



# Studies on the Impact of Arpa River Check Dams on the Microenvironment of District Bilaspur, Chhattisgarh

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## ABSTRACT

Bilaspur city is second largest city of the Chhattisgarh state and the River Arpa is the lifeline of this district. Arpa River has its origin from the lush dense forest area of Khondari-Khongsara. In 147 kms of the river length, it contributes more than 90 kms to the forest area, including Bilaspur city and irrigated lands of this district before meeting to Seonath river. The river is having catchment area of about 2022 sq. km. During rainy season its water level raises 2-3 meters up and in summer it moves 5 meters down. The river bed is mostly sandy with thickness of about 1.5 meter and few rock exposures at some places. More than ten check dams (Khondari, Belgahana, Lachhanpur, Rapta, Torwa, Darrighat, Sherwani, Kaneri, Mangla, etc.) have been constructed on this river. Earlier these check dams were constructed to overcome the problem of irrigation and for human welfare. But due to reduction in water level of origin site since last five years its water content is decreasing day by day and these check dams have become danger for the livelihood in the area. The maximum part of rain water gets stored in these check dams and is used by the people as a result little water reaches to Bilaspur city. Deforestation around the banks of Arpa river near the Bilaspur city has increased the pollution, thereby making the environment unstable. Study reveals that the sincere efforts need to be taken to manage the various check dams on the river for successful harvesting and recycling of rain water during monsoon season so that microenvironment of the city can not be adversely affected.

## INTRODUCTION

Bilaspur is located in eastern part of Chhattisgarh and fall within latitude 21°47' to 23°8' and longitude 81°14' to 83°15'. It is surrounded by Koriya district in north, Shahdol district of Madhya Pradesh in south, Raipur district in east and Korba, Janjgir-Champa district in west (Anonymous 2003). The total area of Bilaspur is approximately 6,377 sq. km. It is hilly towards north and plane in south which lead to quite cold and hot, respectively. The maximum temperature of Bilaspur district is 45°C and average rain fall is 1220 mm. Major rivers which surround Bilaspur district are Aagar, Maniyaar and Arpa. Among these Arpa river is the lifeline of Bilaspur. It is originated from Khondari-Khongsara, at Pendra (tehsil) and flows to meet with Seonath river at Thakur deva near Bartori that in turn meets with Mahanadi. The river Kharang is a major tributary of Arpa river. The length of Arpa is about 147 km and average water flow is 400 m. River catching area is 2022 sq. km. Besides, more than ten check dams (Khondari, Belgahana, Lachhanpur, Rapta, Torwa, Darrighat, Sherwani, Kaneri, Mangla, etc.) have been constructed on this river to mitigate the problem of irrigation and for raising the socioeconomic standards of the people of the region (Anonymous 2008). The present study was aimed to investigate the effects of check dams on the microenvironment of the region especially District Bilaspur.

## MATERIALS AND METHODS

An integrated approach was used to survey the Arpa river watershed through the collection of primary and secondary data. The primary data were collected through the eye views and interviewing with villagers representing different section of the society, which are settled on/and around the banks of Arpa river watershed. However, the secondary data were collected from the wide network including, scientific research journals, agriculture, revenue, forest and irrigation departments of the state especially at tehsil and district levels. Both the data were used to meet the objectives of the study. The information was collected and compiled by selection of stratified random sampling (35-40 samples/tehsil) which is settled on the bank of Arpa river watersheds. The data were collected on the different aspects like water status and its utilization, causes of decreasing water level, dependency of human and livestock population on Arpa, diversification of agri-based entrepreneurs and finally the quality of water, etc. that greatly influence the microenvironment of the region.

## RESULTS AND DISCUSSION

The results of the present study on different aspects are discussed below:

**Origin and nature of Arpa river:** Arpa river is originated from Khondari-Khongsara, at Pendra (tehsil) in Bilaspur

Table 1: Salient features of Arpa river.

Length	147 km
Width	400 m
Depth	7-8 m
Catchment area	2022 km <sup>2</sup>
Origin	Khomdari-Khongsara, Pendra
Meeting point	Seonath river at Thakur Deva near Bartori
Climate	Sub-tropical nature
Temperature	Minimum 16.6°C; Maximum 44.36°C
Average rainfall	135 cm

Source: Annual report department of irrigation district Bilaspur (2008-09)

district (Fig. 1). The length of Arpa is about 147 km and average water flow is 400 m. River catchment area is 2022 sq.km. The water flows from north-west to south direction. Except rainy season, it faces scarcity of water. During rainy season its water level raises 2-3 m up and in summer season it moves 5m down (Joshi et al. 2004). The river bed is mostly sandy with a thickness of about 1.5m and few rock exposures at some places. The salient features of Arpa river are given in Table 1.

