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WATER RESOURCE POTENTIAL AND DEVELOPMENT IN BILASPUR DISTRICT (M.P.)

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ABSTRACT : The paper discusses the potential availability of surface and ground water in Bilaspur district and their utilization.

INTRODUCTION

Water is an essential requirement for human life. Increasing need of water consequent upon agricultural development may be met by intensive and extensive use of the available resources. Industrial need is equally acute. Supply of clean drinking water and development of water resources for irrigation form an important aspect of any development plan. The primary source of water is precipitation much of which is lost by evaporation, a good deal of it runs-off and is called surfece water and a small amount soaks into the ground and is known as ground water.

The district receives a mean annual rainfall of 128cm of which about 92 percent is concentrated in the period extending from 15th June to 15th October. Further, the rainfall is very irregular both in area and time. This fact makes it necessary that proper assessment and conservation of this vital resource be done for the development of the district.

THE REGION

Bilaspur is one of the eastern district of Madhya-Pradesh state. Extending over an area of 19,905 km^2 between 81° - 12' and 83^0 - 19'E and 21° - 41° and 23° - 70' N. It occupies second rank with respect to population among the districts of the state. It consists of fiften tahsils and twenty five development blocks. Northern part of the area is hilly and upland covered with forests and southern part is plain. Cultivation is done on about 53.9 percent of the area. Double cropping is done hardly on 22.1 percent of the net sown area. (Fig. I)

RAINFALL

Rainfall analysis is based on the monthly data of seven raingauge stations for the period 1960-90.

SPATIAL AND MONTHLY DISTRIBUTION

The average annual rainfall in the district varies from 105-9 cm. at Mungeli in the south-west to 148.3 cm. at Katghora in the north-east part of the district. The highest rainfall occurs in northern and eastern parts where its average amount exceeds 140 cm. Rainfall declines from these tracts towards west and south-west because this area is affected by the Maikal range rainshadow.

