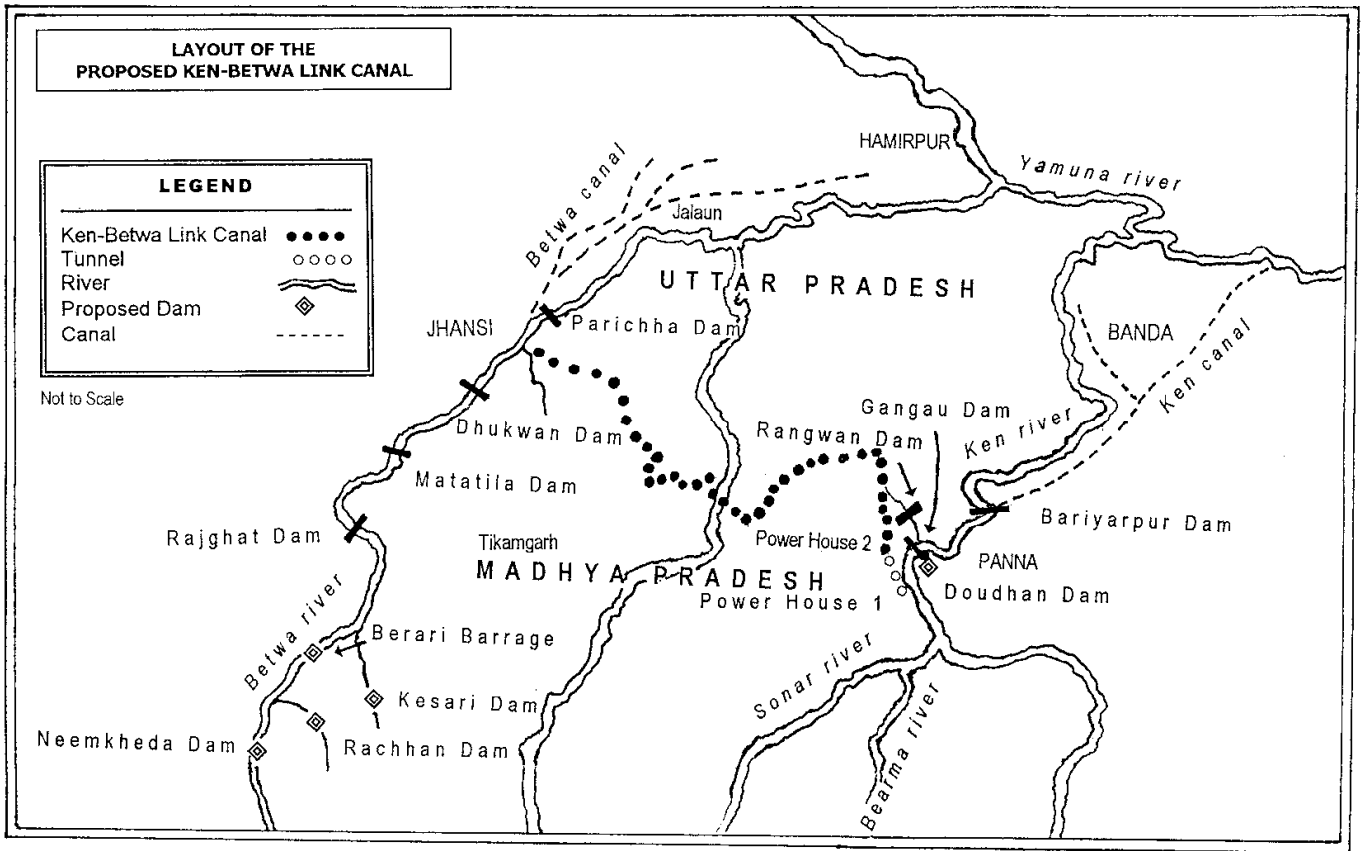
Ken Betwa Link: Why it won't click



Analysis of the Ken Betwa River Link Proposal

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Ken-Betwa Link: Why it won't click

In this paper available information on the proposed Ken-Betwa Link, one of the first links to be taken up under the Interlinking of Rivers Plan and a critique thereof has been put together. Also included is the information on the existing projects in Ken and Betwa basins to get a picture of what is the situation in these two basins. The paper attempts to provide a critique as to why this proposal is not viable or desirable. Readers are invited to provide further inputs, information and comments.

Ken-Betwa Link Project (KBLP) is one of the links among 30 River links proposed by the Government of India's National Water Development Agency (NWDA), involving MP and UP in the Bundelkhand region. A 73.8 m high Greater Gangau Dam (GGD) is proposed on Ken River near Daudhan village, on the border of Chhatarpur-Panna districts in Madhya Pradesh, 2.5 km upstream from the existing Gangau Weir. The water is to be transferred to Betwa river through a 231.45 km long concrete lined link canal which is to drop water upstream of the existing Barwasagar reservoir in Jhansi district in UP. The project is supposed to strengthen the Paricha barrage canal system. Two power projects (60 MW and 12 MW) are also planned on the left bank of the proposed dam.

KBLP at 1st meeting of Task force At the very First meeting of the Task Force on Interlinking of Rivers (ILR) held on Feb 10 2003 it was decided that UP and MP may finalise and confirm their master plans pertaining to water resources development within a period of one and two months respectively so as to proceed further regarding KNLP. (GOI, MOWR, Monthly Summary for the Cabinet for Feb 2003).

However, it took much longer for the agreement between MP and UP to materialise. On August 25, 2005, in presence of Prime Minister Dr Manmohan Singh, UP and MP Chief Ministers signed the Memorandum of Understanding for taking up Detailed Project Report (DPR). The DPR is to cost Rs 40 crores and Rs 6 crores has been allotted in the 2005-6 budget. As per the latest available information, the Central Water Commission or Engineers India Limited was to be given the work of preparing the DPR for the Link.

Task Force According to the Chairman of the ILR Task Force the Ken is to be linked with the Betwa through a canal to replace the 659 MCM (Million Cubic Meters) of Betwa waters reaching Paricha weir by equivalent supply of water from Ken. This would enable annual irrigation of about 0.127 M Ha in Raisen and Vidisha districts of MP in the upper Betwa basin. The Daudhan reservoir link canal is to divert about 1020 MCM of water from the Ken basin. Out of this flow, about 312 MCM is to be used for en route annual irrigation of about 40 000 Ha in Chhatarpur and Tikamgarh districts in MP and 7 000 Ha in Hamirpur and Mohoba districts in UP. The link is also to provide 11.75 MCM water for drinking water supply in these en route districts. This apart, water from the Daudhan reservoir is to be utilised to irrigate about 0.323 M Ha in Panna and Chhatarpur in MP (water used will be 1375 MCM) and about 0.148 M Ha in Banda district in UP. [This last claim sounds rather strange, as this is not mentioned in the official National Council for Applied Economic Research report on Socio Economic and Environmental aspects of six links, done in 1994 for National Water Development Agency.]

Ken River Basin

Rising from the north-west slopes of the Kaimur hills in Jabalpur district at an elevation of about 500 m above the mean sea level, the average annual flow of the river is 11 300 MCM. It is 427 km long up to its point of confluence with the Yamuna near village Chilla in the Banda district of UP. The river Basin lies between north latitudes 23º20' and 25º20' and east longitudes 78º30' and 80º36'. The Ken basin covers the area of Jabalpur, Sagar, Damoh, Panna, Satna, Chhatarpur and Raisen districts of MP and Hamirpur and Banda districts of UP. It is bounded by Vindhya ranges in south, Betwa basin is the west, free catchment of the Yamuna in east and the river Yamuna towards the north. The catchment area of Ken Basin is 28 224 km^2.

Tributaries Chandrawal, Urmil, Shiam, Shihu, Karoran, Kel, Bichhui, Gawain, Siamri, Banne, Khuraran, Kutni, Lohruk, Kusar, Kail, Sonar (Tr- Bewas, Bamner, Kopra), Vyarma, Aloni, Vearma.

Some Existing Major Projects on Ken River

SN	1	2	3
Project	Gangau Weir	Rangwan	Bariyarpur
Year of Completion	1915	1957	1905
Ht Above Lowest Foundation, m	16.15	36	27
Gross Capacity of Res. (MCM)	119.43	163.62	12.59
Purpose	Irrigation	Irrigation	Irrigation
Max. Dishcarge Cap of Spillways, cumecs	13 700	2410	14 275
Benefit 1000 Ha	—	37.64	—
Catchment area km2	18637	828	20760

Dams on tributaries of Ken River

Dam	Year	River	Ht (m)	Gross storage capacity MCM
Chandrawal	1973	Chandrawal	10.97	34.71
Urmil	1994	Urmil	18.24	116.6

Gangau Weir Gangau weir in Chhatarpur district is a large water body formed by damming the river Ken at Nonapanji within this district. Gangau reservoir serves as a feeder dam to the Bariyarpur weir from where numerous canals have been taken out to Panna (MP) and Banda (UP) districts of Bundelkhand. At present Left Bariyarpur Canal is under construction. UP objects to the construction of Left Bariyarpur Canal until the completion of Greater Gangau Dam. According to UP, it is impossible to supply water to Left Bariyarpur Canal from Bariyarpur Weir, as there is already shortage of water in Ken Canal System. In view of MP, Left Bariyarpur Canal is constructed as per 1972 agreement and remodelling of Ken Canal was allowed with the condition of construction of Left Bariyarpur Canal. MP has already spent Rs 500 M on Canal construction. The issue remains undecided even after discussion in meeting of Central Regional Board on 18.02.2000.

