

State of India's Rivers
For
India Rivers Week, 2016

MADHYA PRADESH



Author

Manoj Misra

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INTRODUCTION

1. State profile

The state of Madhya Pradesh was bifurcated in the year 2000.

Area: The total area of MP state is 3,08,245 sq. km

Administrative units: The state has been divided into 50 districts and 342 sub districts.



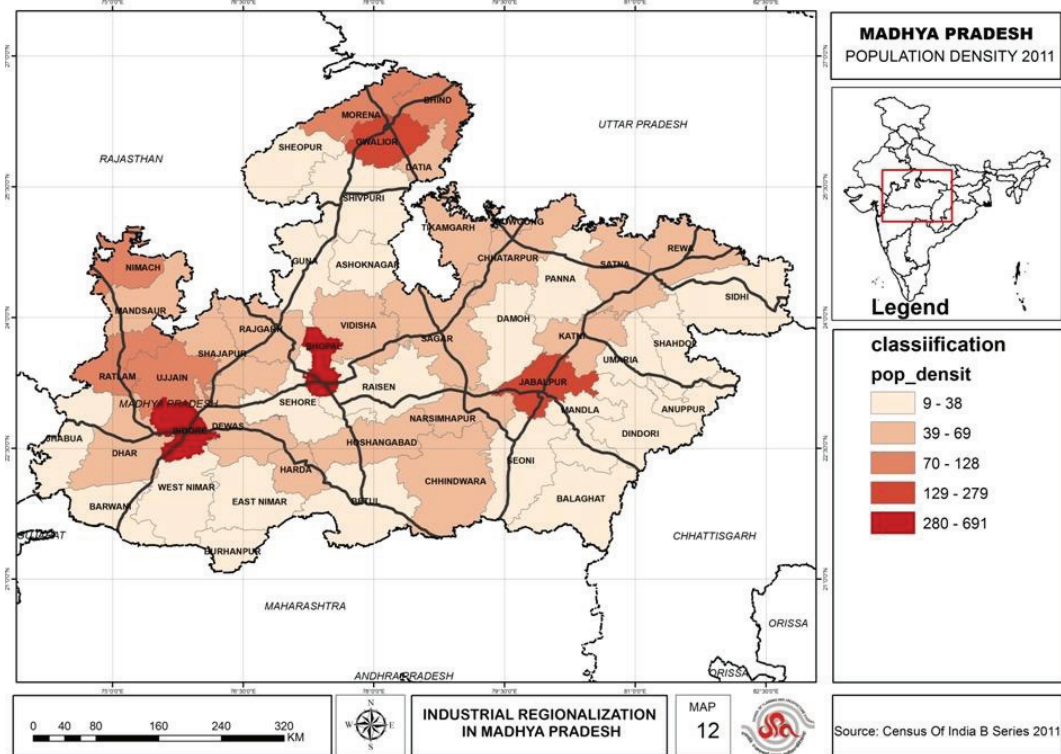
Map No 1: District Division Map of Madhya Pradesh

Population: The total human population of the state is 725.97 million. (2011 census) with a decadal growth rate of 20.3%. Key centres of growth are around the urban centres of Gwalior, Indore, Bhopal and Jabalpur.

2. Climate:

It has a subtropical climate. Hot dry summer extends from April to June followed by monsoon from July to September and winter months (November to February) are cool and relatively dry. The average rainfall is about 1,370 mm and it decreases from east to west.

Summer mean maximum temperature rises to about 42.5 deg C in northern parts and the average temperature during winters is as low as 10 Deg C again in the north while it varies from 10 – 15 deg C in the south. (Source: Gosain et al in *Climate Change in Madhya Pradesh: A Compendium of Expert Views – II*)



Map No 2: Population Density Distribution of Madhya Pradesh

3. Physiographic conditions:

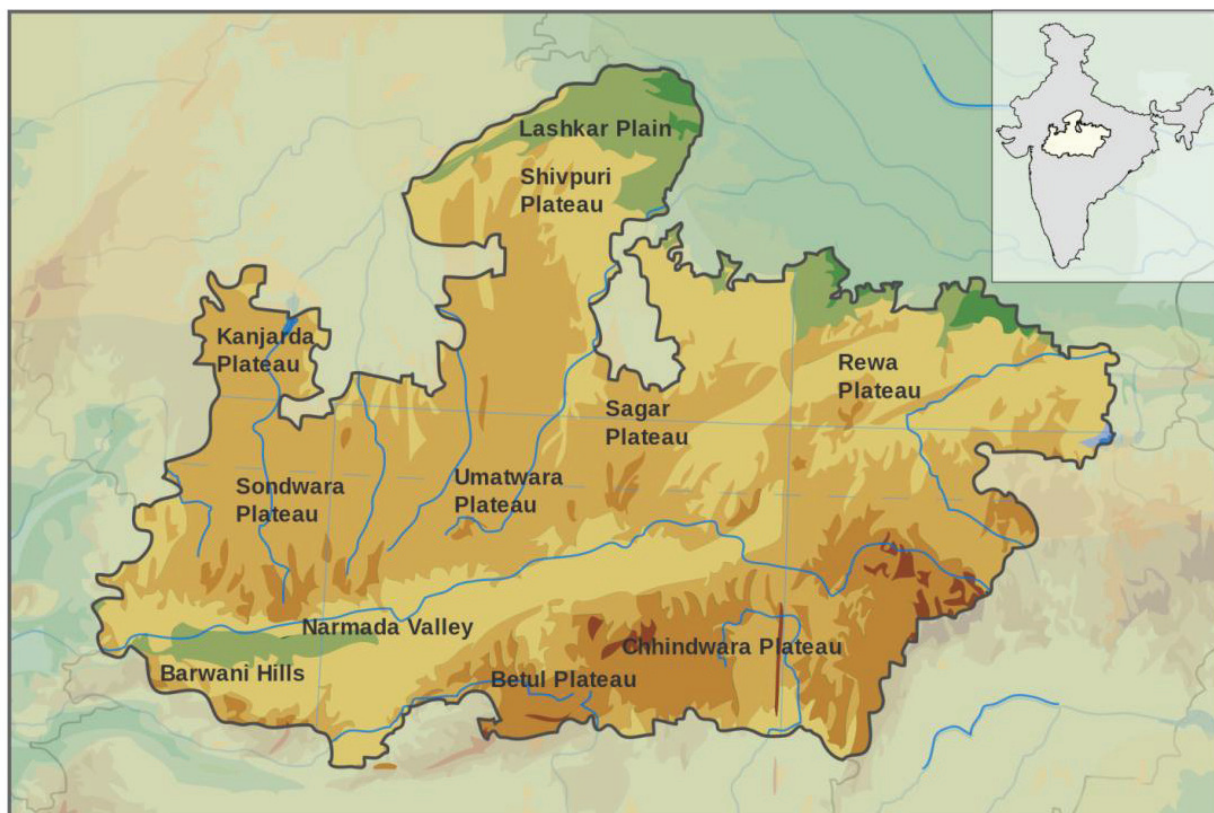
Madhya Pradesh consists largely of a plateau streaked with the hill ranges of the Vindhyas and the Satpuras with the Chattisgarh plains to the east.

For the sake of convenience Madhya Pradesh is divided into 7 Physiographic divisions which are mentioned below:

([HTTP://WWW.INDIASTUDYCHANNEL.COM/RESOURCES/162624-BAGHELKHAND-PLATEAU-MADHYA-PRADESH.ASPX](http://www.indiastudychannel.com/resources/162624-BAGHELKHAND-PLATEAU-MADHYA-PRADESH.ASPX))

- Malwa Plateau
- Plateau of Madhya Bharat
- Bundelkhand Plateau
- Rewa Panna Plateau
- Narmada-Son valley
- Satpura Maikal Range

- Baghelkhand Plateau



Map No 3: Physiographic Pattern of M.P

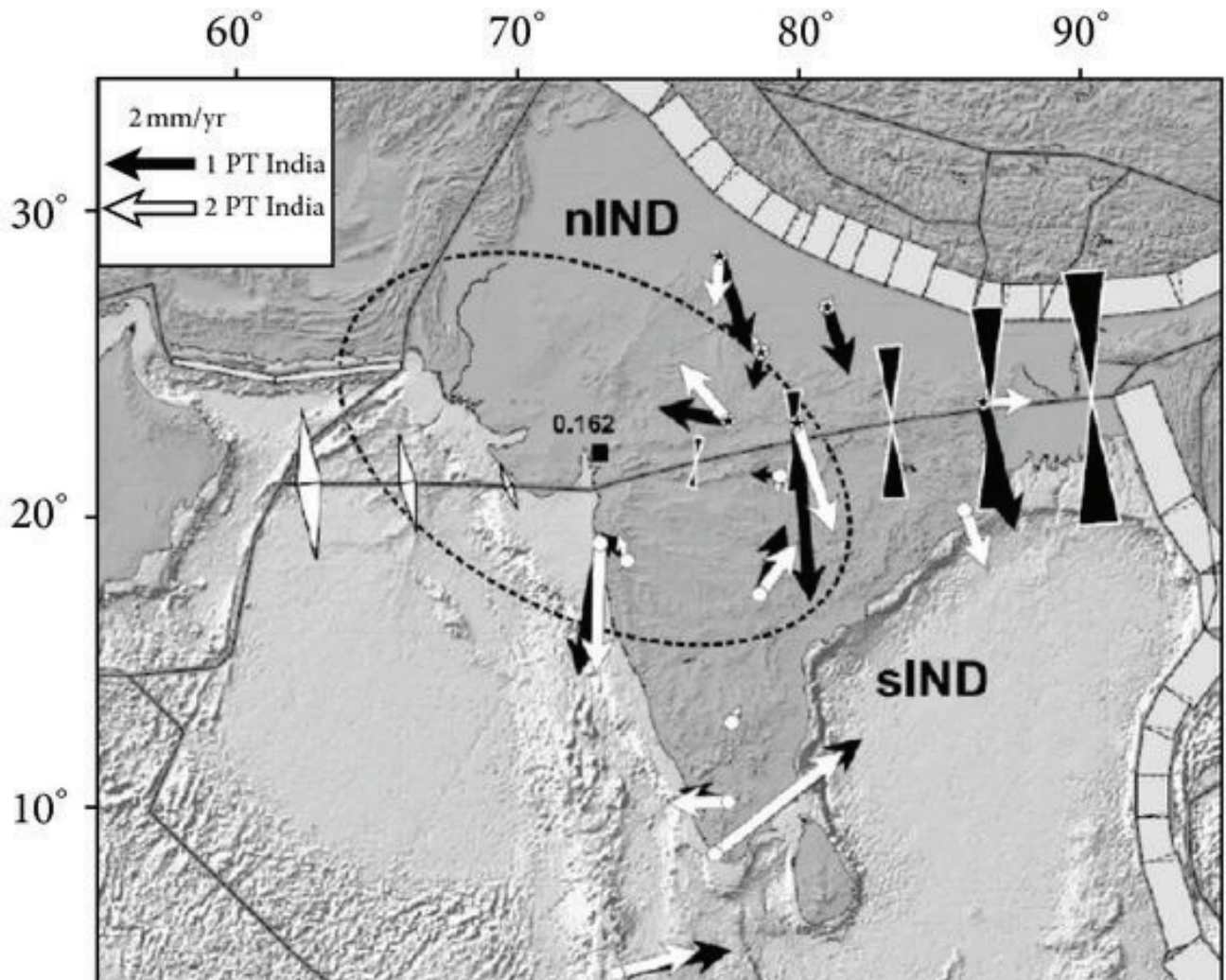
With the Vindhya and Satpuda ranges stretching through, almost the entire land mass of the state with few exceptions (Lashkar plain in north, Narmada valley in south west and patches in north west) lay on a number of plateaus and hills (Kanjarda, Sondwara, Umatwara, Shivpuri, Sagar, Rewa, Chhindwara and Betul Plateau and Barwani hills). Resultantly number of rivers originates from these uplands draining ultimately into neighboring states.

West flowing river Narmada (in association with the north and north east flowing river Son) utilizes the rift valley between the Vindhyan and the Satpuda range to bifurcate the state into north – south halves. Tapi, another west flowing river, with small catchment in the state also flows in a rift valley. This is explained below.

4. SONATA (Sone-Narbada-Tapi) RIFT

The SONATA zone in central Indian shield divides the Indian plate into two halves and has a long tectonic history dating back to the Archaean times and trends in ENE-WSW direction and is laterally traceable for more than 1000 km. It demarcates the Peninsular India into two geologically distinct provinces: the Vindhyan-Bundelkhand province to the north and the Deccan province to the south. The Narmada and Tapi rivers throughout their course follow these tectonic trends that are also known as central Indian tectonic zone (CITZ)

([HTTPS://WWW.HINDAWI.COM/ARCHIVE/2013/325808/](https://www.hindawi.com/archive/2013/325808/))



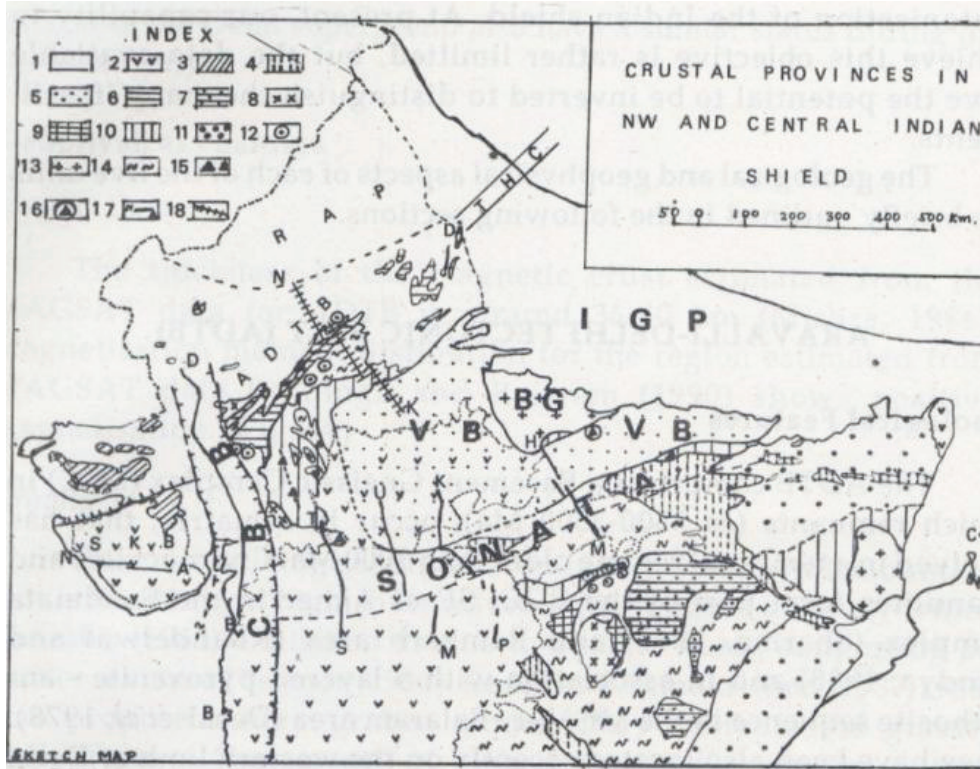
Map No 4: Tectonic Control on Drainage

[HTTPS://WWW.HINDAWI.COM/ARCHIVE/2013/325808/FIG7/](https://www.hindawi.com/archive/2013/325808/fig7/)

Rifting in the Indian subcontinent along certain Precambrian structural trends started right since its detachment from the mainland. Thus during the migratory history of the subcontinent three rifted basins namely Kutch, Cambay and SONATA (Son-Narmada-Tapti) developed.

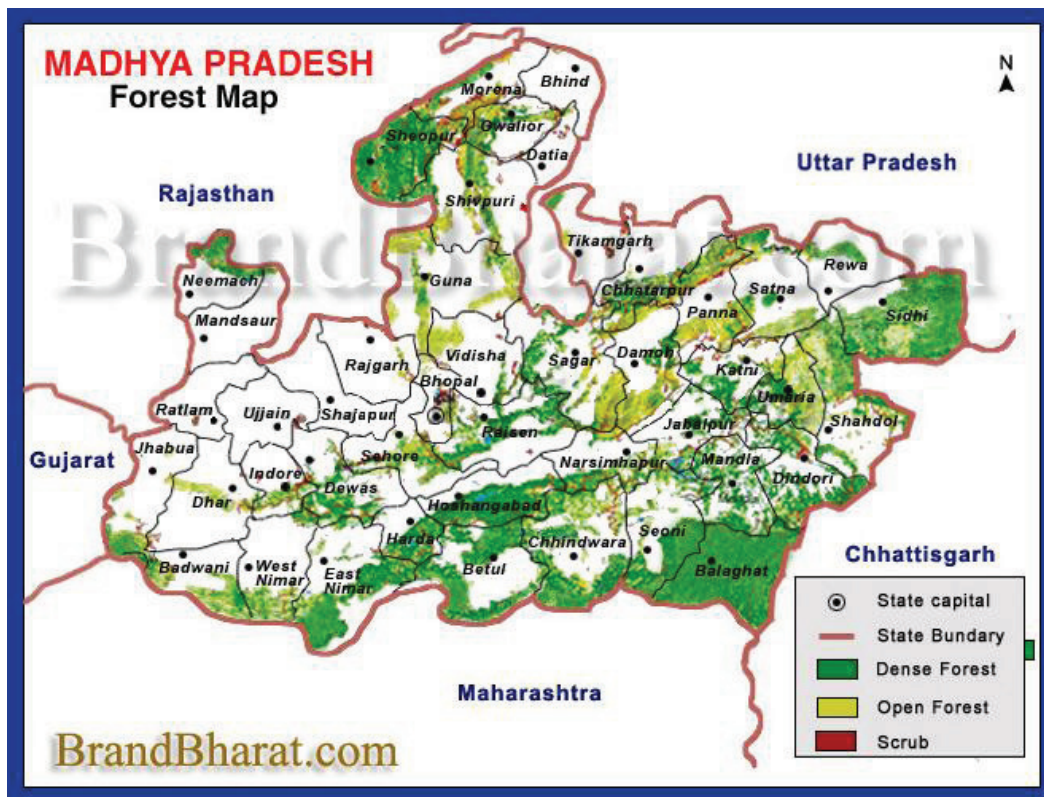
The SONATA zone traceable for a length of 1600 km has been identified as a typical mid continental rift ... Relative vertical movement up to one km and lateral movement to the extent of 30 km have been established in the 150-200 km wide SONATA belt during Quaternary times.

([HTTP://HOME.IITK.AC.IN/~VINAYKG/ISET411.PDF](http://home.iitk.ac.in/~vinaykg/ISET411.pdf))



Map No 5: Crustal Province

5. Forests



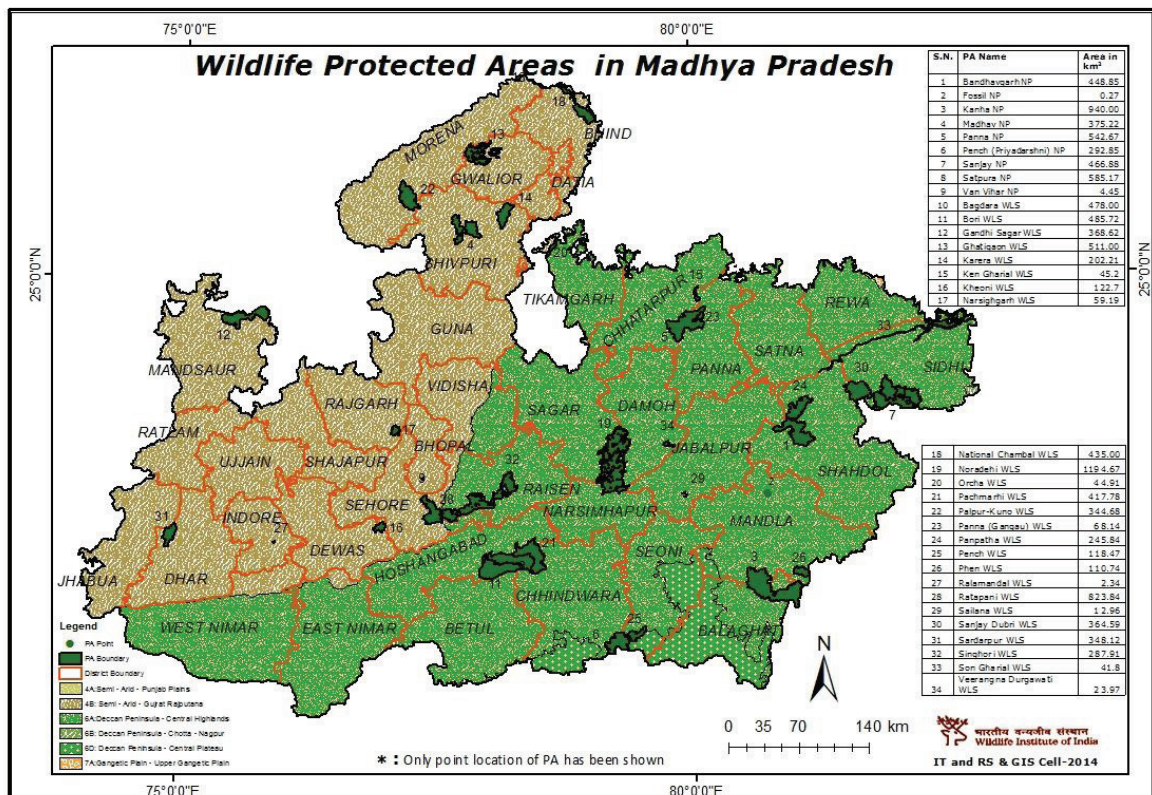
Map No 6: Forest Map of M.P

Forests of Madhya Pradesh cover around 95,221 sq kms area of the state. This area has been classified into 'Reserved Forest', 'Protected Forest' and 'Unclassified Forest'. Variability in climatic conditions brings about significant difference in the forest types of the state. There are four important types of forests namely Tropical Moist, Tropical Dry, Tropical Thorn, and Subtropical broadleaved Hill forests. The forest area can also be classified on the basis of composition of forest terrains. Based on composition, there are three important forest formations namely Teak forest, Sal forest and miscellaneous Forests. Bamboo bearing areas are widely distributed in the state of Madhya Pradesh.

Central, southern and eastern parts of Madhya Pradesh are rich in forests, while western and northern parts are comparatively deficient in forest.

([HTTP://WWW.INDIANETZONE.COM/50/FORESTS_MADHYA_PRADESH.HTM](http://www.indianetzone.com/50/forests_madhya_pradesh.htm))

Forests play a crucial role as river nurseries (most origins lay there) and house of springs that feed the rivers, the year round. The health of springs is key to river base flows in lean season, since devoid of high hills and glacial melt (as is true in the case of Himalayan rivers), rivers are fed by their forested catchments.

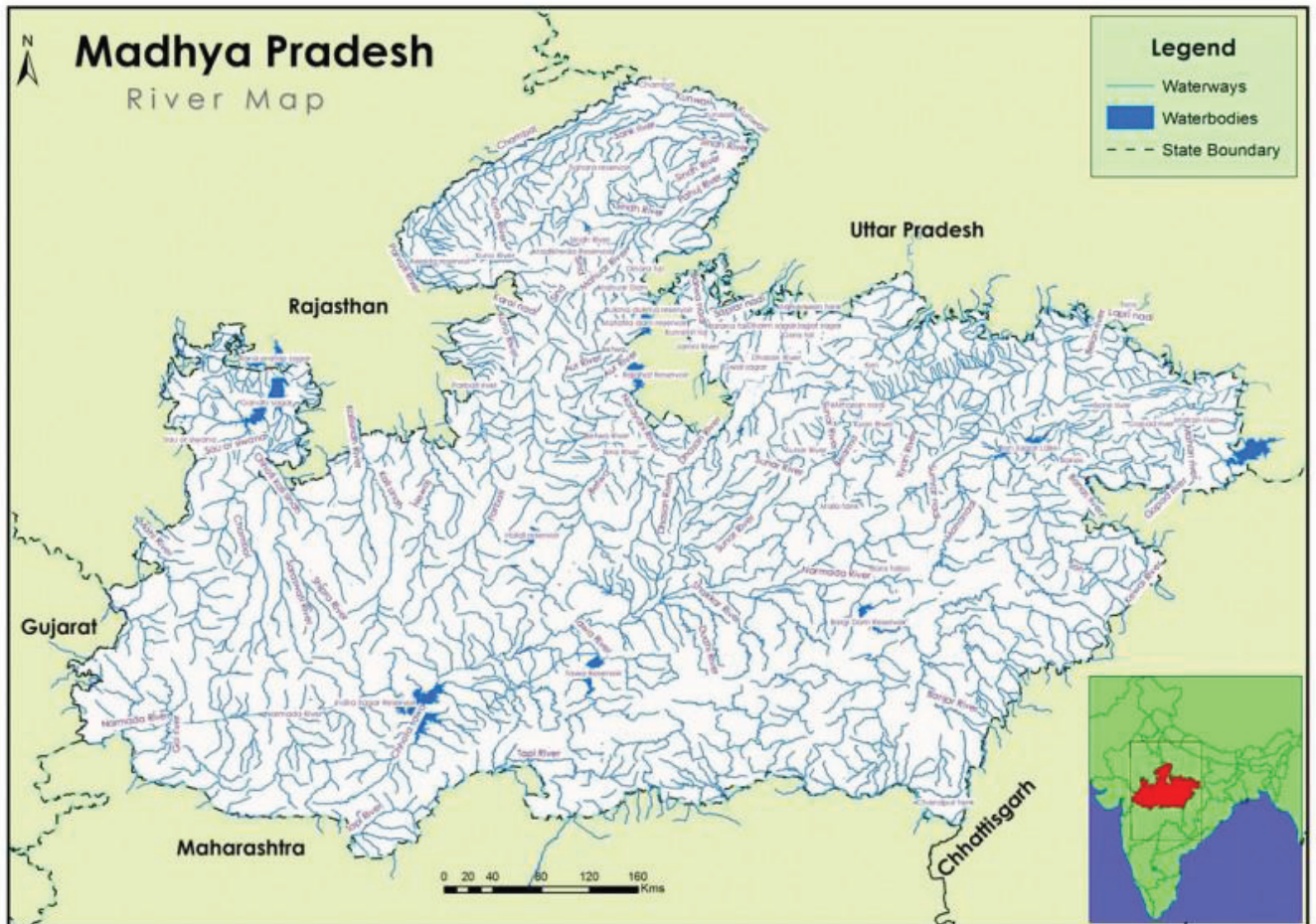


Map No 7: Wildlife Protected Area in M.P

6. Water

Surface water

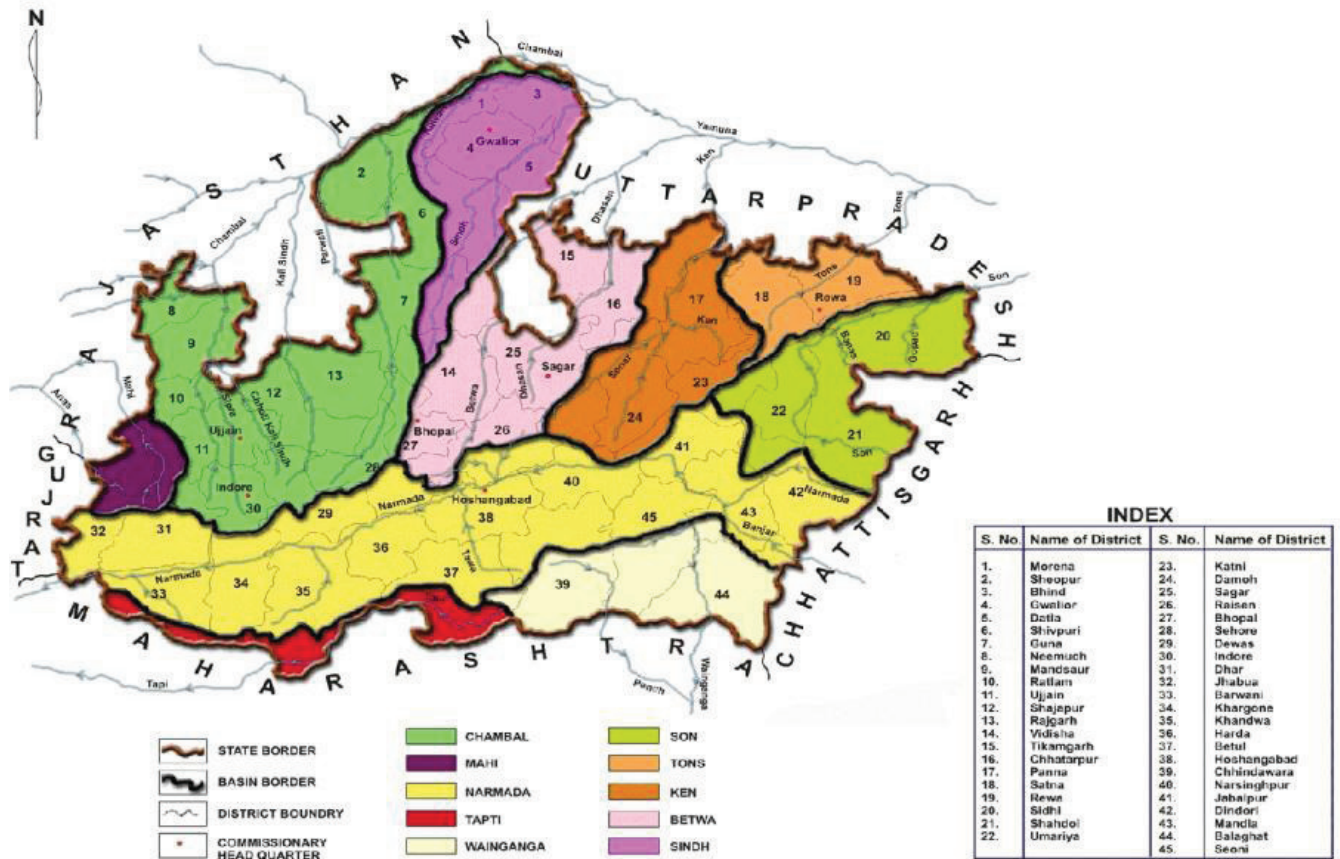
The drainage map of the state indicates streams spread over almost the entire land surface of the state.



Map No 8: River Map of M.P

Centrality and topography of the state results in rivers originating from within the state but draining out into the neighbouring states.

Ganga, Godavari, Tapi, Narmada and Mahi are the major river basins fed by the state. The State is further divided in to ten river sub basins. These are: 1) Chambal; 2) Sindh; 3) Betwa; 4) Ken; 5) Tons (Tamsa); 6) Son; 7) Narmada; 8) Wainganga; 9) Tapi; and 10) Mahi.



