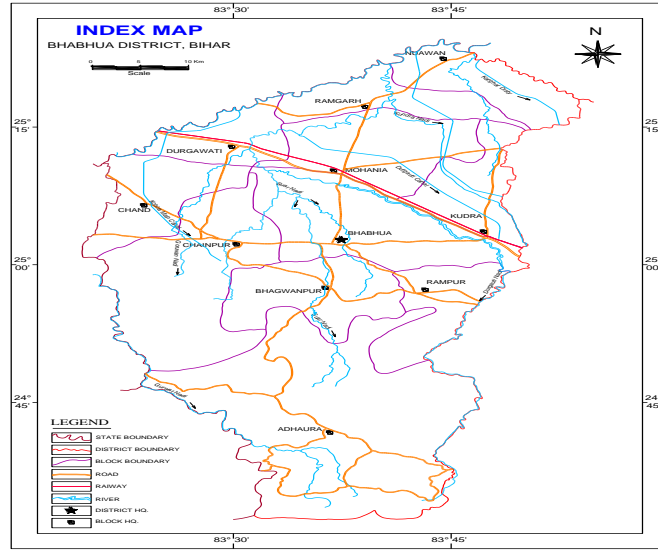




भूजल सूचना पुस्तिका
कैमूर(भभुआ) जिला, बिहार
Ground Water Information Booklet
Kaimur (Bhabhua) District, Bihar State



केन्द्रीय भूमिजल बोर्ड
जल संसाधन मंत्रालय
(भारत सरकार)
मध्य-पूर्वी क्षेत्र
पटना

Central Ground water Board
Ministry of Water Resources
(Govt. of India)
Mid-Eastern Region
Patna

सितंबर 2013
September 2013

PREPARED BY
CARTOGRAPHY

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- **Shri Lokendra Kumar, D/Man Gd-II**

**GROUNDWATER INFORMATION BOOKLET
BHABUA DISTRICT, BIHAR**

BHABUA DISTRICT AT A GLANCE

Sl. No.		Statistics
1.	GENERAL INFORMATION	
	I. Geographical Area (Sq. Km.)	3362
	II. Administrative Divisions	2
	No. of Panchayats/Villages	151/9304
	Number of Tehsil/Block	11
	III. Population (As per 2011 Census)	Total: 1,626,384 Rural: 1,560,813 Urban: 65,571
	IV. Average Annual Rainfall (mm)	1055.4
2	GEOMORPHOLOGY	
	Major Physiographic Units	1. Bhabua Plateau (Southern part) 2. Alluvium (Northern part)
	Major Drainages	Karmanasa, Kudra, Dhoba, Durgavathi
3	LAND USE	
	a) Forest Area	1130.39 sq.km
	b) Net Area Sown	1720.53 sq.km
	c) Total cropped Area	2222.43 sq. km
4	MAJOR SOIL TYPES	inceptisols, entisols and alfisols.
5	PRINCIPAL CROPS	Rice, wheat, pulses
6	IRRIGATION BY DIFFERENT SOURCES (Area in hectares, 2008) Source: Statistical handbook, Bihar	
	Dugwells	
	Tubewells/Borewells (STW)	49,000
	Tanks/ponds	16,000
	Canals	83,000
	Other Sources	1000
	Net Irrigated Area	1,49,000
	Gross Irrigated Area	1,94,000
7	NUMBER OF GROUND WATER MONITERING WELLS OF CGWB (2011)	
	No. of Dugwells	08
	No. of Piezometers	Nil
8	PREDOMINANT GEOLOGICAL FORMATIONS	Alluvium, Sandstone
9	HYDROGEOLOGY	