Rangwan The Rangwan dam (capacity 152.14 MCM) is built by UP on Banne river (Tributary of Ken) in Chhatarpur district, which is also used to feed Bariyarpur weir as well as provide irrigation in Chhatarpur and Panna districts. MP has completed canal of length 25 km, as per agreement made in 1972.

There is a dispute between MP and UP on this project. MP has demanded for control over
i) Regulation of gates of Rangwan dam
ii) Inspection houses constructed at Gangau
iii) Link road between Rangwan and Dhamari.
MP is demanding 55.53 MCM of water in Rabi season, which was agreed in 1972 for Kharif season. It was agreed upon that, available water in Rangwan Reservoir will be distributed between UP & MP in ratio of 36:15. But by providing 55.53 MCM of water to MP in Rabi season, the ratio will become 16:35, which is against bilateral agreement, as per UP. Also it will badly affect irrigation in UP.

Urmil Dam Urmil Dam is situated in village Shamshera, Dist Mahoba on Urmil River. Completed in 1994, the Urmil Dam is to provide Annual irrigation to 4 769 Ha from CCA of 6800 Ha of Dist Mahoba and Chhatarpur (MP) through main canal of 29.4 km and distribution system 18.75 km. It provides 1.7 MCM water for drinking water supply. The 18.34 m high dam has live storage capacity of 111.5 MCM.

Bariyarpur Weir Bariyarpur weir is built at Ajaigarh in Panna district in MP in 1905 by UP. It was built essentially to irrigate the agricultural area of Banda through Ken-canal system but since the reservoir was located in this district, the benefit of recharging of groundwater reserve naturally goes to Panna district. Bariyarpur Weir is supposed to provide irrigation to 0.23 M Ha in Banda and Chitrakoot (UP) and Chhatarpur districts (M.P) through main canal of 59.34 km length and distribution system 960.56 km. The annual gross irrigation is 65 950 Ha. The total area submerged due to project is 3078 Ha, including 119 Ha forest land. At least 3 000 people are known to have been displaced due to this project.

Ken Canal System, having 2500 cusecs capacity (after remodeling), originates from right bank of Bariyarpur weir to irrigate areas in Panna (MP) and Banda (UP).

Left Bariyarpur Canal According to agreement of 1972 & 1977, it was proposed to construct Left Bariyarpur Canal (1385 cusecs capacity & 59.38 km length) and Greater Gangau Dam by MP. UP agreed for construction with the condition that, both the projects should be constructed at the same time.

Augasi Pump Canal Augasi Pump Canal augments water to tail portion of Ken Canal System; Sanda Distributory & Adhayu Minor. It provides irrigation to CCA of 13 360 Ha. It has 68 km distribution system including 3.34 km long Augasi main canal. Constructed in 1981-2, the canal has capacity to transfer 150 cusecs of water from Yamuna River to Ken canal system. However, since only 50 cusecs was available, reducing the Kharif Irrigation from planned 6 012 Ha to 306 Ha and Rabi irrigation from 6 680 Ha to 2 772 Ha, the scheme is now being modernized to increase the utilisation.

Chandrawal dam Chandrawal Dam is situated on Chandrawal River at Charkhari in Mahoba Dist. in UP. It provides Irrigation to CCA of 19 038 Ha of Mahoba Dist. through 43 km main canal and 32.28 km distribution system.

Actual irrigation (UP)

Ha

	Bariyarpur Weir	**Chandrawal**	**Urmil**
1994-5	84 900	7 140	3 189
1995-6	56 560	7 285	3 855
1996-7	73 120	6 833	4 209
1997-8	71 630	3 950	1 839
1998-9	76 230	6 852	5 266

Betwa River Basin

The 590 km long Betwa rises from Raisen in MP (near village Barkhares, S-W of Bhopal) in the Vindhya Plateau at an elevation of 576 m. It meets Yamuna in Hamirpur Dist in U.P. It is a rain fed river with very high discharge during monsoon and extremely low discharge during summers. The basin lies between the N latitudes 22º51' and 26º0' and E longitudes 77º10' and 80º20'. The basin includes parts of a number of districts of Bundelkhand like Sagar, Tikamgarh, Chhatarpur (all MP), Lalitpur, Jhanshi, Jalaun and Hamirpur (all UP). The catchment area of the basin is 43 895 km^2 of which 68.84% is in MP and 32.16% in UP.

Tributaries Ghurari, Gairao, Barwa, Garrukha, Dhasan (Tr- Ur, Sukhani, Saprar, Rohini), Lakheri, Chainich, Parwaha, Jamini (Tr-Sajnam, Shahzad), Bina, Bearma (Tr- Arjun), Jamini (Tr: Sajnam and Shahzad).

Dhasan River A tributary of Betwa, this river touches Lalitpur district at the SE tip and flows about 38 km before it re-enters the neighbouring Tikamgarh district.

There is a small stream named **Rohini**, a tributary of river Dhasan, which flows in the north-east direction across the Mahroni tehsil in the south-west corner of the district. Rohini has a dam built for irrigation.

Jamini River An important tributary of Betwa, it enters Lalitpur dist. cutting through the forest near Madanpur village, and flows northward for 45 km leaving the town of Mahroni on its right. It then takes north-easterly bend and after 6 km further comes to form the boundary of the district for about 60 km. It comes very close to Betwa just before it finally leaves the district. Jamini has been dammed within Lalitpur district.

Other important streams Important tributaries of Jamini are **Sajnam and Shahzad** rivers. While Sajnam joins it at Chandawali, Shahzad joins it near Hazaria village. These streams drain enormous volumes of water during rains while in other seasons they shrink to narrow channels. Shahzad, an important river flowing by the side of Lalitpur town, has been dammed to make Gobind Sagar reservoir near Lalitpur. Sajnam has also been dammed in this district.

Some Existing Major Projects in Betwa Basin

	1	2	3	4
Project	Paricha	Dhukwan	Matatila	Rajghat
Year of Completion	1885	1909	1964	Ongoing
Ht above foundation, m	17	15	46	43.8
Gross capacity, MCM	91.41	106.44	827.69	2172
Purpose	I	I	I,H	I,H
Max discharge cap. Of spillways, cumecs	21 510	18 451	23 360	38 997
Benefit, '000 Ha	—	1.31	5.46	109 (UP) 117(MP)
Catchment area, km2		20824	20435	16861
Installed Power capacity, MW	—	—	30.6	45

I: Irrigation; H: Hydropower

Dams on the tributaries of Betwa

Dam	Completion Year	River	Ht (m)	Catchment(sq km)	Storage MCM	Dist (State)
Gobind Sagar	1953	Shahzad	18.29	368	96.80	Lalitpur (UP)
Shahzad	1992	Shahzad	18.00	514	130.0	Lalitpur
Sajnam	1990	Sajnam	18.78	290	83.50	Lalitpur
Jamni	1973	Jamni	19.18	414	92.89	Lalitpur
Rohini	1984	Rohini	15.50	44	12.12	Lalitpur
Barwasgar	1968	Barwa	—	—	10.2	Jhansi (UP)
Lachura	1910	Dhasan	17	NA	35.96	Mahoba (UP)
Pahari	1912	Dhasan	16	NA	79.34	Jhansi (UP)
Saprar (kamlasagar)	1956	Saprar (trbty of SukhaniDhasan)	21	363.52	75.93	Jhansi (UP)
Siaori lake	1911	Lakheri (Trbty of Dhasan)	14	—	7.82	Jhansi
Arjun	1957	Arjun	24	10.77	63.8	Mahoba (UP)
Keolari	1965	Keolari	11.73	N/A	7.67	Mahoba
Kabrai	1955	Magaria & Kulharni	15.25	N/A	13.22	Mahoba
Lakheri (U/c)	1988	Lakheri	10.6	N/A	15.6	Jhansi
Maudaha	N/A	Bearma	22	N/A	200	Hamirpur (UP)
Utari (Prpsed)	U/C	Utari/ Sajnam	N/A	80	11.16	Lalitpur (UP)
Bhaunrat (prpsed)	U/C	Jamini	N/A	749.5	31.44	Lalitpur
Lachura weir	1910	Dhasan	14.94	N/A	10.56	Mahoba (UP)
Majhgawan	1917	Gunchi Nala	17.07	N/A	26.8	Mahoba (UP)
Pahari weir	1912	Dhasan	16.46	N/A	47.8	Jhansi (UP)

Paricha Situated about 21 km north-east of Jhansi on River Betwa. Paricha Weir provides Irrigation in Jhansi, Hamirpur & Jalaun districts (UP) through 30.2 km main canal and 2625 km distribution system. The CCA is 0.43 M Ha and annual irrigation is 0.23 M Ha.

Actual Irrigation

Ha

	Paricha	Govind Sagar
1994-5	279 630	17 453
1995-6	251 510	17 576
1996-7	238 020	19 272
1997-8	172 210	8 466
1998-9	217 720	16 688

Dhukwan This weir on Betwa serves to enhance the irrigation capacity of Betwa canals.

