipitators (ESPS). Of the six units of the DVC's Chandrapura Thermal Power Plant in Giridih district, only one has an ESP, while the others make do with old mechanical dust collectors. As these plants are located on the banks of the river, the flyash eventually finds its way into the water.

Disposal of solid waste, or bottom ash, from boilers degrades the river even more. The bottom ash is supposed to be mixed with water to form slurry which is then drained into ash ponds. Most of the ponds are full and in several cases drainage pipes are choked. The slurry is discharged into the river.

The people who live in the vicinity of the Damodar are the worst affected. The river and its tributaries are the largest sources of drinking water for the huge population that lives in the valley. On April 2, 1990 about 200,000 litres of furnace oil spilled into the Damodar river from the Bokaro Steel Plant. The oil travelled about 150 km downstream to Durgapur and for at least a week after the incident, the five million people in the area drank contaminated water. The water from the river that the people drank was unfit for human consumption, with oil levels 40-80 times higher than the maximum permissible value of 0.03 mg/l. It is obvious that due to extensive coal mining and vigorous growth of industries in this area water resources have been badly contaminated. The habitants have, however, been compromising by taking contaminated and sometimes polluted water, as there is no alternate source of drinking water. Thus, a sizeable populace suffers from water borne diseases. As per the health survey of about 3 lakh population, the most common diseases are dysentery, diarrhoea, skin infection, worm infection, jaundice, and typhoid. Dysentery and skin infections occur in high percentage in the area. If proper steps are not taken up the total population mostly tribals will be on the verge of extinction.

5.2 Subarnarekha River:

Figure 5: Polluted Subarnarekha River in Ranchi city.

Map No 5: Subernarekha Basin Map

The river has been increasingly polluted over the last few decades due to increasing mining activity, industrialization, urbanisation and deforestation in the upper and middle reaches of the river basin. Between JadugodaandBaharagora(and further downstream), the river is contaminated with radioactive materials due to the mining and processing of the uranium.

The arc-shaped Singhbhum copper belt is a major source of river pollution. There are four industrial areas (Ranchi-Hatia, Muri. Adityapur-Tatanagar, Jadugoda-Ghatsila) which contribute maximum pollution load of the river. The daily organic pollution load generated in the Subarnarekha basin stands at 264 tons from rural and urban sources. Out of 117 tons of total BOD load two-thirds are generated from Ranchi and Singhbhum districts of Jharkhand.

Industrial units also throw COD load, suspended solids, oil and grease, phenol, fluoride and nitrates to the river. The Upper segment from Hatia dam to Baharagora is polluted by uncontrolled discharge of untreated or semi-treated domestic waste effluents. Runoff from agricultural lands transports 450 tons of nitrogen. 120 tons each of phosphorus and potassium along with small quantity of organ chlorine pesticides to the river annually.

Translated literally, Subarnarekha means 'streak of gold'. With a drainage area of 1.93 million ha this smallest of India's major inter-state river basins is a mute host to effluents from various uranium mining and processing units. While most rivers in the country are classified -- depending on the pollution load -- on a 'best designated use' basis, the Subarnarekha defies any classification, as the existing parameters do not include radioactivity.

The rain-fed Subarnarekha originates 15 kms south of Ranchi on the Chhotanagpur plateau draining the states of Jharkhand, Orissa and West Bengal before entering the Bay of Bengal. The total length of the river is 450 kms and its important tributaries include the Raru, Kanchi, Karkari, Kharkai, Harmu Nadi, Singaduba, Kodia, Garra and Sankh rivers.

The only streaks visible in the river are those of domestic, industrial or - incredibly - radioactive pollution. Subarnarekha's rich resource base has spelled doom for the basin. Between Mayurbhanj and Singhbhum districts, on the right banks of the Subarnarekha, are the country's richest copper deposits. The proliferation of unplanned and unregulated mining and mineral processing industries has led to a devastating environmental degradation of the region. Improper mining practices have led to uncontrolled dumping of overburden (rock and soil extracted while mining) and mine tailings. During monsoons, this exposed earth flows into the river, increasing suspended solid and heavy metal load in the water, silting the dams and reservoirs.