Map No 9: River Basin Map of M.P

The northern part of the state drains largely into the Ganga basin and the southern part into the Godavari and Tapi (Tapi) system. The Narmada, Tapi and Mahi rivers flow from east to west. The Vindhyas form the southern boundary of the Ganga Basin, with the western part of the basin draining into the Yamuna and the eastern part directly into the Ganga itself. All the rivers, which drain into the Ganga basin flow from south to north, with the Chambal, Shipra, Kali Sindh, Parbati, Kuno, Sind, Betwa, Dhasan and Ken rivers being the main tributaries of the Yamuna, joining the Ganga. While Tons and Son which originate in the state join directly the Ganga. The Son is of great significance in that it is the largest tributary going into the Ganga from the south bank and arising out of the hills of Madhya Pradesh rather than from the Himalayas. (Source: Gosain et al in Climate Change in Madhya Pradesh: A Compendium of Expert Views – II).

The Wainganga, the Wardha, the Pench, the Kanhan and Penganga rivers, discharge their waters into the Godavari system.

Table 1 : River Basin and Their Features

S. No.	River basin	Key rivers (length within the state in Km)	Catchment in the state (sq km)	Key tributaries
1	Ganga	Sone (500 km)	47849	Mahanadi, Katni, Kawal, Johila, Gopad, Bana, Kanhar, Rehar
2		Tamas (Tons) (238 km)	11974	Simarbarh, Satna, Bihar, Belan, Sonekar
3	Yamuna	Chambal (965 km)	59940	Kalisindh, Parvati, Kshipra, Khan, Kuno, Seop
4		Sindh (450 km)	26699	Kunwari, Mahuar, Pahuj
5		Betwa (216 km)	19365 (?)	Kaliasot, Halali, Baah, Bina, Dhasan, Jamni
6		Ken (360 km)	24785	Sonar, Bewar, Bearma, Barve, Patne, Urmil, Semeri,
7		Baghain (km)	?	
8		Paisuni (km)	?	Jamsar, Rajnak (??)
9	Narmada	Narmada (1077 km)	85930	Tawa, Barna, Dudhi, Shakkar, Hathani, Tenduni, Hiran
10	Tapti	Tapti (332 km)	9800	Ambharo, Mona, Puna, Kanair, Kanha, Sukta
11	Godawari	Wainganga (272 km)	??	Pench, Kanhan, Bagh
		Wardha (58 km)	??	??
12	Mahi	Mahi (183 km)	??	Anas, Khairya, Bageri, Jammarr

(SOURCE: ADAPTED FROM STATE OF ENVIRONMENT REPORT: MADHYA PRADESH, 2006)

Ground water

Madhya Pradesh has diverse hydrogeological characteristics resulting into varied water potential at different places. More than 80% of the total land area of the state is covered by variety of hard rocks varying in geological structures, geomorphological set up and hydro meteorological conditions.

State has following hydrogeological units:

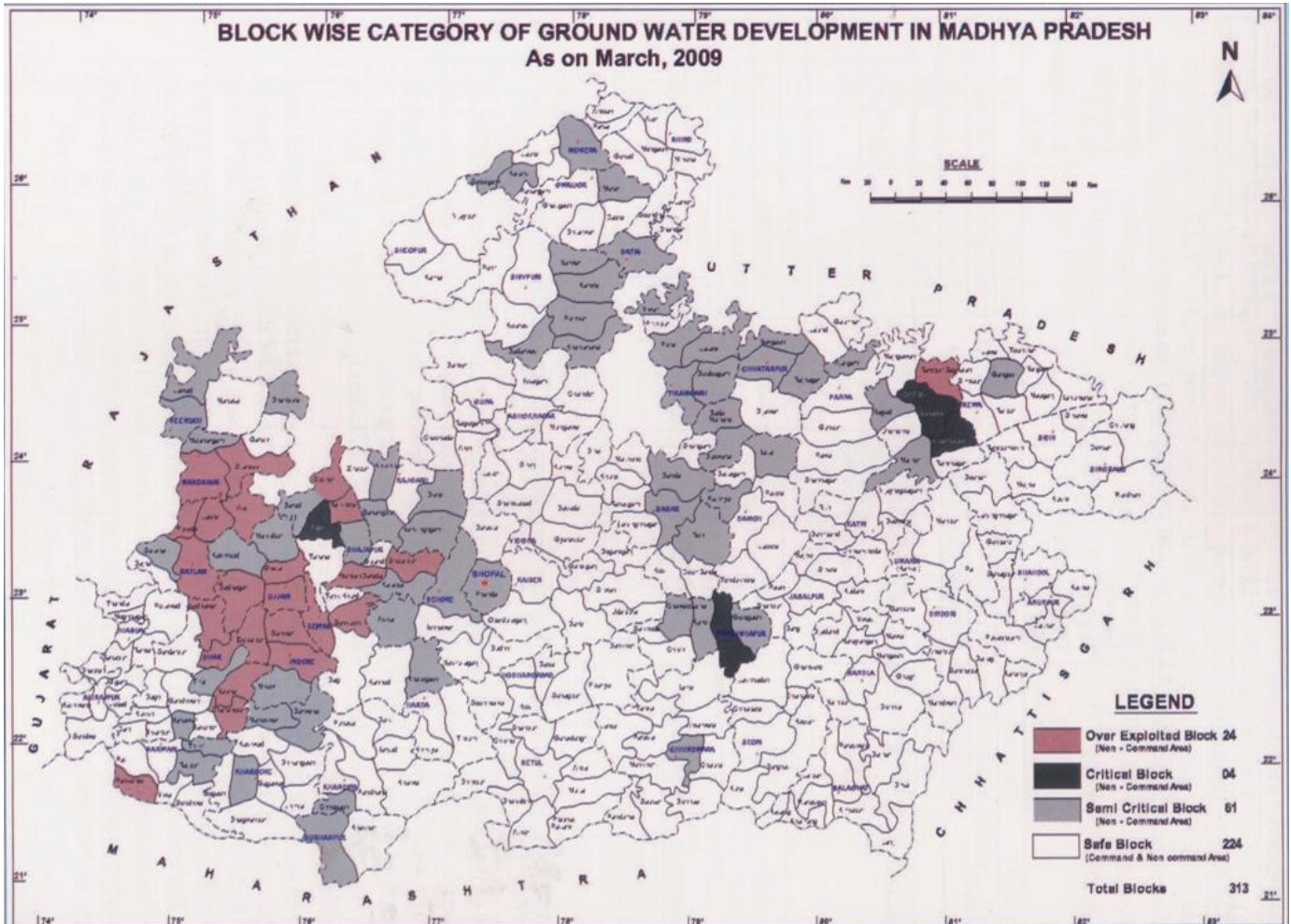
1. Archeans: comprising of old metamorphic rocks, granites, gneisses and schists. They have very low primary permeability and form poor aquifers
2. Vindhya: Comprise of sand stone, shale and limestone. Sand Stone and Shale are hard and compact forming poor aquifers, Limestone has secondary permeability
3. Gondwans: Sedimentary formations rich in granular zones and form good aquifers
4. InfraTrappeans: Sedimentary formations but have a limited extent and poor to moderate permeability
5. Deccan Traps: The weathered, fractured, jointed and vesicular units of Basalts form moderate to good aquifers, this type of units form the most important aquifers in the region. They occupy the Malwa Plateau
6. Alluvium: comprises of unconsolidated gravel, sand, silt clay in various proportions, has primary intergranular porosity and permeability. They form very good aquifers.

According to a 1998 report the net GW availability in the state (excluding the area now in Chattisgarh) is 3.1 million (ha.m). Out of which total utilizable GW (70% of the net availability) is 2.17 million (ha.m). Current GW draft is 1.43 million (ha.m). (*Quoted in SOE report, MP, 2006*).

More than 90% of the rural and 50% of Urban population is dependent on ground water sources in the state. Ground water being the major source of irrigation. According to ground water report submitted in 2013 about 6,714,300 hectare of land is irrigated through ground water. There are reports about declining Ground water levels throughout the state. Ground water has also proved to be an important resource to meet the rapidly expanding demand of drinking water.

([HTTP://WWW.IOSRJOURNALS.ORG/IOSR-JAC/PAPERS/VOL9-ISSUE6/VERSION-1/D0906012835.PDF](http://www.iosrjournals.org/iosr-jac/papers/vol9-issue6/version-1/D0906012835.pdf))

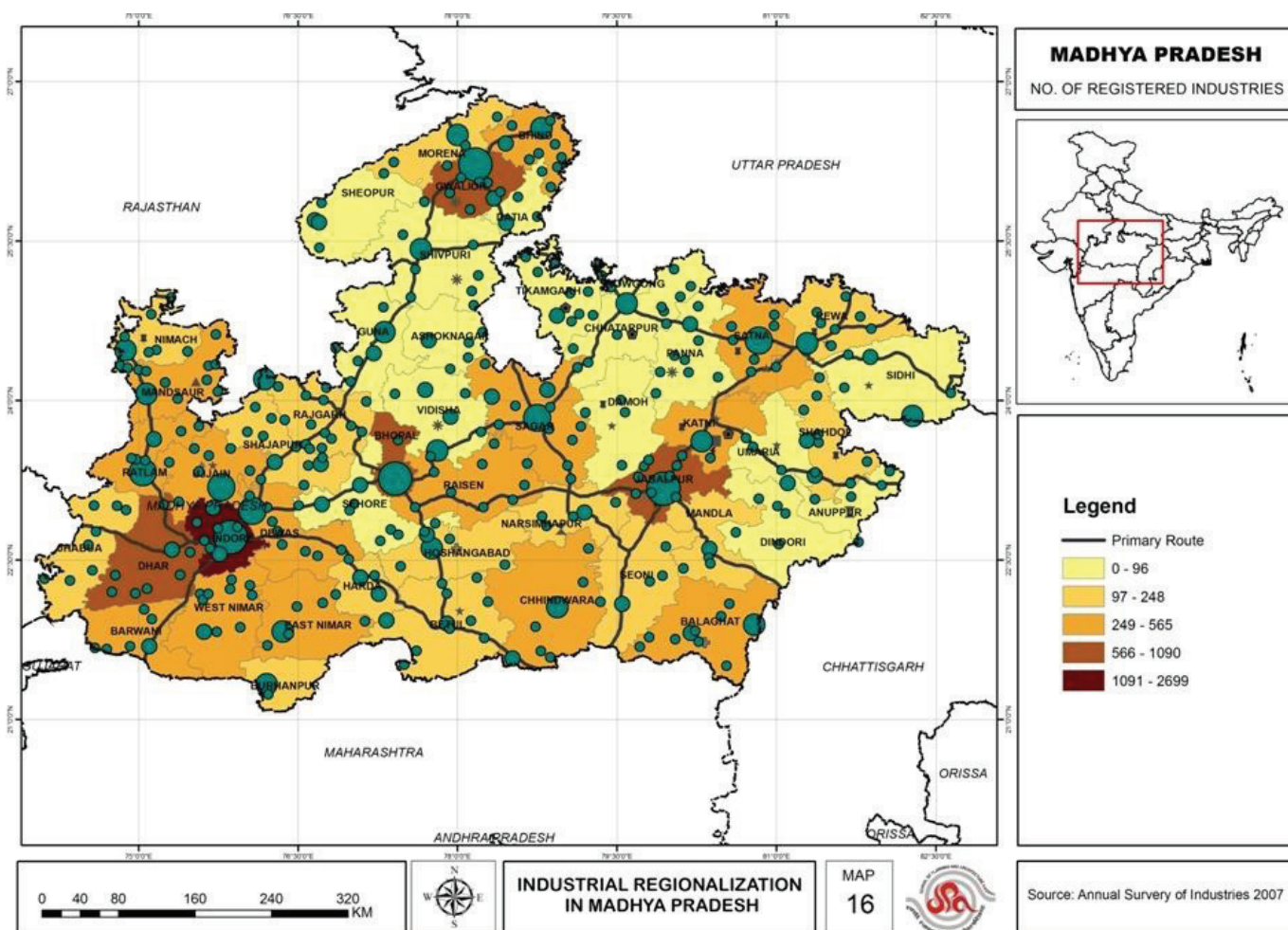
It is well known that the flowing rivers contribute significantly to ground water recharge through their associated aquifers.



Map No 10: Block Wise Category of Ground Water Development in M.P

7. Industries

Industrialisation is often associated with an increase in the pollution load onto water bodies including rivers. The pace of industrialization in the state is slowly but steadily rising. The key industrial centres in the state are in and around the cities of Indore-Ujjain, Ratlam, Mandsaur, Neemach, Bhopal, Gwalior, Morena, Sagar, Jabalpur and Satna.



Map No 11: Registered Industrial Location

Table 2: Industries Discharging Treated Effluent Into Rivers in MP:

S.No	River	Industry	Location
1	Chambal	M/s Grasim Industries	Birlagram, Nagda, Mandsaur
2	Sone	M/s Orient Paper Mill	Amlai,
3	Narmada	M/s Security Paper Mill	Hoshangabad

(SOURCE: MPPCB (([HTTP://WWW.MPPCB.NIC.IN/BASIN.HTM](http://www.mppcb.nic.in/basin.htm)))

POLLUTION

8. Polluted River Stretches in Madhya Pradesh

The rivers in Madhya Pradesh are monitored by CPCB at 96 locations on 41 rivers. Among these 45 locations are not complying with the Water Quality Criteria. These 45 locations are situated on 21 rivers viz. Banjar, Betwa, Bichia, Chambal, Chillar, Denwa, Gohad, Gour, Jammer, Kalisot, Khan, Kolar, Kshipra, Kunda, Malei, Narmada, Parvati, Shivna, Tapi, Tons and Wainganga. The polluted rivers in Madhya Pradesh are in 5 priority classes (Class- I, II, III, IV and V).

The details of polluted river stretches are as under:

Table 3: The Details of Polluted River Stretches

S. No.	River (Basin)	Stretch	Towns	Length (km)
1	Banjar (Narmada)	Malanjkhanda - Tingipur	Malanjkhanda, Tingipur	15
2	Betwa (Yamuna)	Mandidweep - Vidisha	Mandidweep, Vidisha, Bhopal, Raisen	70
3	Bichia (Tons)	Silpari - Gadhwara	Rewa	5
4	Chambal (Yamuna)	Nagda - Rampura	Nagda, Rampura	150
5	Chillar (Chambal)	Shajapur - Muradpura	Shajapur, Dansipura, Muradpura	10
6	Denwa (Narmada)	Dhupgarh - Sarni	Dhupgarh, Sarni, Banipura	50
7	Gohad (Sindh)	Gohad dam - Gormi	Gohad, Gormi	25
8	Gour (Narmada)	Jabalpur - Saliwada	Jabalpur	15
9	Jammer (Mahi)	Dholowad - Raoti	Raoti	5
10	Kaliasot (Betwa)	Mandidweep – Samardha	Bhopal,	12

		village	Mandidweep	
11	Khan (Kshipra)	Kabit Khedi - Khajrana	Indore	8
12	Kolar	Surajnagar - Shirdipuram	Indore	8
13	Kshipra (Chambal)	Siddhawati - Trivenisangam	Ujjain	8
14	Kunda	Khargone - Khedikhurd	Khargone	15
15	Malei	Jaora - Barauda	Jaora	10
16	Narmada (Narmada)	Mandala – Bhedaghat. Sethani ghat - Nemawar	Mandala, Jabalpur, Hoshangabad, Nemawar	160
17	Parvati (Chambal)	Batawada - Pilukhedi	Batawada, Pilukhedi, Narsinghgarh	80
18	Shivna (Chambal)	Mandsaur - Malaykhedi	Mandsaur	8
19	Tapi (Tapi)	Nepanagar - Burhanpur	Nepanagar, Burhanpur	25
20	Tons (Ganga)	Chakghat - Chappar	Gargata, Chakghat, Chapar	5
21	Wainganga (Godavari)	Chindwara - Balaghat	Chindwara, Balaghat, Seoni	150

(SOURCE: [HTTP://CPCB.NIC.IN/RESTORATION-OF-POLLUTED-RIVER-STRETCHES.PDF](http://cpcb.nic.in/restoration-of-polluted-river-stretches.pdf))

9. Trace and Toxic Metals In Mp Rivers, 2014 (Cwc)

Table 4: Toxic Metal in Rivers

S. No.	River	Location	Pollutant
1	Mahi	Khanpur, Mataji, Paderdibadi	Fe
2	Narmada	Bamanghat, Garudeshwar, Handia	Fe

3	Sone	Japla, Koelwar	Fe
4	Tapi	Sarangkheda	Fe
5	Sone	Kuldah Bridge	Cu
6	Narmada	Dindori, Mandleshwar, Manot,	Cu
7	Wardha (Godawari)	Bamni,	Cu
8	Banjar (Narmada)	Bamni	Ni, Fe
9	Narmada	Sandia	Ni, Fe
10	Narmada	Hoshangabad	Ni, Fe
11	Tapi	Burhanpur	Cu, Ni, Fe
12	Tapi / Purna	Gopalkheda	Ni, Fe
13	Wainganga	Kumhari, Pauni and Ashti	Cu, Ni
14	Wardha	Hivra	Cu, Ni

SOURCE: [HTTP://WWW.CWC.NIC.IN/MAIN/DOWNLOADS/TRACE%20&%20TOXIC%20REPORT%2025%20JUNE%202014.PDF](http://www.cwc.nic.in/main/downloads/trace%20&%20toxic%20report%2025%20june%202014.pdf).

(STATUS OF TRACE AND TOXIC METALS IN INDIAN RIVERS, 2014 (CWC))

10. Water Quality of rivers at interstate borders, 2015:

(SOURCE: [HTTP://CPCB.NIC.IN/UPLOAD/NEWITEMS/NEWITEM_211_IRBM_REPORT.PDF](http://cpcb.nic.in/upload/newitems/newitem_211_irbm_report.pdf))

Water Quality of River Chambal:

Water quality monitoring of the river is carried out at 02 locations at the interstate boundaries of U.P/M.P. and Rajasthan/M.P. The BOD and DO concentrations are meeting to the prescribed standards at both the locations. However, Total Coliform count is exceeding at the location Udi (U.P.).

Water Quality of River Mahi:

Water quality monitoring of the river is carried out at 2 different locations of interstate boundary of M.P./Rajasthan and Gujarat/ Rajasthan. The BOD and DO concentrations are within the prescribed range at both the locations. Total Coliform count is exceeding at Kadna Dam, (Gujarat).

Water Quality of River Betwa:

Water quality monitoring of the river is carried out at 2 different locations of interstate boundary M.P./U.P. Concentration of BOD and DO is meeting the prescribed standards whereas Total Coliform count is exceeding at both the locations.

Water Quality of River Sone:

Water quality monitoring of the river is carried out at 2 different locations of the interstate boundary M.P./U.P. The BOD and DO level are within the prescribed range whereas Total Coliform count is exceeding at both the locations.

Water Quality of River Wardha:

Water quality monitoring of the river is carried out at 2 different locations at the interstate boundary M.P./Maharashtra. The BOD and DO level are meeting to the prescribed standards. However, Total Coliform count is exceeding at one location i.e. Belur Dhemadabad (Maharashtra).

Water Quality of River Tapi:

Water quality monitoring of the river is carried out at 3 different locations at the interstate boundaries of Maharashtra/Gujarat and Maharashtra/M.P. The BOD and DO level are meeting the prescribed standard. However, Total Coliform count is exceeding the prescribed standards at all 03 locations.

Water Quality of River Narmada:

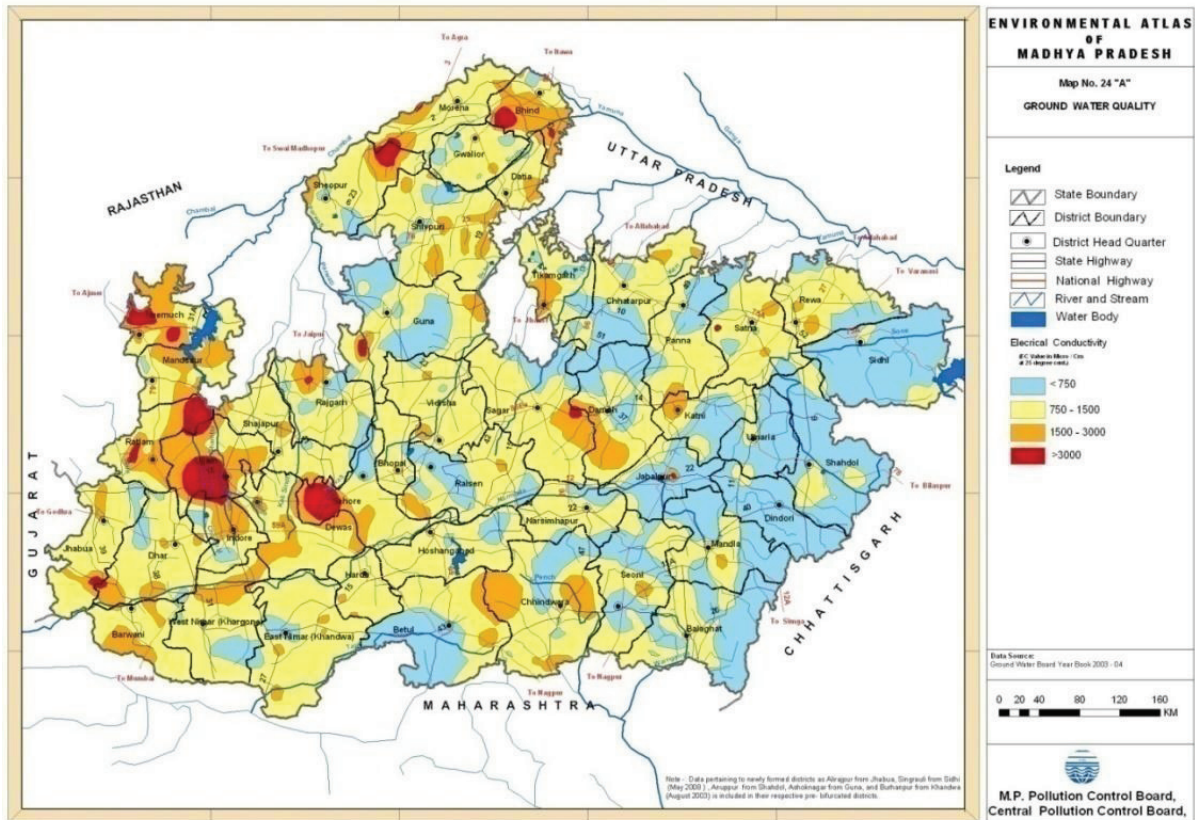
Water quality monitoring of the river is carried out at the location at the interstate boundary of Gujarat/M.P. The BOD and DO level are meeting the prescribed Standards. Where as the Total Coliform count is exceeding at said location.

Water Quality of River Wainganga:

Water quality monitoring of the river is carried out at the location of interstate boundary of Maharashtra/M.P. The BOD and DO level are within the prescribed range indicating the good water quality at the location. Total Coliform count is exceeding at the aforesaid location.

11. Ground water quality

The quality of ground water in the state has been shown in the following map prepared by MPPCB. It is seen that the ground water quality is poor mostly in and around major cities in the state.



Map No 12: Ground Water Quality

(SOURCE: [HTTP://WWW.NCHSE.ORG/MPGIS/IMAGES/MAAPS/POLLUTION%20CONTROL%20BOARD/GROUNDWQA.JPG](http://www.nchse.org/mpgis/images/maps/pollution%20control%20board/groundwqa.jpg))

DAMS AND HYDRO POWER DEVELOPMENT

(Source: http://www.india-wris.nrsc.gov.in/wrpinfo/index.php?title=Madhya_Pradesh)

1. There are 758 dams on various rivers in the state.
2. The major Hydro Power Stations in Madhya Pradesh are listed below:
 1. Bansagar Tons HE project (River Sone)
 2. Indirasagar HE project (NHDC) (River Narmada)
 3. Omkareshwar HE project (NHDC) (River Narmada)
 4. Madikheda HE project (River Sindh)
 5. Bargi HE project (River Narmada)

6. Pench HE Project (Joint venture of MP & Maharashtra) (River Pench)
7. Rajghat HE project (Joint venture of MP & UP) (River Bewas, Ken system)
8. Maheshwar HE project (Under Construction)- Under Private sector (River Narmada)
9. Tawa HE Project (Under private sector) (River Narmada)
10. Birsinghpur HE project (River Johilla, Sone system)

INTER-STATE AGREEMENTS

12. Narmada Basin

1. Agreement Dated 22nd July, 1972 between Governments of Gujarat, Madhya Pradesh and Rajasthan on Narmada Development.
2. Agreement Dated 12th July, 1974 between the Governments of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan about the Narmada water dispute.
3. Agreement Dated 8th March, 1975 between the Governments of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan on development of Narmada waters.
4. Agreement Dated 5th April, 1978 between the Governments of Gujarat and Madhya Pradesh about the medium schemes in Narmada Basin.
5. Narmada Water Dispute Tribunal Award

13. Ganga Basin

1. Agreements Dated 29th April, 1965 between the Governments of Uttar Pradesh and Madhya Pradesh regarding the following Projects. i) Execution of Bhandar Canal (Matatilla Dam) ii) Allocation of Waters from the Rangwan Dam iii) Allocation of waters from the Jamni Dam.
2. Agreements Dated 18th October, 1965 between the Governments of Uttar Pradesh and Madhya Pradesh regarding Bhandar Canal project.
3. Agreements Dated 1st August, 1972 between the Governments of Uttar Pradesh and Madhya Pradesh regarding some Irrigation projects in Bundelkhand.
4. Agreements Dated 16th September, 1973 among the Governments of Bihar, Madhya Pradesh and Uttar Pradesh regarding Bansagar project.
5. Summary record of decision taken at the interstate meeting held on 8th December, 1973 between the officials of Madhya Pradesh and Uttar Pradesh regarding supplies to Bhandar Canal- Rabi Season of 1973-74.
6. Agreements Dated 9th December, 1973 between the Governments of Uttar Pradesh and Madhya Pradesh regarding Rajghat Project.

7. Summary record of decision taken at the interstate meeting held on 13th January 1977 between the chief Ministers of Madhya Pradesh and Uttar Pradesh regarding the following projects: (i) Rajghat (ii) Paisuni (iii) Ken Canal (iv) Kanhar (v) Urmil, (vi) Bansagar, and (vii) Bhandar Canal
8. Agreements Dated 20th February, 1982 on sharing of Kanhar waters reached between the states of Bihar, Madhya Pradesh and Uttar Pradesh.

14. Tapi Basin

1. Agreement Dated 8th March 1964 between the Governments of Maharashtra and Madhya Pradesh regarding interstate irrigation and Hydel projects.
2. Agreement Dated 16th May, 1969 between the Governments of Maharashtra and Madhya Pradesh regarding inter-state Irrigation and Also regarding constitution of inter-state control board for Joint Irrigation and Hydel Project.
3. Agreement Dated 12th January, 1986 for sharing of Tapi water between Maharashtra and Madhya Pradesh.

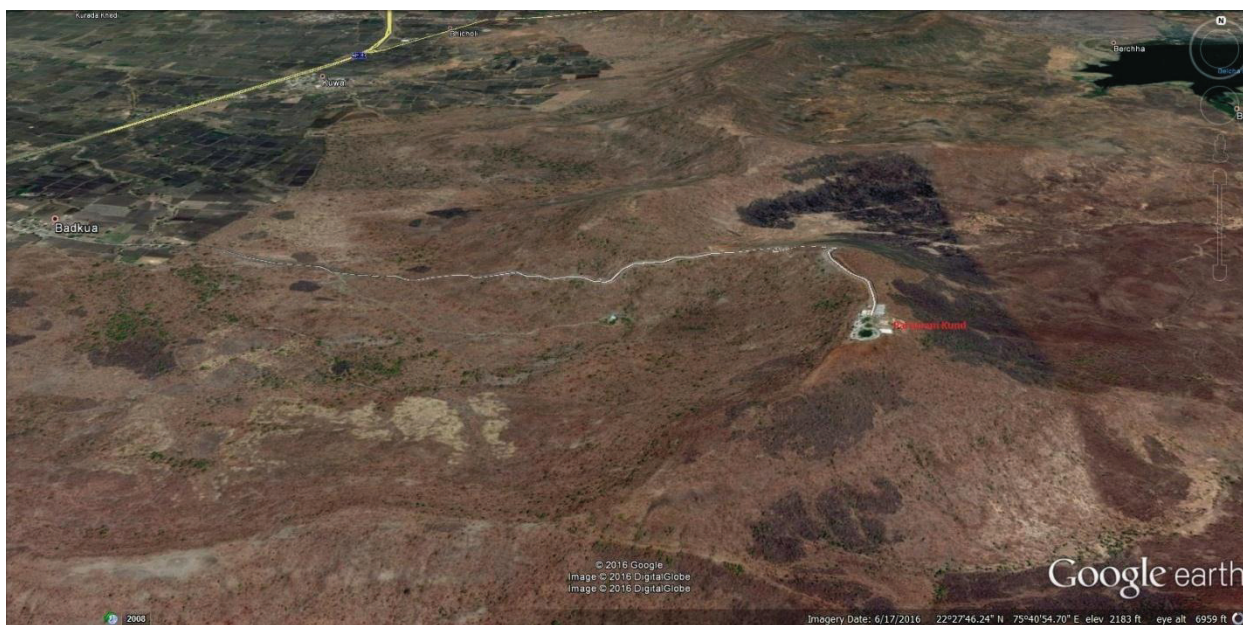
15. Godavari Basin

1. Summary record of decision taken at the inter-state conference held on 27th July and 28th July, 1951 among the states of Bombay, Madras, Hyderabad, Madhya Pradesh and Mysore regarding the utilization of Krishna and Godavari waters.
2. Agreement Dated 8th March, 1964 between the Governments of Maharashtra and Madhya Pradesh regarding certain inter-state irrigation and hydel projects
3. Agreement Dated 16th May, 1969 between the Governments of Maharashtra and Madhya Pradesh regarding certain Inter-state irrigation and Hydel Projects: Pench & Bagh and also regarding the constitution of interstate control board for joint irrigation and hydel projects.
4. Agreement Dated 31st January, 1975 between the Governments of Maharashtra and Andhra Pradesh regarding the Swarn Project and other agreements between the governments of Madhya Pradesh and Maharashtra regarding the following Projects: Bhawanthadi, Bhopalpatnam Project I and II, Kalisarar Project, Nugur II Hydro-Electric Project, Kotri Nibra Hydro-Electric Project and Bandia Hydel Electric Project.
5. Godavari Water Dispute Tribunal

RIVER BASINS

16. Chambal

Starting its life as a very tentative stream from a small pond (Parsuram Kund) on top of a concave hillock (Janapao hill) near Mhow, it is soon joined by a number of equally ephemeral and meandering streams and the river does not come into its own till it passes by a village called Chambal Baroda some 25 km from the origin.