Matatila The dam is situated in Lalitpur district but does not provide any irrigation to Lalitpur district. The dam was constructed in 1957 for irrigation. Matatila power House with three machines of 10.2 MW each on the existing Dam has been commissioned in 1965. Matatila Dam provides 16.36 MCM water for drinking water supply. Benefited districts are Jhansi, Jalaun, Hamirpur (all UP) and Gwalior (MP). The total area submerged due to the project is 14 243 Ha and total no of people displaced as per official estimates is 7 500.

The rate of siltation in Matatila Dam has been three times higher than expected - increasing from 13 200 to 44 000 cum/100 sq km/yr. The excessive siltation has decreased the reservoir capacity, reduced the life of the dam, and impeded the flow of water in the canals.

Due to construction of Rajghat dam, located about 50 km upstream, Matatila dam would have to pass off an additional peak flood discharge of 38 997 m^3/sec of water released from Rajghat.

Annual generation

Year	Generation in MU
1996-97	131.172
1997-98	157.997
1998-99	132.805
1999-00	160.909
2000-01	138.083
2001-02	140.203

Rajghat Rajghat Dam Project is an Inter-state project of the MP and UP being constructed on River Betwa about 22 km from Lalitpur. The Engineering surveys were conducted in 1960 and the first project report submitted in 1970 and second report submitted in 1972, but the project could not materialise due to interstate problems. Finally an agreement was reached on 9 Dec 1973 under which a tripartite Betwa River Board was establish under the then Union Minister of Irrigation with the chief ministers and concerned ministers of two states as its members. According to UP govt, the project on completion will provide irrigation to 109 052 Ha in UP (districts Lalitpur, Jhansi, Jalaun and Hamirpur) and 116 592 Ha in MP (districts Guna, Shivpuri, Datia Tikamgarh, Gwalior and Bhind). The water distribution system is under execution. The installed capacity of the powerhouse is 45 MW (3 x 15 MW). The costs and benefits of the project are to be shared by the two States equally. The projects existing on the downstream are Matatila Dam Project, Dhukwan and Paricha Weir. Thus, the Rajghat Dam Project will serve as mother storage for Irrigation in UP and MP through a cascade of hydraulic structures in the downstream of River Betwa. The total area submerged due to the project is 23 390 Ha and the forestland submerged is 990 Ha. About 75 villages in UP and MP are partially and fully submerged, rendering 19 000 people homeless as per official reports.

It is to create reservoir having a gross and live storage capacity of 2172 MCM and 1945 MCM respectively. If only 5% of catchment area of the Rajghat Dam was considered critical, the cost of minimal Catchment Area Treatment would be over Rs 48.1 M. The cost of effective soil conservation measures would be more than Rs 144 M, that is, 11.7% of the Rs 1.23 B, which the project was expected to cost in 1973.

Apart from the cost of building the Rajghat reservoir (estimated at over Rs 1.23 B), the cost of canal irrigation system was additional.

There were at least 39 water bodies in the submergence area, ranging in size from 0.5 Ha to 19 Ha with an aggregate area of about 136 Ha. The Rajghat dam submerged about 23 temples and also Pancham Nagar Mahal.

Claimed additional irrigation for Bundelkhand Region includes 0.109 M ha in UP (districts Lalitpur, Jhansi, Jalaun and Hamirpur) - Costing Rs 2.25 B and 0.117 M ha in MP (districts Guna, Shivpuri, Datia Tikamgarh, Gwalior and Bhind)- Costing 782.8 M. On completion of the project, the maintenance of Dam and regulation of reservoir shall be carried out by the Betwa River Board, whereas operation and maintenance of Rajghat HEP is to be done by the MPEB.

The estimated cost of the Rajghat Dam at March 1995 price level is Rs 2.67 B and at Jan 2000 price level is Rs 3.01 B. The cost of the powerhouse at March 1997 price level is Rs 1.31 B. The construction of the dam and its appurtenant works are almost complete. Land acquisition for 9 villages out of 49 villages in UP is to be completed. Civil, Electrical and Mechanical works of the Rajghat Power House have also been completed. All the three units of power House have been tested and synchronized during July to Dec 1999. According to Rajghat project agreement (1972), available water in river Betwa, at dam site was estimated 3303.8 MCM. As per studies conducted by UP in 1983, discrepancy was found in estimation of catchment area and also water availability at dam site was estimated as 3525.9 MCM. To meet the water shortage at Matatila dam, downstream of Rajghat dam, UP has requested to get the extra 222.1 MCM of water. Due to rectification in catchment area, MP had requested to Betwa River Board, for redistribution of water. Since the issue was beyond the jurisdiction of Board, it has referred to Central Regional Board.

Govind Sagar Dam On Shahzad river, a tributary of Jamini river in Betwa basin, the GSD was completed in 1953 and has a catchment of 368 sq km. It provides

annual irrigation to 10 830 ha through main canal of 66.43 km and 123.57 km distribution system. It provides 2.26 MCM water for drinking water supply. Live storage is 80 MCM.

Shahzad Dam In Lalitpur district, just upstream of Lalitpur town, on Shahzad river, a tributary of Jamini river in Betwa basin. Shahzad dam, completed in 1992, provides irrigation to 16 002 ha in Dist Lalitpur through main canal of 43.75 km and distribution system 56.1 km. It provides 1.7 MCM water for drinking purpose. Catchment area is of 514 sq km, live storage 96 MCM.

Sajnam Dam Sajnam dam provides annual irrigation to 7145 ha in Dist. Lalitpur through main canal of 37.5 km and distribution system 48.05 km. It provides 1.42 MCM water for drinking purpose. Completed in 1990, it has live storage of 75 MCM. It has catchment area of 290 sq km on a tributary of Jamini River.

Actual Irrigation (UP)

Ha

	Sajnam	Jamini	Shazad	Lahchura Weir
1994-5	12951	32710	9455	47856
1995-6	13136	32757	10043	41186
1996-7	13162	33333	10223	40821
1997-8	3158	3150	6635	31978
1998-9	13656	32786	8457	35971

Jamini Dam Jamini Dam, completed in 1973, provides irrigation to CCA of 55 144 ha through main canal of 67.4 km and 177.91 km distribution system. It provides 1.42 MCM water for drinking water supply. Annual Irrigation is of 13 699 Ha. Catchment area is 414 sq km. Live storage is 84 MCM. Jamini River is a tributary of Betwa River.

Rohini Dam Situated in Lalitpur dist., it was completed in 1984. Rohini Dam provides irrigation to CCA of 3302 ha in Dist Lalitpur through main canal of 8.64 km and distribution system 11.22 km. It provides 0.71 MCM water for drinking water supply. It has catchment area of 44 sq km, gross storage of 12.12 MCM. Rohini is a tributary of Dhasan River.

Barwasagar Barwasagar is situated nearly 15 km east of Jhansi and dammed by a 1.21 km strong embankment, this lake dates to the Chandela period. It was rebuilt by Orchha ruler in the 18th century to hold 10.332 MCM water. Canals from this lake were built sometime before 1862 AD.

Siaori Lake Situated at about 8 km north-west of Mauranipur at village Siaori on Lakheri river, this lake was improved in 1906 and opened for irrigation. This also receives water from Kamlasagar, which has increased its irrigation capacity.

Lahchura weir Lachura Weir in Dist Mahoba is built on Dhasan at about 11 km north of Harpalpur station during 1906-10. This dam consists of a masonary weir and earthen bunds on each side. It has CCA of 97 790 ha in Mahoba and Hamirpur districts through main canal of 32 km and distribution system of 599.63 km. The live capacity of this 14.94 m dam is 10.56 MCM.

Saprar Dam The Reservoir is known as Kamlasagar. Built during the first five-year plan, this consists of a 3.9 km long earthen dam. The reservoir irrigates Jhansi district through Ranipur canals and enhances the capacity of Siaori lake.

Pahari dam Situated about 18 km east of Mauranipur in Jhansi district on Dhasan river this weir was built during 1909-12. This serves the purpose of irrigation through the Lachura dam mainly in Hamirpur district. 16.46 m Pahari Weir provides irrigation to Jhansi dist. Gross capacity of reservoir is 47.8 MCM and live storage capacity is 46 MCM.

Arjun Dam Arjun Dam is situated at Charkhari in Dist Mahoba on Arjun River, which was completed in 1957. Arjun Dam provides Irrigation to CCA of 59 722 ha of Dist Mahoba & Hamirpur through main canal of 42 km and distribution system 217.3 km. Length and height of the dam are 5200 m and 27.43 m. The gross & live capacity of reservoir is 68.35 and 62.97 MCM.

Actual Irrigation

Ha

	Arjun Dam	Majhgawan	Keolari	Kabrai
1994-5	18264	7505	3796	3684
1995-6	18778	7297	4113	3663
1996-7	19501	7551	4044	4104
1997-8	8225	3667	761	2831
1998-9	23244	7513	1568	4520

Maudaha Dam The 22 m high Maudaha dam on Bearma River, a tributary of Betwa in Rath Tehsil in Hamirpur district. It consists of 48 Km long main canal with head discharge of 15 cumecs, 50 Km of remodelled Channi and Sumerpur branch canals with distribution network of 337.8 Km. It is to provide irrigation to 24 297 Ha in Rabi and 3937 Ha in Kharif in Hamirpur & Mahoba districts. It provides 2.8 MCM for drinking water supply. The 200 MCM gross capacity reservoir has live storage of 179 MCM.