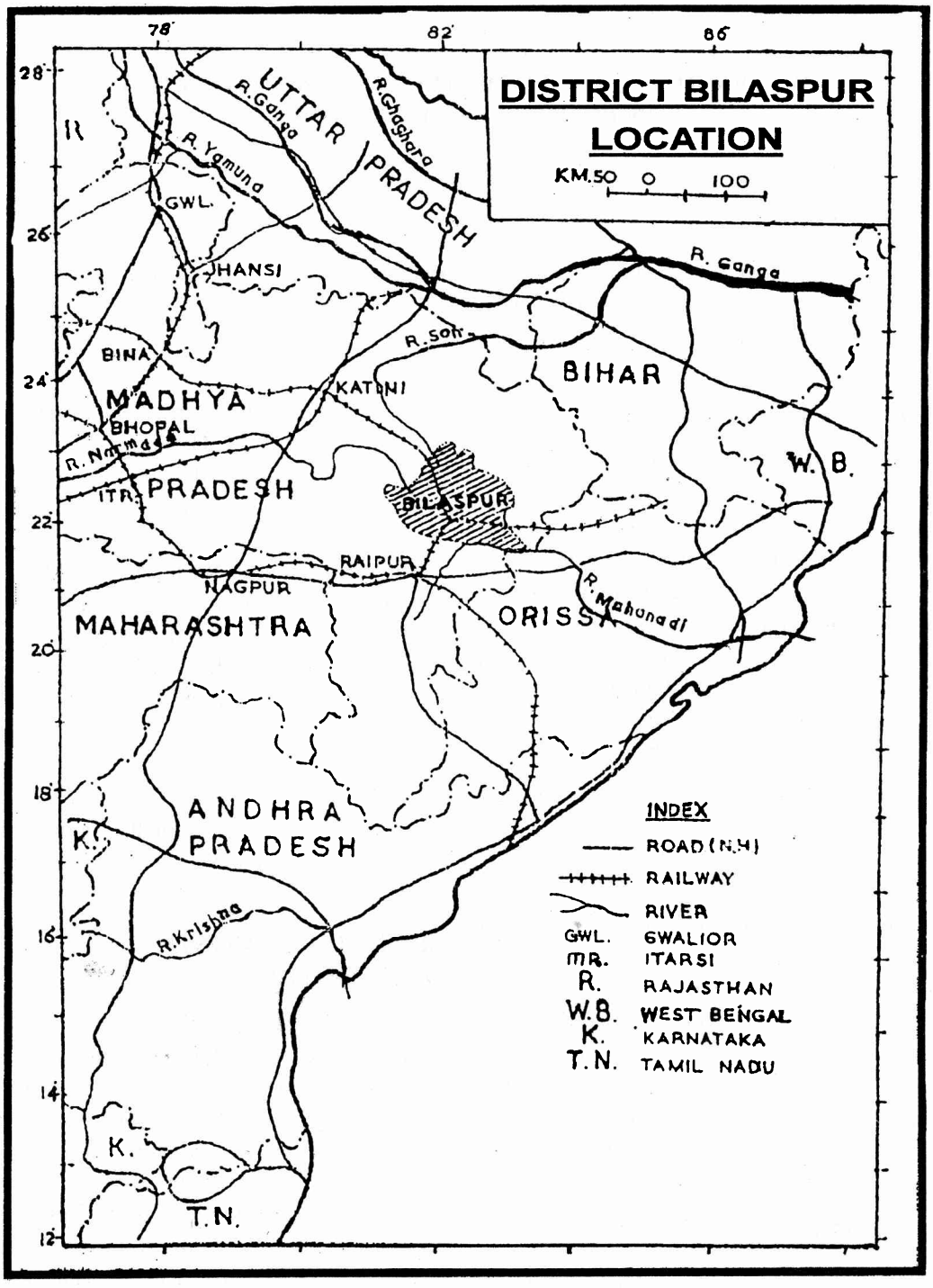

Fig. 1 : District Bilaspur Location

About 92 percent of annual rainfall occurs during mid-June to mid October, July and August being the rainist month accounting for about 63.7 percent of the annual total. September gets only 24.3 percent rainfall. In October rainfall become uncertain when 3.9 percent of the total rainfall is recorded.

VARIABILITY OF RAINFALL

Variability denotes deviation of individual values from the mean. The coefficient of annual rainfalll variation in the district ranges from 20 percent at pendra (upland area) to 30.2 percent at Champa (Plain area). This highly variable and unraliable nature of rainfall puts great stress on the agricultural production in the district. As a result droughts and famines are not infrequent in the district. High variability (Champa area) of rainfall brings forth the importance of the early need for assured irrigation for sustained agricultual growth.

THENDS OF RAINFALL

Fig-2 shows that the rainfall fluctuates highly from year to year. It is revealed that fluctuations in rainfall do not occur with any definable regularity any where in the district. A glance at the linegraph of actual annual rainfall revaals that the rainfall in the district has been fairly high up to1966 with a few exceptions, but onward it has been low particularly during 1966-75. The period of 1975-80 recorded the lowest reainfall at Janjgir and Sakti but during the same period Bilaspur and Pendra stations received highest rainfall. After 1980, rainfall was fairly normal. The regression lines indicate a decline in annual rainfall over this period at all stations of the district. The value of decrease in annual rainfall ranges from 0.09 cm. at Sakti to 1.29 cm. at Janjgir. So, thue situation is alarming and necessitates proper management of water resources. (Fig. 2)

WATER BALANCE

Ideally any study of water resources of an area should be based on long record of water supply and water loss. The analysis is based on the average potential evapotranspiration (PE) data for Bilaspur and rainfall data of nine stations. The data for rainfall (p) and PE were used to calculate soil moisture storage change, actual evapotranspiration (AE), water deficit and water surplus by the method developed by Thorn-thwaite and Mather (1955).