Map No 13: Google Image of Janapao Hill (Parsuram Kund)

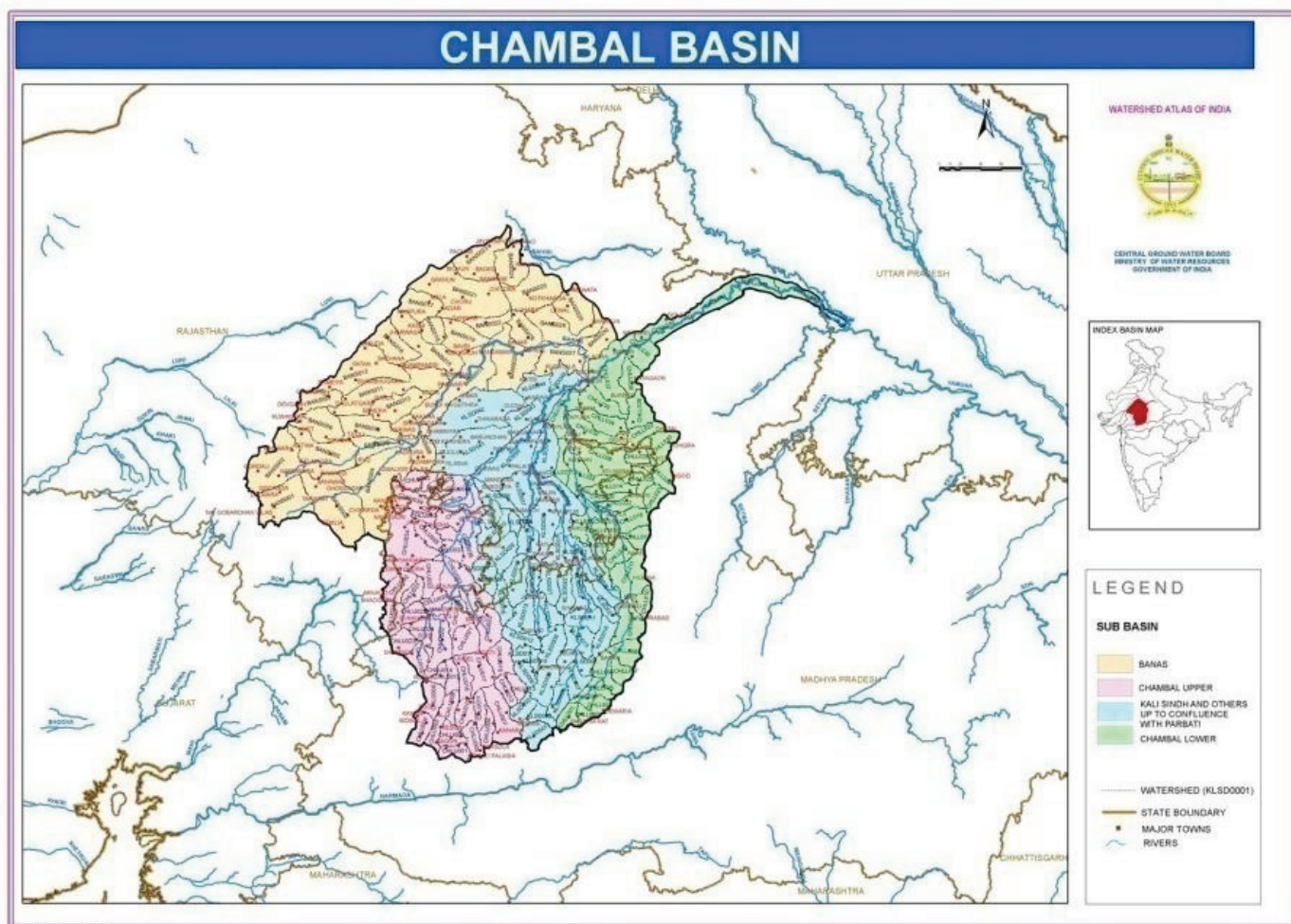
Even later, the river is still unsure of itself, despite few notable tributaries meeting and feeding it, till Chamla river joins it little downstream of the city of Nagda.

According to Volume IV of “Immortal India” by J.H.Dave (Bhavan’s Book University, 1991):

“It is stated that from the same cluster of hills three streams are flowing, namely Chambal, Chambela and Gambhir. This river Chambal is the same as Charmanvati of the Epic and Puranic literature. It has been described at several places in the Mahabharata – Adiparva 138, Vana Parva 82, Drona Parva 67, and Santi Parva 29; in *Padma purana* 1-24 and *Meghadoota* 1-45; also mentioned in *Panini* VIII 2-12.

In Kalidasa’s, *Meghadoota* 1-45, the Yaksha advises the cloud to pay homage to river Charmanvati by getting down to take its water and this Charmanvati is described by Kalidasa as having her birth on account of the prowess of Surabhi, the daughter of Kamadhenu. The river is further described as the fame of King Rantideva flowing as it were in the form of a river.

It is with this Rantideva that river Charmanvati i.e. Chambal is connected. It is said that King Rantideva was so hospitable that two lakhs of cooks were employed in his establishment (drone Parva 67-1). He supplied the best of foods to his guests. He also performed numerous sacrifices, and as a large number of animals was killed for this purpose, their hides (charma) were collected into big heaps and the river was flowing here with its mud mixed with blood through the heap of hides. It is on this account that the river came to be known as Charmanvati.



Map No 14: Chambal River Basin

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Chambal system in the state (derived from Google earth imageries):

Table 5: key notables about the river Chambal system

S. No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	3 km		River passes under	

			the NH (Agra-Mumbai)	
2	25 km	Number of seasonal streams join to form a perceptible stream	Chambal Baroda vill on right bank	30 km
3	55 km	Baweri river	Mundla (L)	20+ km
4	115 km	Chamla river Anicuts on the river	Piploda (L)	90+ km PINK due to number of anicuts and small dams on its founder streams
5	127 km	Bageri river joins / major Weir on river Chambal	Nagda (L)	30+ km
6	128.5 km	?? nala (Dam on the Nala)	d/s of Nagda (R)	10+ km
7	146 km	Anicut on the river	Rajgarh vill	
8	152 km	Anicut on the river	Malla Khedi vill	
9	170 km	Anicut on the river	Tamboliya vill	
10	174 km	Maleni River joins (actually three streams Kurel, Pingla & Maleni meet up to form Maleni). Dams on Pingla and Kurel	Menda Kheda vill (L)	90+ km PINK due to dams on tributaries.
11	176 km	Anicut on the river	Gondi Shankar vill	
12	185.5 km	Anicut on the river	Bharatpura vill	
13	204 km	River Kshipra joins (Kshipra is combined waters of rivers Khan, Gambhir and Kshipra)	Ekalgadh vill. (R) Kshipra before confluence forms MP-Raj border for	Kshipra – 215 km Gambhir – 132 km Khan – 74 km Kshipra & Khan,

		3 Dams and anicuts on tributaries	about 20 km. Indore, Ujjain cities in Catchment	both are RED category due to dessication and heavy pollution.
14	204.5 km	Anicut on the river	Ekalgarh vill.	
15	218 km	River Choti Kali Sindh joins. Major dam on the river Chambal called Gandhi sagar. 8 Dams and number of anicuts on Tributaries	Para Pipli vill. (R) The backwaters of Gandhi Sagar dam starts	154 km. PINK due to number of dams and anicuts on it.
16	248 km	River Shivna joins the reservoir. Anicuts on the river and tributaries	Hingoriya bada vill. (L) Mandsaur town	102 km. PINK due to number of anicuts and pollution from Mandsaur city.
17	252 km	River Retam joins the reservoir. Three dams on tributaries.	Bordia vill. (L)	90 km PINK due to dams and anicuts.
18	255 km	River Idar joins the reservoir. Dam on tributary	Chachor (L)	70 km PINK due to anicuts and dam on its tributary.
19	301 km	Dam on river Chambal. Within MP (Neemach & Mandsaur Districts).	Gurla. Reservoir length is 60 km + Neemach, Malhargarh, Shyamgarh, Garoth,	

			Bhanpura,	
20	310 km	River Chambal in gorge before falling into the reservoir of Rana Pratap sagar another dam on river Chambal in Rajasthan (Chittorgarh district)	River enters Rajasthan	
21	311 km	River Gunjal meets the Reservoir. Two dams on tributaries.	Baghpura vill (L)	40 + km
22	336 km	Dam site. 25 km long reservoir.	Rawatbhata. Rajasthan Atomic Power Station. Rawatbhata township.	
23	342 km	River Brahmani joins Chambal. River Chambal forms gorge.	Bhainsrogarh (L) Bhainsorgarh, Budhpura, Mandalgarh, Bichore, Jagpura, Singoli, (Raj) Begun (MP) townships Stone mining.	50 + km PINK due to anicuts and small dams on a tributary
24	382 km	Barrage on river	Kota town.	

		<p>Chambal. River flows through a 40 km long gorge.</p> <p>Most river water diverted at the Barrage.</p>	<p>Keshoraipatan township on Chambal. Famous temples.</p> <p>Kota Thermal Power Station.</p> <p>River exits the plateau after flowing through Bhainsorgarh and Darra sanctuaries in Rajasthan</p>	
25	407.5 km	?? nala joins Chambal	Manasgaon (R)	45+ km
26	444 km	?? nala joins Chambal	Kherli Khush (R)	25+ km
27	449 km	<p>??nala joins Chambal (two dams on it)</p> <p>Chambal in poor health till Kali Sindh joins it.</p>	Sanga Heri (R)	40+ km
28	452.5 km	<p>River Kali Sindh meets Chambal (River Kali Sindh has Parwan, Laxman, Niwaj, Amjhar, Lakhundar and Ahu as its key tributaries. 8 dams exist on smaller</p>	<p>Navnera (R).</p> <p>River Kali Sindh at confluence is a bigger river than Chambal.</p> <p>Jhalawar, Ram Ganj</p>	<p>300+ km</p> <p>PINK due to number of anicuts and dams on its tributaries.</p>

		tributaries)	mandi, Nalkheda, Rajgarh, Pachore, Shujalpur, Sarangpur,Shajapur, Sonkatch towns	
29	464 km	River Mej meets Chambal. River Kural is a major tributary. At least 5 dams exist in river Mej system.	Balwan Khurd (L) Lakheri,Khatgarh, Shakargarh towns Lakheri cement plant.	150+ km PINK due to anicuts and dams.
30	488 km	River Parbati meets Chambal. Major tributaries of Parbati are Aheli, Banganga, Kul, Andheri etc. Number (10) dams on the rivers.	Pali (R). River Chambal after confluence with Parbati forms the inter-state border between MP and Rajasthan. Khatoli, Bapcha Thermal Power plant, Vijaypur Refinery, Ashta, Sehore towns.	300+ km RED due to dams and anicuts. PINK due to pollution.
31	507 km	River Banas and River Sip join Chambal on either banks. Key Tributaries of river Banas are Berach, Menali,	Banas at Barwas (L). Sip at Manpur (R). It is almost the same distance that river	River Banas – 500+ km River Sip – 50+ km River Sip is PINK due to dams. River Banas is RED

		Kothari, Khari, Dai, Dheel, Sohadra, Morel and Kalisil. Banas is perhaps the most dammed river in Rajasthan.	Chambal and Banas has taken before meeting.	category
32	520.5 km	??Nala meets the river Chambal	Danteti (R)	20+ km
33	554 km	River Kuno meets Chambal. One dam on a tributary	Sikheda (R) Kuno Sanctuary in the catchment.	160+ km River Kuno is BLUE category
34	802 km	River Yamuna meets river Chambal. River Chambal forms MP-Raj border for first 134 km and then MP-UP border for next 84 km.	Bhareh (L). It is amazing that for the last 248 km of its flow, river Chambal has no tributary of any significance, till it meets Yamuna.	River Chambal also forms a tri state (Raj, MP, UP) Ghariyal Sanctuary
				2707 km

Clearly the total length of the river Chambal basin is in excess of 3509 km. (802 + 2707).

THE CHAMBAL RIVER BADLANDS IS A LATE PLEISTOCENE-HOLOCENE DEGRADATIONAL LANDSCAPE.

<https://www.quora.com/Why-does-the-Chambal-River-in-Madhya-Pradesh-India-have-ravines>

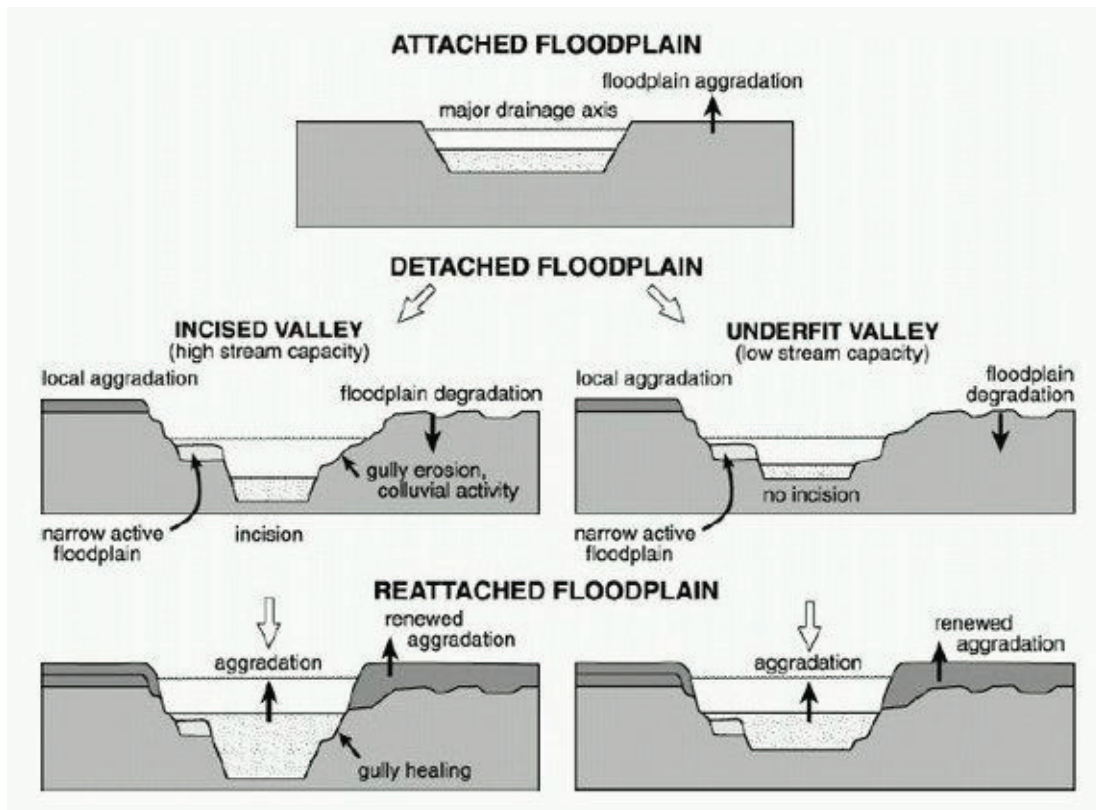
The Chambal is the largest of cratonic (the part of a continent that is stable and forms the central mass of the continent) rivers in Ganga-Yamuna drainage basin. From source to its confluence with the Yamuna it is about a 1000 km long. It flows over both the Deccan Basalts and Proterozoic Vindhyan strata and contributes

significant amount of sediment to the foreland basin.

Rivers and their associated floodplains go through aggradational and degradational phases. In an aggradational phase the river is carrying a large sediment load and flooding results in deposition of this sediment in the flood affected areas. This periodic deposition builds up or aggrades the floodplain.

Conditions may change. For example during longer wet periods and increased rain intensity river discharge increases. Sediment is not deposited locally but is carried out of the system to the sea. In these conditions rivers incise or cut into their own deposits. The river channel becomes situated in a deep valley detached from its floodplain. **Starved of sediment, the floodplain degrades as erosion along the main channel and smaller streams cuts gully and ravines forming badlands.**

Pictorial representation of this process -



Chambal region badland formation coincided with the intensification of the southwest Indian monsoon at the end of the Last Glacial Maximum around 15 thousand years ago and likely continues today, amplified over the last couple of millennia by intense human reworking of the landscape.

Another mechanism that may initiate a phase of river incision is tectonic uplift and tilting of the region. Tectonic upwarp may steepen stream gradients increasing their erosive power. That mechanism has been invoked by

some to explain phases of incision of the Yamuna and the Chambal

Ravined badlands border not just Chambal river, but also Yamuna, Betwa and Sengur regions in the region. The incised main channel of the river and the ravines expose older sediment. In these older sediments, earlier degradational and aggradational episodes can be recognized and coincide with fluctuations in monsoon intensity.

NATIONAL CHAMBAL SANCTUARY

(<http://upecotourism.in/NationalChambalSanctuary.html>)

National Chambal Sanctuary, also called the National Chambal Gharial Wildlife Sanctuary, is a 5,400 sq. km tri-state protected area in northern India home to critically endangered gharial (small crocodiles), the red-crowned roof turtle and the endangered Ganges river dolphin. Located on the Chambal River near the tri-point of Rajasthan, Madhya Pradesh and Uttar Pradesh, it was first declared as a PAs in Madhya Pradesh in 1978 and now constitutes a long narrow eco-reserve co-administered by the three states. Within the sanctuary the pristine Chambal River cuts through mazes of ravines and hills with many sandy beaches along its banks.

Deep within the subcontinent lies a land whose many secrets lie still hidden from the human eye in its still largely unexplored terrain. A land is synonymous with harsh terrains and on its breath taking beauty, Chambal. Now uncover the many secrets of the famed land at the Chambal National Sanctuary. Originating in the Vindhayan ranges in M.P. the Chambal River snakes its way through the states of M.P. Rajasthan and U.P. before finally meeting the Yamuna in the Etawah district of U.P. Its rich bio-diversity ensured that it was declared a National Sanctuary in 1979 with its total area spanning across the three states of M.P. Rajasthan & U.P. The last bastion for some of the country's most endangered wildlife like the Gharial, Muggar, Turtles, Otter and the fresh water Dolphin, the Chambal region also boasts of a wide variety of aquatic and terrestrial bird.

After rampant poaching and fishing almost wiped out the Gharial population from the country in the 70's, captive breeding and reintroduction programme was started. Chambal was chosen as one of the main areas for reintroduction the species back in to the wild. The Chambal Sanctuary in U.P. covers an area of 635 sq. kms.

Spread over the Agra and Etawah districts, and a total of 290 different species of migratory and resident birds have been identified in the region so far. Winter is the best time to visit the sanctuary. A boat ride in its tranquil waters during this time is an exhilarating experience with spectacular sightings of the big reptiles basking along the 180kms. Sparkling sand stretches in the morning sun. but the main draw of the sanctuary are of course the Flamingoes that arrive here in November and stay till May. The Rudy Shelduck Also arrives a little earlier in September & stays here till May. The Indian Skimmers have Huge Colonies in the sanctuary and bred prolifically

here.

Biodiversity:

According to a study on vertebrate fauna of the Chambal river basin with emphasis on the National Chambal Sanctuary (NCS) by Tarun Nair and Y. Chaitanya Krishna

([HTTP://THREATENEDTAXA.ORG/INDEX.PHP/JOTT/ARTICLE/VIEW/1407/2570](http://threatenedtaxa.org/index.php/JOTT/article/view/1407/2570))

Faunal diversity:

Recorded 147 fish species comprising 32 families; 56 reptile species comprising 19 families; 308 bird species comprising 64 families and 60 mammal species comprising 27 families from this region, based on available literature and field observations. This includes six Critically Endangered, 12 Endangered and 18 vulnerable species as categorised by the IUCN Red List of Threatened Species (IUCN 2011).

Places of Mythological and Archeological importance:

Kayatha Culture

(SOURCE: [HTTPS://EN.WIKIPEDIA.ORG/WIKI/KAYTHA](https://en.wikipedia.org/wiki/Kayatha))

Several Chalcolithic sites have been discovered in the Malwa region (catchment of upper Chambal) of central India. The site at Kayatha, situated on the right bank of the Choti Kali Sindh river (a tributary of Chambal river), is the type site of this culture, known as "Kayatha culture".

Excavations conducted by V. S. Wakankar (1965–66) and by M. K. Dhavalikar and Z. D. Ansari (1968) revealed layers from five different periods:

1. Kayatha culture
2. Ahar culture
3. Malwa culture
4. Early historical culture

Sunga-Kushan-Gupta culture

The Kayatha culture represents the earliest known agriculture settlement in the present-day Malwa region. It also featured advanced copper metallurgy and stone blade industry.

Using calibrated radiocarbon, Dhavalikar dated this culture to a period spanning from 2400 BCE to 2000 BCE. However, calibrated dates by Gregory Possehl place it between 2200 BCE and 2000 BCE

Historical sites:

Table 6: Historical Site along Rivers

S. No.	Site	Place	District
1	Prehistoric Painted Rock Shelters at Chatarbhuji Nala	Bhanpura	Mandsaur
2	Prehistoric Painted Rock Shelters at Sita Khardi	Bhanpura	Mandsaur
3	Brahmanical Rock temple	Dhamnar	Mandsaur
4	Buddhist Caves (No. 1 to 51)	Dhamnar	Mandsaur
5	Nav Toran temple	Khor	Mandsaur
6	Yashodharman's pillar of Victory	Sondhani	Mandsaur
7	Ekattatso Mahadeva temple	Mitaoli	Morena
8	Gadhi	Padavali	Morena
9	Temple	Padavali	Morena
10	Temple	Padavali	Morena
11	Siva temple (Locally known as Kakanmath temple)	Suhania	Morena
12	Temple No. 1 to 22	Naresar	Morena
13	Group of temples	Bateshwar	Morena

(SOURCE: [HTTP://ASI.NIC.IN/ASI_MONU_ALPHALIST_MP.ASP](http://asi.nic.in/asi_monu_alphalist_mp.asp))

Sipra or Kshipra

Kshipra, a key tributary of river Chambal is considered as a very sacred river. The city of Avanti or Ujjaini is on the banks of this river and the importance and greatness of Sipra, Avanti, and Avanti Mandala and the Mahakalavana are described in great detail in a special Khanda of Skandapurana called the Avantya Khanda. After its rise in Malwa this river flows in a north-western direction. At many places it flows as a shallow stream. In the downs of Malwa this river has got low banks, and the water is used for irrigation, but at other places, particularly between Mehidpur and A lot the banks are rocky and high. This river passes by Ujjain after it has

flowed for about 54 miles from its source. It has been observed that this river has been considered so sacred that it contains holy spots almost throughout its course and as depicted in several puranas, particularly Skandapurana, its banks were made holy by the hermitages of ancient and reputed sages. Numerous legends are current in connection with the acts of sages, gods and demons.

Kalidasa described the city of Avanti situated on the bank of river Sipra in the Raghuvamsa, Canto VI, verses 34 and 35: “This ruler of Avanti stays near the moon-crested Lord Siva enshrined in the temple of Mahakala, one of the twelve famous Jyotilingas of Siva. This ruler is in the position to enjoy the company of his queens even in the black of the month feeling the pleasure of the bright half of the month (inasmuch as he is near the moon-crested God). O lovely princess! If you elect to get married to this young ruler of Avanti you will enjoy yourself in the gardens of Ujjayini where the trees are shaken by the winds blowing over the ripples of river Sipra.”

It is said that river sipra has come out of the blood of Lord Vishnu and the belief was current even in the days of Abul Fazl that the waters of this river turned into milk on certain occasions.

Viramitrodaya, Tirthaprakasha, page 531, quoting Matsyapurana, says that just as there are two eyes on the face, similarly there are two sacred places or tirthas on the earth and they are: one Avimukta (Kasi) situated on the bank of Ganga and the other Mahakala (Ujjain) situated on the bank of river Sipra.

Periplus mentions Ujjain as Ozeni and states that all commodities were brought from Ujjain to Broach (Barygaza) for being exported to different parts of India.

The ruins of the ancient city of Ujjain are about a mile from the present city. There are several ghats on the Sipra river. Every year on the full moon day of the month of Karthika, there is a fair held at Ujjain. Every twelve years when Jupiter is in the sign of Scorpio there is a big Kumbhamela held at Ujjain. On this occasion lakhs of sadhus representing different sects and sampradayas gather together from all parts of India and they take their bath in the water of river Sipra. Along with the sadhus many pilgrims also join in the Kumbhamela and have a dip in the sacred river.

Human Intervention and Impacts

Existing Surface water Projects on river Chambal system are a) Gandhi Sagar; b) Ranapratap Sagar; c) Kota Barrage; d) Parwati Pick-up Weir; e) Harish Chandra Sagar; f) Gudha Dam;

There are 52 irrigation projects including 7 medium projects with the total storage capacity of 271Mm as on going Surface Projects in the state of Rajasthan. These projects are expected to complete by 2015.

([HTTP://CIVILDIGITAL.COM/CHAMBAL-RIVER/](http://CIVILDIGITAL.COM/CHAMBAL-RIVER/))

River Chambal feeding its own tributaries

Water transfers From Chambal River in the state of Rajasthan

([HTTP://CIVILDIGITAL.COM/CHAMBAL-RIVER/](http://CIVILDIGITAL.COM/CHAMBAL-RIVER/))

- to Banas Basin (634 Mm3)
- to Gambhir Basin (214 Mm3)
- to Parbati Basin (50 Mm3)

ECOLOGICAL IMPACTS OF THE PROPOSED KANERA LIFT IRRIGATION SCHEME – Tarun Nair

<http://www.sanctuaryasia.com/magazines/conservation/5971-of-dams-dacoits-and-death-the-saga-of-the-chambal-gharials.html>

The Kanera Lift Irrigation Scheme on the Chambal river at Kanera, District Bhind, Madhya Pradesh has been proposed in an area that is one of the few breeding sites of the critically endangered gharial. It is also home to the Gangetic dolphin, marsh crocodile and several migratory and resident birds. Approach roads and pipelines have been proposed adjacent to ravines and thorn forests that harbour wolves, caracals, civets and more. According to a study report by the Wildlife Institute of India (WII) in 2010, “The construction of pillars, the intake well and the jack well will adversely affect the river bed and the sand bar directly; are likely to change the river morphology, which will affect the gharial nesting beaches and enhance sedimentation in the downstream. If these projects become operational, there will be no flow in the river and there will be deficit in water availability in the downstream.” The flow regime of the river has already shown a declining trend in the last two decades and resulted in isolated sub-populations of gharials and dolphins. A second report by WII in 2011 further adds: “The minimum flow requirement for long term survival of gharials is 164.34 m³/sec and for dolphins it is 289.67 m³/sec. At present, this flow is available only during the months of July to October for gharial and July to September for dolphin in the river stretch between Dholpur and Panchhnada. The period of reduced availability of flow also corresponds to the gharial breeding season. As the suitable habitat at present is already compromised by 50 per cent or less in lean months, further withdrawal of water will negatively impact the habitat suitability for gharial and dolphins significantly. The minimum flow requirement for long term survival of gharials and dolphin could be achieved if flow from Kota barrage and other subsidiary dams in the Chambal basin is restored.”

Importance and threats faced by National Chambal Sanctuary (NCS)

([HTTP://THREATENEDTAXA.ORG/INDEX.PHP/JOTT/ARTICLE/VIEW/1407/2570](http://THREATENEDTAXA.ORG/INDEX.PHP/JOTT/ARTICLE/VIEW/1407/2570))

The NCS is among the most important and significant habitats where several globally threatened fauna still survive.

Apart from being a strong candidate for World Heritage and Ramsar Convention listings, the NCS is also subject to international treaties like the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), which lists both flagship species of the NCS, namely the Gharial *Gavialis gangeticus* and Gangetic River Dolphins *Platanista gangetica*.

It contains the most viable breeding populations of the Critically Endangered Gharial and Red-crowned Roofed Turtle *Batagur kachuga*. It is also among the most important strongholds of the Deccan Mahaseer, *Tor khudree*, Putitor Mahaseer, *Tor putitora*, Narrow-headed Softshell Turtle *Chitra indica*, Three-striped Roofed Turtle *Batagur dhongoka*, Indian skimmer *Rynchops albicollis*, Black-bellied Tern *Sterna acuticauda*, Sarus Crane *Grus antigone* and Gangetic River Dolphin *Platanista gangetica*.

The NCS functions as a vital source and nursery for fish fry and fingerlings, contributing significantly to downstream fisheries in the Gangetic river system (Sivakumar & Choudhury 2008). It is an Important Bird Area particularly for the Oriental White-backed Vulture *Gyps bengalensis*, Long-billed Vulture *Gyps indicus*, Pallas's Fish-Eagle *Haliaeetus leucoryphus* and Greater Spotted Eagle *Aquila clanga* among others (Islam & Rahmani 2004). The NCS also serves as among the best over-wintering sites for migratory birds. In addition, this river sanctuary also forms a vital corridor and link for the movement and dispersal of Tigers *Panthera tigris* from the source population of Ranthambore Tiger Reserve to the protected areas of Kuno-Palpur, Madhav National Park and Darrah-Mukundra (Reddy et al. 2012; Rakesh Vyas February 2008 pers. comm.).

Threats: The Chambal faces severe extractive and intrusive pressures in the form of water impoundment and abstraction, sand- and stone-mining, fishing, poaching, riparian agriculture, livestock grazing, firewood collection, miscellaneous domestic activities, and infrastructural development (Hussain 2009; Nair 2010; Katdare et al. 2011; MoEF 2011; Tarun Nair 2006, 2008, 2009–2013 pers. obs.).

Seven major, 12 medium and 134 minor irrigation projects operating in the Chambal River Basin, have greatly reduced river flow (Hussain & Badola 2001). Misleading environment impact assessments have permitted recently commissioned water abstraction projects to operate in the NCS by suppressing information on species' occurrences and falsely stating "As there is no significant flora and fauna in or around Chambal River, there should also not be any ecological impacts from the increase in abstraction" (RUSDIP 2008, page 44). Up- and downstream effects of dams are well-known, stemming from inundation, flow manipulation, and fragmentation. Dams obstruct the dispersal and migration of organisms, and these and other effects have been directly linked to loss of populations and entire species of freshwater fish (Nilsson et al. 2005). Low-flows in the Chambal River result in discontinuity between deep pools in the river, due to which species become more vulnerable to netting and dynamiting (Dubey & Mehra 1959; Katdare et al. 2011). Additionally, reduction in the

number of inaccessible islands results in increased destruction of nests of Gharials, turtles and ground-nesting birds like skimmers and Black-bellied Terns (Sundar 2004; Nair 2010). Altered flow regimes, and insufficient flooding disrupts siltation rates and sand deposition in the river channel. As Moll (1997) notes, upriver dams exacerbate the problem by preventing replacement sand from coming downriver while increasing erosion by periodic and unseasonable elevation of water levels.

Sand-mining destroys crucial breeding areas and is one of the most serious threats to the survival of species that lay their eggs on sand deposits. Stone-mining, common in the upper sections of the river, causes considerable disturbances to wildlife, destroys key breeding habitats like otter-holts and provides easy access to ammunition for dynamite fishing (Katdare et al. 2011).

Poaching is another issue that continues unchecked (Murthy 2004; Tarun Nair 2009–2013 pers. obs.) due to inadequate allocation of field personnel to patrol the sanctuary. Illegal fishing and turtle poaching are rampant, using a variety of methods (gill net, baited hook-line, dynamite) and these also claim other species like Gharials, Mugger, river dolphins, otters and several birds (Dubey & Mehra 1959; Vyas 2004; Nair 2010; Taigor & Rao 2010; Katdare et al. 2011). Gill nets are particularly responsible for entangling and drowning juvenile Gharials, thereby impacting survival and recruitment of smaller size-classes.

Riparian agriculture and associated activities like constant human disturbance from irrigational pump operation and crop protection, and risks of water pollution from agro-chemical use and oil leaks also contribute substantially to habitat loss, degradation and pollution (Katdare et al. 2011).