Quarrying of construction material, such as granite, basalt, quartzite, dolerite, sandstone, limestone, dolomite, gravel, and even sand, has created vast stretches of wasteland in the river basin. Used and abandoned mines and quarries are a source of mineral wastewater and suspended solids. Subarnarekha also has to bear radioactive waste that enters the river through seepage from tailing ponds of the Uranium Corporation of India at Jadugoda. It has three productive uranium mines, all within a 5 km radius: Jadugoda, Batin and Narwapahar.

The uranium ore is mined from underground and brought to the surface. Uranium is then extracted and processed to make 'yellow cake', an ingredient used to fuel nuclear plants. What is left behind are 'tailings' or effluents comprising radioactive products, which are mixed into slurry and pumped into tailing ponds. These ponds, each covering about 160 ha of land and about 30 metres deep are situated between adjoining villages.

The water pollution in Subarnarekha River is due to:

1. Industrial waste water
2. Municipal sewage
3. Domestic sewage and waste water
4. Agricultural waste and waste water

5. Some other occasional and seasonal factors like Cremation, statues immersion, human excreta and urine, animal excreta etc.

The examination of quality of water at different sites of the river, indicate that the industrial waste and waste waters containing hazardous chemicals are causing major pollution.

According to the analysis of river water in Jamshedpur done in Department of Chemistry, Karim City College, parameters are:

- PH - 5.60 to 7.0
- Alkalinity - 60.0 to 140.0 mg/l
- Total hardness - 49.5 t0 131.4 mg/l
- Cyanides - 0.67 to 1.80 mg/l
- Phenols - 4.0 to 8.2 mg/l
- Iron content - 3.22 to 3.42 mg/l
- Mercury content - Up to 0.02 mg/l
- Chromium (VI) - Up to 1.03 mg/l

The river water at some point is highly acidic. Hence, the economic value of the water for drinking and washing purposes is lost. Also, aquatic life would not survive in this highly acidic water. The cyanide content is very high. Free cyanide (as CN or HCN) is toxic. It interacts with ferric haem moiety of cytochrome oxidase and blocks respiration.

Iron content is also very high. As far as it is known, human beings suffer no harmful effect from drinking water rich in iron content but it is unsuitable for processing food, beverages, laundry operations etc. If this water will be used for boiler, then it will lead to a pronounced blocking of the pipes together with rusting of the iron pipes. The boiler may get chocked due to the presence of iron as red mud. The high concentration of Cr (VI) has following hazardous effects.

1. It affects the biochemical reactions of lower as well as higher plants.
2. It causes skin disorder and liver damage.
3. It is oncogenic (carcinogenic).

The chromium concentration in urine provides information about the current exposure to water soluble chromium (VI) and about the body burden of chromium. Mercury content is also high. Methyl mercury is highly toxic. It causes irreversible nerve and brain damage. Methyl mercury poisoning also leads to segregation of chromosomes, chromosome breakage in cells and inhibited cell division.

No standards have been met in their construction and no measures taken to control the emissions. Overflow and seepage from the tailing ponds ultimately ends into the streams that feed Subarnarekha. These radiations pose the greatest threat to human health, as they harm living cells, often leading to genetic mutation, cancer and slow death.

Subarnarekha is the lifeline of tribal communities inhabiting the Chhotanagpur belt. Once these communities made a living out of the river's gold and fish. But today the polluted Subarnarekha has little to offer. Between 5,000-6,000 families of local tribals, including the fishing community of Dharas, residing on the riverbanks from Mango in Jamshedpur to Bharagora, have been affected by the river's pollution.

Oil and slug deposits on the riverbed deter the growth of moss and fungi, vital food for fish, hindering the movement of Hilsa fish from the Bay of Bengal to Ghatsila. Even sweet water fish like sol die in large numbers during their breeding season. Reports reveal that villages in the region around Ghatsila such as Kalikapara, Royam, Jadugoda, Aminagar, Benasol and Baraghat are suffering from skin diseases. The male fertility rate has also declined. Unfortunately, people have not been active in protecting the river as yet, when they could do well and take an example from other social movements in other river basins.