Majhgawan Dam Majhgawan Dam is situated in Dist Mahoba on Gunchi Nala, a tributary of Dhasan and the project was completed on 1917. Maximum flood discharge from the dam is 170 cumecs. Majhgawan Dam provides irrigation to 11 248 ha in Dist Mahoba and Chhatarpur (M.P) through main canal of 29.1 km and distribution system 31.30 km. Height of the dam is 17.07 m. Gross capacity of the reservoir is 26.8 MCM and live storage capacity is 26 MCM. Irrigable Command Area is 11 248 ha.

Keolari Dam On Keolari River, a tributary of Dhasan in Mahoba district of UP, Keolari Dam provides irrigation to CCA of 14 390 ha and annual irrigation of 4 100 Ha through main canal of 28.27 km. Completed in 1965, the reservoir has gross storage capacity of 7.67 MCM and live capacity of 7.23 MCM.

Kabrai Dam Completed in 1955, it provides Irrigation to CCA of 14 960 Ha and annual irrigation of 3760 Ha in Dist Mahoba & Hamirpur through main canal of 23.544 km and distribution system 66.4 km. It provides 1.73 MCM water for drinking water supply. The Gross storage is 13.22 MCM and live storage 11.94 MCM.

Some under Construction Projects **Lakheri Dam** Lakheri Dam is situated a little upstream of the junction of Chiraya & Tola Nallas near Village Mahewa about 16 km from Mauranipur in Dist Jhansi on Lakheri river. Max. flood discharge of the dam is 1744.07 cumecs. The construction of the dam started in 1981. Lakheri Dam will provide irrigation to 1980 ha of land in doab of Lakheri and Pathari river spread in 13 villages of Tehsil Garautha, through main canal of 9.20 km and distribution system 21 km. The length and the height of the dam are 4 880 m and 10.6 m respectively. Dead Storage Capacity of the dam will be 1.7 MCM and Live Storage Capacity will be 13.9 MCM.

Proposed Projects **The Orchha Multipurpose Project** This Project was proposed by MP on river Betwa in Tikamgarh district in 1978. The project costing Rs 668.2 M is to produce 90 MW hydropower and irrigate 29 150 ha. On the same river Dhukawa HEP was proposed by UP, utilizing the water head between Dhukawa and Paricha, with an installed capacity of 75 MW.

Proposed project of MP will require construction of three dams and two barrages, whereas Dhukawa project of UP will require neither construction of dam, nor any submerged area. In view of MP, Orchha Multipurpose Project is more beneficial, as it would generate excess of 15 MW power and would irrigate 29 150 ha area. In secretary level meeting held at Bhopal in April 1999 it was decided to undertake comparative studies of both the projects. In compliance of decision taken in Central Regional Board meeting in Feb 2000, a questionnaire for comparative studies of the projects has been sent to MP and the response is awaited.

Other proposed projects The centre and state govts have sanctioned Rs 232.5 M for power generation from various small HEPs in UP. Betwa project is expected to produce 0.2 MW and the Betwa Canal Head powerhouse in Jhansi is expected to generate 1.3 MW. The Ghunchai project in Pilibhit would produce 0.8 MW, while 0.2 MW would be generated from Jamini project in Lalitpur and 1.4 MW from Kuthaund project (Jalaun). (BUSINESS LINE 190403)

- CEA has done ranking study for in India's Hydropower schemes. Two of Project named Orchha (39 MW, UP) and Dhurwara (28 MW, MP) are also proposed in Betwa basin.

Utari Dam It is proposed on river Utari, a distributary of River Sajnam near village Surikalan in Mahroni Tehsil of Dist Lalitpur. Utari Dam will provide irrigation to CCA of 2012 ha through feeder channel of 10.8 km length from its right flank. It is to provide kharif irrigation of 600 Ha and Rabi irrigation of 1800 Ha. The Gross storage capacity is 11.16 MCM and live capacity 10.82 MCM.

Bhaunrat Dam It is proposed on river Jamini 20 km D/s of existing Jamini Dam near village Bhairoghat in Mahroni Tehsil of Dist Lalitpur. Bhaunrat dam will provide irrigation to CCA of 7900 Ha through feeder channel of 17.6 km from left bank. It has gross storage capacity of 31.44 MCM and live capacity of 29.75 MCM. It proposes to provide kharif irrigation in 2500 Ha and Rabi irrigation in 7900 Ha.

THE LINK PROPOSAL

The Ken drains an area of 28 060 sq km of which 16 020 sq km is cultivable. The water balance carried out by NWDA indicates that the Ken basin as a whole has a potential of 10968 MCM of surface water resources. Based on the Technical Advisory Committee 60% of the cultivable area (9870 sq km) will be brought under irrigation by 2025 AD. Thus, the requirement of surface water will be 5883 MCM in the entire basin. Thus it is claimed surplus of 5085 MCM in the Ken basin.

Salient Features of the Proposed Project

Location Latitude 24º37' 30" N, Longitude 79º51' 40" E

Greater Gangau Dam	
MWL	288 m
FRL	287 m
Minimum Draw Down Level	268 m
Dead Storage Level	238 m
River Bed Level	215.28 m
Water spread at FRL	8650 Ha
Water spread at MWL	9000 Ha
Live storage	2752.69 MCM
Capacity at FRL	2775 MCM
Masonary Dam: Foundation Level	209.94 m
Top of Dam	291 m
Earthen Dam: Top of dam	287.97 m
Max ht. above Ground	24.49 m
Link Canal: Bed width at head	12.00 m
Full depth of flow	3.50 m
Side slope	1.5: 1
Length	231.45 km
Land required for Canal	2 135 ha in MP and 180 ha in UP
Design discharge	72.00 cumecs upto 134 km, 62 cumecs 134 - 195 km & 57 cumecs 195 km-terminal at BarwaSagar
Affected Area and Persons (only by GGD)	
No of Villages Affected by reservoir	19
No of Person affected	8 550
Forest area	6 400 Ha

Dams in Raisen and Vidisha districts (MP)

	Proposed Projects		Km2 to be irrigated as per master plan	Annual Irrigation (km2)*	Water Requirement (MCM)
A	Betwa Complex	Barari Barrage	696	870.09	452
		Neemkhera dam	8	10.53	5
		Richan dam	295	368.28	192
B	Kesari dam		21	18.40	10
	Total upper Betwa (A+B)		1020	1267.30	659

*As estimated by NWDA

In addition there is also be a 60 MCM dam on Kainu Nadi, a tributary of Betwa river. Thus, in all there are going to be six large dams to be created under the KBLP, but even basic information about any of the dams except the Greater Gangau dam has not been given.

Sub Basin wise Surface water Resources of Betwa Basin (km^2)

	Area and Water resources	Betwa Basin		Jamini Basin	Dhasan Basin	Bearma Basin	Total
		Lower	Upper				
A	Geographical Area	8635	16876	4510	11102	2772	43895
B	Culturable Area (% of A)	6266 (72.57)	10977 (65.05)	3251 (72.08)	6909 (62.23)	2391 (86.26)	29794 (67.88)
C	Claimed Gross Irrigated area by 2025	2424 (38.68)	6089 (55.47)	1607 (49.43)	2450 (35.46)	912 (38.14)	13482 (45.25)
D	Total Availability as surface water resources, MCM (D/A)	2497.0 (0.289)	4676.0 (0.277)	1156.0 (0.256)	2912.1 (0.262)	717.7 (0.259)	11958.8 (0.272)
E	Requirement of surface water resources, MCM (E/C)	2855.0 (1.18)	6172.0 (1.01)	1101.0 (0.685)	2762.8 (1.13)	829.5 (0.91)	13720.4 (1.018)
F	Surplus/ deficit of surface water	-358.0	-1496.0	+55.0	+149.3	-111.8	-1761.6

Sub Basin wise Surface water Resources of Ken Basin (km^2)

SN	Details	Ken Basin		Vearma Basin	Sonar Basin	Total Basin
		Lower	Upper			
A	Geographical Area	8722	6986	5890	6550	28058
B	Culturable Area (B as % of A)	6735 (77.22)	3232 (46.26)	2753 (47.74)	3295 (50.31)	16015 (57.08)
C	Gross Irrigated Area by 2025 AD (C as % of B)	5890 (87.45)	1387 (42.91)	1020 (37.05)	1576 (47.83)	9874 (61.65)
D	Total Availability of Surface Water, MCM (E/A)	4453.3 (0.5106)	2165.0 (0.3099)	2480.8 (0.4212)	1868.8 (0.2853)	10967.9 (0.391)
E	Requirement of Surface Water, MCM, (E/C)	3412.9 (0.579)	782.3 (0.564)	736.4 (0.722)	952.1 (0.604)	5882.8 (0.596)
F	Surplus / Deficit of surface water	(+) 1040.4	(+) 1382.7	(+) 1744.4	(+) 916.7	(+) 5085.1

Ken-Betwa Surface Water Balance

MCM

		Ken	Betwa	Total
1	**A** Total SW available at 75% dependability	7657.6	9196.2	16853.9
	B Import	2426.9	955.2	3382.1
	C Regeneration	883.4	1807.4	2690.8
	TOTAL	10967.9	11958.8	22926.7
2	Requirement SW **A** Domestic Use	220.4	1103.3	1323.7
	B Industrial Uses	402.8	903.5	1306.3
	C Irrigation	5260.3	8301.0	13561.3
	D Exports		3854.5	3854.5
	TOTAL	5882.8	13720.4	19603.2
3	Surplus (+)/ Deficit (-)	(+)5085.1	(-)1761.6	(+)3323.5

Surface Water Balance Upto Greater Gangau Dam Site

MCM

A	Gross annual yield at 75% dependability		6211
B	Surface water requirement for	Irrigation	2969
		Domestic	133
		Industrial	236
		Sub Total	3338
C	Export (for downstream Irrigation needs)		2225
D	Regeneration from	Irrigation	176
		Domestic	107
		Industrial	188
		Sub Total	471
E	Net Availability (A-B-C+D)		1119

It has been proposed to construct four large reservoirs, namely, Barari barrage and Neemkheda dam on the main Betwa, Richhan dam on Richhan river and Kestan dam on Kestan river. These reservoirs will have an annual irrigation potential of 0.127 M Ha in Raisen and Vidisha districts of MP. The water balance conducted by the NWDA is based on 1901 to 1983-4 data.