In the future, river flows would be further impacted by the 52 irrigation projects that are under construction and 376 projects that have been planned in the basin (Department of Water Resources, Rajasthan). Additionally, there are proposals to divert the two most important tributaries of the Chambal – the Parbati and Kalisindh rivers (NWDA). In spite of water being the most critical resource in the NCS, the environmental impact assessment for this project does not account for changes in the hydrological regime due to the diversion of water (NWDA). There have also been calls to denotify the sanctuary itself in order to facilitate sand-mining.

Red List of Rivers In Chambal Basin

While the upper Chambal system (till Kota town) has been compromised through a number of dams raised on the main river, the lower Chambal system, despite its status as a three state wildlife sanctuary (National Chambal Sanctuary) is being increasingly compromised through increasing diversion of water in form of water lift schemes to meet irrigation as well as drinking water needs of cities in its catchment.

Within the state of MP, the most threatened (**RED**) river of the Chambal system is the **River Kshipra** on account its dessication over the years as well as heavy pollution of its tributary namely the river Khan within the city of Indore. A water lift and transfer scheme from river Narmada to river Kshipra hailed as a succesful model of river rejuvenation through linking is in reality nothing more than an opportunistic provision of water to meet ceremonial functions.

([HTTPS://SANDRP.WORDPRESS.COM/2014/02/24/HYPE-VS-REALITY-OF-NARMADA-KSHIPRA-PIPELINE-PROJECT/](https://sандрp.wordpress.com/2014/02/24/hype-vs-reality-of-narmada-kshipra-pipeline-project/)) &
([HTTP://WWW.CATCHNEWS.COM/INDIA-NEWS/DEFYING-GRAVITY-AND-LOGIC-WHY-MP-S-NARMADA-KSHIPRA-LINK-IS-A-NON-STARTER-1466433169.HTML](http://www.catchnews.com/india-news/defying-gravity-and-logic-why-mp-s-narmada-kshipra-link-is-a-non-starter-1466433169.html))

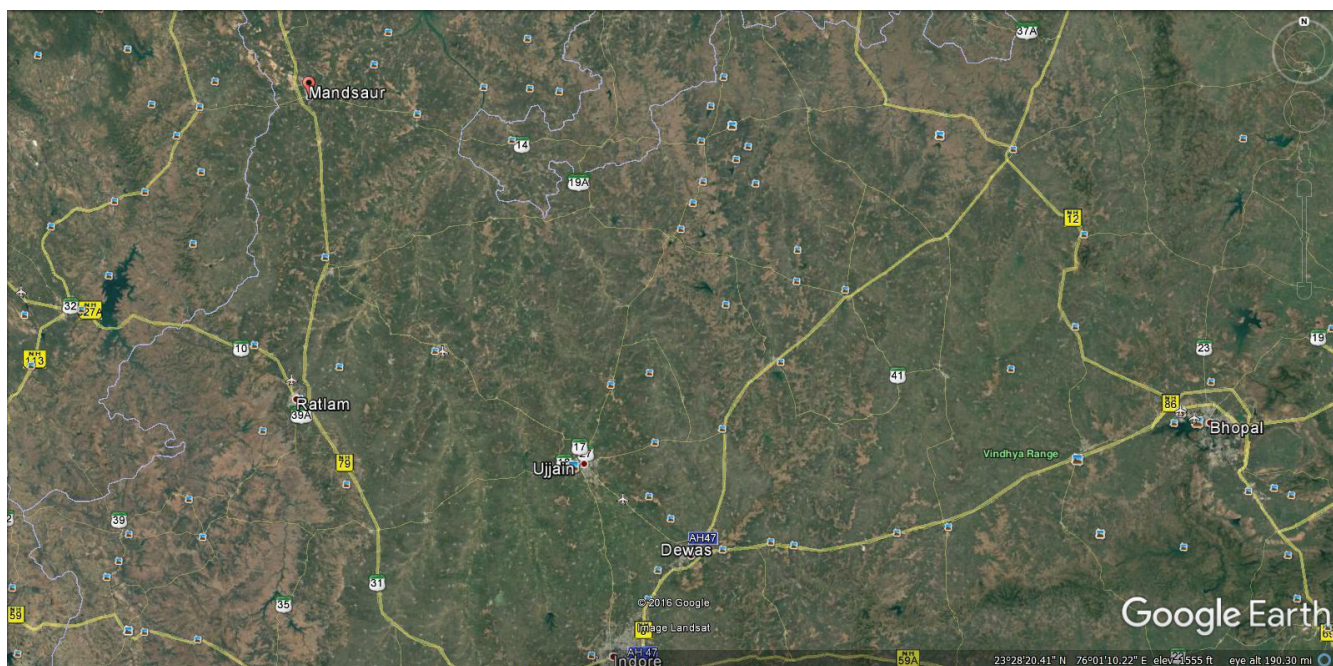
The only river in the Chambal system which could be termed **BLUE** (safe) as of now is the **River Kuno** which on account of its passage through a wildlife sanctuary (Kuno Sanctuary) is relatively secure from deleterious human impacts like diversions and pollution.

All the rest rivers would be termed **PINK** (Threatened) on account of either dams / anicuts built on them/their tributaries or loss of their catchment vegetation which has impacted base flows in them.

STATUS

Sub Basins:

SB 1: Origin till the Confluence with River Shivna (250 km)



Map No 15: Cities of Indore, Dewas, Ujjain and Mandsaur can be seen. White Line Represents MP-Raj Border.

Notables:

- River originates from near Indore in this Unit
- Vegetal cover in catchment is sparse
- There is no wildlife Protected Area of note in the Unit
- There are a number of historical and archeological sites specially along river Kshipra in the Unit
- 5 Key **tributaries** (**Chamla, Maleni, Kshipra, Choti Kali Sindh, Shivna**) meet the main-stem of river Chambal in the Unit
- Key **polluting cities** including **Nagda (Chambal), Indore (Khan), Dewas (Kshipra), Ujjain (Kshipra), Mandsaur (Shivna)** fall within the Unit
- According to CPCB (2012) Stretch of river **Chambal** d/s of Nagda town; **Chillar** river (10 km); **Khan/Kshipra** river (8 km); **Kshipra** river (8 km); **Shivna** river (8 km) fall within polluted stretches in the Unit
- Number of **Anicuts**, both in the river Chambal as well as in the Tributaries in the Unit
- Number of dams (small) on tributaries in the Unit
- Backwaters of Gandhisagar dam (**major**) on river Chambal in the Unit
- First river Kshipra and later after confluence river Chambal forms MP-Raj boundary for some distance
- People’s organizations are reported from the city of Indore.

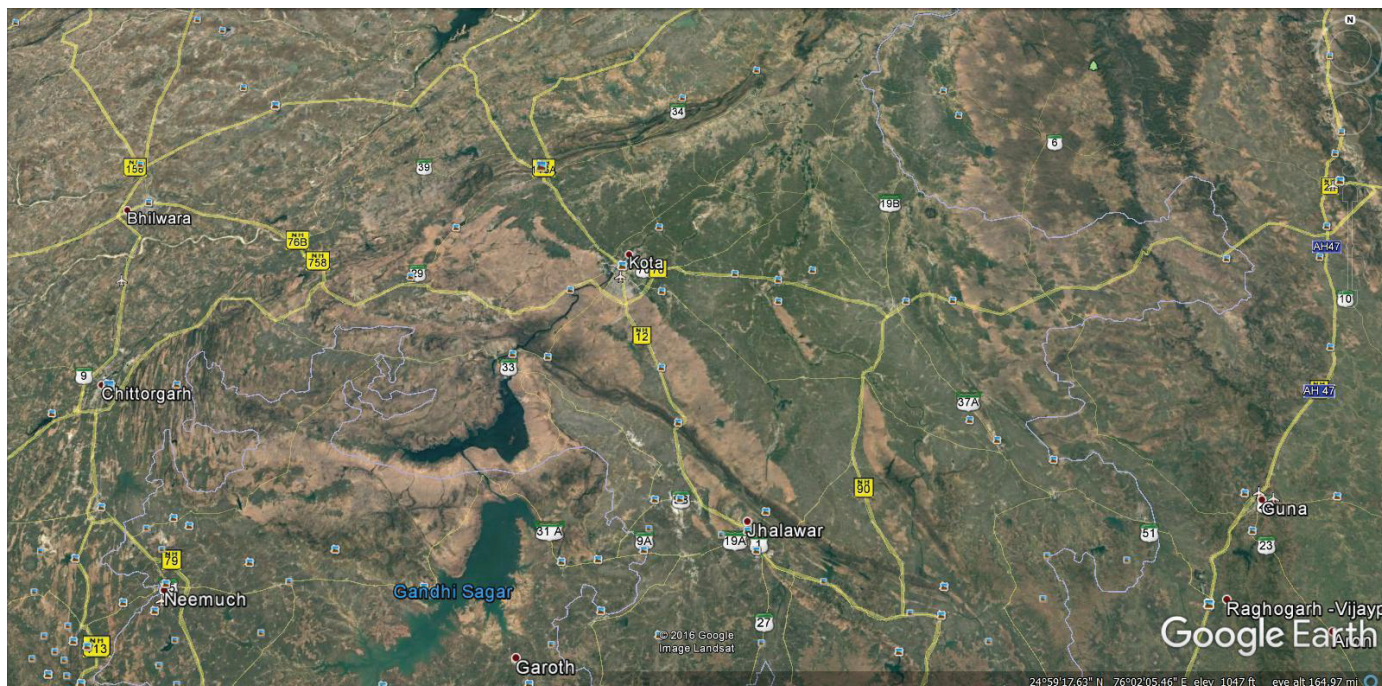
Contributors

Table 7: Contributors of Pollutant of Shivna River

Unit	Vegetal cover	Dams	Anicuts	Cities	Polluting influence	GW/SW	People’s Connect	Overall
SB 1	P	R	P	R	R	R	P	RED
Chamla	P	P	P	B	B	R	P	PINK
Maleni	P	R	P	B	B	R	P	PINK
Kshipra	P	R	R	R	R	R	P	RED
Choti Kali Sindh	P	R	R	P	B	P	P	PINK
Shivna	P	B	P	P	B	P	P	PINK

- Over all the river in this Sub basin is categorized as **RED** (Critical).
- River Kshipra, the largest key tributary in the Unit is with **RED** (Critical) status.
- Pollution originating from the cities of Indore, Dewas, Ujjain and Mandsaur is a cause of high concern.
- Revegetation of catchment lands in the sub basin needs special attention and effort.
- The GW in almost the entire region falls within Critical (Over exploited) levels.

SB 2: Confluence with River Shivna till confluence with River Parbati (~250 km)



Map No 16: River Confluence on Rivers Shivna & Parbati

Notables:

- River Chambal travels first for around 60 km within MP, out of which 50 km is the Gandhisagar reservoir, before entering the state of Rajasthan
- River Chambal then travels within Rajasthan till the end of the Unit
- Gandhisagar (MP), Rana Pratap sagar, Jawahar sagar and Kota Barrage (all in Rajasthan) are the key dams on the river Chambal
- River Chambal straddles a rocky terrain for almost 130 km till it exits the city of Kota.
- Bhainsorgarh & Darra Sanctuaries in the catchment. Portion of National Chambal Sanctuary.
- The key cities in the Unit are Neemach (MP), Malhargarh (MP), Rawatbhata (Raj), Bhainsorgarh (Raj),

- The key Tributaries (7) of Chambal are rivers **Retam, Idar, Gunjal, Brahmani, Kali Sindh, Mej** and **Parbati**. Out of these two rivers namely **Kali Sindh** and **Parbati**, being more than 250 km in length constitute a sub basin of their own.
- River Kali Sindh revives river Chambal on confluence as Barrage in Kota diverts most of the river water.
- There are number of forts and temple towns in the Unit.

Contributors

Table 8: Contributors of Pollutant of Parabati River

Unit	Vegetal cover	Dams	Barrage & Anicuts	Cities	Polluting influence	GW/SW	People's Connect	Overall
SB 2	P	R	R	R	R	G	P	R
Retam	P	R	P	B	B	G	P	P
Idar	P	P	P	B	B	G	P	P
Gunjal	P	P	P	B	B	G	P	P
Brahmani	P	P	P	P	P	G	P	P
Kali Sindh								R
Mej	P	P	P	P	P	G	P	P
Parbati								P

It is interesting to note that while all but one tributary in this Unit secure a PINK status, the river main-stem still gets a RED. This is due to the number of major dams and a barrage that diverts large amount of the river water.

River Kali Sindh Sub basin

Table 9: River Kali Sindh Sub basin

S. No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	50	??nalla meets. River comes into its own.	Singawada (L) Dewas District.	10+ km
2	60	??nalla meets.	Roshanabad (R) Shajapur district	25+ km

3	67	Anicut in the River	Sonkatch town	
4	76	??nalla meets.	Manasa (L)	30+ km
5	116	??nalla meets	Badakheda (L)	15+ km
6	133	Anicut in the river	Sarangarh town	
7	144	??nalla meets	Bioara mandu (R)	20+ km
8	190	River Lakhundar joins. Seven Dams on the system. Number of Anicuts within less than 5 km in the the river.	Takhla (L) Shajapur district. Shajapur, Nalkheda towns	90+ km RED due to dams
9	220	??nalla meets Two dams on it. River Kali Sindh meets MP-Raj border	Baray (L)	25+ km
10	235	River KS forms inter state border. ??nalla meets. Dam on nalla. River enters Rajasthan.	Bhumara (L)	15+ km
11	255	Barrage on the river as it meets the plateau	Jetpura. Bhensrodgarh WL Sanctuary	
12	260	??nalla meets Two dams on it	Moria Kheri (R)	15+ Km Two pronged.

13	272	??nalla meets Three dams	(L) Kali Sindh Thermal Power Plant	25+ km Two pronged.
14	278	Anicut. River slices through Jhalawar plateau	Jhalawar town.	
15	279	River Ahu meets. 4 dams	Manpura (L) Kota stone mines in the catchment Ramganj mandi town	150+ km Multipronged RED due to dams and stone mining
16	285	Anicut on the river River leaves the plateau	Chalet	
17	322	River Ujor meets. Major Dam on the Ujor at plateau. Nalla meets.	Thoonpur (R) Kareeriya (L) Sangod town.	90+ km 15+ km PINK due to one major dam
18	324.5	Anicut on the river	Guwawada	
19	330	Combined Rivers Parwan, Ghar & Newaj meets. Major dams on all rivers.	Pachara (R) Rajgharh, Pachore, Shujalpur, Aklera Towns. Shergarh WL	140+km 100+ km Multipronged RED due to dams and anicuts and towns

			Sanctuary	
20	332	Anicut on the river	Palaita	
21	380	River meets Chambal	Navnera	

Contributors

Table 10: Contributors of Pollutant of Kali River

Unit	Vegetal cover	Dams	Barrage & Anicuts	Cities	Polluting influence	GW/SW	People's Connect	Overall
SB Kali Sindh	P	R	R	P	P	R	P	RED
Lakhunder	P	R	R	P	P	R	P	RED
Ahu	R	R	R	P	R	R	P	RED
Ujor	P	P	R	P	P	P	P	PINK
Parwan (Ghar, Newaj)	P	R	R	R	P	R	P	RED

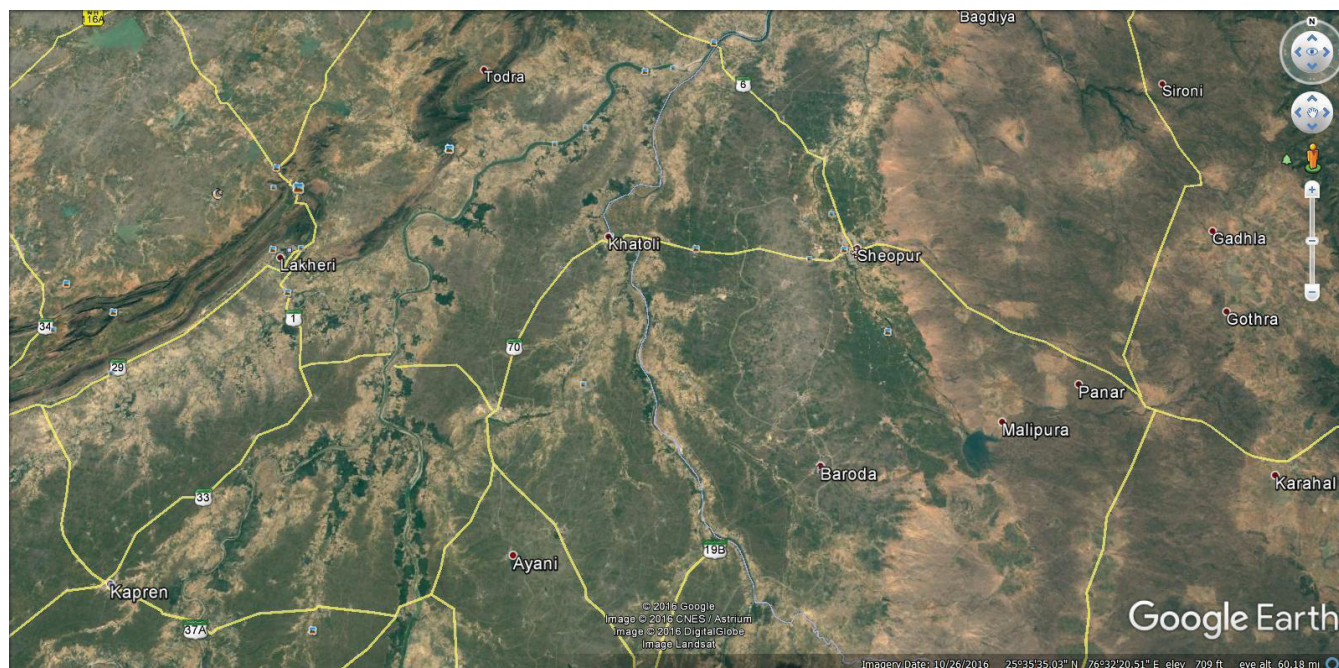
River Parbati Sub Basin

Table 11: River Parbati Sub Basin

S. No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	5.5	Major dam on the river	Siddiqueganj	
2	30		Ashta town	
3	33	Nalla ?? meets River is taking a NE direction	Shahwajpur (R)	30+ km
4	63	Nalla ?? meets	Bhimpura (R)	40+ km

		Two dams		multipronged
5	78	Nalla ?? meets Three dams	Manakheda (R) Township of Sehore	30+ km Multipronged
6	108	Nalla ?? meets Dam on origin	Pilu Khedi (R)	30+ km Multipronged
7	140		Town of Narsinghgarh on left bank	
8	235	River meets the MP-Raj border		
9	295	River forms MP-Raj border before entering Rajasthan		
10	310	River Andheri meets.	Atru (L) Adani Thermal Power plant	50+ km PINK due to pollution
11	370	River meets Raj-MP border River Kul meets. Three dams on river Kul	Balunda (R) Interesting Volcanic valley of Bhand Devra (6 sq km)	60+ km Multipronged RED due to dams

		River from now on forms MP-Raj border		
12	400	River Aheli meets. Dam on origin	Gurunawada Utanwad (R)	40+ km Multipronged PINK due to dam
13	410	Site of Parbati – Kali Sindh natural link	Gordhanpura (L) Relict course of river Chambal???	
14	440	River Parbati meets Chambal	Pali	



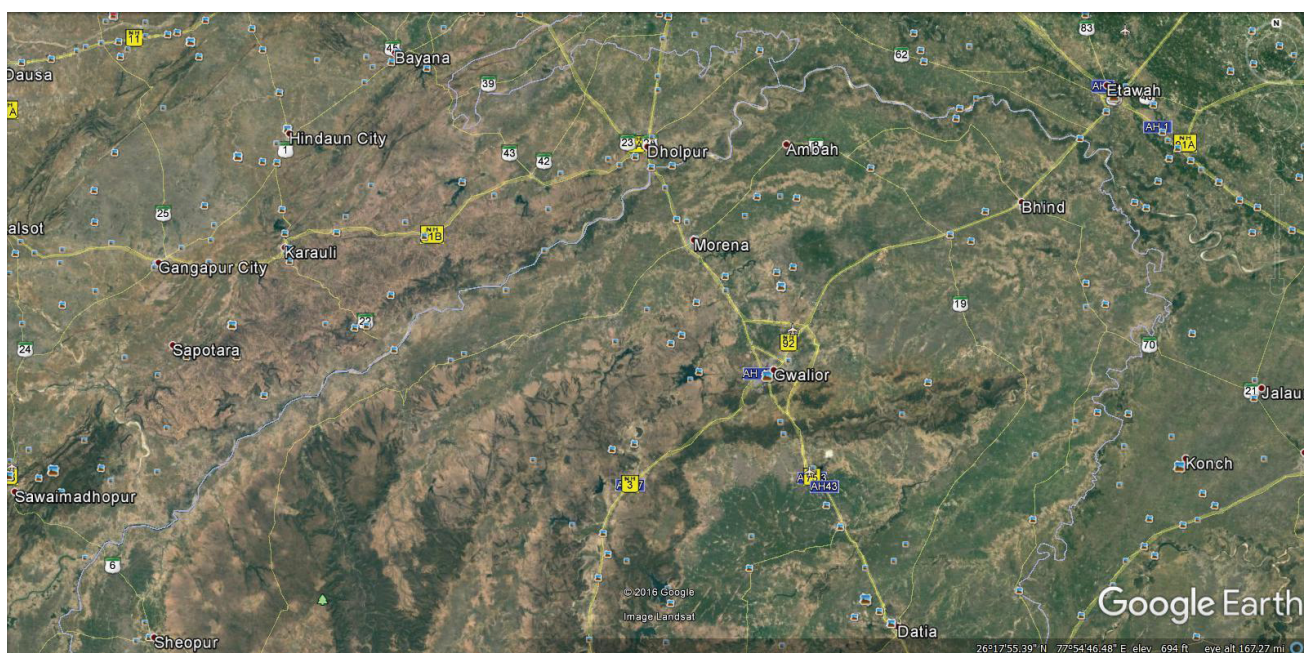
Map No 17: Google Image of Relict Course of River Chambal

Contributors

Table 12: Contributors of Pollutant of Chambal River

Unit	Vegetal cover	Dams	Barrage& Anicuts	Cities	Polluting influence	GW/SW	People's Connect	Overall
SB Parbati	P	P	R	P	P	G	P	PINK
Andheri	P	B	P	P	P	G	P	PINK
Kul	P	R	R	P	P	G	P	RED
Aheli	P	P	R	P	P	G	P	PINK

SB 3: Confluence with River Parbati till confluence with River Yamuna (~400 km)



Map No 18: River Confluence on Rivers Parbati & Yamuna

Cities of sawai Madhopur, Karauli, Dholpur (Raj) and Sheopur, Gwalior, Morena, Bhind (MP) and Etawah (UP) can be seen. White line is the river Chambal as well as the Inter state boundary, till very near its confluence with Yamuna.

Notables:

- River Chambal forms the inter state border, first between MP and Rajasthan and later MP and UP all along its length except the last 40 km where it travels entirely within UP before confluence with Yamuna.
- The entire stretch of the river Chambal is part of the tri-state (MP, Rajasthan, UP) National Chambal Sanctuary
- Kuno sanctuary falls in the catchment and covers a large part of the river Kuno
- The river forms deep ravines on its either banks, as well as possess sandy banks offering suitable habitat to varied life forms
- The key tributaries of Chambal are **Sip, Kuno** (right bank) and **Banas** (left bank).
- It is notable that after the confluence of river Kuno with Chambal at Jimarccha there is no tributary of Chambal for almost 350 km till its own confluence with river Yamuna at Bhareh
- There are number of ghats and famous forts along the river.
- The key cities on the river are Dholpur (Raj) and Morena and Bhind (MP).
- The quality of water in the river is pristine, as there are no major cities or industries within the river catchment
- Heavy illegal removal of sand is reported from the sand banks at number of sites
- Number of water lift schemes (for irrigation and drinking water) both in the states of Rajasthan and in MP threatens the flow integrity in the river.

Contributors**Table 13: Contributors of Pollutant of River Yamuna**

Unit	Vegetal cover	Dams	Barrage& Anicuts	Cities	Polluting influence	GW/SW	People's Connect	Overall
SB 3	P	B	B	P	R	R	B	PINK
Sip	P	P	P	P	P	G	P	PINK
Banas	R	R	R	P	R	R	P	RED
Kuno	B	P	B	B	B	B	P	BLUE

NOTE: The status of the river main stem despite it being a part of the wildlife Sanctuary is still designated threatened (PINK) due to polluting influence (sand mining) and water lift schemes.

INDICATORS (Over All For The Entire River Basin)

Table 14: Indicators

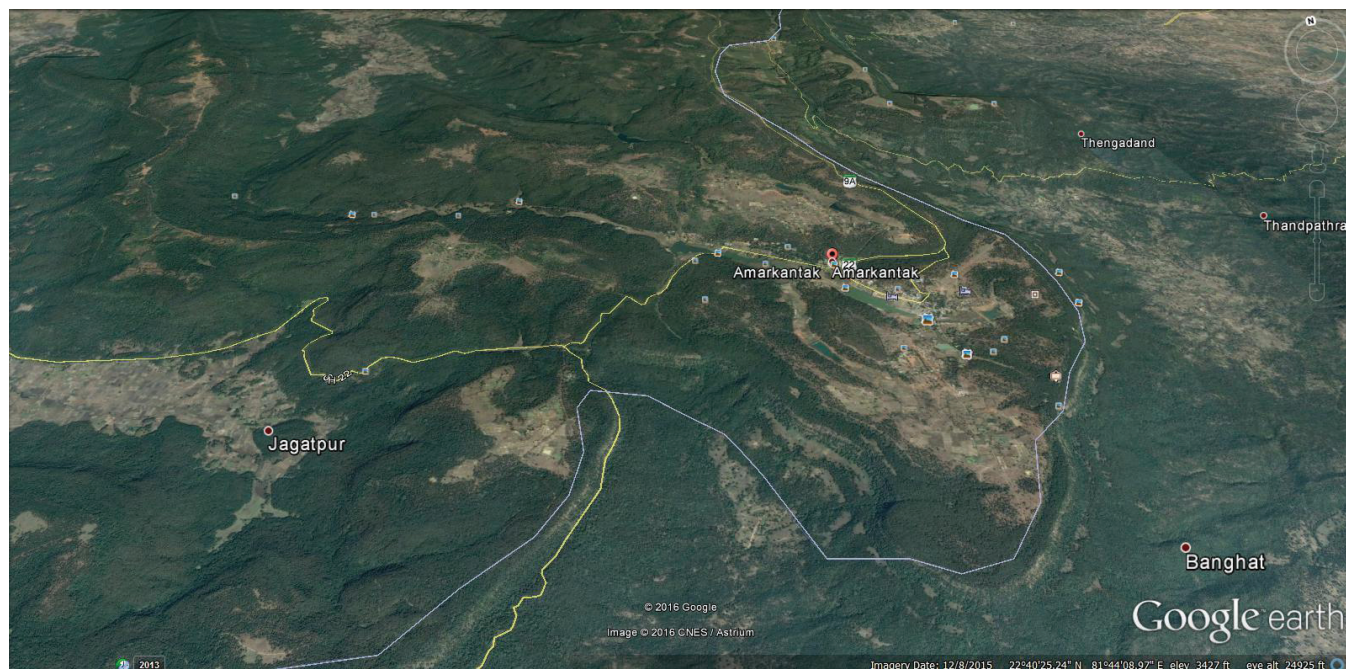
Biodiversity	Discharge	Pollution	PA/Special areas	People's Action	River Conflicts
P	G	P	P	P	B

It is necessary that following actions are taken to restore the health of river Chambal basin as a system:

- a) All dams on the main-stem as well as the tributaries and sub tributaries must be mandated to ensure environmental flow into the respective channels
- b) Massive program of revegetation in the catchment need to be started to revive base flows
- c) Some of the anicuts on the main-stem as well as the tributaries need to be removed to allow reasonable free flow of the river
- d) All polluting influences (industries, mining, cities) need to be brought under control
- e) Integrity of wildlife areas (Sanctuaries) needs to be respected and all developmental plans that could compromise the same must be reviewed and dropped.
- f) Much better effort at riverine research in particular biodiversity is needed.
- g) Health of the **river Banas** system (biggest tributary) as well as **river Kshipra** system (most polluted) is a major cause of concern.
- h) The **river Kuno**, the only healthy river in the system needs to be declared as NO GO river in terms of any developmental activity.
- i) The founder basin of **rivers Kali Sindh, Parbati and river Datuni** (Narmada) which lie very close to one another (near Siddiqueganj) may be declared a special area for riverine protection.

17. Narmada

The origin of Narmada, also known as river *Rewa* is a kund at Amarkantak in the Maikal range. Amarkantan is at a height of around 1000 m on MP-CG border.

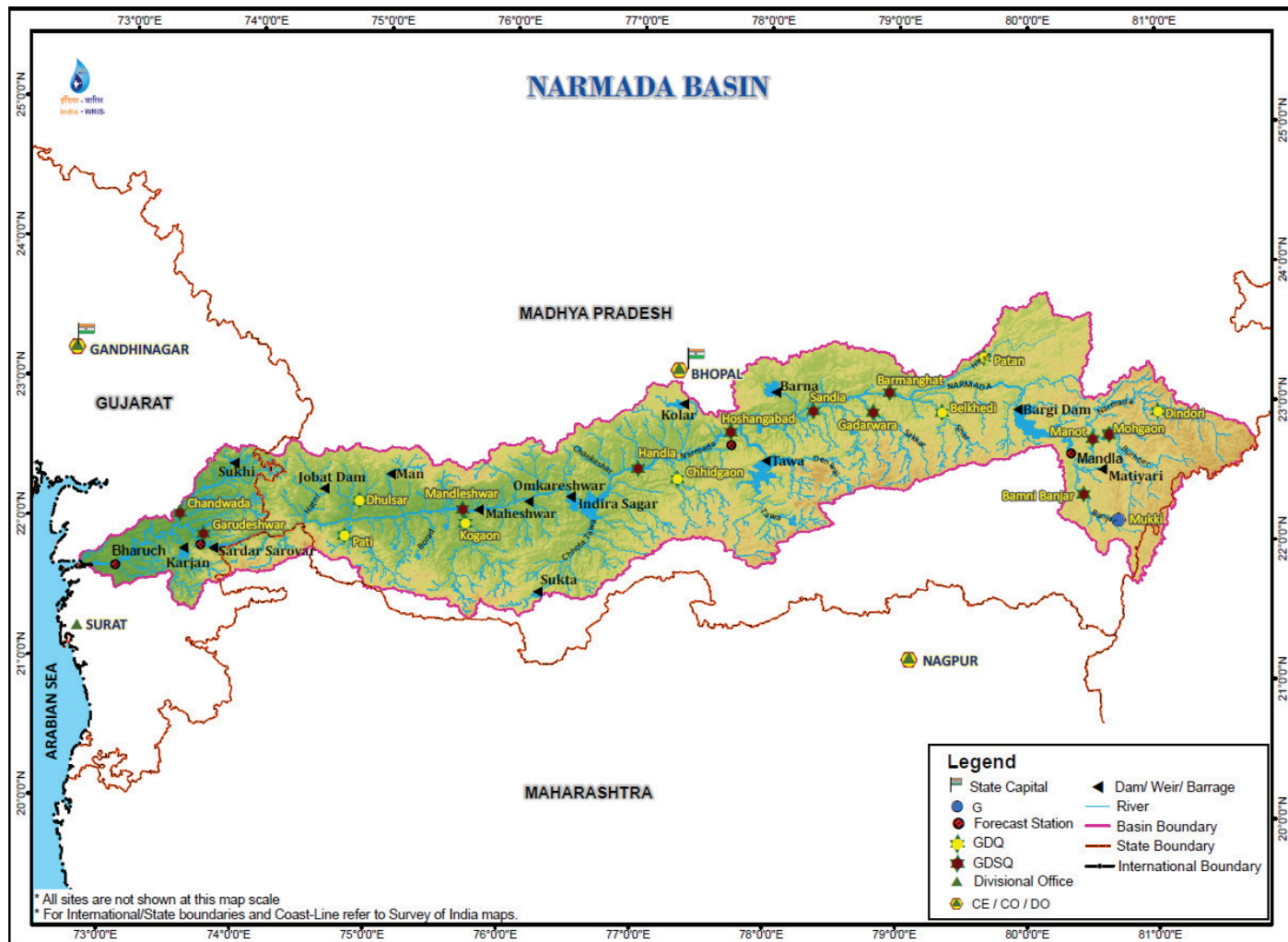


Map No 19: Amarkantak – The origin of river Narmada

The river basin is divided into 3 sub-basins. The Narmada Upper, middle and lower sub-basin with a total of 150 watersheds. 19 important tributaries along with the main river Narmada, drains an area of 92,672.42 Sq.km which is 3% of total geographical area of the country. (India-WRIS).