The basin also houses the Subarnarekha multipurpose project that has Jharkhand's Chandil & Icha dams as well as the two barrages and three small storage reservoirs in Odisha, apart from a wide network of canals. The area is faced with grave environmental and displacement-related issues due to the project. The protests against the project culminated with the demonstration of a group of over 10,000 tribals armed with bows and arrows, leading to police firing and four deaths on January 6, 1979.

Despite the protests and alleged corruption (as per CAG report of 1999), the project took off after 40 years of delay. The project received a major shot in the arm when it became a part of the Centre's Accelerated Irrigation Benefit Project. It received the clearance of Ministry of Forest, Environment and Climate Change (MoEF) but the promise of jobs and electricity to the locals was held up.

The overall study reveals moderately serious contamination of the river with sediments of metals, predominantly in some locations under the anthropogenic influences like mining and industries.

5.3 The Nalkari River:

Figure 6: Nalkari River

The Nalkari, a tributary of the Damodar river that flows through the eastern states of Jharkhand and West Bengal, may easily be mistaken for a nallah or waste water canal. Around 7 kilometre from Patratu in Jharkhand, the Nalkari carries huge quantities of oil and ash, discharged by the Patratu Thermal Power Station (PTPS).

The PTPS, established in the sixties in collaboration with Russia, has a total installed capacity of 840 megawatt (MW), spread over 10 units. While six of its units of 50-100MW each were supplied by Czech firm Skoda, the remaining 4 units of 110MW each were provided by the public sector company, BHEL. Patratu town, located 40 kilometre from state capital Ranchi, was developed to house employees of the power station.

However, of its 10 units, only one or two units are working today, generating merely 10-15 per cent of the plant's total capacity. The remaining units are either closed or non-operational. Since the functional units are based on outdated technology, the power plant has failed to control pollution, whether in air, water or on land.

“The Patratu dam was built to store the fresh water of the Nalkari river, so that the PTPS can run. Nobody had ever thought that the same plant would kill the river one day. All the effluents and ash from the plant are being thrown in the river, which is not only poisoning the Nalkari but also, the Damodar river, which it meets downstream.

This plant is also at the centre of a dispute between the plant managers and the local community. Landowners from more than 23 villages had given their land when the plant was set up. Apart from PTPS, land in Patratu had already been acquired by Bihar Alloy Steel (BASAL), National Cooperative Development Corporation (NCDC), Damodar Valley Cooperation (DVC), Railway and Central Coalfields Limited (CCL). The small portion of land left to sustain people’s livelihoods, was again taken by the plant in 1990 for construction of the new ash pond.

5.4 Kharkai River:

Figure 7: Kharkai River

The Kharkai River is a river in eastern India. It is one of the major tributaries of the Subarnarekha River. It flows through Adityapur region of Jamshedpur

It arises in Mayurbhanj district, Odisha, on the north slopes of Darbarmela Parbat and the western slopes of Tungru Pahar, of the Simlipal Massif. It flows past Rairangpur and heads north to about Saraikela and then east, entering the Subarnarekha in northwestern Jamshedpur.

The Kharkai is derived from the Sanskrit word “Kharkaya” meaning "fast flowing river".
It is one of the major tributaries of the Subarnarekha River. After entering Jharkhand its tributaries include the Torlo and Lli Gara on the left. Its last major tributary is the Sanjay, entering from the left, 17 km as the river flows above its mouth. There is a steel plant at Jamshedpur and many industries in Adityapur Industrial Area. The river gets polluted throughout its journey.
Garbage from Adityapur has found a new address — the banks of Kharkai, which is one of the major tributaries of Singhbhum’s lifeline Subernarekha.

Two truckloads of domestic waste, equivalent to 400 cubic feet, are being emptied on the waterfront every day, turning the erstwhile oasis into an eyesore and olfactory challenge.