The proposed link canal will take off on the left bank of the Ken river at 245.5 m from the tail race of power house - I of the GGD. The GGD site is covered by hillocks with dense forest. The proposed link canal will run in almost northerly direction for distance of 81 km in MP thereby passing through the Bhusor and Bandari protected forest area of Chhatarpur district. Thereafter it will run in westerly direction for a distance of 131.4 km within the vicinity of the state boundary between MP and UP. The Canal will cross on its way the Dhasan river, a major tributary of Betwa, many other small minor streams, state highways, railway line and Pabra and Magarwara reserve forest till it outfalls into the terminal reservoir across the Kainau Nadi near village Jobra (as per NCAER report. However, the NWDA Feasibility report does not mention this.) This terminal reservoir will have a storage capacity of 60 MCM. The sluice in the terminal reservoir will regulate the flow of the water to Barwasagar Nalla, which will connect to the Betwa river at a point 13 km upstream of the existing Paricha weir. As per the agreement between the govts of UP and MP, these states will receive 850 and 1375 MCM of surface water respectively from the GGD. (This possibly refers to existing irrigation from Ken River downstream of the existing Gangau Dam, as shown above in the surface water balance downstream of existing GD.)

Proposed command area of link canal The Ken-Betwa link canal project proposes to provide enroute irrigation in 89 villages in the Chhatarpur and Nowgang tehsil of Chhatarpur and 74 villages in Niwari and Jalara Tehsil of Tikamgarh districts of MP. It is proposed to provide irrigation to the areas/ tehsils, which have less than 30% annual irrigation of their culturable area by 2025 AD.

Extension of irrigation in the Upper Betwa basin Based on the agreement between the MP and UP on sharing of Betwa waters, the MP govt has prepared a master plan to utilise 659 MCM of surplus water by constructing the Barari Barrage, and the Neemkhera, Richhan and Kesari Dams in the upper reaches of the Betwa to provide irrigation facilities in the districts of Raisen and Vidisha in MP. To replenish the water used in the upper reaches of the Betwa, an equal quantity of water (659 MCM) will be made available through the proposed Ken-Betwa link canal. It is proposed that the upper Betwa complex will provide for the irrigation of 0.127 M Ha a year, given the 125% intensity of irrigation. That means 5189 cubic m of water is provided per Ha irrigated.

On account of the transfer of surplus water of the Ken to Betwa 13 km upstream of the Paricha weir, the tehsils now having less than 30% culturable area will by 2025 AD derive the benefit of irrigation (Mahoba, Muranipur, Jhanshi, Konch and Hamirpur). The annual irrigation of 69 194 Ha and 365 MCM of water utilisation will take place in these tehsils. That means 5275 cubic m of water is provided per Ha irrigated.

Cost estimates The entire Ken-Betwa link project has been divided into two units. Unit-I relates to the Ken-Betwa link project works and unit-II to the link canal and the other canal networks, which also includes the upper reaches of the Betwa and the lower Betwa basin down stream of the Paricha weir up to the confluence with the Yamuna. Unit III includes two power houses, power intakes structures, tunnels and penstocks, surge tank, tail race and approach tunnel, switch years and transformer yard, transmission line, cost of electric equipments, etc.

Rs B

	1989-90 price level	April 1994 price level
Unit I	1.59	3.6792
Unit II	0.3995	5.7244
Unit III	--	0.5072
Ken Command	--	5.5411
Betwa Command	--	4.4356
Total	1.99	19.8875

1989-90 price level figures were given in the NCAER report and the 1994 price level figure are given in NWDA's Feasibility report. Betwa command cost figures are notional, calculated on the basis of assumption that it will cost Rs 35 000/- per ha of area irrigated.

Currently (Sept 2005) the estimated cost has gone up to Rs 45 B as per Union Minister for Water Resources.

Environmental Implications Out of six dams to be constructed under KBLP, information is given in the NCAER study about only one of the dams, namely GGD. No information is given about the other dams. So the total impacts of all the proposed dams and canals under the KBLP cannot be known till full information about all the dams and canals is given.

The left bank of the site selected for GGD is gradually rising hill slope and the right bank is steeply rising hill slope. Number of streams flow down the hill slopes forming the gulleys. The estimated areas to be submerged due to the formation of reservoir at the designed full reservoir level is 9605 Ha (p 16, Vol. II) or, almost 10 000 Ha (p 17, Vol. II) coming under Panna, Chhatarpur and Damoh dists of MP. Channels near the reservoir are likely to get enlarged and loosen the talus and screen. This may cause increase in silting. However, the submergence area, strangely comes

down to 8650 ha in the Feasiblity report, even though the height of the dam goes up in the Feasibility report. No explanation is given for this difference, which gives rise to a suspicion that the submergence area has been understated.

With FRL at 284.2 m, the submergence area comprises of 3750 Ha forest, 2510 Ha cultivable land and 3740 Ha others. Part of the area, close to the reservoir and to the south along Ken river, will fall under Panna district and the western part along Shyamri river will fall under Chattarpur and Damoh districts in MP. As per the toposheet study the villages which will get fully submerged including the habitations are Daudhan (dam site), Kharyani (5 km south of Daudhan), Palkoha (4.5 km south west of Daudhan), Sukwaha (6 km SW of Palkoha), Bhorkhuwa (3.5 km SW of Sukwaha), Basudha (5.5 km SW of Bhorkhuwa) and Ghughari. About 30 km length of road (Gangau-Palkoha-Sukwaha-Bhorkhuwa-Basudha-Shahpura) will also get submerged. Maniyari and Padriya villages will also get affected, but NCAER claims they are part of the above-mentioned villages. Many other villages will be affected, as admitted by NCAER, but NCAER has no information about them. At one place (page 77, Vol. II), NCAER mentions that 19 villages will be affected, but no details are given about affected population.

The protected forest slated for submergence on the north is away from the reservoir area but a part in south is within the protected forest included in the Panna National Park. Almost all the hill slopes are marked by dense mixed jungle comprising of deciduous, a few evergreen of semi-evergreen and few xerophytes to semi-xerophytes type of species.

It is claimed that the canal will be designed with proper cross drainage works. The movement of subsurface groundwater may get affected along the route of canal. It is claimed that the link canal will be fully lined with suitable material.

The villages along the periphery of the reservoir will face the problem of wastewater disposal, as the existing drains will become inefficient due to the reservoir in their vicinity. The estimated number of families in the villages to be submerged is 600 in NCAER report and 900 in FR. The population thus facing submergence is given as 3250 in the NCAER report and 8550 in the FR. Scheduled tribes and Scheduled castes constitutes about 34.38% and 15.54% respectively, as per NCAER report. These are the villages in forest areas. In the interior villages the concentration of scheduled tribes is very high e.g. 91.84% in Ghughari village. Population in the other peripheral villages will also be affected but no details available in this regard.

At present the groundwater is used by villagers from the wells in the vicinity of the villages and the springs nearby. The wells are generally shallow (3-6 m) and subterranean water is available in them.

The total peripheral zone around the area likely to be submerged in the reservoir could not be examined by NCAER during its study of the Socio Economic and Environmental impacts of the project, due to their inaccessibility. However, only partial study of the area was done and geological and hydro geological data for the rest is used for assessing the impact on the ground water regime. The function of rivers as good surface drainage outlets for these villages will be affected adversely. The groundwater table will rise and general deterioration of the environment will take place.

In the command area water logging may result unless proper water distribution plan is prepared and implemented. Certain areas on the existing roadside over which the canal will pass, are dependent on well water and shallow tubewells located on crushed and altered granitic and gneissic rocks. The catchment areas of such rocks are likely to get covered by the canal construction, resulting in reduction in drinking water supply.

The manipulated water Balance

The water-balance that is at the basis of the KBLP as described above is fundamentally flawed in many respects, some of which are described below.

- The most fundamental problem with the water balance study is that it does not take into account groundwater potential and use in the relevant basins. Moreover, the water balance also does not look at rainwater as a resource and potential of rainwater harvesting before deciding if there is really any deficit or surplus.

- Another very fundamental issue is that there seems to be no allocation for the environment flow requirements in the river downstream from the six proposed dams.