	Major water bearing formations	Alluvium
	Pre-monsoon Depth to water level during 2011	5.96 – 12.73 m bgl
	Post-monsoon Depth to water level during 2011	3.62 – 6.35 m bgl
	Long term water level trend in last 10 yrs(2002 – 2011) in m/yr	No significant decline
10	GROUND WATER EXPLORATION BY CGWB (As on 31-03-2013)	
	No. of well drilled (EW,OW, PZ, SH, Total)	Nil
	Depth Range (m)	-
	Discharge (m³/hr)	-
	Storativity (s)	-
	Transmissivity (m²/day)	-
11	GROUND WATER QUALITY	
	Presence of Chemical constituents more than the permissible limit (e.g.EC, F, As, F)	Nitrate, F, EC.
	Type of Water	Potable
12	DYNAMIC GROUND WATER RESOURCES (as on 31st March 2009) in mcm	
	Annual Replenishible Ground Water Resources	789.47
	Net Annual Ground Water Draft	252.94
	Projected Demand for Domestic and Industrial Uses up to 2025	40.05
	Stage of Ground Water Development	31.6%
13	AWARENESS AND TRAINING ACTIVITY	Nil
	One day Training Programme Organized	Nil
	Date	
	Place	
	No. of Participants	
14	GROUND WATER CONTROL AND REGULATION	
	No. of OE Blocks	Nil
	No. of Critical Blocks	Nil
	No. of Blocks Notified	Nil
15	MAJOR GROUND WATER PROBLEMS AND ISSUES	Fluoride and Nitrate are reported at few places
	Note: Latest available data may be incorporated	

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 - 1.4 Studies/Activities carried by CGWB
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1.0 INTRODUCTION

1.1 Location, Area and Administrative Details

Bhabua district, located in the extreme south-western part of the State extends between the north latitudes $24^{\circ}-54'$ and $25^{\circ}-20'$ and east longitudes $83^{\circ}-20'-00''$ and $83^{\circ}-40'$ and falls in the Survey of India toposheet no. 63 O and P. The district has an old and interesting story. It formed part of the mighty Magadh Empire from 6th century B.C. to 5th century A.D. under the Mauryan and Gupta rulers of Magadh. In the 7th century A.D., this district came under the control of Harshawardhan, the ruler of Kannouj. An inscription in the Mundeshwari temple near Bhabua refers to the king Udaysena as the ruling chief of the area.

The district is bounded in the north by Buxar district of Bihar and Gazipur district of Uttar Pradesh, in the south by Garhwa district of Jharkhand State, in the east by Rohtas district of Bihar and in the west by Chandauli and Mirzapur district of Uttar Pradesh. The present Bhabua district was formed out of the Rohtas district in the year 1991.

As per the 2011 Census, the total population of the district stands at 1,626,384 with a population density of 488 persons per Sq Km.

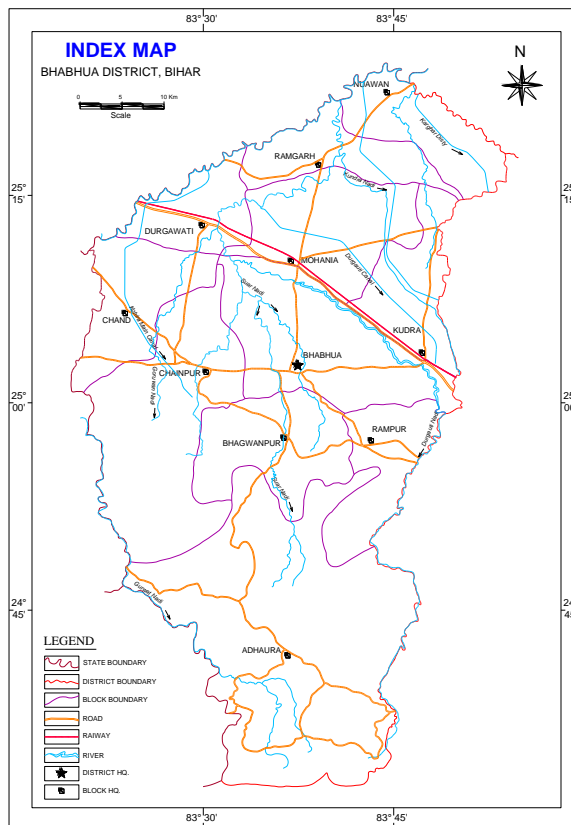


Figure 1: Administrative map of Bhabua district, Bihar with block boundaries road (rail) networks.