WATER DEFICIT

The amount by which PE exceeds AE is termed as water deficit. The condition of water deficit prevails from October to June. The annual deficit ranges from 577 cm. at Katghora to 759 mm and 760 mm at Mungeli and Pendra respactively. In the major part of the district the deficit is less than 700 mm. In Pendra area it is caused by the lower field capacity of soil, while in the Mungeli area it is due to low rainfall. (Fig III)

WATER SURPLUS

During rainy season rainfall exceeds PE. The excess is called water surplus. July, August and September are the months of water surplus. The annual water surplus ranges from 307 mm at Mungeli to 881 mm at Sakti.

STREAM FLOW

About one-third of the annual rain water flows on the surface through small and big streams. Out of the total area of the district, 18954 km^2, i.e. 95 percent lies in the catchment of the Mahanadi. The rest 954 km^2 area of the north-western part

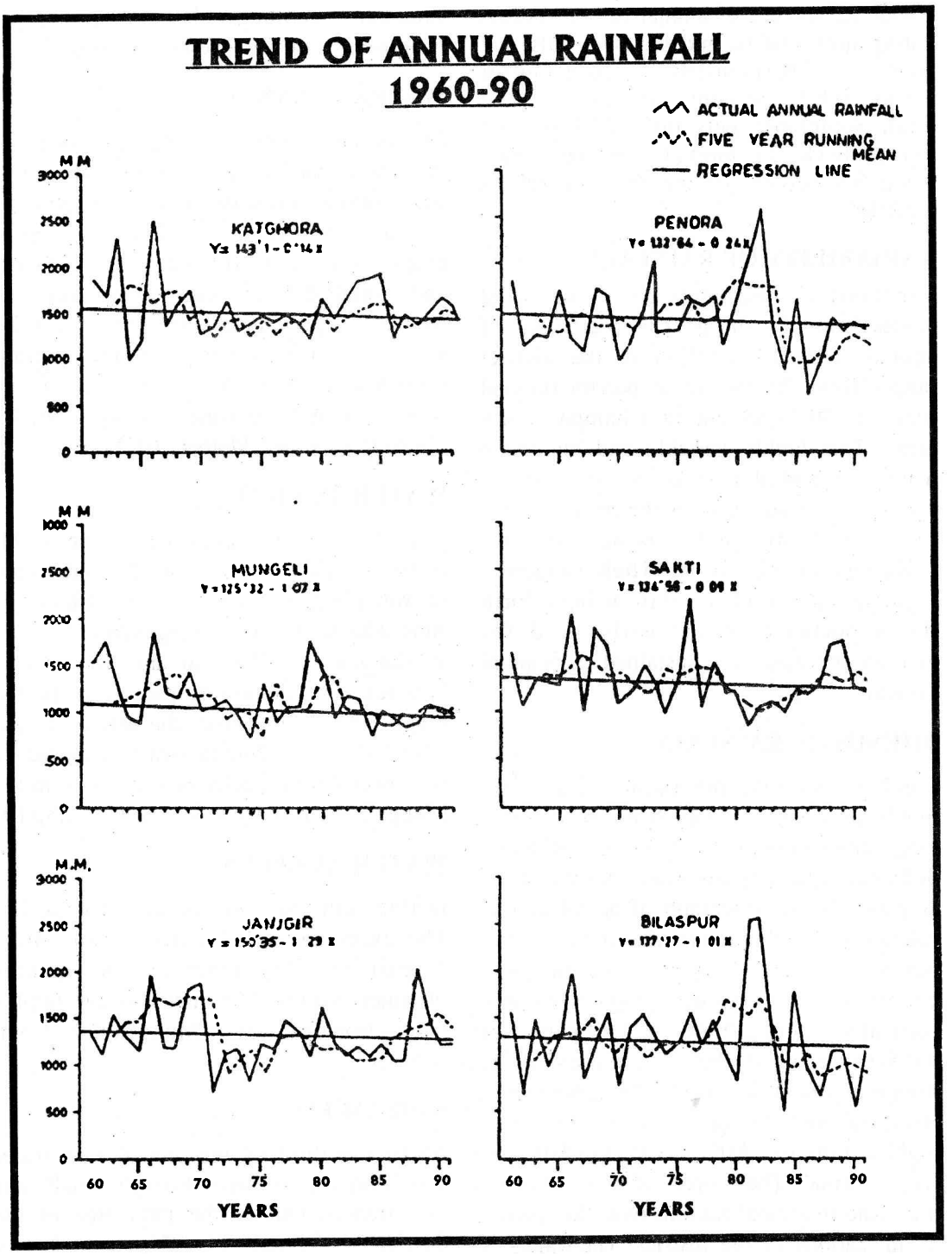

Fig. 2 : Trend of annual rainfall : 1960-90

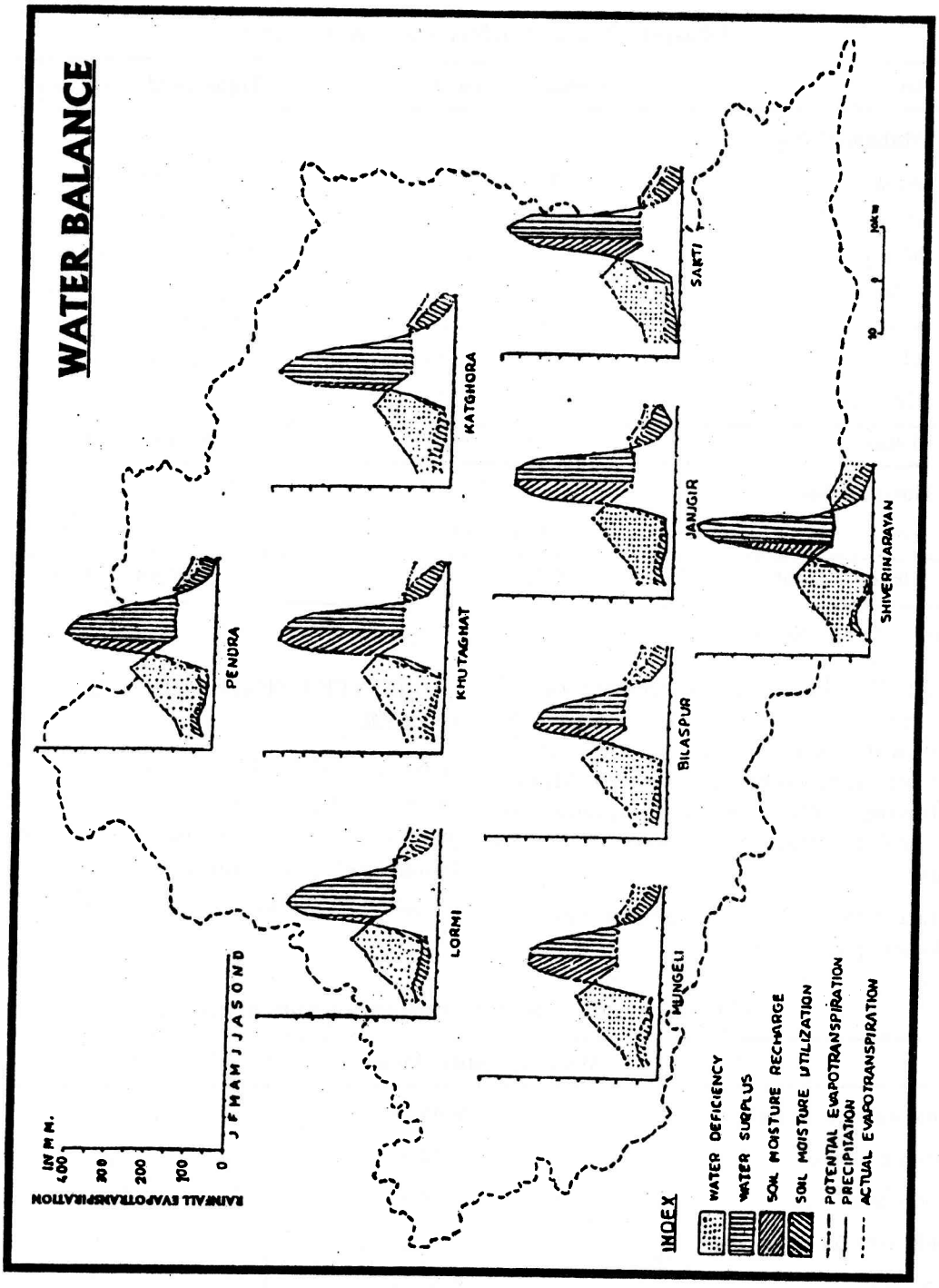

Fig. 3 : Water Balance

Table 1

Bilaspur distict : Surface water availability

River	Catchment area (In Km^2)		Total Yield (in Mcum)	
A) Mahanadi Basin :		(%)		(%)
Arpa .	7621	(38.2)	2676.52	(38.2)
Hasdo	3580	(17.9)	1245.66	(17.8)
Maniyari	2885	(14.4)	1026.49	(14.6)
Lilagar	1503	(7.5)	488.46	(6.9)
Borai	1810	(9.0)	644.49	(9.2)
Mand	830	(4.1)	313.46	(4.5)
Hap	725	(3.6)	257.99	(3.7)