- While calculating surplus in Ken basin, the assumption is that every Ha irrigated will need 5327 cubic m water. This is very low compared to the requirement assumed at 6157 cubic m per Ha assumed in case of Betwa basin. No reason is given for this huge 16% difference. However, if we look at the fact that whole attempt is to show that Ken is water surplus basin and Betwa is water deficit basin, the rationale behind such assumptions becomes clear. By assuming low water requirement in Ken basin, one can show surplus water availability and by showing higher water requirement in Betwa basin, one can show higher deficit in Betwa basin and thus try to justify a link project that otherwise has no justification.

- This attempt to show the surplus in Ken basin and deficit in Betwa basin is further exemplified by the fact that 67.88% of geographical area in Betwa is shown to be cultivable, the figure for Ken basin is much lower at 57.08%.

- About 85% of the so-called water deficit in the Betwa basin is seen in the Upper Betwa basin, where water from Ken Betwa link cannot be taken. This deficit has been made possible by the assumption that 65.05% of Upper Betwa sub-basin is cultivable and 55.47% of cultivable area here is to be irrigated by 2025. The % cultivable area to be irrigated is highest for Upper Betwa sub basin among all the sub basins in Betwa basin. Contrast these with the figures for Upper Ken Basin: 46.26% of geographical area is cultivable and 42.91% of cultivable area is to be irrigated by 2025.

- It is assumed that by 2025, 87.45% of cultivable area of Lower Ken sub basin will be irrigated, while only 37.05% of cultivable land in Vearma basin will be irrigated. This clearly shows that the projections are to provide more irrigation to already highly irrigated areas, and starve the unirrigated areas. This difference becomes even more alarming when we consider the fact that over 77% of geographical area in Lower Ken basin is considered cultivable, whereas the figure for Vearma basin is just around 47%.

- The Study mentions in the Betwa basin water balance that some 3854.5 MCM is to be exported from the Betwa basin. No information is given what is this about, from where and to where and what for this export is. The moot point is that if Betwa basin were not to export this amount of water, it would in fact be a surplus basin. Similarly, no details are given about 2426.9 MCM water being imported into Ken basin and 955.2 MCM water being imported into Betwa basin, as to from where, how, where exactly in the respective basins and what for these imports are. It is clear that NWDA and NCAER has refrained from giving correct data and has in fact tended to give biased information, giving rise to a suspicion that the figures are manipulated to justify an otherwise unjustifiable project.

- This bias is further evident when the study repeatedly describes Betwa as "water starved" basin right at the outset (e.g. Vol. II, page iii, again on Vol. II page 6), whereas the role of (NWDA and) NCAER is to study and investigate what is the situation of water resources in both the basins.

- The ignorance of NCAER and shoddiness of the report is apparent when it states in Executive Summary (Vol. II page iii again Vol. II p 3) that KBLP will benefit the districts of Ujjain and Indore in MP!

- The shoddy piece of work that NCAER has done is further evident when on page 3 (Vol. II) it says that KBLP involves "construction of large reservoirs on river Yamuna".

Questions on Projected Irrigation Benefits The irrigation benefits projected from the proposed KBLP seem highly doubtful. Some reasons are given above when there are fundamental discrepancies in the water balance studies. The fact that utilisation of rainwater and groundwater in the Ken Betwa basin is so low shows that there are better options available if fulfilment of justifiable needs of irrigation water in Ken Betwa river basins are the objective.

Moreover, if we look at the water allocation and area to be irrigated in KBLP, we find that water allocation is 5189 to 5275 cubic m for every Ha to be irrigated under KBLP. It is a mystery that if the Betwa basin water balance assumes irrigation requirement of 6157 cubic m per Ha of irrigation provided, than why is just about 20% less water allocated for area irrigated by link canals in the same Betwa basin? Or is this just to push up the projected irrigation areas to levels beyond what can be achieved? This is another indication of how the FR is essentially an attempt to push unjustifiable project?

What studies do not say The impacts that the submergence will have on the Panna Tiger Reserve (PTR) will be numerous and serious.

According to official website of the PTR, the Ken river, which flows through the Reserve from south to north, is home for Gharial and Mugger, and other aquatic fauna and is one of the least polluted rivers. It is one of the sixteen perennial rivers of Madhya Pradesh and is truly the lifeline of the Reserve. Ken offers some of the most spectacular scenery to the visitor while it meanders for some 55 km through the reserve. (http://www.pannatigerreserve.org/) When Great Gangau Dam comes up, the reservoir will not only submerge significant parts of PTR, it will also make approach of the wildlife to the only perennial water source impossible due to the silt that gets deposited on the periphery of the reservoir. Moreover, the Ken Gharial Sanctuary, located downstream of the proposed KBLP is also likely to be affected due to stoppage of freshwater flow in the river.

Also, destruction of over 3750 Ha of rich forests due to GGD alone will have many impacts by itself. This will mean loss of wildlife and all the biodiversity, loss of whose system of rainwater absorbing ecology and subsequent increase in water flow in the monsoon and decrease in the water availability in non monsoon months, shrinkage of resource base of surrounding population and shrinkage of living space for the wildlife.

Says the official website of MP tourism dept (http://www.mptourism.com/dest/khaj_exc.html) about PTR, "Most likely, it will be here if the Caracal, a

vanishing cousin of the extinct Cheetah, is ever sighted". The building of GGD will most likely forever submerge such a prospect.

According to official web site http://panna.nic.in/tiger.htm, PTR has the following Endangered Species:- Tiger, Leopard, Caracal, Four-horned antelope, Indian Wolf, Pangolin, Rusty Spotted Cat, Sloth Bear and Gharial, found in the Park, are included in Schedule I of WPA, 1972. Their habitat will be seriously impacted by the proposed GGD.

Does NWDA or NCAER know the meaning of EIA? In the beginning of the chapter 2 of Vol. II, NCAER has listed what it calls "massive data" required for "Comprehensive assessment of environmental impact". That list *excludes*, believe it or not, command area impacts (water logging, salinisation, drainage), downstream impacts, impacts on biodiversity, loss of forests, carrying capacity, impact of sudden releases in the downstream areas, geologic, seismic issues, siltation and catchment area treatment, to name just a few. This strongly raises the question if the NCAER understands the meaning of EIA and it is capable of taking up such studies. The ILR task force, we understand, has asked NCAER to take up the EIA work! That would certainly seem a disaster in waiting.

R&R for Link projects According to NCAER study, NWDA has not prepared any concrete proposal for the rehabilitation and resettlement of the population likely to be affected. Therefore the persons likely to affected are not aware of any R&R package.

On KBLP, the NCAER study says the total number of families to be displaced will be 600 and no of persons would be 3250. In Vol. I of the NCAER study it is shown that in this area, there are on average 6.5 persons per family. This means that 3900 persons will be displaced if 600 families are to be displaced. However, if population densities in the area is any guide, than at least 10 000 families (65 000 population) will be displaced by one GGD alone. No information is available about submergence due to five other dams or the link canal area or in the downstream areas or due to building of other related infrastructure.

While in Annexure 7 of Vol. II NCAER tries to give the R&R norms followed in various states and various projects, it either does not know the provisions or it is trying to misguide the readers. In either case, NCAER becomes disqualified for any such work in future. To give just one stark example, NCAER says that in case of Sardar Sarovar Project, norm is to give land for land upto 4 acres land holding, 4 acres land for 4 to 12 acres holding and 1/3rd of the holding for 12-15 acres land holding and so on. But the norm is that all families, including the encroachers and the landless in the submergence villages are to get a minimum of 5 acres of irrigated land (irrigation to be provided by state govt) and each major son (or daughter in some states) is considered a separate family. Even landless are to get that provision of land. Thus, by not stating the existing provisions honestly, NCAER has shown its bias against the affected people.

What is clear is that total quantum of submergence, displacement is not even known to either prepare any just R&R plan or take the affected people into confidence and take their free, prior and informed consent about the project or any of the options for irrigation needs of the region. Also, the people displaced by the dams in the Ken and Betwa basins described in earlier sections of this report are yet to be fully and justly resettled. Unless that is achieved, any further displacement in the basin cannot be considered, as recommended by the report of the World Commission on Dams.

Public Awareness An attempt has been made by NCAER to find out awareness among the households regarding the proposed link project in the command area. Only 8% were aware regarding the proposed project while 92% were not aware. This clearly shows that even as pre feasibility and feasibility reports of the scheme are claimed to have been done, local people are not even informed about the existence of the proposal.

Perception about Irrigation During the course of field inquiry an attempt was made by NCAER to ascertain the extent of existing irrigation facilities along with various socio-economic and agro-economic parameters in the command areas of the proposed link project. According to the qualitative view of irrigation facilities in the command area 72.4% households stated that the existing irrigation facility is not adequate, while 27.6% households stated that existing facility is adequate. According to NCAER, this suggests urgent need of the creation of additional irrigation potential. This clearly is a wrong and biased conclusion and also a misrepresentation of the results. The question was about quality and not only quantity of irrigation. Moreover, if irrigation facilities are quantitatively inadequate, there can be very many ways of extending it and link canal is not the only or even the best way.

The households of command area of link canal were asked to state their suggestions for improving irrigation facilities in their areas. The responses are as follows:

SN	Irrigation facility required	Percent
1	Canal	11.8
2	Lift Irrigation	49.2
3	Well/ Tubewell	26.8
4	Ponds	5.3
5	Others	6.5
6	Not responded	0.4
	Total	100

The majority of respondent suggested for lift irrigation and well and tubewell as a solution of inadequate irrigation facility. This clearly shows that majority of the people were not for a project like KBLP. In fact only 11.8% households have preferred canal irrigation as additional irrigation facility. The Vote of the local people is clearly against KBLP.