There are a total of 35 Hydro-meteorological stations in the basin. In the basin, 4 distinct seasons occurs across the year. 90% of the rainfall occurs in the monsoon season. The mean average temperature varies from 18 OC to 32 OC.

About 30% of the basin is covered under major and medium command area. The 21 major and 23 medium projects constitute 277 dams, 2 barrages, 2 weirs and 4 lifts. These projects have an extensive canal system spread largely in the middle and lower plains of the basin. Also 2 major hydro-electric projects- Sardar sarovar (Installed Capacity-1450 MW) and Indira Sagar project (Installed capacity-1015 MW), along with 3 other projects contributes to a total of 3498.5 MW hydro-power generation in the basin. (Source:India WRIS)



Map No 20: Narmada Basin

Table 15: Length of major rivers of Narmada system

S. No	River	Length km*	Comments
1	Narmada	1,333	
2	Hiran	205	
3	Tendoni	111.3	
4	Barna	111.67	
5	Kolar	104.3	

6	Man	89.6	
7	Uri	74.5	
8	Hatni	111.5	
9	Orsang	152.3	In Gujrat state
10	Burhner	182.2	
11	Banjar	266.7	
12	Sher	135.8	
13	Shakkar	167.4	
14	Dudhi	171.2	
15	Tawa	164.7	
16	Ganjal	110.8	
17	Chhota Tawa	54	
18	Kundi	107.6	
19	Goi	137.3	
20	Karjan	85.7	

**GIS based calculation (India WRIS)*

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Narmada system in the state (derived from Google earth imageries):

Table 16: key notable About the River Narmada System

S. No	Distance from	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
-------	---------------	--------------------------------------	-----------------	-----------------------

	origin			
1	0	Narmada Udgam	Amarkantak	
2	7 km	Water fall (50 m)	Kapil Dhara	
3	7.2 km	Water fall (3 m)	Doodh Dhara	
4	16.5 km	???Nalla meets Narmada	Pharrisemar (R) Nala also originates close to Amarkantak	10+ km
5	46.5 km	River Seoni meets Narmada	Musamundi (L)	50+ km Multipronged
6	71 km	Two streams meet Narmada	Lalpur (L) Lalpur (R)	40+ km 10+ km
7	74 km	Stream joins	Sunha dadar (L)	10+ km
8	84 km	Stream joins	Gidha (L)	25+ km
9	97.5 km	Streams join on both banks	Ghanaghat (L) (R)	20+ km 12+ km
10	99 km	Anicut on Narmada	Dhindori town	
11	124.5 km	???Stream joins river	Keolari (L)	70+ km
12	145 km	??? Stream joins Anicut on the river	Malpur (R)	30+ km
13	175 km	???Stream joins	Tendudih (L)	25+ km

14	195 km	??? Stream joins. Dams on streams	Bisbani (R)	50+ km Multipronged
15	205 km	River takes a sudden southwards turn	Balpur	
16	211.5 km	??? stream joins. Series of dams	Matiyari (L)	30+ Km Multipronged
17	223 km	???Stream joins. Dams on it.	Bilgarha (R)	15+ km
18	233 km	??? Stream joins	Khairi (L)	10+ km
19	245 km	Combined waters of rivers Halon and Burhner. One dam on a tributary at Bichiya.	Deogaon (L)	150+km. Multipronged. BLUE as no major diversion, intact vegetation and no pollution.
20	260 km		Ramnagar, a medieval town with monuments	
21	265 km	Narmada takes a westwards turn		
22	275 km	Narmada takes a northwards turn. Anicut in the town. River banjar meets narmada	Mandla Town (L) Malajkhand Copper mines in the catchment of Banjar.	150+ km. Multipronged. PINK as one major town, polluting influence and dams on

		from the south. Dams on streams.	Mandla,	tributaries.
23	281 km	Sahasradhara in the river Narmada	Interesting river bed formation.	
24	285 km	Backwaters of Bargi dam on river Narmada	Khari village	
25	305 km	???stream joins. Dams on streams.	Kikra (R)	30+ km. Multipronged.
25	350 km	Major Dam at Bargi on river Narmada. ???Stream joins upstream of the Reservoir	Udaipur (R)	30+ km. Multipronged.
26	356 km	River Temar joins d/s of the Dam	Bargi vill (L)	50+ km. Multipronged.
27	366.5 km	???Stream joins	Deori vill (R)	20+ km. Multipronged.
28	370 km	River Gaur joins. 4 dams and anicuts on the tributaries	Tewar vill (R)	100+ km Multipronged. PINK status
29	371 km	??/Stream joins	Mahgaon (L)	20+ km. Multipronged.

30	378.5 km	Dumna nala joins. Dam on the stream near Airport.	Jabalpur city. (R)	20+ km. Multipronged.
31	385 km	???stream joins	Lamheta ghat (L)	10+ km Multipronged.
32	388.5 km	Marble rock falls	Bhedaghat	
33	393 km	???stream joins	Gwari vill (L)	10+ Km.
34	406.5 km	???stream joins	Tonta vill (L)	15+ km. Multipronged.
35	412 km	???stream joins	Bhikampur vill (L)	10+ km
36	412.6 km	??River joins	Bhikampur d/s (L)	40+ km Multipronged
37	432 km	?/stream joins	Muarghat (L)	10+ km Multipronged.
38	445.5 km	River Heran joins. Vast catchment along Bhanrer range. One dam	Sankal (R)	150+ km Multipronged. PINK status
39	478 km	River Sher joins.	Sagonghat (L).	100+ km.

		Vast catchment. Sher is a mix of Burerewa, Macharewa, Umar and Sher. One dam on one small tributary.	Narsinghpur city in the catchment.	Multipronged. BLUE Status
40	518 km	River Shahdol joins.	Timrawan (R). Tendukheda town in the catchment.	50+ km Multipronged.
41	526.5 km	River Shakkar joins. Two dams on tributaries.	Sokalpur (L). Gadarwara town in the catchment.	100+ km Multipronged. PINK status
42	553 km	River Dudhi joins.	Umardha (L). Originates from Pataalkot.	100+ km. Multipronged BLUE status
43	555 km	??stream joins	Ketughan (R)	30+ km. Multipronged.
44	565 km	?? stream joins	Sandiya (L)	50+ km. Multipronged.
45	577 km	?? stream joins	Ajera (L) Pipariya town in the	70+ km. Multipronged.

			catchment.	
46	584 km	River Tenduni joins. Three dams on the tributaries.	Sirawada mukandi (R) Silwani town in the catchment.	100+ km Multipronged PINK status
47	586 km	River Barna joins. Barna Dam on Barpa.	Semrighat (R) Bari, Bareli key towns.	100+ km Multipronged RED status
48	592 km	??stream joins.	Bamanwada (R)	20+ Km. Multipronged.
49	600 km	?? Stream joins.	Isarpur (L)	30+ Km
50	602 km	?? Stream joins	Lakhanpur (L)	25+ km. Multipronged.
51	605 km	?? Stream joins	Satwasa (L)	15+ Km Multipronged
52	622 km	?? Stream joins	Nasirabad (L)	20+ km. Multipronged
53	637 km	?? Stream joins	Sudania (R)	20+ km. Multipronged
54	647 km	?? Stream joins	Jahanpur (R)	15+ km.

				Multipronged
55	650 km	River Tawa joins. Major dam on Tawa. Another dam at Sarni u/s on Tawa for Thermal power station.	Ramnagar (L). Betul city, Pachmarhi, Shahpur, Ghoradungri, sarni key towns in the catchment. Satpura NP, Pachmarhi & Bori Sanctuary in the catchment.	150+ km. Multipronged. Drains Mahadeo Hills and North of Betul Plateau. RED category due to heavy damming.
56	656 km	Strange formations in the Narmada river bed.	Hoshangabad city on south of the river.	
57	667 km	?? Stream joins.	Budni (R)	15+ km
58	678 km	?? Stream joins	Holipura (R)	20+ Km
59	680 km	?? Stream joins. Originates from Delawadi .	Bibda (R)	20+ Km
60	687 km	?? Stream	Khoksar (L)	20+ km
61	699 km	?? River joins.	Hathnapur (L)	40+ km
62	704 km	?? Stream joins	Bhela (L)	30+ km
63	709 km	?? Stream joins	Opp Babri(R)	20+ km. Multipronged.

64	714 km	?? Stream joins	Kajli (L)	20+ km. Multipronged
65	716 km	?? Stream joins	Bhiladiya Khurd (L)	10+ km
66	720 km	?? Stream joins	Hamidpur (L)	25+ km Multipronged
67	725 km	River Kolar joins. Three dams on it.	Mandi (R)	100+ km. Multipronged. RED due to dams
68	733 km	River Ganjal joins. One dam on it.	Ariya Bedi (L)	150+ km. Multipronged. PINK Status
69	736 km	River ?? joins. One dam on it.	Chipaner (R). River Narmada on rocky bed. Breaks into number of shallow streams and rapids.	100+ km. Multipronged.
70	743 km	?? Stream joins.	Opp Pachora, Lachora (R). Specialised vegetation on rocks in the river bed.	10+ km. Multipronged.

71	755 km	Two streams join on either banks.	Surjana (L) Daiyat (R)	30+ km. Multipronged. 10+ km.
72	759 km	River Jamner joins.	Nemawar (R) Township of Handia on the opposite bank is considered as half way mark for river Narmada.	60+ km Multipronged.
73	770 km	??Stream joins.	Mandaleswar (R)	20+ km. Multipronged.
74	773.5 km	?? Stream joins.	Bhanjakhedi (R)	15+ Km. Multipronged
75	782 km	River Datuni & Chankeshar joins.	Melpipalya (R). Backwaters of Indirasagar Dam on Narmada begin. River takes a southwards and then northwards turn and forms a parabola.	50+ Km Multipronged

76	840 km	<p>Damsite on river Narmada.</p> <p>Rivers Machak, Ajnai and Chota Tawa now ends into the reservoir called Indira Sagar or Punasa dam.</p> <p>River Narmada enters into a rocky Gorge.</p> <p>The original Shasradhara of Narmada at confluence with Ajnai and Machak is totally transformed. (see google images)</p>	<p>Punasa</p> <p>River Ajnai and Machak (L)</p> <p>River Chota Tawa (L). Town of Harsud is inside the reservoir.</p> <p>Narmada Nagar, Khandwa, Harda, Mundi, New Harsud and Khirkiya are the towns in the catchment.</p> <p>STPP at Dongaliya.</p>	<p>Both Ajnai and Machak are 100+ km.</p> <p>Multipronged.</p> <p>Chota Tawa is 150+ km.</p> <p>Multipronged.</p> <p>Ajnai is PINK</p> <p>Machjak is BLUE</p> <p>Chota Tawa is PINK</p>
77	845 km	<p>??Stream meets the river.</p>	<p>Downstream of the Dam (R)</p>	<p>15+ km.</p> <p>Multipronged.</p>
78	850 km	<p>??River meet the Narmada</p>	<p>Premgarh (R)</p>	<p>50+ km.</p> <p>Multipronged.</p>
79	872 km	<p>River Sukhi / Kanar meets Narmada.</p> <p>Confluence affected by backwaters of Dam at Omkareswar.</p>	<p>Kandya (R)</p>	<p>50+ km</p> <p>Multipronged.</p>
80	883.5 km	<p>River Kaveri meets the reservoir of the Dam.</p>	<p>Reservoir (L)</p>	<p>50+ Km</p>

				Multipronged.
81	885 km	Dam site at Omkareswar.	Omkareswar and Mandhata are historical places of pilgrimage. Mandhata is an hilly island formed within the river, reportedly in a sign of OM.	
82	895.5 km	River Choral meets Narmada. Dam on its origin.	Barwaha (R). Barwaha township. Patalpani (see pic) is an interesting geomorphological feature in the river channel.	90+ Km. Multipronged. PINK status
83	910 km	??Stream joins	Devnalya (R)	20+ km Multipronged
84	915.5 km	River Raspat joins.	Bakawan (L). River Narmada forms an island at the rocky confluence.	60+ km Multipronged.
85	920 km	??stream joins. Dam at the udgam of the stream.	Bahegawan (R)	20+ km Multipronged

86	924.5 km	??stream joins.	Pathrad (R)	10+km.
	937 km	?? Stream joins.	Amlatha (L)	15+ km Multipronged.
87	940 km	??Stream joins. Dam on it.	Jalud (R)	20+ km. Multipronged.
88	942 km	Barrage on Narmada	Mandleswar. Place of Pilgrimage.	
89	942.5 km	River Beda joins. Dams and anicuts on tributaries.	Opp to Mandleswar (L). It is combined waters of Beda, Kundi and Amba rivers. City of Khargone is in the catchment.	100+ km Multipronged. PINK status
90	949 km	Stream joins.	Kathora (L). Kasrawad town is in the catchment.	15+ km. Multipronged.
91	951 km	Stream joins.	Maheswar (R). Maheswar is a pilgrimage centre.	20+ km. Multipronged.
92	961 km	River ?? joins.	Uchawawad (R)	40+ km.

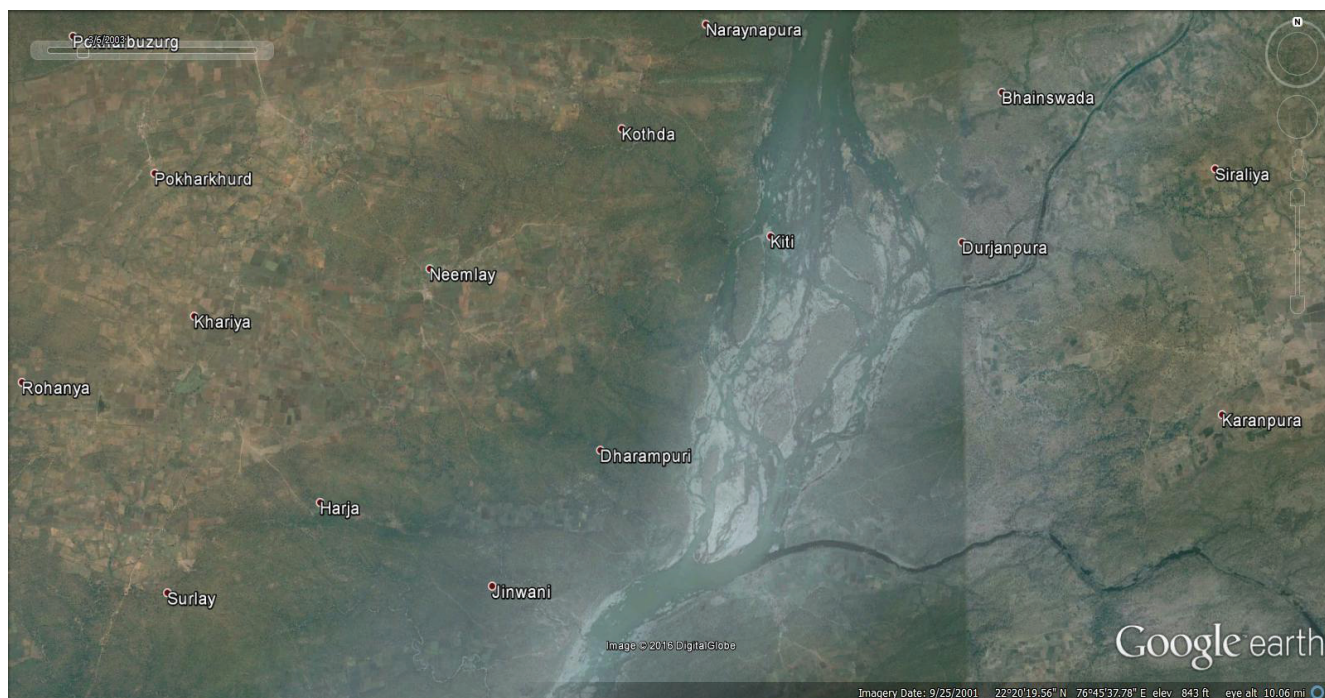
				Multipronged.
93	966.5 km	Stream joins. Dam on origin.	Khal Bujurg (L)	25+ Km. Multipronged.
94	976 km	Stream joins	Chichali (L)	10+ Km
95	982 km	Stream joins	Dharpuri (R) Place of Pilgrimage	25+ km Multipronged
96	985 km	River Borad joins. Four dams on tributaries.	Nandgaon (L)	50+ Km Multipronged.
97	996 km	River Man joins. Four dams on Tributaries.	Ratwa (R)	50+ Km Multipronged.
98	997.5 km	River ?? joins. Four dams on Tributaries.	Nawada Khedi (L)	50+ Km Multipronged.
99	1005 km	?? Stream joins. Two dams on tributaries.	Kesharpura (L)	30+ km Multipronged
100	1010 km	??stream joins	Perkhad (R)	15+ km Multipronged.
101	1020 km	?? stream joins. Dams on Tributaries	Piplod (L)	30 km Multipronged

102	1023 km	??stream	Bodhawada (R)	20 km Multipronged.
103	1025 km	?? stream	Dehdala (L)	15 km Multipronged.
104	1031 km	?? stream	Bhilkheda (L)	15+ km Multipronged
105	1040 km	?? stream	Rohana (R)	15+ km
106	1041 km	River Bagh and Uri joins. Dams on Tributaries.	Kothada (R). Kukshi and Bagh are the key towns in the catchment.	100+ km Multipronged PINK status
107	1043.5 km	River Goi joins. Dams on tributaries.	Bhawati (L) Sendhwa is key town in the catchment.	100+ km Multipronged PINK status
108	1077 km	River Hatni joins. Dam on Tributary.	Kakrana (R). Alirajpur is the key town in the catchment. Backwaters of Sardar	80+ km Multipronged.

			Sarovar Dam at Navagam is evident.	
109	1080 km	?? stream joins.	Bhadal (L). Stream forms MP- Maharastra border.	25+ km Multipronged.
110	1115 km		MP-Gujarat border.	
		Total		4407 km, say 4410 km

Thus the total length of Narmada system in MP is in excess of $1115 + 4410 = 5525$ km

Formation of Sahardhara (braids) in the river bed at several locations points to river's notable geo-morphology. So is the alternation of rocky bed and alluvial bed all along the length of the river.



Map No 21: Rivers Ajnai and Machak meet Narmada (in Sahasdhara) 25 9 2001



Map No 22: Rivers Ajnai and Machak confluence with Narmada (without the Sahasdhara) 24 1 2010

Following list of Earthquakes from Hoshangabad District in Narmada valley points to the seismic vulnerability of the valley:

Table 17: list of Earthquakes from Hoshangabad District in Narmada valley points

S. No.	Date	Epicentre	Magnitude
1.	1847 May, 27	Near Burwani	-
2.	1863, Nov, 19	The Nimar and Burwani country	-
3.	1926, December, 31	25°.0' N, 77°30' E	-
4.	1927, June, 2	24°.0' N, 82°.3'E	6.5
5.	1938, March, 14	21°.5' N, 75°.0'E	6.5

6.	1957, August, 25	22° . 0' N, 80° . 0' E	5.5
7.	1957 October, 17	21° . 5' N, 79° E	5.0
8.	1967 January, 6	22° N, 74° E	4.8
9.	1969, March, 26	22° . 6' N, 78° . 10' E	4.2
10.	1969, March, 26	22° . 50' N, 78° . 10' E	4.5
11.	1973, July, 12	630 Km. (From Delhi—(Near Jabalpur)-	
12	1997, May, 22	Jabalpur , Koshamghat	6.0

(Source: Hoshangabad gazetteer)

Biodiversity

Balasure (2001) studied and reported 21 fish species belonging 16 genera, 6 families and 4 orders on the fish fauna of River Narmada.

(FILE:///C:/USERS/ADMIN/DOWNLOADS/ARTICLE_EJBPS_VOLUME_2_AUGUST_ISSUE_4-1441187664.PDF)

The present study deals with the fish diversity of Barna River and its tributary in Raisen district, Madhya Pradesh, Central India. Fish studies were undertaken during Oct. 2011 to Nov. 2012. The aim of the study was to explore the fish fauna of Barna River, a tributary of river Narmada. The sampling stations were conducted in Barna and its tributary streams. Fishes were collected directly from sampling stations two times in a period of investigation.

The results of present investigation reveal the occurrence of 33 fish species belonging to 5 orders, 9 families and 21 genera. The order Cypriniformes was found dominant (24 species) followed by Perciformes and Ophiocephaliformes (3 species) both, Mastacembeliformes (2 species) and Beloniformes (1 species). The most abundant family was Cyprinidae, having 250 individuals (75%) followed by Cobitidae with 32 individuals (10%).

(FILE:///C:/USERS/ADMIN/DOWNLOADS/85_IJAR-2445.PDF)

Mythology:

It is very frequently mentioned in the Mahabharata and the *Matsya*, *Padma*, *Kurma* and *Skanda* Puranas. According to one view, Narmada and Rewa are different rivers. Narmada starts from the Mekala mountain which is a part of the Riksha Parvata while Rewa starts from Amarakantaka in the Vindhya. According to *Amara Kosa*, Narmada is the same as Rewa and is also called Somodhbhava and Mekala-Kanyaka. The *Satapathabrahamana* mentions one Revottaras. Whether Narmada and Rewa are one of different in their origin, one starting from Amarkantaka and the other from Mekala, both the streams merge into one and are indiscriminately described both as Rewa and Narmada.

Amarakantaka is mentioned as a very sacred spot where numerous tirthas abide and it is considered very holy and efficacious for the purpose of performing sraddhas.

Narmada has been described as the best among the rivers, she having issued from the body of Rudra. It is said she is capable of purifying all creatures and ever immoveables. River Ganga is said to be holy at Kanakhala, river Saraswati is similarly holy at Kurukshetra; while Narmada, whether she is flowing from a village or a forest, is said to be holy at all places. The water of river Saraswati is said to purify a person in ten days, that of river Yamuna in seven days, while the water of river Ganga purifies a person immediately; but in the case of river Narmada a mere sight of the river even without a bath or a sip of her water is said to be purifying.

Amarakantaka is described as part of the Kalinga country. Numerous sages have performed penance on her banks. Many perform the Parikramana of the river from its source to its Sangama with the sea.

Narmada is called Naredos by Ptolemy and Namnados by the Periplus. Between Amarakantaka and Broach, the *Agni Kurma* and *Skanda* Puranas state that there are 60 crores and 60 thousand Tirthas but *Skanda* adds that in this Kali Yuga there are very few pratyasha tirthas as men in this age are losing their spiritual strength.

Narmada has 35 Sangamas. The best is the Sangama of Rewa with the sea.

Historical, religious sites

Important religious places and Ghats along the course of the river, starting from its origin at Narmadakhund at Amarkantak hill, are

- a) the Amarkantak (in Sanskrit: Neck of Shiva) or Teertharaj (the King of Pilgrimages),
- b) Omkareshwar, Maheshwar, and Mahadeo temples, Nemawar Siddeshwar Mandir in the middle reach of the river – all named after Shiva,
- c) Chausath Yogini (sixty four yoginis) temple,
- d) Chaubis Avatar temple,

e) and Bhrigu Rishi temple in Bharuch.

The Narmada River is also worshipped as mother goddess by Narmadeeya Brahmins.

The importance of the Narmada River as sacred is testified by the fact that the pilgrims perform a holy pilgrimage of a parikrama or circumambulation of the river. The Narmada Parikrama, as it is called, is considered to be a meritorious act that a pilgrim can undertake. Many sadhus and pilgrims walk on foot from the Arabian Sea at Bharuch in Gujarat, along the river, to the source in Maikal Mountains (Amarkantak hills) in Madhya Pradesh and back along the opposite bank of the river. It is a 2,600-kilometre (1,600 mi) walk.

Fossil records

Narmada Man – the only stone age fossil from India Narmada Man or Narmada Human is the earliest Homo species of Indian sub-continent. This fossil was found on banks of Narmada River in Hathnora Village of Madhya Pradesh in 1982. Narmada Man used to live 2.5 Lakh years ago and belonged to Homo erectus species, which was first among the three Homo species (Homo habilis, Homo ergaster and Homo erectus) to acquire tool making skills. These three species predate Homo sapiens, to which we belong. The importance of Narmada man is that it is only authentic record of a Homo species fossil from Stone Age in India.

(http://www.gktoday.in/paleolithic-age-in-india/#Narmada_Man_8211_the_only_stone_age_fossil_from_India)

During a recent exploration in the central Narmada valley, researchers have unearthed skeletal parts of hitherto unknown archaic humans that have inhabited central Narmada valley in India during late to mid Pleistocene.



Hominin femur fossil found from Central Narmada Valley . Image Courtesy: Current Science

According to a research communication published in the Current Science Journal, a partial piece (bone which extends from shoulder to elbow), a fragmented femur and other stone artifacts collected from netankheri, located

3 km away from Hathnora on the banks of Narmada river, shows that Central Narmada Valley had two different archaic human races.

While one was large robust hominins who used to hunt down large mammals with heavy duty weapons, the later developed pygmy sized one which was hitherto unknown to science, used to hunt smaller animals with lightly refined tools. The pygmy sized race could be the real ancestors of all short-bodied populations in South Asia, says the study.

[HTTP://INDIANBIODIVERSITYTALK.BLOGSPOT.IN/2013/01/PYGMY-SIZED-HUMAN-ANCESTOR-IN-CENTRAL-NARMADA-VALLEY-FOSSIL.HTML](http://indianbiodiversitytalk.blogspot.in/2013/01/pygmy-sized-human-ancestor-in-central-narmada-valley-fossil.html)

With many short tributaries flowing into it from north and south, the Narmada basin forms a very important topographic feature of peninsular India. At a time when the Indus and Gangetic valleys were uninhabited wilderness, Narmada valley was the home for a rich mosaic of human cultures. Since those times lost in antiquity till today a very large human population including a variety of tribal societies such as Bhils, Gonds, Saigas, Kurkus, Bhilalas have continued to live depending on Narmada. In short the Narmada basin forms an ideal microcosm of our country with its extraordinary rich natural heritage supporting cultures ancient and more recent. People of India venerate Narmada river as the epitome of freedom and sanctity. Even pumping the waters of Narmada for any purpose is considered by many as sacrilege.

([HTTP://WWW.NARMADA.ORG/SARDAR-SAROVAR/NARMADA.HTML](http://www.narmada.org/sardar-sarovar/narmada.html))

DROWNING A HISTORY IN THE NARMADA VALLEY: A SEAT OF OLD HUMAN SETTLEMENTS AND EVOLUTION IS NOW UNDER THREAT

Posted on **June 15, 2015** by **admin**

<HTTPS://COUNTERVIEW.ORG/2015/06/15/DROWNING-A-HISTORY-IN-THE-NARMADA-VALLEY-A-SEAT-OF-OLD-HUMAN-SETTLEMENTS-AND-EVOLUTION-IS-NOW-UNDER-THREAT/>

A recent fact-finding report, "Drowning a Valley: Destroying a civilisation – Report from Sardar Sarovar Project Submergence Areas in Madhya Pradesh, Maharashtra and Gujarat", prepared by an independent commission, has found massive inconsistencies in the rehabilitation of Narmada dam oustees. At the same time, has said that the dam would lead to a sharp setback to areas which have come to be consisted as of great historical and archaeological significance. Consisting of CPI(M) MP Hannan Mollah, National India Federation of Women leader Annie Raja, ex-forest minister from Kerala Vinay Bishwom, sitting ongress MLA from Badwai, Ramesh Patel, and experts Raj Kachroo, a senior hydrologist, and Soumya Dutta, a well known expert on energy and climate issues, wonders how could the great heritage be preserved when large number of fresh areas are slated to under submergence when the dam's height is being raised from the present 121.92 metres to 138.64 metres. Excerpts:

The Narmada valley is not just like any other river valley, though all rivers are in a sense mothers to human civilisations, by providing plentiful water and soil fertility. As a result of the "Narmada Basin Paleo-anthropology Project" (NBPA), and the large scale excavations /explorations jointly undertaken by MS University Vadodara and the US based "Stone Age Institute", it is being realised that this old river valley has harboured pre-historic human settlements, possibly even pre-Harappan primitive human 'civilisation'. According to Prof K Krishnan, head of MSU's Department of Archaeology and Ancient History, "This project may throw new light giving credence to the belief that the Narmada Valley could have been (one of) the centre of human evolution".

Advanced stone tools and implements have been unearthed in the valley, dating back to the age of the beginning of modern humans, over 50,000 years ago, and possibly much older. Even if it is one of the oldest global sites of early evolution of 'modern' humans, this is a priceless heritage, certainly not fit for submerging for a few mega watts of power and some misguided mega-projects.

The NBPA project was founded with the discovery of vertebrate fossils including the only pre-modern human fossil known in South Asia from the Narmada Basin. *The Times of India*, while reporting on this in August 2012, says – "In 1980s, former director of Geological Survey of India (paleontologist) Arun Sonakia had created a sensation surprising the world with his discovery of the "only human fossil in Asia" from near Hoshangabad in Central Narmada Valley Basin in Madhya Pradesh which he said was that of a homo erectus (predecessors of today's human). In recent times, however, archaeologists have argued that although the discovery has been variably attributed to different species of homo, its age remains uncertain.

"Through this project, we will collect more human fossils, look at the context of this fossils and go for a precise dating methodology as very little dating of fossils has been done so far," co-director and research associate of

NBPA from Stone Age Institute Parth Chauhan told TOI. “Study at Narmada Basin is important because of its geographical location which is very strategic for migration of animal population from North to South and East to West. It is not only rich in fossils and archaeological sites, but it has a long history of human occupation and this region is facing submergence due to dam construction,” says Chauhan.