**Present conditions of Arpa river:** From Khondari-Khongsara to Bilaspur, the river passes through various adverse conditions. Streams originating from the Michel range which is located between the Khondari-Khongsara is the source of water of this river which flow throughout the year. Between Belgahan and Bilaspur there is no such stream which can add water to the river. Its width between Belghan to Bilaspur is quite wide as compared to the availability of water. For last five years this river has been fully dependent on rain water. The main reason behinds this is the drying of its origin sites as shown in Fig. 2.

More than 10 check dams have been constructed on this river. Earlier these check dams were constructed to overcome the problem of irrigation and for human welfare (Kerr 2002). But due to the drying of its origin sites for last 5 years its water content is decreasing day by day and these check dams have become danger for the river. The maximum part of the rain water gets stored in these check dams and is used by the local people and as a result little water reaches to Bilaspur (Kerr et al. 2004). The features of two important check dams on Arpa river are presented in Fig. 3.

**Dependence of Bilaspur city on Arpa river:** As Bilaspur is situated on the bank of Arpa, people are fully dependent on it since ancient times. In the earlier times flood was the major problem and to overcome this problem M.P. government in 1974 built first check dam on this river near Belgahana. But only one dam was not sufficient to stop the flood water so taking this fact under consideration many check dams were constructed between Belgahana and Bilaspur city to stop the flood water and its maximum

Table 2: Parameters of water quality of Arpa river.

Parameters	Min	Max	Mean
Temperature, °C	26	26	26
Biochemical oxygen demand (mg/L)	2.4	3.8	3.2
pH	7.5	8.5	8.00
Conductivity (µmhos/cm)	162	816	389
Dissolved oxygen (mg/L)	6.8	7.5	7.2
Nitrate (mg/L)	1.02	1.30	1.16
Nitrite (mg/L)	0.02	0.03	0.03
Ammonia (mnp/100mL)	1.24	1.48	1.37
Total coliform (MNP/100mL)	83	185	146

(Source: <http://cpcbenvi.nic.in/wq-2005/MAHANADI.htm>)

utilization for agricultural purposes (Srivastava et al. 2003). But due to continuous deforestation, increasing population and climatic change water level of Arpa river has gone down and a situation of drought has been generated in Bilaspur which can be easily recognized today (Khorasi 2004). In Bilaspur city many big and small bridges have been built on this river in which Koni bridge, Indra-setu, Choti pool, Rapta pool and Torwa pool are main. From Belgahana to Rapta pool, the entire Bilaspur city faces water problem except some rainy seasons (Wani et al. 2003).

**Water quality:** The water quality of Arpa with respect to pH ranges from 7.5-8.5. The average value of conductivity is 389 µmhos/cm at Bilaspur district of Chhattisgarh. The DO value varies from 6.8-7.5 mg/L. The BOD ranges from 2.4-3.8 mg/L and the highest value was observed at U/s of Belgahana (16 mg/L) in Chhattisgarh. The total faecal coliform range from 83-185 MPN/100 and the average value is 146 MPN/100mL). The concentration of nitrite (NO<sub>2</sub><sup>-</sup>) range from 0.02-0.03 mg/L. The concentration of nitrate (NO<sub>3</sub><sup>-</sup>) ranges from 1.02-1.30 mg/L, while the average concentration of nitrate (0.03 mg/L) is recorded at U/s of Bilaspur, Chhattisgarh (Anonymous 2005). The water quality status observed in river Arpa with respect to pH, conductivity, DO, BOD, COD, faecal coliform count and total coliform count are given in Table 2.

#### Effects of Arpa River on the Environment of Bilaspur

- Due to drying of river, the underground water level of Bilaspur is going down day by day, which is appearing as major problem to the growing population (Kerr et al. 2004).
- People employed to pisciculture are wandering for another job.
- Water pollution is caused due to addition of polluted water of the city into the Arpa river. In addition to this, due to lack of proper flowing, the stagnant water has become major cause of disease which in turn also pollutes under



Fig.1: Origion of Arpa river at Khondari-khongsara at Pendra.



Fig. 2: Origin site of Arpa river showing its drying.



Fig. 3: Check dams (Mangla) and (Rapta) are constructed on Arpa river.

ground water. With the urbanization and increasing pressure of population, rate of deforestation is increasing day by day. This results in air pollution as well as soil erosion (Sethi & Jena 2004).

- On the other side of Bilaspur, from Rapta pool to southern portion of Bilaspur, water is stored for irrigation purpose and for the supply of drinking water by Nagar Nigam Bilaspur. The environment condition of this region is much better than northern parts. But due to industries like Kanio Paper Mill, Brick Bakery, the water of Arpa river and air is getting polluted day by day (Reddy et al. 2004).

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