Total	**18954**	**(95.2)**	**6653.07**	**(95.0)**
B) Ganga Basin :				
Son	954	(4.7)	342.91	(4.9)
Grand - Total :	**19908**	**(99.9)**	**6995.98**	**(99.9)**

***Source** : Office of the Chief Engineer, Bilaspur (M.P.)*

(about 5%) lies in the catchment of the Son river, a tributary of Ganga river. The total water yield of the district at 75 percent dependability is 6996 Mcum. Following table gives a comprehensive idea about surface water potential of the district.

Surface water is also available in numrous tanks and ponds.

ULTIMATE USE OF SURFACE WATER

A balance of 29.20 % of annual available surface water has not been utilized. It is therefore, suggested that the proper attention should be given towards the installation of lift irrigation works on the rivers and nalas of the district.

The water use capacity of various schemes areas

.	Water quantity (Mcum)	%
Total water availability	6995.98	100.00
Existing works	1222.61	17.46
Works under inst.	3695.65	52.83
Addl. 10% for lift scheme	39.65	0.56
Total use	4958.91	70.52
Average annual balance	2037.07	29.20

GROUND WATER POTENTIAL

Rainfall is the principal source of ground water potential. The echage may be estimated by (i)rainfall infiltration method and (ii) water level fluctuation method. Rainfall infiltration method is as under -

(a) RC = R+r

(b) R = (A.B.C.) -S

Where, RC = Recharge in culturable area

R = Recharge

A = Average annual rainfall in the area

B = Infiltration index