Even the Narmada Hydroelectric Development Corporation Ltd recognizes (SK Dodeja and VB Bhatt, NHDCL, ‘Sustainable Management of Archeologically Important Monuments’) that “...the valley is very rich in archeologically important wealth”, but arrogantly and foolishly talks about ‘sustainable management’ of such human history by finding and relocating a few bits and pieces of this treasure.

One can also judge the historical (both anthropological and archaeological) importance of the Narmada basin from this deep concern expressed by the Anthropological Survey of India – “This modest beginning is a challenge for future since these human fossils have world-wide interest and implications in understanding human origins. It is also acclaimed by notable scholars, like Kenneth A. R. Kennedy, that India has enormous field resources for the palaeo-anthropological investigations where the Narmada basin and the Siwaliks are in particular of great significance.

“And, we have tapped only a fraction of the same. Therefore, it is imperative that extensive and intensive systematic explorations and excavations of Central Narmada basin are of immediate concern. This is particularly very compelling in view of the inevitable submergence of the basin in the wake of Narmada Sagar Dam backwaters and monsoonal over flooding of Narmada River.”

Apart from these pre-historic treasures, the present day Narmada valley population is also a richly diverse ethnic and cultural treasure. The adivaasi populations are Bhils, Gonds, Rathwas, Tadvīs and many others, each with its unique culture and traditions. The large village of Chikhalda, with over 750 houses, faces submergence of about 688 houses, while pre-historic human settlements were discovered nearby. The entire valley is ripe with hundreds of temples dotting its banks and villages, mosques dating few decades to many centuries. The invaluable treasure of the tribal gods and goddesses, mounds and hillocks are never counted!

Renowned historian SB Ota who has worked for the Archaeological Survey of India (ASI) has written that the Narmada valley is the only one that has precious remnants from the Palaeolithic age to the current age, at one place. His revealing findings, which were not favourable to the Government, were disregarded and even his research work was hampered by the Government which curtailed funding. Eminent archaeologists Romila Thapar, Irfan Habib and others resolved in one of the national meetings of the Archaeological Congress that at least a hundred years of research would have to be undertaken, in order to unearth all the old, precious remnants, before the valley can be submerged.

The Narmada valley is thus a national treasure that should be preserved and celebrated. It is a great misfortune for India that we have governments which value human history and culture so low, and are bent upon being the destroyers of this heritage.

The Narmada Bachao Andolan Movement [NBA]

([HTTPS://ESSENTIALTHINKERS.WORDPRESS.COM/2013/10/13/THE-STORY-OF-NARMADA-BACHAO-ANDOLAN-HUMAN-RIGHTS/](https://essentialthinkers.wordpress.com/2013/10/13/the-story-of-narmada-bachao-andolan-human-rights/))

Since the early 1980s, the Narmada Project has faced mounting opposition from a variety of sources. Protest groups formed in all three affected states and included or were supported by individuals facing displacement, students, social activists, Indian environmental NGOs, international NGOs, and transnational networks. In Gujarat, nineteen villages, whose submersion the Sardar Sarovar dam ensured, formed the **Chhatra Yuva Sangharsh Vahini**, a youth protest group. The group engaged in protests and initiated court actions, ultimately forcing the government of Gujarat to offer a more generous resettlement package. The group's belief that Gujarat's water needs made the dam project necessary guided its decision to focus on rehabilitation efforts and to ensure that the government adhered to its promises.

In contrast, groups in Madhya Pradesh and Maharashtra opposed the dams altogether. Two such groups, the **Narmada Ghati Navnirman Samiti** in Madhya Pradesh and the **Narmada Ghati Dharangrastha Samiti** in Maharashtra, subsequently merged to form the Narmada Bachao Andolan in 1989. Under the leadership of the principal figure associated with the movement, **Medha Patkar**, the NBA initially sought to verify the claims regarding the benefits that would flow from the construction of the dams. In the process, it focused on securing access to documents from the government and the World Bank to ensure greater transparency.

The NBA's Methods

The success of the NBA campaign resulted from its innovative strategies of resistance that operated simultaneously at the grassroots, national, and international level. As such, the campaign's significance as a social movement extends far beyond India's national borders. Balakrishnan

Rajagopal—a leading scholar on development and social movements and a long-time observer and researcher of the Narmada struggle—notes that globally, the NBA is “**regarded as one of the signature public contestations of the twentieth century that redefined the terms of development, democracy and accountability.**”

While the NBA originally employed “**Gandhian methods**” such as peaceful marches and protests, after a high-profile hunger fast in 1991 failed, the NBA announced a “**noncooperation movement**” in the Narmada valley. This movement campaigned against the payment of taxes and sought to deny entry to the villages to all government officials, except teachers and doctors. The NBA subsequently began to consider litigation as an additional option for a variety of reasons. Their tactics up to this point had frequently drawn violent reactions

from the government. In addition, other disadvantaged groups had successfully moved the Supreme Court, inspiring the NBA to do the same.

The NBA's Leadership

One of the biggest reason for the success of the NBA was the excellent leadership provided by the most able persons of the country. The NBA, a broad-based participatory movement, flourished under the leadership of visionary environmental champions. One of India's most vibrant and best known living activists, **Medha Patkar** (or **Medha didi (big sister)** as she is called) has led the Narmada movement for over two decades. Her uncompromising stance against government apathy toward the human and social costs of dam construction and her ongoing efforts to ensure that transparency and accountability remain hallmark features of development projects have helped fashion the NBA into one of the most dynamic social movements of our time. A “**veteran of several fasts [and] monsoon satyagrahas [civil disobedience] on the banks of the rising Narmada,**” she has endured police beatings and jail terms in her quest to secure the right to life and the right to livelihood for the over twenty million people whose lives would be adversely affected by the Narmada Project.

Other women have also played central roles in the campaign. The NBA's struggle against the Maheshwar Dam in Madhya Pradesh state, for instance, has been led by the **Narmada Shakti Dal**, a separate women's organization within the NBA that was set up on March 8, 1988—International Women's Day—and is comprised of female villagers from Maheshwar. Alongside Medha Patkar, social activist **Baba Amte** provided moral leadership to the cause to preserve the Narmada River. Though renowned for his work against leprosy, beginning in the early 1980s he involved himself in the struggle against mega dams. Amte first achieved national prominence for his work on dams with the publication of *Cry O Beloved Narmada* in 1989, an elegiac booklet that made the case for a dam-free Narmada.

Direct Action

Medha Patkar and Baba Amte together led a series of protests, some of which failed while the others achieved success. In September 1989, Amte led a 60,000-person anti-dam NBA rally in Harsud—a town of 20,000 people in Madhya Pradesh that faced submersion. In May 1990, a massive NBA five-day *dharna* (sit-in) at then-Prime Minister V. P. Singh's residence in New Delhi forced the Prime Minister to agree to “reconsider” the project. In December 1990, Amte, along with 5,000 protestors, began the *Narmada Jan Vikas Sangharsh Yatra* (Narmada people's progress struggle march), marching over a hundred kilometers from Amte's headquarters near Barwani in Madhya Pradesh to Ferkuva on the Madhya Pradesh–Gujarat border. The government reacted by deploying the Gujarati police force and by bussing in thousands of government-supported pro-dam demonstrators from urban centers in Gujarat. Following the government's

announcement that rising waters from the dam would begin to submerge villages, domestic protest intensified and with it the resulting backlash from the state. On January 5, 1991, Amte began a “*dharna* [sit-in] unto death.”

The most popular slogans of the NBA were *Vikas Chahiye, vinash nahin!* (“We want development, not destruction”) and *Koi nahi hatega, bandh nahi banega!* (“No one will move, the dam will not be built”).

The World Bank Withdraws

The protests against the building of dams were going on increasing day after day. In response to this, the World Bank decided to review its policies. The World Bank announced in June 1991 that it would commission a team of independent experts, known as the Morse Commission, to reexamine the Sardar Sarovar Project.⁹⁶ The Commission’s independent review had two aims: to assess steps taken to resettle those affected by the Sardar Sarovar dam, and to assess the efficacy of measures aimed at diminishing the project’s environmental impact.⁹⁷ It was chaired by Bradford Morse, the former head of the UN Development Programme, and Thomas Berger, a former British Columbia Supreme Court judge, neither of whom had ever been Bank employees.

The Commission completed its task and prepared a 357 page report. The report clearly mentioned that there were several discrepancies in the functioning of the Bank and granting the loan to the Indian Government. It also recorded a great deal of environmental degradation and a huge violation of human rights.

According to one of the passages of the report.... :-

“We think the Sardar Sarovar Projects as they stand are flawed, that resettlement and rehabilitation of all those displaced by the Projects is not possible under prevailing circumstances, and that environmental impacts of the Projects have not been properly considered or adequately addressed. Moreover we believe that the Bank shares responsibility with the borrower for the situation that has developed... We have decided that it would be irresponsible for us to patch together a series of recommendations on implementation when the flaws in the Projects are as obvious as they seem to us. As a result, we think that the wisest course would be for the Bank to step back from the Projects and consider them afresh. The failure of the Bank’s incremental strategy should be acknowledged. ”

As a result of the report and huge criticism of the Bank, the Bank withdrew its support from the project.

The Sardar Sarovar Project Today

Construction of the Sardar Sarovar dam proceeded uninterrupted after the suspension on construction was lifted in 1999. On December 31, 2006 Gujarat Chief Minister Narendra Modi announced the completion of the Sardar Sarovar dam and symbolically poured the last bucket of concrete. Construction was halted at 121.92 meters and

experts associated with the project announced they would install only thirty gates of fifty feet [15.24 m] each within three years. As noted above, according to unofficial estimates, approximately 320,000 people have been displaced by the Sardar Sarovar dam and as many as one million may be affected due to related displacements by the canal system and other allied projects. The NBA has continued to engage in various forms of direct action even as it pursued its legal remedies. While the case stagnated in the Court system, NBA activists organized and participated in public meetings, rallies, marches, demonstrations, fasts, *dharnas*, and *satyagrahas*. These activities have had three overlapping aims: first, to call for rehabilitation work to take place at the same time as the raising of the dam as ordered by the Supreme Court; second, to demand the termination of the project altogether; and third, to protest the series of Supreme Court orders declining to suspend construction. The struggle of the NBA has also fired the imagination of some of India's most prominent citizens who have, along the way, acted as the voice of the movement.

As for the movement's leaders, each won countless human rights awards in recognition of their contributions. In 2000, Amte returned to his community development project at Anandwan (Forest of Bliss) near Nagpur in Maharashtra, where he passed away in February 2008 at the age of ninety-four. Upon his death, the Dalai Lama lamented, “[h]is demise is a great loss to all of us. I am an admirer of Baba Amte..... [H]is [compassion] shone through everything he did, including his work for creating greater awareness about the protection of our environment.” Patkar continues to protest against the Narmada Project. While she has abandoned efforts to pressure the government to forsake the dam, she continues to fight for the rights of displaced persons in Madhya Pradesh to receive the compensation that the Narmada Tribunal determined they were owed.

Conclusion

According to one NBA partner, the campaign against the construction of dams on the Narmada River is “symbolic of a global struggle for social and environmental justice,” while the NBA itself is a “symbol of hope for people's movements all over the world that are fighting for just, equitable, and participatory development.” Though the NBA has yet to achieve the goals for which it has so tirelessly fought, its victories against the mammoth odds have earned it the reputation of being one of the most dynamic social movements of our time and one that the government continues to expend considerable resources to fight against. As noted by Medha Patkar upon her release from jail on August 6, 2007: “**It's obvious that the Government [of Madhya Pradesh] is all out to kill our right to land and also [our] right to agitate.**”

DAM AT MAHESWAR

Environment ministry promises action against Narmada dam builder

Submitted by [admin4](#) on 16 February 2010 - 5:31pm

By IANS,

New Delhi : Environment Minister Jairam Ramesh Tuesday said that his ministry will issue a show cause notice to the company working on the Maheshwar dam in the Narmada valley in view of the large scale protests of people there who have been affected because of the work, but not rehabilitated.

A group of about 500 people, under the aegis of the Narmada Bachao Andolan, reached the capital Tuesday to protest against the dam construction. A smaller group went to meet the minister with their complaints.

Alok Agarwal, one of the protesters, said: "Our demand is that the environment ministry should immediately suspend the construction work on the Maheshwar dam project, which has far outstripped the progress of the rehabilitation and resettlement measures."

According to Agarwal, the Maheshwar dam, built on the Narmada river Madhya Pradesh, is slated to submerge the lands and the homes of 50,000-70,000 peasants, fishermen and landless workers in 61 villages.

The project was privatised and handed over to the S. Kumar's Group of Companies in 1992. The environmental clearances were issued in 1994 and then again in 2001.

"The binding provisions of the Environment (Protection) Act, 1986, held the state government of Madhya Pradesh and S. Kumar's Group of Companies accountable for the rehabilitation of the villagers. A comprehensive rehabilitation plan was to be submitted by December 2001 but it has not been done till date," Agarwal said.

"When we met the minister today, he told us that they would issue a show-cause notice to the Maheshwar Hydel Power Corporation today under Section 5 of the Environment (Protection) Act, 1986," he said.

"The notice would demand a reply from the company as to why the construction work should not be suspended due to non-compliance with conditions of the clearances given. The firm will have 15 days to reply before action is taken by the ministry," Agarwal added.

http://twocircles.net/2010feb16/environment_ministry_promises_action_against_narmada_dam_builder.html#.V90a0oh96M8)

Some Notable books on river Narmada:

English:

1. Waters Close Over Us: A Journey along the Narmada: A Journey along the Narmada (English) (Hardcover, Hartosh Singh Bal). Harper Collins, 2013.
2. Caring for Nature: The River of Life (The Story of the Narmada Bachao Andolan), Subhadra Sen Gupta, TERI, 2016.

3. Ecology of River Narmada, By K. Sankaran Unni
4. Narmadaparikrama - Circumambulation of the Narmada River: On the Tradition of a Unique Hindu Pilgrimage, by [Jurgen Neuss](#)

([HTTP://WWW.ALIBRIS.COM/NARMADAPARIKRAMA-CIRCUMAMBULATION-OF-THE-NARMADA-RIVER-ON-THE-TRADITION-OF-A-UNIQUE-HINDU-PILGRIMAGE-JURGEN-NEUSS/BOOK/29104044](http://www.alibris.com/NARMADAPARIKRAMA-CIRCUMAMBULATION-OF-THE-NARMADA-RIVER-ON-THE-TRADITION-OF-A-UNIQUE-HINDU-PILGRIMAGE-JURGEN-NEUSS/BOOK/29104044))

5. Sacred Virgin: Travels along the Narmada, Royina Grewal, Penguin, 1995

Hindi:

6. Narmada ki Dhara Se, Shiv Kumar Tiwari & Govind Prasad Mishra
7. Saundarya Ki Nadi, Narmada; Amrtasya Narmada; & Teere, Teere, Narmada by Amrit Lal Beghad

STATUS

Table 18: Narmada River Status

River	Key Tributary	Catchment Veg	Dams/A nicuts	Cities	Polluting influence	GW	People's connect
Narmada							
	Halon (150+)	B	P	B	B	B	B
	Banjar (150+)	B	P	P	P	B	B
	Gaur (100+)	P	P	P	P	G	P
	Heran (150+)	B	P	B	P	B	P
	Sher (100+)	B	P	B	B	B	P
	Shakkar (100+)	B	P	P	P	B	P
	Dudhi (100+)	B	B	B	B	B	B
	Tenduni (100+)	P	P	P	P	P	P
	Barna (100+)	P	R	P	P	B	P

	Tawa (150+)	P	R	R	P	P	P
	Kolar (100+)	P	R	P	P	P	P
	Ganjal (150+)	B	P	B	B	B	B
	Ajnai (100+)	P	P	P	P	B	P
	Machak (100+)	B	B	B	B	B	B
	Chota Tawa (150+)	P	P	P	P	P	P
	Choral (90+)	P	P	P	P	P	P
	Beda, Kundi, Amba (100+)	P	P	P	P	P	P
	Bagh, Uri (100+)	P	P	P	P	P	P
	Goi (100+)	P	P	P	P	P	P
	Hatni (80+)	P	P	P	P	P	P

There are still five rivers (Halon, Sher, Dudhi, Ganjal and Machak) within the Narmada valley in MP that deserve a BLUE status and Barna, Kolar and Tawa that deserve a RED status. All the rest are PINK.

18. Son

River Son forms the other part of the SONATA rift valley. It like its westwards expansion viz., river Narmada, forms the north-south physical divide of the sub continent of India.

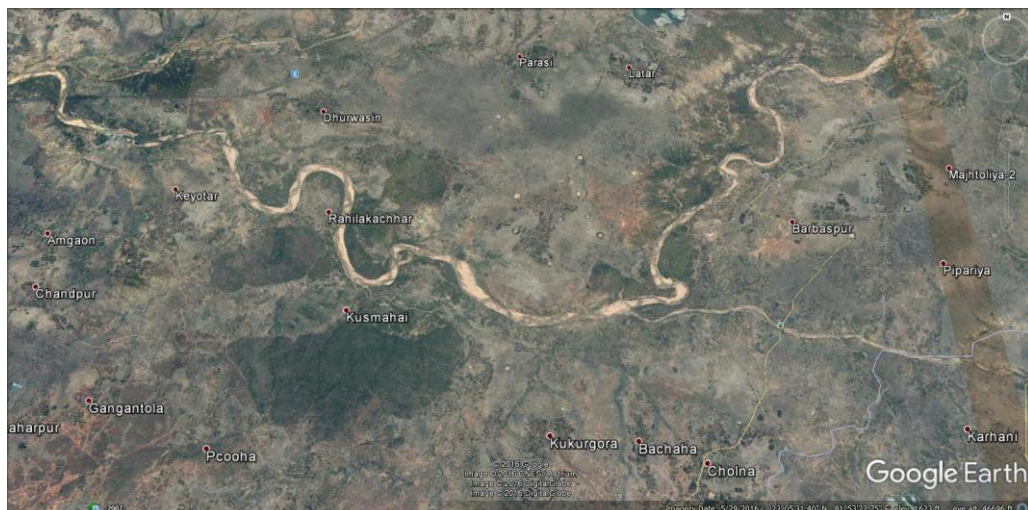
River Son is also referred to as Sonabhadra. It is called Nala in masculine and not Nadi in feminine.

The exact origin (udgam) of river Sone is disputed as its headwaters are spread over large tract in the Pendra Plateau in CG. Although it is claimed to originate from Amarkantak, like Narmada and some hold that it originates from Sonemunda village in Pendra in CG.



Map No 23: Pendra Origin of River Sone

For our purpose we have looked at river Sone from the point where it comes into its own after its confluence with river Kevai.



Map No 24: River Kevai (from north east) Meets River Sone (smaller & from south east)

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Sone system in the state (derived from Google earth imageries):

For the purpose of our study we presume its point zero at its confluence with river Kevai in Anuppur district of MP.

Table 19: Key Notables about the River Sone System

S. No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	0	Kevai river meets Sone river	Barbaspur / R	80+ km Kevai river is PINK due to dams on origin
2	5	Santosh nala joins	Kusmahai (L)	15+ km
3	14	River Sarva meets	Chulkari / R	50+ km
4	19	Kirnar nala meets	Senduri (L)	15+ km
5	28	River Tipan meets	Anuppur (L) Anuppur is District headquarters town.	50+ km
6	29.5	Chandas nala meets	Anuppur (L)	10+ km
7	31	Bakan river meets	Chachai Viran (L)	25+ km
8	35	Suthna Nala meets Big reservoir (Chachai lake) on the nala	Chachai (L) Amarkantak Thermal Power station	15+ km
9	37	Katna river meets	Kelhauri (R)	30+ km

10	40.5	Anicut on the river	Amlai. Amlai is an industrial town. Amlai paper Mill, (OPM)	
11	50	Nargara nala meets	Saabo (L)	10+ km
12	53.5	Kaser nala meets	Jarwahi (R)	20+ km
13	67	Sarpha / Jamuniha River meets. Anicut on Sarpha. River Sone turns from south west to north.	Lalpur (L)	30+ km
14	73	Nagauwa river meets	Bhaga (R)	20+ km
15	83	Kunuk River meets	Shyamdi (R) Shahdol town is nearby.	50+ km
16	103	Muhna / Nirmal river meets	Balbai (L)	50+ km
17	126	Johilla river meets. Major Dam on river Johilla at Kurkucha	Majhauri (L) Sanjay Gandhi Thermal power station at Birsinghpur Coal mine near Narwar on one of the tributaries of Johilla	150+ km PINK river due to major dam and pollution issues.

18	131.5	Janar river meets. Originates from Bandhavgarh forests	Pipari Tola (L)	15+ km
19	132	Chundi River meets	Barna (R)	50 + km
20	185	Mahanadi / Katni river meets, Sone river takes a right angle turn to east and moves in a close valley. Presently it is under the Bansagar Dam reservoir	Bansagar Dam reservoir. Mahandi meets on left bank as the River Sone turns east. Panpatha and Son Ghariyal wildlife sanctuaries impacted.	250+ km Katni is a PINK river due to pollution from Katni city. Mahanadi is a BLUE river.
21	220	Samdhin river meets.	Chachai (R)	25+ km
22	238	Banas / Mahan river meets.	Chandrehi (R) Sanjay, Bagdara and Dubri Sanctuaries in the catchment.	200+ km BLUE river
23	335	Gopad river meets.	Bardi (R) Towns of Sidhi, Churhat in the catchment.	150+ km
24	380	Sone river enters Uttar Pradesh	Newari (UP)	
		Total		1315+km

Thus the total length of Sone rivers in MP is 380 km + 1315 km = 1695 km +

It is actually river Katni later meeting river Mahanadi which then goes onto meet river Sone, which is at the root of the SONATA rift formation.

Biodiversity

Fish Biodiversity

(FILE:///C:/USERS/ADMIN/DOWNLOADS/ARTICLE_EJBPS_VOLUME_2_AUGUST_ISSUE_4-1441187664.PDF)

A total of 43 fish species belonging to 06 Orders, 14 families and 31 genera were recorded and documented from the selected sampling sites of the River Sone. In present investigation family Cyprinidae was dominant at all the sampling sites with 15 species, followed by family Bagridae with 06 species, Schilbeidae 04 species, Channidae & Siluridae 03 species each.

Conservation Status:

It was revealed that, out of a total 48 fish species of River Sone as per CAMP (1998), 4.65% of the fishes belongs to lower risk least concern (LRlc), 39.53% lower risk near threatened (LRnt), 27.91% vulnerable (VU), 18.61% not evaluated (NE) and 9.30% endangered (EN) category and according to the IUCN, 79.07% of the fishes belongs to Least Concern (LC), 16.28% Near Threatened (NT) and 4.65% Data Deficient (DD) (Table-01 & Fig.-01).

Mythology and early history:

(SOURCE: IMMORTAL INDIA, JH DAVE, BHARTIYA VIDYA BHAWAN, 1991)

“In Balakanda of Ramayana (Chapter 32 verses 7 to 10) Girivraja is described as the city of Vasumati established by one king called Vasu. It was surrounded by five hills and it is stated that the river sumagadhi or Magadhi, which flowed by the side of Girivraja and which is referred to in the Ramayana, is the same as river Son. River Son has been referred to in many Puranas as a big river. The source of this river is also stated to be the mountain range known as Riksha parvata. This mountain has been identified with the eastern part of the Vindhya range. River Suktimati and several other rivers also are stated to rise from the Riksha parvata according to Markandeya and other Puranas.

It is said that one performing sandhya on the banks of river Sona is emancipated or attains heaven and the merit is even capable of removing the sin of Brahmahatya. River Son in masculine is also referred to by Kalidasa in his Raghuvamsa (Canto VII-36). There it is stated that Prince Aja ordered his father's Minister to guard Indumati with the help of his army and then Prince Aja proceeded to stop the army of his opponents just as river Son full of rising waves is proceeding to stop the flow of river Ganga.

Kalidasa also refers to Pushpapura or Pataliputra (which was situated on the banks of Sona) in Raghuvamsa VI-24 where it is stated “ O, Princess! If you desire to marry this Parantapa, the worthy king of Magadha, then you will enter the capital of Magadha and will give delight to the eyes of ladies of that city sitting in the balconies of palaces to see you.”

It is stated that rivers Son, and Narmada came out from the two tears dropped by Brahma on the two sides of the Amarakantaka plateau.

Visvamitra and Rama are described by Valmiki as having crossed Son and Rama states that river Son is full of deep and pure waters and has sandy banks.

River Son, which was called Hiranyavaha, is referred to by Arrian and Megasthenes as Erannaboas and the reason why it is connected with Hiranya or gold is stated to be this. It had sands of red gold colour conspicuously visible on its banks particularly during the rainy season. Another explanation is that in ancient times gold was found in the alluvium of this river.

It is called Soa by Ptolemy, Sonas by Arrian and is the same as Erannaboas of the Greeks.

The *mahatmya* of Sona is recorded in *Sonamahatmya* and in Brahad-brahmaopurana. The river is referred to in the *Ramayana* and the *Mahabharata*. The bed of this river is formed of the sand-stone of the Vindhya range. Sometimes there are quicksands in the river which are called *chor-baru*. The silt deposited by the river after it overflows is very rich and helpful for the growth of abundant crop”.

SONE FLOOD FEAR OVER MP DAM WATER BURST - VANSAGAR DISCHARGE TRIGGERS ALARM FOR BIHAR – 2011

([HTTP://WWW.TELEGRAPHINDIA.COM/1110927/JSP/BIHAR/STORY_14557827.JSP](http://www.telegraphindia.com/1110927/jsp/BIHAR/STORY_14557827.jsp))

OUR SPECIAL CORRESPONDENT



A rescue team at work in Rohtas district after a fresh release of water in the Sone. Picture by Sanjay Choudhary

Patna, Sept. 26: The threat of floods looms large again on at least nine districts across central, south and north Bihar following unprecedented discharge of water in the river Sone from the Vansagar dam in Madhya Pradesh and Rihand dam in Uttar Pradesh.

The discharge in the Sone today was 9.5 lakh cusecs against 8.39 lakh cusecs on September 11, when the sudden rush of water had sparked panic in Bihar. The river hasn't received such volumes of water since 1975, as a result threatening areas in central and south Bihar which are normally spared the fury of floods.

The dispute over the sharing of water from Vansagar dam between Bihar and Madhya Pradesh is pending in Patna High Court. A farmers' body has filed a PIL asking Madhya Pradesh to regulate the flow of water from the dam.

The surging waters, along with the torrential rains in the catchment areas of the Sone and Ganga in the last 48 hours, have inundated hundreds of villages in Bhojpur, Arwal, Aurangabad, Kaimur, Rohtas, Gaya and Patna districts in central and south Bihar, besides Saran and Vaishali in north Bihar.

Meteorologists said an atmospheric depression that created a zone of rain across Bihar while the monsoon withdrew from the northwest caused water levels to rise in several rivers in the state.

The depression that had crossed the Orissa coast last week and has since evolved into a low pressure zone hung over northern Bihar this evening, after wiping out Bihar's rainfall deficit in the past 24 hours.

"Rainfall over the past 24 hours has been hundreds of times the normal for this time of the year," said Animesh

Chanda, the director of the Patna Meteorological department.

The cumulative rainfall over Bihar since the start of the monsoon on June 1 had until Sunday been about two per cent below the long-period average, Chanda said. “Now, it is four per cent above average,” he said.

The India Meteorological Department said widespread rain and thundershowers are likely to occur over parts of Bihar, northern Bengal, Sikkim and the Northeast during the next 48 hours after which the rains are expected to decrease.

The Sone waters have spilled on to the Chhapra-Patna National Highway 19 at Jhaua and Awatar Nagar. The Sone meets the Ganga at Haldi Chhapra (Bhojpur). A surge in the Sone has caused excess water in the Ganga, affecting the settlements along its bank.

Besides, there is enormous pressure on the banks of the Punpun and Muhane — tributaries of the Sone that crisscross Gaya, Aurangabad and Patna districts. The water has gushed into several villages forcing the people to move to hillocks and other safer places.

A communiqué from the water resources department today said all the embankments along the Sone were “safe”.

Water resources public relations officer Shubchandra Jha said the Bagmati basin’s catchments areas in Nepal today recorded 12 to 89mm of rainfall, posing the threat of floods in Madhubani, Darbhanga and Araria districts of north Bihar.

Though the discharge in the Sone is the highest in 36 years, it can still in no way be compared to the devastation caused by the Kosi in 2008. The Kosi, which originates from Nepal’s highland, had breached its embankment at Kusaha (Nepal) and had changed its course, marooning millions, taking heavy toll of human lives and cattle, ending the existence of hundreds of villages and causing massive destruction to soil and fertility.

On the other hand, the floods caused by the discharge of water in the Sone have so far not taken any human toll. But it has added to human misery as it has hit people who have seldom encountered floods in their life.

Unlike the people living in north Bihar, which are dotted with makeshift wooden and bamboo houses — obvious signs of preparedness against floods — those staying in central and south Bihar’s plateau-like landscape replete with concrete structures besides hillocks and hilltops, are hardly prepared for such a calamity.

Principal secretary, water resources, Afzal Amanullah said: “The flood fighting machinery might have been taken a bit off-guard when over eight lakh cusecs of water was suddenly discharged in the Sone on September 10 and 11. But we are alert to the situation now. Patrol parties comprising technical experts and district officials have been guarding the embankments round the clock while rescue teams are helping the affected people. There is no need to panic.”

19. Betwa

In Sanskrit "Betwa" is *Vetravati*.

The total length of the river from its origin to its confluence with Yamuna is 590 kilometres (370 mi), out of which 232 kilometres (144 mi) lies in Madhya Pradesh and the balance of 358 kilometres (222 mi) in Uttar Pradesh. In accordance with an inter-state agreement between the states of Uttar Pradesh and Madhya Pradesh in 1973, Betwa River Board (BRB) was constituted under the Betwa River Board Act, 1976. The Union Minister of Ministry of Water Resources the Chairman of the Board and the Union Minister of Power, Union Minister of State for Water Resources, Chief Ministers and Ministers in-charge of Finance, Irrigation and Power of Uttar Pradesh and Madhya Pradesh are its Members.

River Betwa has a number of Udgam points. One is a depression near village Jhiri on Kolar road from Bhopal. Another is point within the Ratapani National Park near Obaidullahganj.



Map No 25: Udgam (origin) in Ratapani National Park

The Betwa sub-basin of Yamuna falls in the Bundelkhand region in central India between latitudes $77^{\circ} 15'$ and $79^{\circ}45'$ N and longitudes $23^{\circ} 5'$ and $25^{\circ} 55'$ E. It originates in the Raisen district in Madhya Pradesh at an elevation of 475 m above mean sea level and joins river Yamuna near Hamirpur in Uttar Pradesh, traveling a total distance of about 564 km.