1.2 Basin/Sub-Basin and Drainage

The district forms part of the Gangetic Plains and falls in the Karamnasa sub basin. Drainage of the district can be divided into two parts, one forming the catchment area of Karamnasa river (Western part) and the eastern part is drained by the Durgawati river. The river Sone which flows from the west towards the east and seen to the south of the area does not at all control the river system of the area. Drainage of the area in the southern part i.e the Bhabua Plateau range is mainly structurally controlled and depends on the lithology, structure, fractures and joints.

1.3 Agriculture and Irrigation practices

The alluvial plain extending up to the foothills of Bhabua ranges is extensively cultivated. Rice, wheat, pulses are the chief crops and the area is dotted with bamboo clumps and mango orchards. The plateau is generally covered with long grasses, viz. Kush and khas. Sal trees of poor quality and vast stretches of bamboo are also found. Firewood, Tendu leaf and Chiraunji are the important forest products.

1.4 Studies/ activities carried out by CGWB

Central Ground Water Board has established seven Hydrograph Network Stations which are primarily dug wells being used for monitoring of water level. From these stations monitoring is carried out four times every year in order to study the general ground water trend in the district and water quality monitoring is made once every year. The district has been covered by Systematic Hydrogeological Survey by CGWB during the year 1975-76 followed by reappraisal survey. Information on aquifer potential is available from the exploratory wells constructed by ETO and State agencies which have been made use of in this booklet.

2.0 CLIMATE AND RAINFALL

The climate of the district is somewhat extreme in nature, i.e., quite hot during the summer and fairly cold during the winter. January is the coldest month when the mean minimum temperature comes down to approximately 4 degree C. The temperature starts rising from March and reaches its peak in May when the mercury touches about 45⁰C. Rain starts sometime in mid June and lasts till mid September. The district gets easterly winds from June to September, and from

October to May wind direction reverses. Maximum rains occur during the months of July and August (289 mm). Sometimes winter rains occur in Jan-February.

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1 Geomorphology

Geomorphologically, the district is divided into two major divisions; the flat alluvial plain in the northern part with general elevation varying from 80 to 135 m amsl and the Bhabua Plateau in the southern part with elevation upto 500m. In respect of drainage, the area can be divided into two parts, one forming the catchment area of Karamnasa river (Western part) and the eastern part is drained by the Durgawati river. The river Sone which flows from the west towards the east and flowing through the south of the area does not at all control the river system of the area under discription. Drainage of the area is mainly controlled by the lithology, structure, fractures and joints.

3.2 Soils

The soils in the northern part of the district are mainly derived from the older alluvium. These alluvial plain soils are greyish yellow to light grey in colour, heavily textured and are neutral to slightly alkaline. The alluvial plain soil is fertile and represents a broad spectrum of sand, silt and humus rich clay. The marginal alluvial soils are found south of G.T. road upto the foothills of the Bhabua. These are calcareous soils and are heavy textured. The Bhabua plateau soil are not fertile and are covered with thin forest. These soils are acidic and are light to medium textured. The potash content is medium to high and has low nitrogen.