C = Sub- surface outflows and evaporation losses

r = recycled irrigation water

Worked out by this method the average annual ground water recharge in the district comes to 2698.29 Mcum. The annual draft has been calculated on the basis of the following norms:

0.5 Ha m per irrigation well

1.0 ha m per 1000 population'

2.0 ha m per irrigation tubewells.

(II) Water level fluctuation method :

Rf = C. Sy. Z.

Where Rf = recharge for fluctuation method

Sy = Specific yield

Z = average fluctuation in water level as per representative wells

C = Culturable area.

Specific yield for hard rock formation may be taken as 12 percent. Net recharge calculated by annual water level fluctuation method 2311.17 Mcum.

It may be noted that only 186.17 Mcum (6.89%) recharge of ground water is being utilized at present (base year 1997). Only in Dabhara (13.8%) and Takhatpur blocks, (10.7%) the ground water is developed to some extent due to well irigation. On the other hand, in the northern blocks of the district ground water use is quite significant. Thus, there is a great scope of ground water development in the district. The balance 2302.12 Mcum ground water is available for further exploitation.

QUALITY OF GROUND WATER

The quality of ground water is suitable both for drinking and irrigational purposes. The total disolved solids are less than 500 ppm and the PH value is below 9. The canal irrigation has perectically no effect on the quality of ground water.