Possible Impacts in Ken Basin The proposed link canal would submerge thousands of hectare cultivable land at Chhatarpur, Tikamgarh and Jhanshi. Gangau and Bariyarpur dams are situated at downstream of Proposed dam. The irrigated area from both projects could get seriously affected due to the proposed link. Thousands of Ha of cultivable land would be taken for canals in Chhatarpur and Tikamgarh. People from scores of villages near Dhaudhan would be displaced due to proposed dam. A major part of world-fame Panna tiger reserve would also be submerged due to the reservoir. The Gangau dam is the feeder dam for Bariyarpur weir, which will receive less or no water from the Ken River during non-monsoon months. Even in monsoon, while the Greater Gangau dam would be filling, there will be no water either for Gangau dam or for the Bariyarpur weir and its command areas. Hence Gangau and Bariyarpur reservoir may become dry for most of year if all the water in the Ken River is stored in the GGD and is diverted to Betwa basin.

Impacts in Betwa Basin The excess water in Betwa basin could create water logging in Hamirpur, Mahoba, Banda and Jalaun districts. The excess water could also make Hamirpur (Including Mahoba), Banda and Jalaun districts flood prone. The groundwater development in all three districts is very low, at 10% in Banda and 12% in Hamirpur and Jalaun districts.

- These districts are situated downstream of Barwasagar reservoir. The combined Hamirpur district has an area of 7165 sq km. Area affected by soil erosion in both districts is 364 218 Ha, which is 50.56% of the total area.
- The total area of Banda district is 7624 sq km. There are 7 major watersheds in this district, each has large eroded area. The total area affected by soil-erosion in the district is 1.2 M Ha.
- The total area of Jalaun district is 4565 sq km and the total cultivated area is 341 818 Ha. The area irrigated by minor irrigation works is 114 000 M Ha.

UP – MP Disagreements Fundamental differences have persisted between Uttar Pradesh and Madhya Pradesh Government on the proposed KBLP and its earlier incarnations of Ken Multi Purpose Project. It is a mystery how UP government agreed to sign the MOU on August 25, 2005, in spite of these serious differences. It was said at the time of signing of the differences will be taken care of during preparation of the DPR. However, how can such fundamental differences that raise questions about the viability of the project be resolved? And when such questions exist, why spend huge amounts like Rs 40 crores for taking up the DPR.

At a meeting on January 11, 2005 between the Chief Secretaries of Govt. of UP, MP and Rajasthan under the chairmanship of the Secretary, Union Ministry of Water Resources, the objections raised by UP Chief Secretary and the UP Principle Secretary for Irrigation to the KBLP included the following. It is clear that the objections being raised by UP, according to official minutes of the meeting, are very serious in nature and the KBLP would have far reaching impacts in Ken and Betwa river basins. It is also equally interesting to see how Secretary, MWR, Govt of India is responding to the issues raised by UP.

1. **Ken is not a surplus basin** Principle Secretary, Govt of UP made is clear that Ken Basin is not surplus basin and if water is transferred from this basin there might be unrest in the Bundelkhand region. This is indeed the most fundamental issue. Secretary, Union MWR's response is amazing: This issue has already been discussed and 'need not be opened again'. NWDA response at the meeting is equally strange: As per NWDA criteria, Ken is a surplus basin. So an issue that raises the most fundamental objection to the Ken Betwa link proposal by the Principle Secretary, UP, has been pushed aside by the bureaucrats without even attempting to answer them. As we have shown in this critique, indeed NWDA has manipulated the water balance figures to show that Ken is a surplus and Betwa is a deficit basin, whereas in reality there is little difference between the situations in two basins. The warning of social unrest in Bundelkhand region has not even been addressed. This is another piece of evidence that shows that the govt is trying to push a project that has fundamentally no merit. What is also shocking here is that UP govt officials, in stead of demanding that this issue be resolved first, agreed to go ahead with further discussions and latter on to sign the MOU, keeping the people of UP entirely in dark.

2. **Irrigation in Lalitpur and Jhansi to be affected** UP officials said that the areas presently irrigated in UP, south of Lalitpur and Jhansi districts will get affected due to the Ken Betwa link project. No credible answer from NWDA or Union govt was given.

3. **Investments in Rajghat and Matatila dam to be waste?** The investment made by UP govt on Rajghat dam will become waste due to implementation of this link project, said UP officials. The response from the Govt of India officials was interesting, in that they did not deny that these investments would become a waste. In fact they said that by the time the four projects of MP in upstream of Rajghat in Betwa basin (namely the Berari, Kesari, Richhhan and Neemkheda dams proposed under KBL project) are constructed, the existing projects like Rajghat and Matatila would

recover their cost. Hence what is clear from this is that current and projected benefits from both Rajghat and Matatila dams will be seriously affected as a result of KBL. It is shocking to learn that, thus, KBL will in fact affect the benefits from a number of existing projects in Ken and Betwa basin and this revelation comes out for the first time. This is not even mentioned in the Ken Betwa project reports. This is another reason in fact to show how unviable the KBL proposal is.

4. **Hydropower generation from Rajghat and Matatila Power Houses would be affected** When govt of UP officials raised this issue and also mode of compensation, NWDA Director General also agreed that the loss of power from the existing projects would have to be assessed. The official minutes further says, "Secretary (WR) stated that he fully agrees with the apprehension of the Govt of UP." The Secretary, MWR, however, said that the computation of losses can be done when the project is approved. This again makes it clear that KBL is leading to loss of benefits from existing projects. Officials agree that such losses are neither computed, nor taken into consideration while preparing the feasibility report. This further reinforces the conclusion that the KBL is not feasible.

5. **Water sharing on Ken River** There is no provision for extra water for UP in addition to present available water utilized by UP, whereas extra water should be distributed equally between UP & MP.

As per NWDA, of the 6066 MCM water available at GGD, Committed Water is 3248 MCM: 2221 MCM for u/s use in MP and 1027 MCM for Ken Canal in UP. Remaining water (2818 MCM), should be equally distributed between the two states as per UP claim. MP does not agree. MP is not ready to supply extra water other than 37 TMC, which is as per 1972 agreement.

UP has demanded that more water to the extent of about 12.5 TMC should be given for domestic & industrial uses in addition to 60 TMC for uses downstream of Daudan dam and that computation of regeneration from upper areas of Daudhan dam should be more realistic. MP disagreed and differences on this remain to be resolved as on other issues.

While the official minutes of the January 2005 meeting are indeed revealing a lot of new issues and they also reinforce the non viability of the link proposals, some of which are highlighted above, what is equally clear is that the neither state govts, nor the Union govt is trying to take the people of the region and nation into confidence about the wide spread implications of the River Link proposals. That is the fundamental characteristic of planning and decision making of India's water resources development, unfortunately.

Basic Unresolved Issues From the above analysis of available information on the proposed Ken Betwa Link Project, it is clear that the case for the proposal is fundamentally weak due to the following reasons, among others.

- **Permanent backwardness for GGD upstream areas?** It seems the areas upstream of the proposed GGD are slated to remain permanently backward. Significant portion of these areas are tribal areas. Very little provision of water has been made for these areas. And feasibility report suggests (p 17) an agreement between UP and MP that MP will not use more water in these areas than what has been allocated for it in the water balance. These areas that have not used developed the water resources in the past are destined to remain backward forever, it seems. And the people of these areas do not even seem to know about this.

- **Problems with the Proposal** The whole proposal is based on basic fallacies of surplus and deficit basins based on manipulated water balance calculations as shown above. If looked at closely, Ken basin does not have any surplus water and Betwa basin has many unexplored local options.

- **Need** The proposal so far does not show convincing reasons about the need for the project.

- **Desirability** Looking at the huge impacts that the project is likely to have in both basins, more destructive than beneficial, it is doubt if the project would prove desirable if all the costs are honestly added.

- **Decision Making Process** The local people have had no role in the decision making process of the project. In fact, as is evident from the Feasibility Report and the NCAER survey they do not even know what this project is about and what for. Nor do they need such a project, as is evident in answer to another question from NCAER.

- **Options** It is clear from the above analysis that existing infrastructure in the two basins is not used to its optimum levels. There is huge scope for achieving more irrigation, water supply, power and flood management benefits from existing infrastructure. Moreover, there is also big scope for local options in terms of rainwater harvesting, groundwater recharge, groundwater use, watershed management, better cropping pattern and technique and so on. In fact such options would be the best way to increase the employment and growth potential in the two basins.

- **Costs** The full costs of the project are not even known. When lower cost options are available, then why go for such project with huge costs and questionable and unsustainable benefits?

- **Viability** Is the project and claimed benefits viable? It is clear from the water balance study given above that the project is not even viable in terms of availability of water or other resources are concerned.

- **Social and Environmental Impact Assessment** It is clear from the above analysis that basic social and environmental impacts of the project are not even known. Even the land and forests to go under submergence for five of the six dams proposed and the canal system are not even known. Also the outstanding social and environmental issues from the dams constructed in the two basins show that there is little credibility that the authorities have either the will or the capacity to address these issues. If they want to show that rehabilitation is possible, they must show it by resettling the people already displaced and if they want to show that environmental issues can be addressed, the same must be shown by first addressing the outstanding environmental issues of existing projects in the two basins.