The basin is saucer-shaped with sandstone hills around its periphery. The topography and elevation (ranging from 700 to 300 m above mean sea level) cause variation in land use, from flat open wheat and gram growing areas to

steep forest-covered hills. About a quarter of basin area contains vegetation ranging from thick forest to scattered bushes, its northern portion is covered with alluvial soils, the central part contains mixed red sandy and black soils, and the southern part has medium black soils.

The average annual rainfall varies from 700 to 1,200 mm with an average annual rainfall of 1,138 mm, the average annual evaporation losses are of the order of 1,830 mm, and the average annual runoff is about 13,430 million cubic meter (MCM), out of which nearly 80% occurs in monsoon.

([HTTPS://WWW.RESEARCHGATE.NET/FIGURE/225169693_FIG1_FIG-1-INDEX-MAP-OF-BETWA-BASIN](https://www.researchgate.net/figure/225169693_FIG1_FIG-1-INDEX-MAP-OF-BETWA-BASIN))



Map No 26: Betwa River Basin

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Betwa system in the state (derived from Google earth imageries):

Table 20: Key Notable about the River Betwa System

S. No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	0		Ratapani National Park	
2	25	Kaliasot nala	Mandidweep (L) Mandidweep is an industrial estate. Bhopal city lies within the river catchment.	15+ km River is PINK due to industrial pollution and domestic pollution from the city of Bhopal.
3	25.5	Anicut	Bhojpur Shiva temple The city of Bhopal is slowly expanding till this point. River forms a small valley.	
4	35	Nalla joins. Dam on Nalla at Ghoda Pachad and Barrage at Kalua Khurd	Mundala Bezyaft (L)	20+ km
5	37	Barrage on river	Siyakundal Barrage	
6	77	River passes by Bodh Stupa	Sanchi (L) The river meanders through an interesting network of small hills till this point	
7	85	Barrage on the river	Udaigiri caves.	

8	87	Satdhara nalla meets the river. Halali dam on the nalla	Vidisha (L) Vidisha is a district level town.	50+ km
9	94	Anicut on the river	Paloh	
10	98	Anicut on the river	Gajar	
11	102	Keotan river meets	Ikodiya Lashkarpur (R)	50+ km
12	104	Anicut on the river	Manpur	
13	107	??Nalla meets the river	Chapkheda (L)	20+ km
14	108	Anicut on the river	Barri Kasba	
15	112	Anicut on the river. Nalla joins	Sirnota (R)	15+ km
16	120	??Nalla joins Dam on nalla at Hinothiya ghat	Chakpiya (L)	50+ km
17	128.5	?? nalla joins Dam on Nalla at Barkheda Jat	Johad (L) Some kind of mining / industrial activity on right bank near Chorawar Ganj Basoda town	50+ km
18	158	?? nalla joins	Letani (R)	50+ km
19	161	?? nalla joins Dam at Ajam nagar	Kolua (L) Kurwai town	30+ km
20	175	Bina river joins. Nalla joins from other bank	Padocha (R) / (L) Bina township and Bina Refinery in the catchment Thermal power plant. Sirchopi	150+ km PINK status due to pollution. 15+ km
21	200	Kethan river joins. Koncha dam at	Badholi (L) Sironj township	100+ km Multipronged

		Banskhedi Another dam on its tributary at Damdama Another dam at Sironj at its another tributary		RED status due to too many dams in the system.
22	217	River Betwa meets inter state border ?? Nalla meets	River begins to form MP-UP border	30+ km Multipronged
23	252	Dam on river Betwa At Rajghat	River follows the MP-UP border	
24	263	??nalla joins	Budhanpur (L)	50+ km Multipronged
25	298	Dam on river Betwa at Matatila Pichor nalla meets the river into the reservoir Dams on Nalla	River follows MP-UP border	15+ km Multipronged
26	305	River Betwa enters UP		
27	318	Sukma Dukma Dam on river Betwa	In UP River Betwa has two channels.	
28	322	River enters MP River Jamni joins. Five dams on Jamni river	Kandhari kalan (R) Tikamgarh township	120 + km Multipronged RED status due to too many dams on the system.
29	335	??Nalla joins	Orchcha (L) Orchcha township. River Betwa in a braided form.	50+ km multipronged

			Orchcha Sanctuary.	
30	342	River enters UP again. Barrage at Pariccha.	Jhansi city. Pariccha Thermal power station.	
31	373	River in and out of UP ??Nalla joins	Baror (R) River finally enters UP	15+ km
32	408	River Dhasan joins Lachura dam on the river Dhasan and number of dams (Saprar, Madaiya Gond, etc) on its tributaries	Chadwari (R)	250+ km Multipronged RED status due to too many dams on thye system
33	460	River Birma joins 5 Dams on Birma and tributaries (Arjun, Swami Brahmananda etc)	Bhujpur (R)	100+ km RED status
33	493	River Betwa joins River Yamuna	Hamirpur is a district head quarters.	
		Total		1245 +

Thus the total length of river Betwa is not around 500 km but $493+1245 = 1738+$ km

It is to be noted that the river Betwa is RED (critical) for almost 50% (~250 km) of its total length due to series of dams, both on the mainstem and on the tributaries as well as pollution from the cities like Jhansi and Tikamgarh and the industrial activity around it.

Biodiversity:

Ramghat of River Betwa: A Sacred Ghat for Fish Conservation By Dr. Vipin Vyas*

Ramghat of river Betwa is a sacred ghat situated in the Vidisha town of Madhya Pradesh. It is a religious ghat (river bank) and many temples are situated on both banks of the river. It is commonly believed that this ghat is a holy place where saints and rishis performed their tapasya in the ancient sacred places (temples). Fishing in the area will hurt the sentiments of the devotees as Hindu mythology does not believe in animal killing in general.

Naming the ghat as Ram ghat is linked to its ancient history which dates backs to the Ramayana. As mentioned earlier, the city Vidisha was ruled by Shatrughati, son of Shatrughan, younger brother of Lord Ram.

About 1 km length of this stretch is restricted for fishing, and fishermen avoid fishing in this stretch. Incidentally, this stretch harbours a deep pool with a depth of 14 meters.

The author conducted experimental netting in adjoining areas close to the deep pool in different seasons and recorded 48 species of fishes . If the religious beliefs and traditional wisdom contributing to biodiversity conservation could be suitably integrated with modern scientific management practices, these sacred groves and pools could become a very useful model for biodiversity conservation. The need of the hour is to document and popularize such hotspots of biodiversity which could be a source of motivation for conservation of biodiversity

([HTTP://WWW.CPREEC.ORG/VOL.9_NO.1_APR10_SEP10.PDF](http://www.cpreec.org/vol.9_no.1_apr10_sep10.pdf))

Mythology and early history:

The River Betwa, known as Vetravati/Vetravanti in earlier times, is ascribed great purity and power in ancient Hindu texts. Described as the Ganga of Kaliyug, it is supposed to wash away all the sins accruing in this sinful age. Similar to other rivers of the Vindhyan Range, it is regarded as symbol of Shakti. The dialogue between Shiva and Parvati in Padmapurana says that it destroys sins, even those incurred by criticizing the Vedas. Brahmapurana refers to Betwa as flowing past the ashram of sage Parashar while the epic Mahabharata describes it as place where the sage Bhrigu performed yagya (sacrifice). The Tungaranya forest on the banks of Betwa is regarded as tapovan (forest) where ascetics did penance in their ashrams, taught the Vedas and purified the wilderness of its evil.

This river is mentioned in the epic Mahabharata along with the Charmanwati river. Both are tributaries of Yamuna. Vetravati was also known as Shuktimati. The capital of Chedi Kingdom was on the banks of this river.

संस्कृत के महाकवि बाणभट्ट ने कादम्बरी और कालिदास ने मेघदूत में इसका उल्लेख किया है। बेतवा का प्राचीन नाम

बेत्रवती है। महाकवि कालिदास ने इसे बेत्रवती सम्बोधन करते हुए लिखा है कि-

तेषां दिक्षु प्रथित विदिसा लक्षणां राजधानीम्

गत्वा सद्यः फलं विकलं कामुकत्वस्य लब्धवा।

तीरोपान्तस्तनितसुभगं पस्यसि स्वादु दस्मात्,

संभ्रु भंगमुखमिव पदो वेत्रवत्याश्चलोर्मि।।

हे मेघकुम्भकरोगे प्राप्त सुख का विलास रमण ही शीघ्र पहुँचकर में राजधानी कनाम विदिशा !, क्योंकि यहाँ बेत्रवती नदी बह रही है। उसके तट के उपांग भाग में गर्जनपूर्वक मनहरण हरके उसका चंचल तरंगशाली सुस्वादु जल प्रेयसी के भ्रुभंग मुख के समान पान करोगे।

Historical, Cultural and archeological sites along Betwa

Mandidwip: Today an industrial township it was famous as an island in the original Bhopal Jheel (lake), which at one point was reputedly the largest such man made water body in the country.

Bhim Betka: The **Bhimbetka rock shelters** are an archaeological site of the Paleolithic, exhibiting the earliest traces of human life on the Indian subcontinent, and thus the beginning of the South Asian Stone Age. It is located in the Raisen District in the Indian state of Madhya Pradesh, near Abdullaganj town and inside the *Ratapani Wildlife Sanctuary*. At least some of the shelters were inhabited by *Homo erectus* more than 100,000 years ago. Some of the Stone Age rock paintings found among the Bhimbetka rock shelters are approximately 30,000 years old. The caves also deliver early evidence of dance. They were declared a World Heritage Site in 2003.

Sanchi: The Great Stupa at Sanchi is the oldest stone structure in India and was originally commissioned by the emperor Ashoka the Great in the 3rd century BCE. Its nucleus was a simple hemispherical brick structure built over the relics of the Buddha. It was crowned by the *chatra*, a parasol-like structure symbolising high rank, which was intended to honour and shelter the relics. The construction work of this stupa was overseen by Ashoka's wife, Devi herself, who was the daughter of a merchant of Vidisha. Sanchi was also her birthplace as well as the venue of her and Ashoka's wedding. In the 1st century BCE, four elaborately carved toranas (ornamental gateways) and a balustrade encircling the entire structure were added. The sanchi stupa built during Mauryan period was made of bricks.

Udayagiri Caves: feature some of the oldest Hindu images and cave temples in India. They are located near the city of Vidisha, northeast of Bhopal in the state of Madhya Pradesh. One of India's most important archaeological sites from the Gupta period, the Udayagiri hills and its caves are an archaeological site under the protection of the Archaeological Survey of India.

Deogarh: is a village in Lalitpur district of the Indian state of Uttar Pradesh. It is located on the right bank of Betwa River and to the west of Lalitpur hills. It is known for Gupta monuments and for many ancient monuments of Hindu and Jain origins are in and outside the walls of the fort.

The Gupta temple dedicated to the Hindu god Vishnu, popularly known as the Dashavatara Temple, is the earliest known Panchyatana temple in North India. The fort on the hill is dominated by a cluster of Jain temples on its eastern part, the oldest of these dating to the 8th or 9th century. Apart from Jain temples, the wall frescoes of Jain images of "iconographic and the stylistic variety", are special features of the fort. The three ghats (ghat means "flight of stone steps leading to the river"), which provide approach to the Betwa river edge from the fort – the Nahar Ghat, the Rajghat and the ghat with the Siddh ki Ghufa (saints cave) – are also of archeological significance.

Orchha: town in Tikamgarh district of Madhya Pradesh state, India. The town was established by Rudra Pratap Singh some time after 1501, as the seat of an eponymous former princely state of central India, in the Bundelkhand region. Orchha lies on the Betwa River, 80 km from Tikamgarh & 15 km from Jhansi in Uttar Pradesh.

Orchha was founded in 1531 (the 16th century AD) by the Bundela Rajput chief, Rudra Pratap Singh, who became the first King of Orchha, (r. 1501-1531) and also built the Fort of Orchha. The Chaturbhuj Temple was built during the reign of Emperor Akbar, by the Queen of Orchha Ganeshi Bai, while *Raj Mandir* was built by 'Madhukar Shah' during his reign, 1554 to 1591.

MANDIDEEP POLLUTION POSES ALARMING THREAT TO BETWA RIVER, HERITAGE SITES

[HTTP://ENGLISH.PRADESH18.COM/NEWS/BIHAR/MANDIDEEP-POLLUTION-POSES-ALARMING-THREAT-TO-BETWA-RIVER-HERITAGE-SITES-673625.HTML](http://ENGLISH.PRADESH18.COM/NEWS/BIHAR/MANDIDEEP-POLLUTION-POSES-ALARMING-THREAT-TO-BETWA-RIVER-HERITAGE-SITES-673625.HTML)

Posted on: Jan 16, 2015 07:26 PM IST | Updated on: Jan 17, 2015 05:32 PM IST

Vivek Trivedi, News18

The unregulated pollution in Mandideep industrial area in Raisen is not only threatening the Betwa river but also causing threat to heritage sites including Bhimbetka and Bhojpur temple.

One of the prominent industrial areas of the State – Mandideep —houses close to 375 big and small industrial units along with 80,000 civilian population, which resides in the industrial town.

However, due to apathy of environment watchdog – Madhya Pradesh Pollution Control Board (MPPCB)—the industrial units are continuing to harm environment through air and water pollution along with the brazen violation of Environment (protection) Act (EPA) 1986.

The untreated sewage of the human habitations is directly flown into the Kaliasot river which flows on the one

side of the town while untreated chemical waste directly mixes into river Betwa which flows on the other side of the town, environment activist Subhash C Pandey alleged.

“The residential colonies are even supplied with the same polluted water of Kaliasot river,” he claimed.

Pointing out breach of norms laid down for industrial areas in EPA, Pandey claimed that the act prohibits any railway station or highway within 500 meter radius of the industrial areas but Mandideep has both within the prohibited limit.

Besides, heritage sites Bhimbetka and Bhojpur temples are also facing damage due to acid rain and air pollution caused by the industrial cluster, Pandey alleged further.

A petition filed by the activist is currently under consideration before the central bench of National Green Tribunal (NGT) Bhopal for 15 months.

In the last hearing the NGT rapped the MPPCB over yet to be seen improvement in water quality despite regular monitoring by the board’s Bhopal region office.

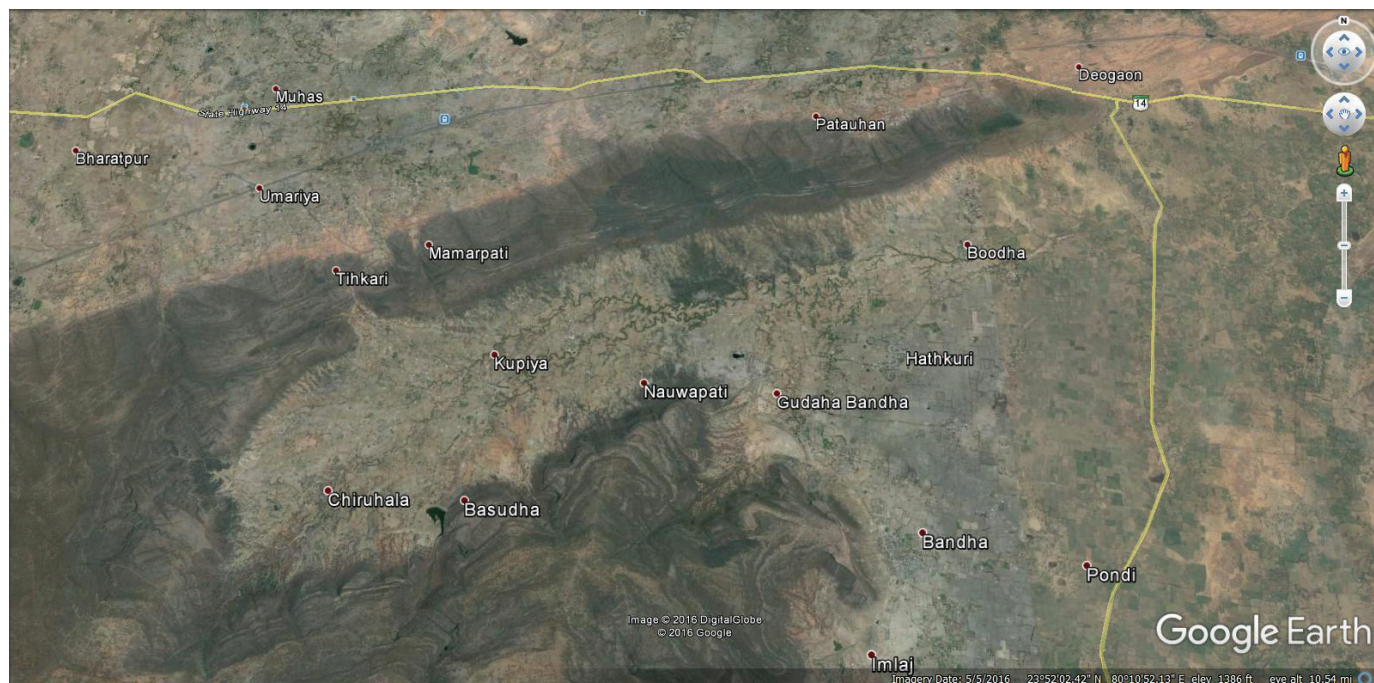
The board which has issued notices to five polluting units in the past, is slapping notices to two more units shortly.

MPPCB Regional Officer Bhopal PS Bundela said that strict action would be taken against industrial units flouting norms in Mandideep.

“Mandideep municipality has proposed two effluent treatment plants for treatment of sewage and other waste and several units have been closed for flouting norms”, he said.

20. Ken

With a fish like founder basin (see google image), river Ken begins its journey from eastern watershed of Damoh plateau near a place called Chiruhala in the Katni District. Deogan is the nearest prominent place.



Map No 27: Ken River Origin

The total length of the main stream is 427 kms, 292 kms in MP, 84 kms in UP and the remaining 51 kms forming the interstate boundary between MP and UP. Total catchment area of Ken is 28058 km². A much larger part, as much as 24576 sq km (87.6%), is in MP and only 3482 sq km (12.4%) in UP.

Currently there is one major irrigation system on Ken, built by the British Government and expanded/ upgraded after independence, involving Gangau Dam on Ken (80 km upstream of MP/ UP boundary), Bariyarpur Barrage (40 km upstream of MP/UP boundary) and Rangarwan Dam on River Banne, a tributary of Ken, 8 km upstream of its confluence with Ken, feeding Bariyarpur Barrage from where Ken Canals take off. The system grossly irrigates 65,950 hectares, about 60,000 hectares in Ken Basin and rest in contiguous Baghain and Mandakini Basins.

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Ken system in the state (derived from Google earth imageries):

Table 21: Key Notables about the River Betwa System

S No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	0		Chiruhala	
2	14	After meeting a number of founder tributaries the river comes into its own	Boodha	
3	20	River takes a NE turn after travelling east	Sumeli	
4	40	??Nalla meets the river. River meanders through a number of small hills and finally moves north till it meets its first notable tributary. Number of dams on the tributary	Rohaniya (L)	20+ km
5	42	??Nalla meets the river	Gidhaua (L)	20+ km
6	45.5	?? nalla meets	Ramgharha (R)	20+ km Multipronged
7	54	?? nalla meets Number of dams on the nalla	Satdhara (L)	30+ km Multipronged
8	60	Two nalla meets on either banks.	Shahpur Kalan (L) & (R)	15+ km 20+ km multipronged
9	81	??Nalla meets. River takes a westwards turn	Ramnagar (R) A very interesting volcano look, stand alone hill	50+ km Multipronged

10	105	River Patne meets Ken. 4 small dams on the tributaries	Dagdha (L)	70+ km Multipronged RED status due to dams on tributaries
11	115	Ken takes an abrupt northwards turn. Nalla meets.	Tighara (L)	15+ km
12	127	Combined waters of rivers Bearma and Sonar (Kopra, Dehar and Bewas) meet Ken. No major dam on either Bearma or on Sonar. Rajghat project is on river Bewas tributary.	Singhaura (L)	150+ km 200+ km Multipronged Bearma and Sonar are PINK due to small dams on its tributaries.
13	130	River Mirhasan joins.	Pandvan (R) River subsides into a gorge within the river bed. Lots of potholes. Amanganj township.	50+ km Multipronged PINK status due to pollution from Amanganj.
14	135	River ken enters Panna National Park	Gorge formation.	
15	154	River ?? joins	Palkhoa (L)	50+ km Multipronged PINK status due to small dams on tributaries.
16	157	Site of a proposed major dam	Daudhan	

		on river Ken		
17	159	Barrage on the river Ken	Gangau	
18	167	River Banne dammed before meeting the river	Ranguwan (L)	50+ km Multipronged RED status due to major dam.
19	187	River Ken leaves the Panna NP. Anicut on the river	Madla	
20	190.5	??nalla joins	Basata (R)	20+ km
21	193	??nalla joins	Khad Khurdi (R)	15+ km
22	200	?? nalla joins	Bapatpur (R) Panna town Diamond mines in Nalla catchment.	20+ km
23	202	Barrage on river Ken	Baryarpur Right Hand canal takes water to UP	
24	212	?? nala joins. Dam on it	Ken Ghariyal sanctuary. Raneh falls	15+ km Multipronged
25	215	River Urmil joins. Major dam on Urmil at Bhirota	Garhaghat (L)	100+ km Multipronged PINK status
26	240	River ken meets UP border	Forms inter state border (MP-UP)	
27	278	River Kail meet Ken	Kudhana (L)	50+ km

				Multipronged. BLUE for no dam or city or industrial unit.
28	293	River Ken finally enters UP	Parei	
29	300		Banda township (UP)	PINK due to Banda city.
30	335	River Chandrawal meets Ken 3 dams on the tributaries	Pailani (L) Mahoba town in the catchment (UP)	70+ km Multipronged PINK due to dams and city of Mahoba
31	350	River Ken meets river Yamuna	Chilla ghat	
		Total		1050 + km

Thus the actual length of river Ken is 350+1050 = 1400 + km

Water balance study:

A water balance analysis was carried out to evaluate water balance of the Ken basin for 25 years (1985–2009). The water balance exhibited that the average annual rainfall in the Ken basin is about 1132 mm. In this, about 23% flows out as surface run-off, 4% as groundwater flow and about 73% as evapotranspiration.

[HTTPS://WWW.RESEARCHGATE.NET/PUBLICATION/261635187_APPLICATION_OF_SEMI_DISTRIBUTED_HYDROLOGICAL_MODEL_FOR_BASIN_LEVEL_WATER_BALANCE_OF_THE_KEN_BASIN_OF_CENTRAL_INDIA](https://www.researchgate.net/publication/261635187_APPLICATION_OF_SEMI_DISTRIBUTED_HYDROLOGICAL_MODEL_FOR_BASIN_LEVEL_WATER_BALANCE_OF_THE_KEN_BASIN_OF_CENTRAL_INDIA)

Fish Diversity

([HTTP://LINK.SPRINGER.COM/ARTICLE/10.1007/S40011-013-0266-7](http://link.springer.com/article/10.1007/s40011-013-0266-7))

Systematic surveys were conducted to explore the diversity of freshwater fishes, distribution, abundance, trophic ecology and current threats of the fishes at different spatial scale of the river Ken, planned for interlinking in India. Altogether, 57 species representing 42 genera and 20 families were recorded for the first time from the studied river. Of the 57 species, seven belong to the ‘endangered’ category and 13 belong to the vulnerable

category. Apart from Indian major carps, *Tor tor*, *Bagarius bagarius*, *Chitala chitala*, *Pangasius pangasius*, *Sperata aor*, *Wallago attu*, *Ompok pabda*, *Ompok bimaculatus*, *Labeo calbasu*, *Channa marulius*, and *Macrognathus pancalus* were the other important species. All the species have been reported for the first time in this river. Presence of a protected area and forest cover on the upper stretches of the river tends to have positive effect on the aquatic habitat which is reflected in high fish diversity as compared to lower stretches which is subjected to several anthropogenic activities. The distribution pattern, community dominance index, evenness index, similarity index and trophic ecology have been discussed. Some segment of the river showed the most diversified environmental structure and had the different fish communities. The results of this study would be useful to develop baseline information for a river, planned for river interlinking which enables predictions on the change/loss of the fish diversity in the post interlinking phases.

Ken-Betwa Link

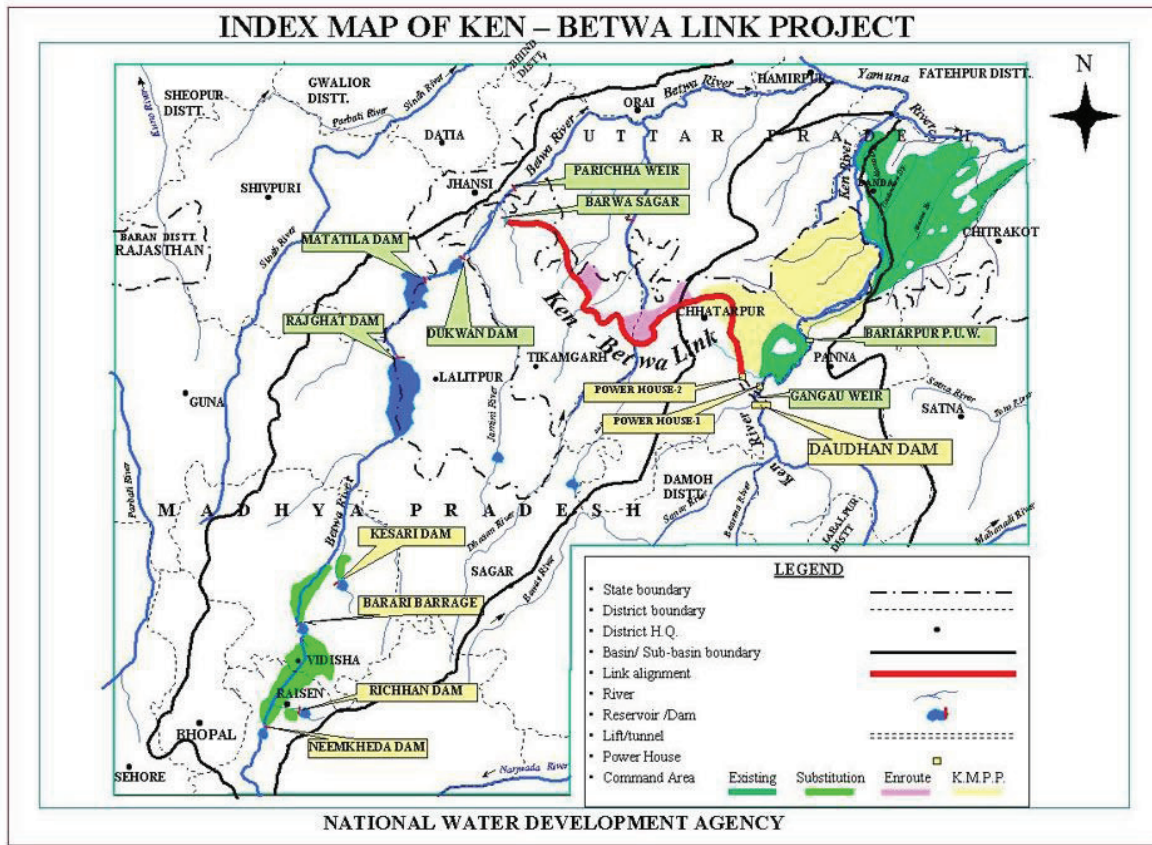
One of the most controversial projects designed by the NWDA in the Ministry of Water Resources (MoWR, RD, GR) is the so called inter linking of the river Ken with river Betwa.

The salient features of the project are:

(SOURCE; PSI STUDY, UNPUBLISHED)

Linking Ken and Betwa rivers is stated to be able to create new irrigation potential of over 6 lakh hectares in the Bundelkhand regions of U.P. and M.P. The estimated expenditure is about Rs. 4000 crore. (since revised to Rs 18,000 crores). The link canal will have a length of about 231 km and shall provide irrigation in the Ken basin areas downstream of proposed Daudhan dam, water short areas of upper Betwa basin (by way of substitution), areas en-route the link canal, and additional areas of lower Betwa basin to the tune of 6.45 lakh hectares (1.55 lakh hectares in Uttar Pradesh and 4.90 lakh hectares in Madhya Pradesh) utilizing 3,196 Mcum of water. It also proposes to provide domestic and industrial water needs to the tune of 12 Mcum, besides an installed capacity of 72 MW of hydro-electric-power. About 37 Mcum of water is proposed to be used in meeting the transmission losses of the canal.

According to the Feasibility Report, an earthen dam is proposed on Ken at Daudhan 2.5 km upstream of the existing Gangau weir as shown in Map. Two power houses, one Power House No. I, at the foot of the proposed dam and the other Power House-II at the end of a 2 km long power tunnel, are also proposed. The design discharge of the link canal at its head is planned to be 72 cumecs. The canal includes a long tunnel in its head reach, crosses several rivers/streams and finally outfalls into an existing major tank of the princely era viz. Barwa Sagar on Barwa river, a tributary of Betwa, close to Jhansi. Barwa Sagar is already linked to Parichha Reservoir, the head works for Betwa Canal System through River Barwa.



Map No 28: Ken – Betwa Link Project

Contention and Controversies:

It would seem interesting and even a bit surprising why the first project taken up under the grandiose Inter Linking of Rivers Scheme should be the transfer of water from a much smaller (only two-thirds of the catchment area) river to a larger river in the same region; that too from a Yamuna tributary downstream to a Yamuna tributary upstream. The contentions put forth by the ruling circles that motivated and supported the project are as follows:

Betwa is a deficit river needing more water for irrigation, urban water supplies, industrial growth etc. This can probably be said for any and all basins where modern agriculture, industries and urbanisation are proceeding on and growing in their usual water guzzling style. And thus it is quite understandable that in the government view Betwa basin is “deficit” or short in water and needs water from elsewhere. It also needs to be noted strongly and clearly that the proposed transfer of water to Betwa basin from outside is primarily and only to make additional waters available to the upper Betwa Basin area in districts of Bhopal, Raisen, Vidisha, which are on a fast track of urbanization, industrialization and modernization of agriculture, being close to Bhopal, the state capital and also along the main railway lines and highways. The controversy thus becomes about real and deeper intentions motivating this transfer.