DEVELOPMENT PLANNING FOR GROUND WATER

For the purposes of ground water development state Hydrological Survey Department has identified areas suitable for tube-wells, wells etc taking in to account the geological formation, water table contours, pump test results. It may be noted that there is much scope of ground water development in the southern plain and its adjacent areas of the upland, An area of about 2551 Km^2 of the district apears suitable for installation of tubewells of 50 to 75 m depth. An area of about 4802 Lm^2 is recommonded for deep dug-wells of 12 to 18 m depth and 3 to 5m diameter. An area of about 4368 Km^2 is suitable for construction of shallow dugwells of 8 to 12 m depth and 4 to 6 m diameter.

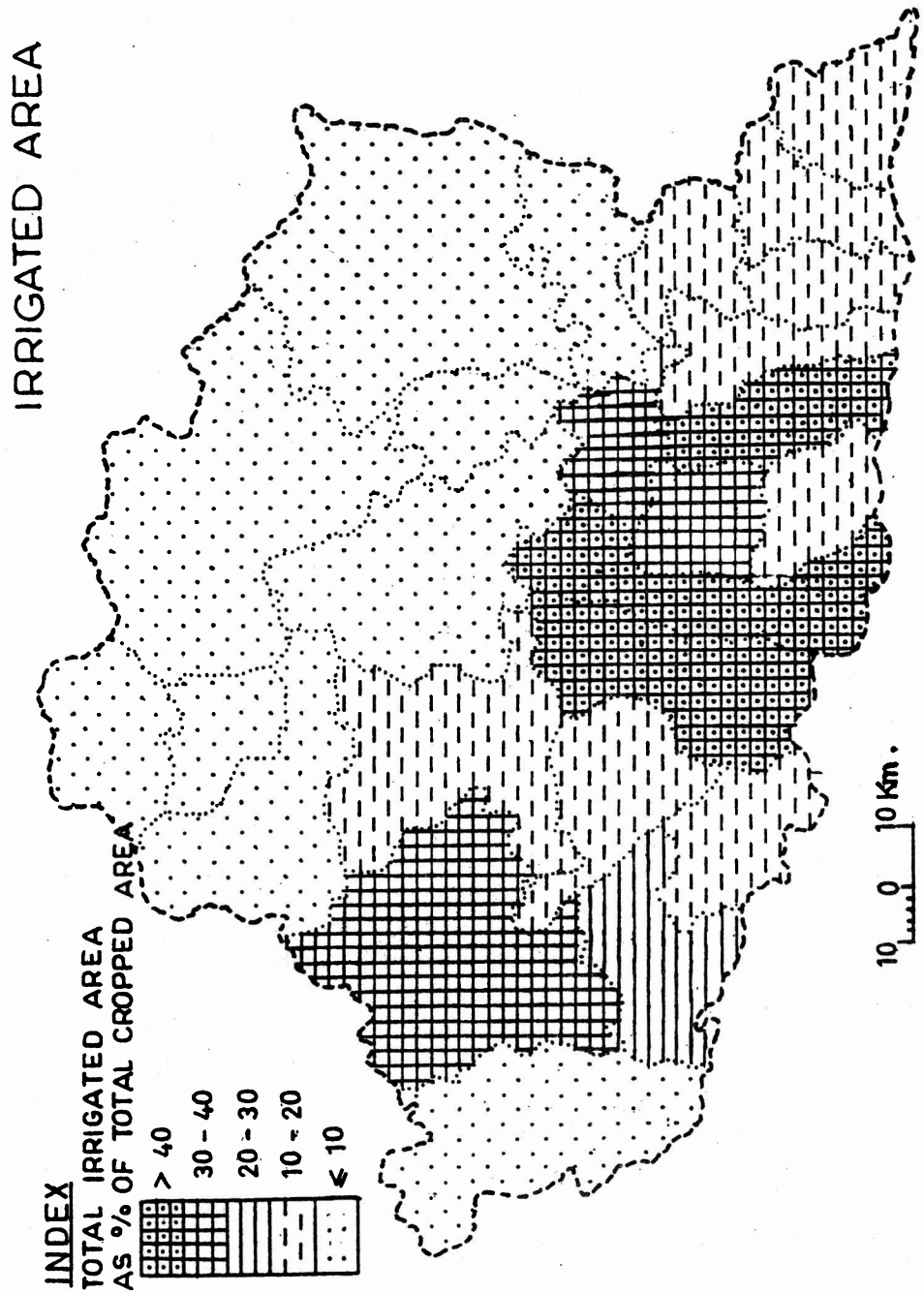

Fig. 4 : Irrigated Area

WATER UTILIZATION

In Bilaspur district, irrigation and domestic uses are the two major uses of water. Other uses are insignificant.