There was a time when the Kharkai banks were popular for a morning walk because of the fresh air we could breathe in. These days, we are even scared to venture on the road near the river because the ambience is so unhygienic.

Severe pollution has reduced the river Kharkai into a 'dumping drain' of toxic refuse, threatening number of people living on its banks with serious health hazards and a loss of their livelihoods. That the river is dying is clearly evident from its stench. The highly toxic waters release a 'gas' that starts irritating the nostrils and throat as soon as humans breathe it. Its foul odors can be smelled from as far away as half a several meters. "Sometimes we are unable to sit in our house due to the unbearable stench from the river water," said a people live at the Kharkai river bank. Soon after the floodwater receded and the river wore its lean period look, the pollution instantly increased due to a lack of dispersion. Several hundred industries, topped with a huge volume of untreated sewage from the city, now remain almost stagnant within the river water. The situation is set to continue until a new flow of water rushes in from the upstream, beginning in perhaps another two months. In the meantime, people living along the river are the worst victims of the pollution, which they say is worse than anything they've seen in previous years.

Kharkai water of Adityapur is polluted by industrial effluents, domestic and sewerage dirt, oil and lube spillage and sediment. Maximum industries excrete toxic substances to water. The people who are living

By the Kharkai which is polluted by various germs and micro-organisms are severely suffering from various diseases like cholera, diarrhea, dysentery etc, often. In the dry season The DO level becomes very low and the river becomes very toxic.

6. HOW TO PROTECT RIVERS FROM POLLUTION?

Presently there is only 1% water which is drinkable on our planet where as our planet is covered with water by 70%, which is salt water and not usable for human. Very soon we all are going to face complex and urgent water problems and the only way to create a healthier future is for everyone to do their part to save rivers from pollution. Presently everyone forget the important of rivers and we just doing exploitation of rivers. No one bother about the pollution which we are creating in all rivers water either they are big rivers or small one. Presently the fast rate of water pollution is adding to the scare, be it the rivers or the groundwater which going to put a gap between demand and supply drinkable water. Recently a study was done on the sate of rivers in the country and which shows polluted rivers in the country has risen from earlier 121 to 275. The condition of rivers is alarming situation for country and unchecked flow of sewage, industrial and mining wastes being one of the main reasons of pollution.

Now this is a big challenge for government and need of society to get clean these rivers because the level of drinking water going down day by day. Believe it, we get a situation very soon when we all start to fight for drinking water or its resources. We all can take example from many areas from India where a big part of population facing the situation of drought.

The most ancient source of water, even before the human race came into being, was the rivers. The river systems have sustained civilizations after civilizations since time immemorial. But these systems are facing grave threat at present than ever before.

The fact of the matter is that the journey of these rivers flowing since ages is being somewhere stopped. Intense pressure of growing populations, industrialization and mind-boggling planned and unplanned development is seriously showing in terms of both quality and quantity of water the rivers provide. Another serious fall-out of pressure on the river basin systems is the over-use of groundwater resource. The demand and supply gap has been widening day by day. As a result both the sources are currently in danger. The solution lies in protecting the rivers and harnessing the available water resources optimally.

We all can help to prevent water pollution and we are all responsible for that so that we all forward a healthy life to future generation. We have to generate the awareness or educate all common people about the threat we are facing with the rivers because many people don’t realized the bad impact on environment through the pollution we are generating in rivers. May be when people understand how much pollution is leaking into our waterways and what it means for mankind. We all can help to keep water clean through many things we can do and prevent water pollution of nearby rivers and lakes as well as groundwater and drinking water.

1. Prevention of pollution by interception and decentralized treatment of wastewater entering rivers and lakes.
2. Management of solid waste around the water bodies and catchment areas.
3. Enhancement of waterfront and catchment areas, such as storm water management, institution of buffer zones and silt traps.
4. Cleaning of water through low cost methods such as de-silting and cultivation of appropriate species for bioremediation.
5. Prevention of pollution by communities living along waterfront, such as through awareness and provision of sanitation.
6. Mobilization of local communities to participate in concerted effort.
7. Planning of waterfront development to improve environmental and economic sustainability.

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