A few points about the benefits from the proposed project as made out in the Feasibility report :

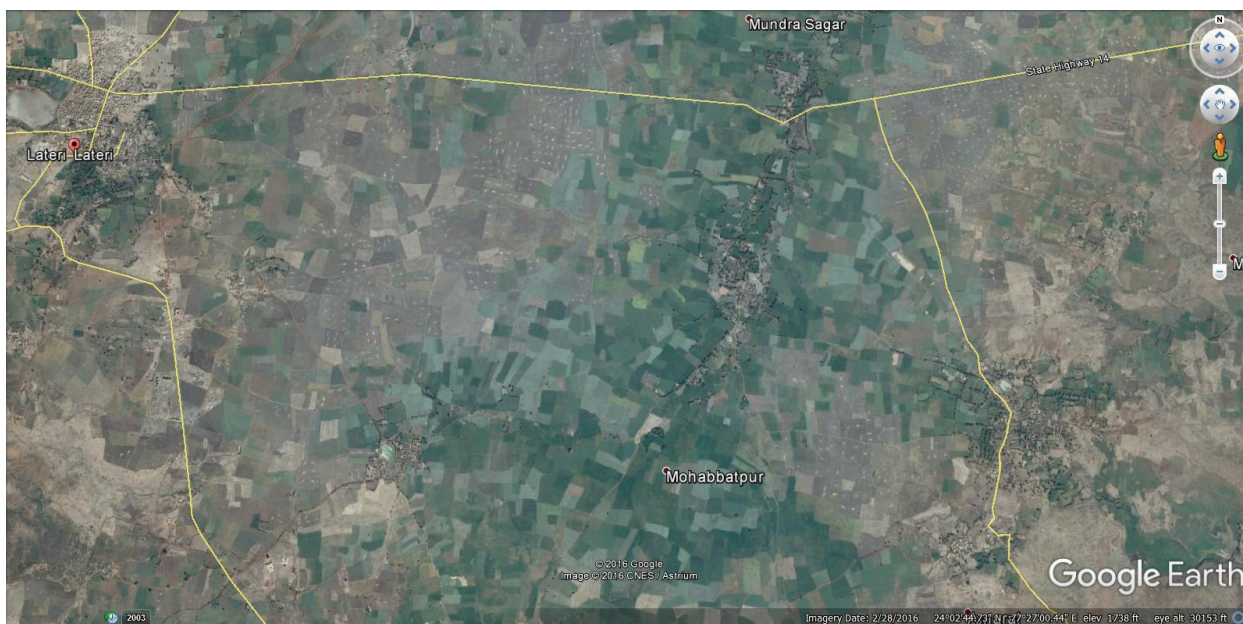
- i. The additional areas irrigated shall largely be in the upper Betwa Basin (mainly in Raisen and Vidisha districts) and shall receive waters from other components of this project and not from the Ken Betwa Link Canal directly.
- ii. There shall be very little if any at all, additional irrigation water made available by this project in the UP districts of Lalitpur, Jhansi, Jalaun, Hamirpur, or Mahoba. The 655 MCM water delivered by the Inter Linking Canal to the Lower Betwa Basin shall only be by way of substitution for the Betwa waters withdrawn, not additional waters. The people of the basin are being deceived on this count.
- iii. The provision of 3196 MCM water to irrigate only 6.45 lakh hectares or of as much as 12 MCM for domestic needs of currently ... lakh population are excessive and wasteful revealing foul plans.

A complimentary part of the official contention is that Ken Basin has surplus water available for transfer elsewhere. The question is whether there really would be any surplus water in Ken after development (urbanization, industrialization and growth in irrigated farming) in Ken Basin at the levels that it has already taken place or is being planned in Betwa Basin. Or the future development of Ken Basin is being mortgaged to the current and near future development of upper Betwa basin. The contention seems to be that the existing Canal System is constraining the development of the upper Betwa basin areas in Bhopal, Raisen and Vidisha districts, since any additional utilization of water there, is feared to adversely affect the availability of water in the already established canals and irrigated areas and thus raise a lot of row and furore. The objective of the link would be to substitute this water withdrawn for the upper Betwa by waters from Ken.

Detailed critique of the K-B link can be seen at: (<HTTPS://SANDRP.WORDPRESS.COM/2014/12/21/WHY-KEN-BETWA-EIA-BY-AFCL-IS-UNACCEPTABLE/>)

21. Sindh

River Sindh originates near a place called Leteri in Vidisha district.



Map No 29: River Sindh Origin

Total catchment area of the river in Madhya Pradesh is 26,699 sq.km and total length is 470 km. A length of 461 km of the river falls in M.P. and 9 km in Uttar Pradesh. Major tributaries of Sindh are Mahuar, Parbati, Pahuj, Kunwari.

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Sindh system in the state (derived from Google earth imageries):

Table 22: key notables about the River Sindh System

S.No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	2.5	River stream crosses the SH14	State Highway 14, 5.5 km east of Leteri town	
2	23	??nalla joins.	Sumerpur (L)	15+ km
3	30	??Nallas join on either banks.	Taharpur (L) & (R)	15+ km and 15+ km
4	42	two nalla join on either banks	Hogoniya (L) & (R)	20+ km and 20+ km
5	48	?? nalla joins	Berkhedi (R)	15+ km
6	54	?? nalla joins	Sepra (R)	15+ km

7	68	?? nalla joins	Kaithal (L)	20+ km
8	75	?? nalla joins	Kothiya (L)	20+ km
9	80	?? nalla joins	Benhta ghat (R)	30+ km
10	105	?? nalla joins	Mehmuda (L)	20+ km
11	121	?? nalla joins	Ghurwar Khurd (R)	50+ km
12	146	?? nalla joins	Sangeswar (R)	20+ Multipronged
13	183	Reservoir of dam on Sindh begins	Shivpuri town in the catchment	
14	205	22 km long reservoir Madhikheda dam on river Sindh		
15	217	?? nalla joins	Pachpedia (L)	20+ km
16	232	Barrage on the river. River takes a eastwards turn from northerly direction	Mohini sagar pick up weir	
17	242	?? nalla joins. Dam on nalla	Daulatganj (R)	20+ km
18	257	River takes a northerly turn		
19	270	River Parbati joins. Drains the Shivpuri plateau. Four dams (Harsi, Kekata etc) on the Parbati system	Manpur (L). River Sindh takes a north east direction.	100 + km Multipronged RED status
20	274.5	River Mahuar joins. Four dams (Samoha reservoir etc) on Mahuar and its tributaries	Hinotiya (R) Karera town	80+ km Multipronged RED status
21	287	?/Nalla joins	Kotra (L)	50+ km Multipronged
22	390	River Vaisali joins. Drains the larger part of the Gwalior plateau One big and few small dams.	Kheda Shyampura (L). Towns of Gwalior, Bhind, Mehgaon	100+ km Multipronged. PINK status
23	425	River Sindh meets the	Hilgawan	

		UP border.		
24	432	River forms the interstate border		
25	441	River Pahuj meets. 3 Dams on Pahuj near Jhansi. Drains Jhansi plateau	Dikauli Jagir (R) Jhansi township	150+ km Multipronged. RED status from dams and the city of Jhansi
26	447	River Kunwari meets. One big dam on its Tributary (Asan) near Morena.	Chamrahi Ter (L) Pohri, Berad, Palpur, Morena towns. Amazing river that runs almost parallel to river Chambal in its south and cuts away all its possible tributaries	250+ km Multipronged. PINK status
27	450	River Sindh meets river Yamuna	Pachnada (Confluence of five rivers)	
		Total		1045+km

Total length of river Sindh is 450+1045 = 1495 km

22. Tons River (Tamas River)

River Tons originates in Satna district near Jukehi village from an interesting narrow valley.



Map No 30: Tons River Origin

Total basin area in Madhya Pradesh is 11,974 sq.km. The river meets Ganga after flowing 246 km in Madhya Pradesh. 7 km making boundary between Madhya Pradesh and Uttar Pradesh and finally 67 km in Uttar Pradesh.

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Tons system in the state (derived from Google earth imageries):

Table 23: Key Notables about the River Tons System

S. No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	0	The founder basin is a narrow valley between two small but continuous hill ranges. It is nestled between the Ken basin on west and the Sone basin on east. The alignment of a railway line, the NH7 and a canal from the	Near Railway line, Khamriya, District Satna	

		Bargi dam on Narmada has cut off number of founder tributaries of the river.		
2	30	River stream furiously meanders	Tigara Khurd	
3	37	?? nalla joins	Kuthilgawan (L)	10+ km
4	53	Drain (previous nalla) joins	Irhara (L) Large Industry (??) under construction	3 km
5	68	??nalla joins	Khaira (L) Large industrial complex of Maihar Cement, power plant and Mine at Sarlanagar	20+ km
6	78	??nalla	Maihar (R) Another cement plant. Maihar town	20+ km
7	84	Two nalla join on both banks	Narhati (L) & (R) Unchahera town	40+ km 15+ km
8	92	??Nalla joins	Podi (R)	20+ km Multipronged
9	107	?? nalla joins	Kaitha (L)	20+ km Multipronged
10	109	River Satna meets. Two dams (Devendra nagar dam, Ulichha dam) on tributaries of Satna river. River Tons starts to move north east	Ghoti (L) Satna and Nagod towns in the catchment.	100+ km Multipronged RED status due to dams and pollution from Satna and Nagod town.

11	126	??nalla joins.	Satri (R) Prism and Bhilai JP cement plants in the catchment.	30+ km Multipronged.
12	146	Dam at the confluence of river Seemrawal and River Tons	Golhata (L)	50+ km Multipronged. River Tons is RED due to the Dam.
13	163	??nalla joins. Dam at Barah kalan on the Nalla. River Tons enters a Gorge after the confluence.	Kumhara (L)	30+ km
14	176	River Bihar joins. Barrage on river Bihar just before the confluence. Chichai falls at the confluence. Govind garh lake.	Chachai (R). Towns of Rewa and Govind garh in the catchment.	100+ km PINK due to Barrage and dams on tributaries.
15	186	Power plant on canal of river Bihar. Water enters river Tons		
16	193	River ?? joins. River Tons turns east. Dam on nalla at Kihunia	Deukhar (L)	80+ km Multipronged PINK status
17	218	River Keoti meets. Famous Keoti falls	Bhungaon (R)	100+ km Multipronged. BLUE status
18	228	River tons turns Northwards.		

19	241	??nalla meets	Panasi (L)	50+ km
20	246	??nalla meets. River meets UP border.	Pandiwar (L) Thermal power plant at Bara in the catchment. Town of Shankargarh	30+ km Multipronged.
21	257	River tons forms MP-UP border. River Belan meets. 3 Dams, one barrage on the river and its tributaries.	Chapar (R)	120+ km Multipronged. RED status due to major dams and barrages on the river system
22	258	Barrage on river Tons. River enters UP.	Gargata	
23	268	??nalla meets.	Kharka Khas (R)	50+ km Multipronged
24	323	River Tons meets Yamuna	Sirsi	
		Total		888+km

The river Tons (Tamas) is actually $323 + 888 = 1211+$ km

Mythology:

The Ashrama of sage Valmiki was situated at the bank's of Tamasa river. When Sita was exiled by Rama, she left Ayodhya and came to the banks of Saryu river some 15 km away from the city, where she met Valmiki. He requested Sita to live in his ashrama situated at the bank of the Tamasa river.

Here Sita spent all her remaining life, and here her twin sons Lava and Kusha received education and trained in military skills under the tutelage of Valmiki. Also on the banks of river Tamsa was the ashram of Bharadwaj, mentioned in the Valmiki Ramayana; it is here that on seeing the plight a bird couple, Valmiki created his first verse, shloka.

23. Tapti (Tapi)

River Tapti also known as Tapi, originates from Multai in Betul district. This river also flows from east to west.



Map No 31: Udgam (Origin) of Tapi at Multai

The Tapi River is the second largest westward draining interstate river of the Peninsula.

It covers a large area in the State of Maharashtra besides areas in the states of Madhya Pradesh and Gujarat. The Tapi Basin is the northern-most basin of the Deccan plateau and is situated between latitudes 20° N to 22° N approximately. The basin extends over states of Madhya Pradesh, Maharashtra and Gujarat having an area of 65,145 Sq km out of which nearly 80 percent area lies in Maharashtra state. It lies between 72°33' to 78°17' east longitudes and 20°9' to 21°50' north latitudes. In Madhya Pradesh the basin has an area of only 9,800 sq km and a length of 332 km out of the total length of 724 km.

The entire Tapi basin can be divided in three sub-basins: Upper Tapi Basin up to Hatnur confluence of Purna with the main Tapi (29,430 sq. km)], Middle Tapi Basin from Hatnur up to the Gidhade gauging site (25,320 Sq. km), and Lower Tapi Basin from the Gidhade gauging site up to the sea (10,395 Sq. km). The annual rainfall for the upper, middle, and lower Tapi basins for an average year is 935.55 mm, 631.5 mm, and 1,042.33 mm respectively.

Madhya Pradesh covers portion of the Upper tapi Basin.

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Tapi system in the state (derived from Google earth imageries):

Table 24: Key Notables about the River Tapi System

S. No	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	7	River comes into its own. Another founder stream meets.	Amlai town	
2	11	Yet more founder stream meet.	Sandiya (R)	
3	18	Dam on the river Tapi	Taikheda	
4	38	River ?? meets	Deodongri (L)	40+ km
5	40	??nalla meets Anicut and Dam on the nalla	Gaula (R)	30+ km Multipronged
6	51	?? nalla meets. Dam at Sonkhedi	Rawa (R)	20+ Km Multipronged
7	57	?? nalla meets	Gudhi (R)	15+ km Multipronged
8	63	?? nalla meets	Hathidinagar (R)	15+ km
9	67	?? nalla meets	Musakhedi (L)	40+ km Multipronged

10	83	?? nalla meets. Six dams on the nalla tributaries	Palaspani (L)	50+ km Multipronged
11	87	River turns north from westwards flow. Nalla meets.	Jhallar (L)	20+ km
12	107	?? Nalla meets. River turns west again.	Theska (R)	15+ km Multipronged
13	135	?? nalla meets	Uti (L)	20+ km Multipronged
14	137	Two nallas meet on either banks. Two dams on the Right side nalla	Jamu (L) & (R)	15+ km Multipronged 30+ km Multipronged
15	151	?Nalla meets	Kunkhedi (L)	15+ km Multipronged
16	157	?Nalla meets	Bori (L)	20+ km Multipronged
17	174	?? nalla meets	Dhodra (R)	30+ Km Multipronged

18	181	?? nalla meets. River turns south.	Naharpur (R)	40+ km Multipronged
19	187	River turns west again		
20	197	River ?? meets.	Patan (L)	80+ km Multipronged
21	198	River ?? meets	Khurda (R)	70+ km Multipronged
22	200	??nalla meets	Chimaipur (L)	50+ km Multipronged
23	202	River Tapi meets MP-MS border.		
24	272	River forms MP-MS border	River tapi enters MP again at Rama Kheda	
25	279	?? nalla joins. Dam at Khari	Satod (L)	30+ km Multipronged
26	284	??nalla joins. Two dams	Jhirmiti (L)	40+ Km Mutlipronged
27	287	?? nalla joins	Amlakhurd (R)	15+ km
28	307	?? nalla joins. Dam at Rehmanpura	Panch imli (R)	20+ km Multipronged

29	343	?? nalla joins.	Burhanpur city (R)	30+ km Multipronged
30	352	River ?? joins.	Mohona (L)	50+ km Multipronged
31	363	River Tapi meets the MP-MS border again		
32	365	River Tapi forms inter state border before finally entering MS	Nachan Kheda	
		Total		800+km

Thus the actual length of Tapi in MP is 365+800 = 1165+ km

Mythology and early history:

Some scholars have identified river Payoshni with the Purna river rising in Berar and falling into river Tapi. Puranas have mentioned Tapi and Payoshni separately.

The Tapi-mahatmya is considered to be a part of the Skanda purana. Verses of the Skanda Purana quoted in the Tirthaprakasa of Viramitrodaya are found in this Tapi Mahatmya.

The Tirthaprakasa or Viramitrodaya, while describing the Mahatmya of Tapi, states that this river is without an equal and is capable of destroying sins even by her mere *smarana*, apart from *snana*, *pana* or *darsana*. Those who give up their bodies on the bank of this river are stated to attain the highest *gati*. This river is called the daughter of Sun or Bhanuja. About 108 famous tirthas are mentioned on the bank of this river.

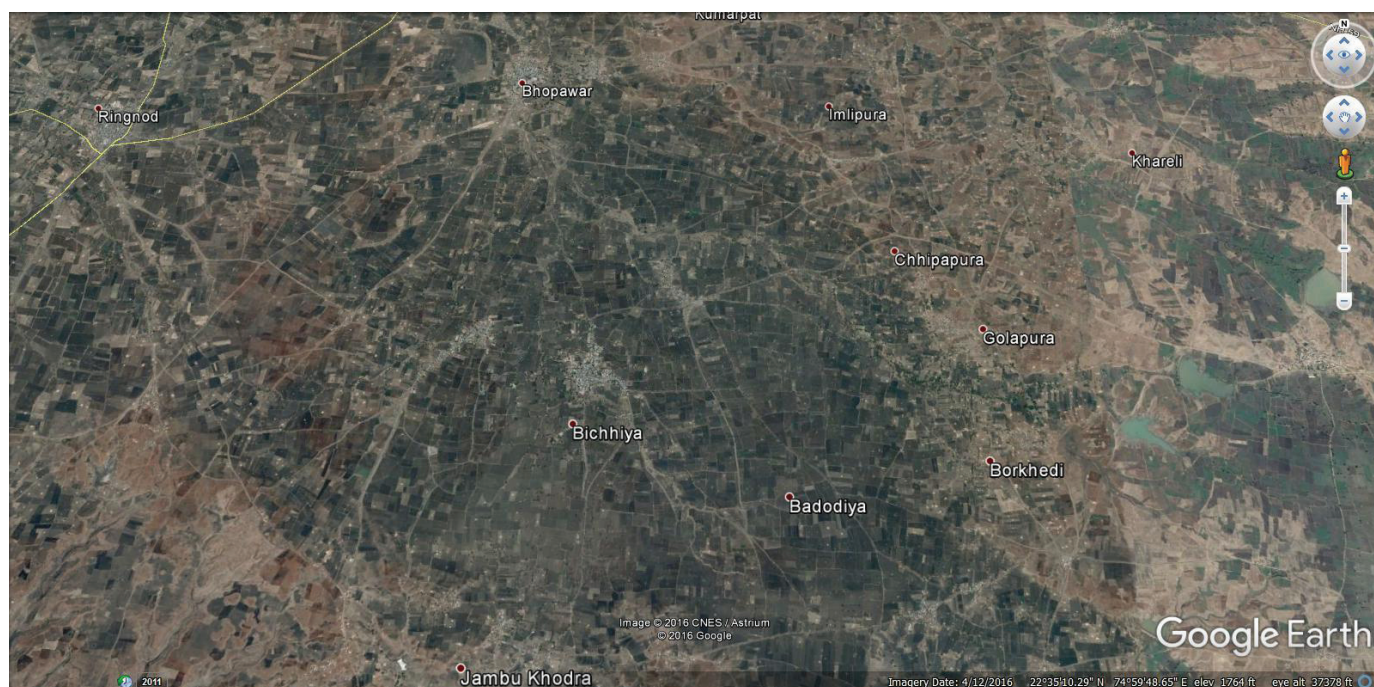
River Tapi is stated to have her birth on the Ashadha Sukla seventh. Tapi was born according to the Tapimahatmya at midday to give shanti to Brahma. This day is observed as a day of great festival. Padmakaparva is considered very holy. As a matter fact, the whole of the month of Ashadha is considered holy for snana, dana, sacrifice, penance etc. on the banks of river Tapi.

In the 1st chapter of Tapi Mahatmya are mentioned 1089 places of pilgrimages, all of them being temples of God Siva situated on the banks of Tapi. The second chapter gives 21 names of this river including Tapi, Tapini, Savitri, Naasatya, Amritasyandini, Sarpavisapaha, Taaraa, etc. This river is also called the daughter of hills, the Queen of forests.

The Pauranic legend of the Tapi Mahatmya says that Rama established Rameswara linga at Ramnath Ghala near Surat, that the ocean came to Ram as a Brahman for Dana, that Rama asked him to state what he wanted and the ocean said that Rama should not bathe in the Tapi-Sagara Sangama – as that would generate such religious merit that Rama would never be separated from Sita and the Deva Karya would in that event remain unfulfilled ! Rama is said to have agreed not to bathe there and thereby fulfilled his destiny!

24. Mahi

The origin of river Mahi is near Sardapur from a place called Bichiya in Dhar district of MP.



Map No 32: Udgam (Origin) of Mahi

Total drainage area of Mahi basin is 34842 km² out of which only 6700 km² lies in Madhya Pradesh. Total length of the river is 583 km of which 158 km traverses in Madhya Pradesh. River Anas is the major tributary of Mahi in the State.

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Mahi system in the state (derived from Google earth imageries):

Table 25: Key Notables about the River Mahi System

S. No.	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	0	Original few streams	Bichiya	
2	7	River comes into its own	Bhopawar	
3	14	Two nalla meets. River is moving north. Anicut on Nalla meeting left. Dam (sardarpur reservoir) on nalla meeting from right.	Sardarpur (L) & (R)	10+ km both
4	20	Nalla meets.	Narsingh deola (L)	15+ km Multipronged.
5	44	Nalla meets. Dam on river Mahi and nalla confluence. Dam on Nalla as well.	Kotda (R)	30+ km Multipronged
6	70	??Nalla meets. Eight dams on nalla and tributaries.	Deogarh (R)	50+ km Multipronged.
7	86	?? nalla meets. Two dams on the nalla and tributaries. Anicut on river Mahi at the confluence. River mahi turns west.	Ghugri (R)	30+ km Multipronged
8	104	??Nalla meets	Ghugad (L)	30+ km Multipronged
9	120	?? nalla meets	Bhimpura (R)	15+ km Multipronged

10	134	?? nalla meets. Dam on nalla	Bhutpada (R)	15+ km Multipronged
11	150	?? nalla meets	Jodhpura (R)	40+ km Multipronged
12	162	?? nalla meets	Amarpura Khurd (L)	30+ km Multipronged
13	165	River Mahi meets Rajasthan border	Jholi Chandragarh	
14	169	River form MP-Raj border before entering rajasthan	Hariyal Kheda	
		Total		265+km

Thus the actual length of Mahi in MP is $169+265= 434 + \text{km}$

25. Wainganga (Godavari Basin)

Wainganga begins from a small place called Pathar kuti draining the southern slopes of Satpura hills.



Map No 33: Udgam (origin) of Wainganga

In Madhya Pradesh, the river Wainganga, Kanhan and Pench belonging to the Godavari basin originate in district Seoni and Chhindwara respectively. Total drainage area of these rivers in Madhya Pradesh is 23,388 sq.km. Of the three river Wainganga drains the largest area in the state.

Following are the key notables (seasonal tributaries of length less than 10 km have not been considered) about the river Wainganga system in the state (derived from Google earth imageries):

Table 26: Key Notables about the River Wainganga System

S. No.	Distance from origin	Tributary River / Stream / structure	Location / Bank	Tributary Length (Km)
1	5	Rivers takes a definite shape after number of founder streams join	Rihedda	
2	15	?? nalla joins	Pipariya Bharti (L)	10+ km
3	27	?? nalla joins. River takes northwards turn from an eastern direction. Dam on nalla at Deori Ganga Ram.	Lakhanwada (R)	10+ km
4	43	River takes a sudden eastwards turn	Sukri	
5	73	River meanders in a south eastern direction. River Thel meets. River Wainganga begins to turn north east	Bhatamatra (R) Seoni town on river Thel	60+ km Multipronged River Thel is PINK due to major town on it.
6	108	Major Dam on Wainganga. Bhimgarh Dam	Gangai banjar	
7	124	??Nalla meets	Jatlapur (L)	20+ km
8	135	?? nalla meets River is moving south east	Chandeni (R)	15 + km

9	150	?? nalla meets	Chirchira (L)	20+ Km
10	165	?? nalla meets. River moves eastwards.	Keolari (R)	15+ km
11	170	Two nalla meets on both banks	Kohka (L) and (R)	15+ km both
12	180	Rivers enters Gorge. Nalla meets	Chaurapatha (L)	15+ km
13	192	River ?? meets. Thanwar Reservoir on tributary. River Wainganga moves southwards.	Nainpur Town in catchment	50+ km Multipronged
14	200	?? nalla joins	Padriganj (L)	30 + km
15	207	River Wainganga breaks into two branches to meet little later.		
16	213	Sawal Jhiriya River meets	Ghangharia (L)	20+ km
17	217	Two branches of Wainganga meets again	Paundi	
18	228	River Hirri meets	Khursara (R)	90+ km Multipronged. BLUE river
19	235	Nalla ?? meets Barrage on Wainganga at the confluence.	Banathar (R)	20+ km
20	251	River Nahara meets	Titwa (L)	50+ km Multipronged
21	266	??Nalla joins. Dam on nalla at Tekadi	Roshana (R)	30+ km

22	301	<p>Wainganga meets the MP-MS border</p> <p>Three rivers (Deo, Son and Bagh) meet wainganga at this point.</p> <p>River takes a south west turn.</p> <p>Two major dams on Bagh river at</p>	<p>Satona (L)</p> <p>Balaghat town in the catchment.</p> <p>Kanha National Park in the catchment.</p>	<p>All three rivers are 100+ km rivers</p> <p>River Deo and Son are BLUE but Bagh is RED due to major dams on it.</p>
23	320	<p>River Wainganga forms MP-MS border.</p> <p>River Chandana joins</p>	<p>Murdada (R)</p> <p>Waraseoni and Katangi town in the catchment.</p>	<p>100+ km</p> <p>PINK status</p>
24	335	<p>River Bhawanthari meets. And now forms MP-MS border.</p> <p>River Wainganga finally enters MS.</p> <p>Sitekasda Dam on Bhawantari river.</p>	<p>Bapera (R)</p>	<p>150+ km</p> <p>PINK status</p>
		Total		1020+km

Thus the actual length of Wainganga in MP is $335+1020 = 1355+$ km

NOTE: There are two smaller river systems within the Ganga system that deserve mention.

26. Mandakini or Paisuni

Total basin area of river Paisuni in Madhya Pradesh is 416 km². It originates in Satna District and meets river Yamuna below Banda District.

([HTTPS://EN.WIKIPEDIA.ORG/WIKI/RIVER_BASINS_IN_MADHYA_PRADESH](https://en.wikipedia.org/wiki/River_basins_in_Madhya_Pradesh))

27. Baghain

The Baghain is said to have its source in a hill in Panna district. It then enters UP, in Banda district and flows in a north-east direction, separating the district from Chitrakoot district, before it meets the Yamuna. The Baghain (1504 sq km catchment in MP) brings with it little alluvial soil but it often deposits a large amount of sand near its junction with the Yamuna. The river has six tributaries including the Ranj and Barua.

([HTTP://BUNDELKHAND.IN/PORTAL/INFO/RIVERS-OF-BUNDELKHAND](http://bunelkhand.in/portal/info/rivers-of-bunelkhand))

CLIMATE CHANGE VULNERABILITY

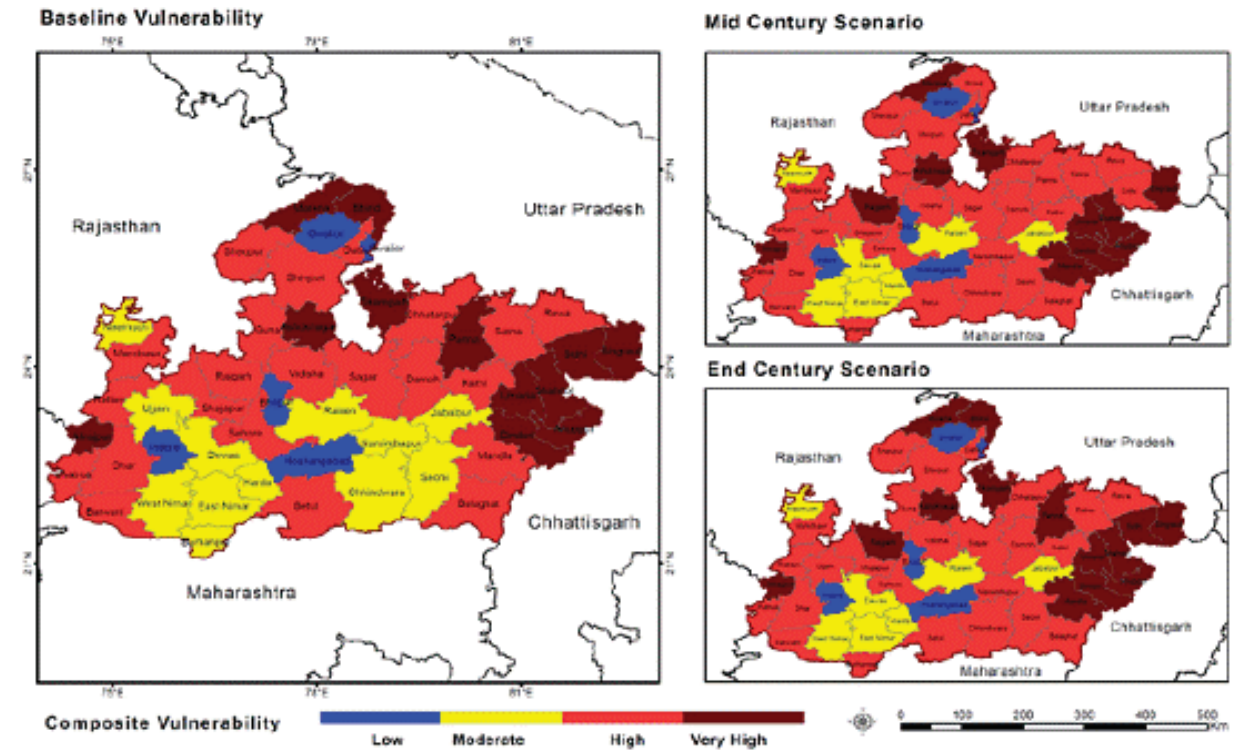
According to a study (*Gosain and Rao, undated EPCO, Bhopal*) titled “Climate Change Impacts on Water Resources of Madhya Pradesh and Adaptation Options:

“Climate change has the potential to affect fundamental drivers of hydrological cycle, and consequently may have a large impact on the water resources. This in turn might affect society in many ways and particularly the sectors fully dependent on water. Climate changes will affect not only the state of resources but also the ways and magnitude of consumption. Potential water resources management sector impacts are briefly summarized as follows (Sharma and Gosain, 2010):

1. Available water resources for municipal, industrial and agricultural use, navigation support, hydropower and environmental flows is a significant concern. Potential climate change impacts affecting water availability include changes in precipitation amount, intensity, and timing; changes in evapotranspiration.
2. Water demand for irrigation may increase as transpiration increases in response to higher temperatures.
3. Water quality is impacted by changing precipitation and temperature resulting from climate change. Changes in water resources may affect chemical composition of water in rivers and lakes.
4. Storm water and wastewater infrastructure may need to include climate change effects in their design and evaluation to improve performance under changing water availability, water demand and water quality conditions.
5. Flood risk reduction structures, because of more frequent and more severe flooding. Reservoir water control plans may need to be adjusted to reflect new flood regimes.
6. Drought results when precipitation is significantly below normal, causing serious hydrological imbalances that adversely affect land resource production system.
7. Hydropower generation will be affected by changes in water resources where impacts have already been reported. Hydropower production at facilities that are operated to meet multiple objectives of flood risk reduction, irrigation, domestic and industrial water supply, flow augmentation and water quality may be especially vulnerable to climate change.

In order to work out the impact of climate change on the water resources of Madhya Pradesh, it is important to understand the various issues about climate change.

Composite Vulnerability Map of Madhya Pradesh



Map No 34: Composite Vulnerability Map of M.P

SOURCE: [HTTP://WWW.NCHSE.ORG/MPGIS/GISPANORAMA/EPCO.HTML](http://www.nchse.org/mpgis/gispanorama/epco.html)

Maximum changes in rainfall are expected in parts of the basins of Godavari, Narmada and Mahi followed by Tapi and Ganga.”