IRRIGATION

Irrigation in the district is not much developed. About 226117 ha of cropped area is irrigated in 93-96, which is only 30.57 percent of the T. C. A. About 95.3 percent of irrigated area is confined in 58.7 percent of the regional area (Southern plain). The rest 41.3 percent of geographical area (Northern upland) has only 4.7 % of irrigated area. Proportion of irrigated area to T.C.A. ranges from only 0.83 percent in Katghora and 1.36 percent in Korba to 61.76 percent in Janjgir 54.9 percent in Bilha blocks. (Fig - IV). For instance Kharung tank, Maniyari tank, Ghondha reservoir and Hasdo-Bango are major irrigation projects and their commond areas are located in the southern plain (Fig IV)

Of the total irrigation about two-third is provided by surface water resources and one third by ground water sources. About 48.26% irrigated area is accounted for by canals, 19.38 % by tanks, only 14.5% by wells and the remaining about one fifth by the other sources such as Banhiyas and water lifting by the electirc and diesel pumps from streams and nalas.

Efficiency of irrigation has been increased by using modern water lifting techniques. On an average, there are 7.84 irrigation pumps per thousand hectares of cropped area.

DOMESTIC USE

At present the average daily supply of water in the towns in 41428.70 thousand litres, by the municipal cor. Which is only 56.71 percent of the total requirement. The additional requirement is met with by personal sources, such as hand-pumps and wells. In rural areas, southern plain of the district there is no scarcity of water, but in th plateau region water is scare and any scheme on large scale for making it available to the villagers will be costly and even uneconomic because the scattered population.

FISHERY

At present about 14,000 ha water area is available for fishing in the district. More than 10 percent of the total fish production of the state is confined within this district. The Government has established fish seed production centres at Kulipote, Sakti, Torwa, Gopalpur, Hado Baraj Darri etc.

INDUSTRIAL WATER SUPPLY

At present Hasdo-Bango project is supplying water to the thermal power plants at Korba and BALCO to the extent of 95 M cum^3 and 14 M cum^3 respectively. The future demand of water from this project by the thermal power plants at Korba and BALCO will be 348 M cum^3 and 18 M cum^3 respectively.

PROSPECTS OF FUTURE DEVELOPMENT

Drinking water problem is being solved through installation of handpumps by the P. H. E. Deptt, but the development of irrigation is very low. Irrigation should be the focal point of water resource planning. A large number of irrigation works are essential for conserving the water not only for irrigation purpose but also for the domestic purposes. The existing canal system should be improved so that agriculture may not suffer even in the draught seasons. (Fig V)

The total renewable surface water available for development in the district in a normal year accounts for 6995 M cum but only 4950