- **Drought and Floods** One of the main justifications that has been forwarded for pushing river link projects has been to show how drought and flood problems can be solved by transferring water from flood prone basin to a drought affected one. In this case, though, both basins experience the droughts and floods simultaneously. Both basins have similar topographical and hydrological features. Hence there is no justification in pushing this project in that respect either.

Other Projects in the region

SN	Project	Year	River	State	Type	Ht, m	Gross Res. Capacity, MCM	Purpose	Max. Discharge Capacity of Spillways	Catchment Area, Km2
1	Beuchore	1964	Aralker	MP	TE	20	7.64	I	47	
2	Rajpur	1926	Arjun Nallah	UP	TE	13	6.62	I	193	
3	Barwa	1964	Barwa	UP	TE	20	39.49	I	535	
4	Barwar	1923	Baura	UP	TE	21	33.78	I	238	
5	Bilanadi	1973	Bilanadi	MP	TE/PG	32	63.69	I	448	
6	Burhanalla	1967	Burha	MP	TE	15	8.66	I	97	
7	Chandia	1927	Chandia Nala	MP	PG	25	5.86	I	506	
8	Kotra Khamba	1915	Hagninadi	UP	TE	18	3.82	I	65	
9	Halali Reser.	1976	Hallai	MP	TE	30	252.8	I	1189	
10	Jaiwanti	1929	Jaiwanti	UP	TE	15	9.43	I	44	
11	Salarpur	1960	Karipa	UP	TE	11	4.02	I		
12	Daroli Tank	1963	Karkra Str.	MP	TE	17	4.87	I	215	2.26
13	Khandeha	1929	Khandeha	UP	TE	14	2.69	I	128	
14	Khaprar Dam		Khaprar	UP			3.5	I,D		27.70
15	Tejgarh Tank	1959	Lamti Str.	MP	TE	26	6.79	I	285	
16	Aunjhar	1931	Local Str.	UP	TE	22	4.35	I	172	
17	Kabrai Lake	1956	Maingaria	UP	TE	15	13.22	I	340	
18	Magarpur	1920	Mind	UP	TE	16	2.46	I	173	
19	Motinala Tank	1957	Moti Str.	MP	TE	16	2.902	I	173	
20	Balmiki Ohen Sarovar Dam	1962	Ohen	UP	TE	24	38.37	I	1415	
21	Dongri	1986	Pahuj	UP				I,D		141.5
22	Pahuj Reser.	8th Pl.	Pahuj	UP			15.0	I,D		
23	Devindra Nagar	1969	Sekra Str.	MP	TE	18	5.68	I	77	4.65
24	Mola	1929	Son Str.	MP	TE	22	19.96	I	615	2.26
25	Rampur Kalyan	1925	Stream	UP	TE	13	1.85	I	110	
26	Karahi	1973	Sunehi	MP	TE	18	3.82	I	360	
27	Khapatia	1919	Thota	UP	TE	16	6.03	I	188	
28	Burha	1962	Tr- Berihadi	MP	TE	16	8.31	I	297	

Rainfall and Groundwater potential of Bundelkhand region and nearby area

SN	District	Area, Km2	Rainfall, mm	Annaul Replenishable Groundwater, MCM	% Groundwater Development (1990)	Forest Cover (%)	Cultiavated area (Ha)
1.	**Banda, CSN**	7 624	1 024	1 426	12	11	498 047
2.	**Chhatarpur**	8 687	1 083	1 036	24.40	10	387 000
3.	**Damoh**	7 306	1 115	829	6.24	36.3	38.6%
4.	**Datia**	2 038	900	313	22.18	9	
5.	**Hamirpur, M**	7 166	794	1 229	12	5	508 890
6.	**Jalaun**	4 565	776	1 239	10	6	341 818
7.	**Jhanshi**	5 024	822	896	93	6	365 512
8.	**Lalitpur**	5 039	822	669	36	13	218 995
9.	**Panna**	7 135	1 248	812	5.80	34	317 410
10.	**Sagar**	10 252	1 279	1 434	10.66	28	
11.	**Tikamgarh**	5 048	1 045	818	33.67	13	331 586

As shown above the groundwater potential of many of districts have not been utilised properly. In the districts of Panna, Damoh and Sagar in MP the groundwater utilisation is only 5.8%, 6.24% and 10.66%, while the Replenishable Groundwater Resources are 812 MCM, 829 MCM and 1434 MCM respectively. Similarly in Jalaun, Hamirpur and Banda districts in UP the groundwater development is only 10%, 12% and 12%, while the Replenishable Groundwater Resources are 1239 MCM, 1229 MCM and 1426 MCM respectively. Rest of the districts have same position and no district has used more than 40% of the potential, except Jhanshi district, which has developed 93% of potential.

Gross Irrigation Utilisation from Various Minor Irrigation sources in Ken and Betwa Basins in 1993-4

Madhya Pradesh

Ha

	District	Dugwells	Shallow Tubewells	Deep Tubewells	Surface Flow Schemes	Surface Lift Schemes	Total
1.	Chhatarpur	96760	455	286	5533	11524	114558
2.	Damoh	17878	8074	747	9057	22531	58287
3.	Datia	50263	—	—	14	50	50327
4.	Guna	42166	11666	2635	4201	22962	83630
5.	Panna	11289	596	340	10518	15061	37804
6.	Raisen	26749	28753	880	2687	23493	82562
7.	Sagar	52117	4014	601	3293	29389	89414
8.	Satna	72031	13190	9939	4401	17426	116987
9.	Tikamgarh	114763	2355	1910	3760	5400	128188
10.	Vidisha	24714	14370	650	1783	155762	197279
	Total	**508730**	**83473**	**17988**	**45247**	**303598**	**959036**

Source Report on Census of Minor Irrigation Scheme 1993-94, Ministry of Water Resources, Govt of India, 2001, Vol II-VI

Net sown area and Irrigated area in Madhya Pradesh 1993-94

Ha

SN	District	Net Area Sown	M & M Schemes	Groundwater	Others	Total (C+D+E)	F as % of B
	A	B	C	D	E	**F**	**G**
1.	Chhatarpur	355071	1655	52265	24096	**78016**	**21.97**
2.	Damoh	295214	1562	15220	34726	**51508**	**17.45**
3.	Datia	131203	1775	18271	6684	**26730**	**20.37**
4.	Guna	569419	5042	27669	33234	**65945**	**11.58**
5.	Panna	233234	804	6619	24348	**31771**	**13.62**
6.	Raisen	414234	41570	27938	23723	**93231**	**22.51**
7.	Sagar	531981	4122	24645	35492	**64259**	**12.08**
8.	Satna	352085	1414	30262	22665	**54341**	**15.43**
9.	Tikamgarh	243365	2440	54736	15730	**72906**	**29.96**
10.	Vidisha	496078	26936	21468	36264	**84668**	**17.07**
	Total	**3621884**	**87320**	**279093**	**256962**	**623375**	**17.21**

Source Report on Census of Minor Irrigation Scheme 1993-94, Ministry of Water Resources, Govt of India, 2001, Vol: VI

UTTAR PRADESH

Ha

	District	Dugwells	Shallow Tubewells	Deep Tubewells	Surface Flow Schemes	Surface Lift Schemes	Total
1.	Banda	27431	32238	22790	228	1947	84634
2.	Hamirpur	5809	31559	5459	—	21	42848
3.	Jalaun	8908	16681	22609	197	936	49331
4.	Jhanshi	95278	8483	220	98	311	104390
5.	Lalitpur	48337	721	—	—	—	49058*
6.	Mahoba	31438	518	—	—	—	31956
	Total	**217201**	**90200**	**51078**	**523**	**3215**	**362217**

Source Report on Census of Minor Irrigation Scheme 1993-4, Ministry of Water Resources, Govt of India, 2001, Vol II-VI
Note In 1996, the Minor irrigated area Lalitpur had gone upto 71077 Ha, according to Progress Report of Minor Irrigation Programme (Jhanshi Division) Oct. 1996.

Net sown area and Irrigated area in Uttar Pradesh 1993-94

Ha

	District	Net Area Sown	M & M Schemes	Groundwater	Others	Total (C+D+E)	F as % of B
	A	B	C	D	E	**F**	**G**
1	Banda	521964	6428	3253	114326	**124007**	**23.76**
2	Hamirpur	310885	29564	43909	20787	**94260**	**30.32**
3	Jalaun	336104	110468	37578	7359	**155405**	**46.24**
4	Jhanshi	292360	50482	52852	47173	**150507**	**51.48**
5	Lalitpur	219004	37099	49067	0	**86166**	**39.34**
6	Mahoba	191746	1569	670	58811	**61050**	**31.84**
	Total	1872063	235610	187329	248456	**671395**	**35.86**

Source Report on Census of Minor Irrigation Scheme 1993-94, Ministry of Water Resources, Govt of India, 2001, Vol: VI

Note The Net sown area figure for Lalitpur has been taken from Sankhyikiya Patrika, State Planning Inst UP, 1994 for Lalitpur for the year 1991-2 as the figure given in Minor irrigation Census (39095 Ha, which was less than the total irrigated area in the above table) was apparently wrong.

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