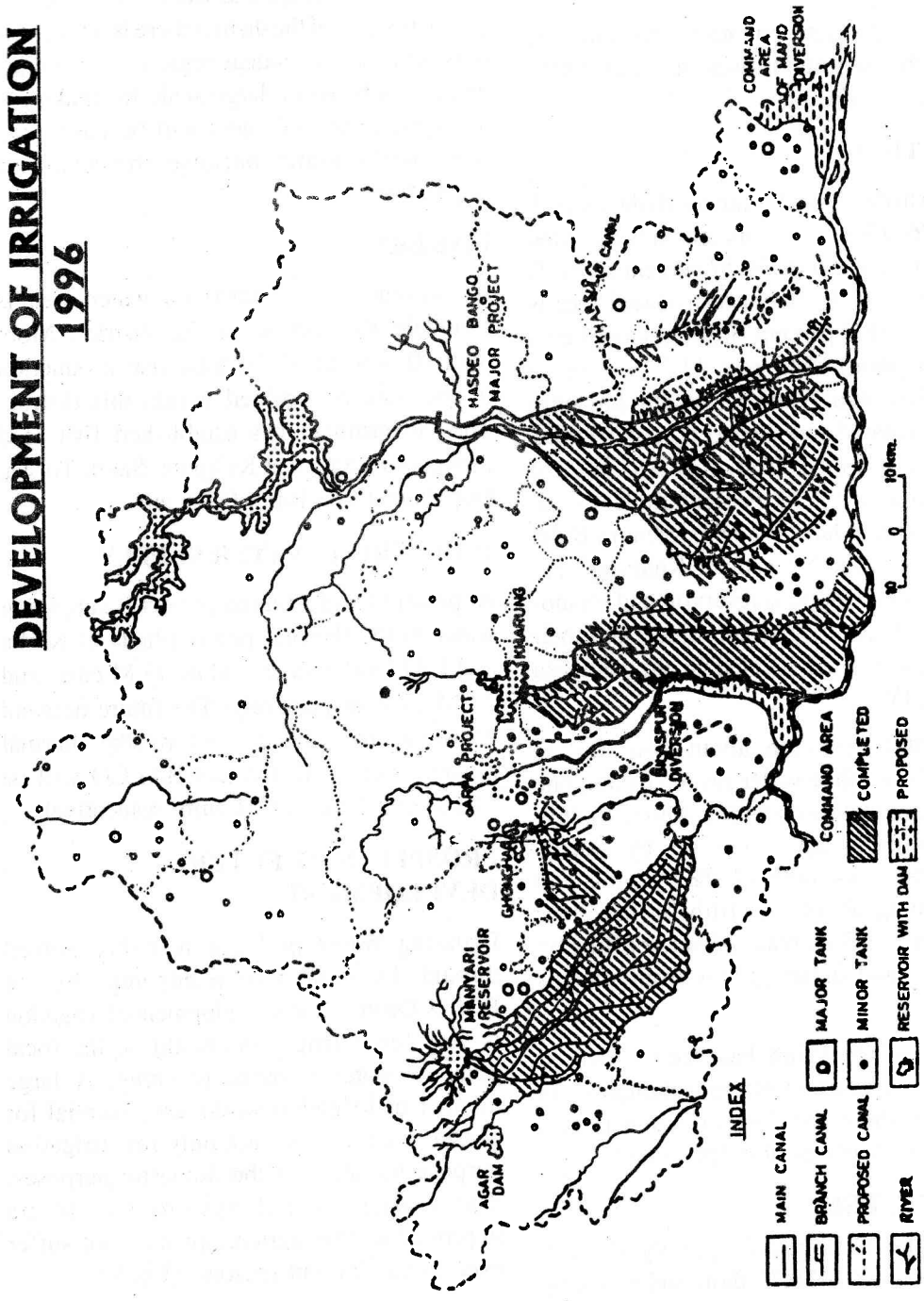

Fig. 5 : Development of Irrigation - 1996

The total renewable surface water available for development in the district in a normal year accounts for 6995 M cum but only 4950 M cum of it can be utilised. Water use possible from various schemes is as under :

Schemes	Mcum
1. Existing works	1222.61
2. Under construction works	3696.65
3. Pin-pointed schemes	539.33
4. Add 0% of lift irrigation scheme	39.65
	5498.24

In future for better utilization of the available water in the tanks and ponds, mobile diesel pumps and electric pump-sets should be considered. The previous discussion has revealed that not even. 6.8% of the ground water is being utilised for irrigation at present. Thus there is a great scope for its use and development. The state Hydrological Survey Department has identified areas suitable for tubewells, wells etc. It may be noted a large tract of the southern plain and its adgacent areas of upland are much scope of ground water development. Other possibilities are :

1. There is much scope for the development of fish culture in the reservoirs and tanks.
2. Beautiful picnic/holiday spots may be developed at the reservoir sites to attract the urban population. In addition, rabi vegetable and oil-seed crops can be taken in the catchment area.

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