4.0 GROUND WATER SCENARIO

4.1 Water bearing formations

Bhabua district, lying in the extreme southwestern parts of Bihar, is covered mostly by the South Ganga Plain and a part in its south by the compact sedimentaries of Vindhyan age. The alluvial area in the district bears good groundwater potential down to depth of around 150 m bgl, with discharge varying between 100 and 200 m³/hr. The groundwater prospects in the areas under the Bhabua Plateau range (Vindhayans) has not been explored under the exploratory programme of CGWB, however, the Vindhayans are generally hard and compact sedimentaries and have been categorized as poor repositories of groundwater. Ground water development in this part is made through open wells and hand pumps tapping aquifers found at favourable

locations within top 10-15 m depth. The hydrogeological information pertaining to alluvial areas in different parts of the district as per the exploration carried out by ETO is summarized as under

Depth range of shallow aquifer (in m bgl)	<i>10-50 m in alluvium areas in general</i>
Depth ranges of deeper aquifer (in m bgl)	<i>50-200 m in alluvium areas in general</i>
	<i>Ramgarh: 76-85,124-152,164-176</i>
	<i>Piparia: 87-98,166-192</i>
	<i>Mohania: 73-97,123-129</i>
Yield potential of deeper aquifer (discharge)	<i>100-200 m³/hr</i>
Transmissivity of aquifers	<i>1706-4162 m²/day</i>

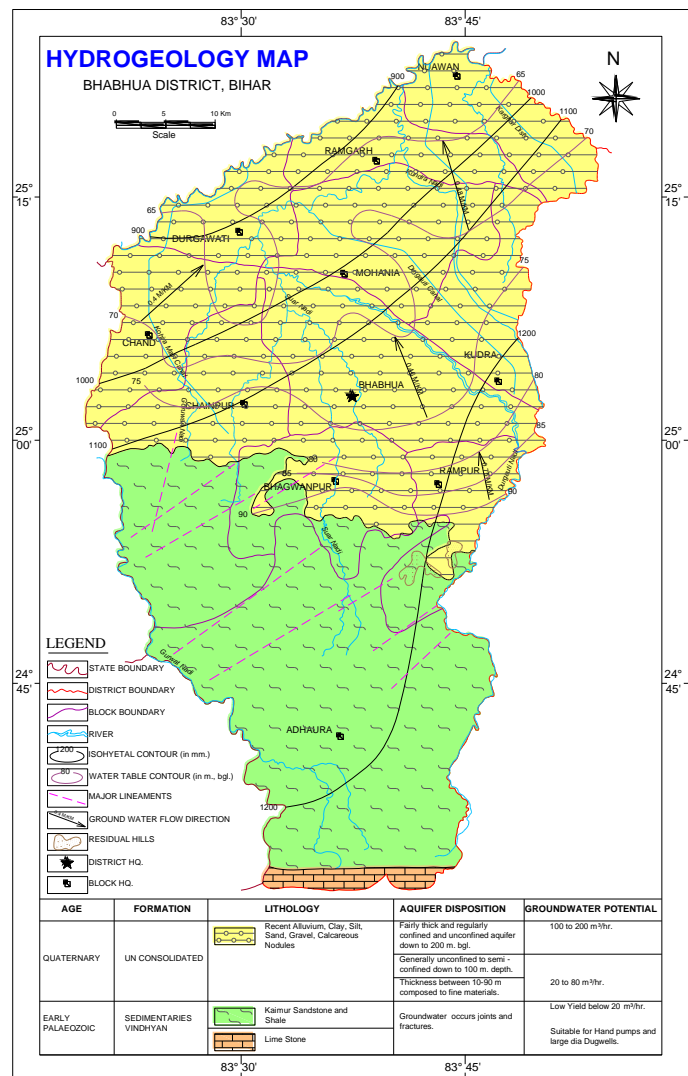


Figure 2: Hydrogeological map of Bhabhua district, Bihar showing Quaternary Alluvium with their yield potential. Electrical conductivity of groundwater has been represented by contours.

4.2 Depth to Water Level

The pre-monsoon water level data of the year 2011 reveals that the depth to water level in the district remains between 5.96 and 12.3 m bgl. During the post-monsoon, the depth to water level was found varying from 3.62 to 6.35 mbgl. The depth to water level map for the pre and the post-monsoon season for the year 2011 is presented in Fig 3 and 4. Summarized details of the monitoring carried out during 2011-12 are presented in Table 1.

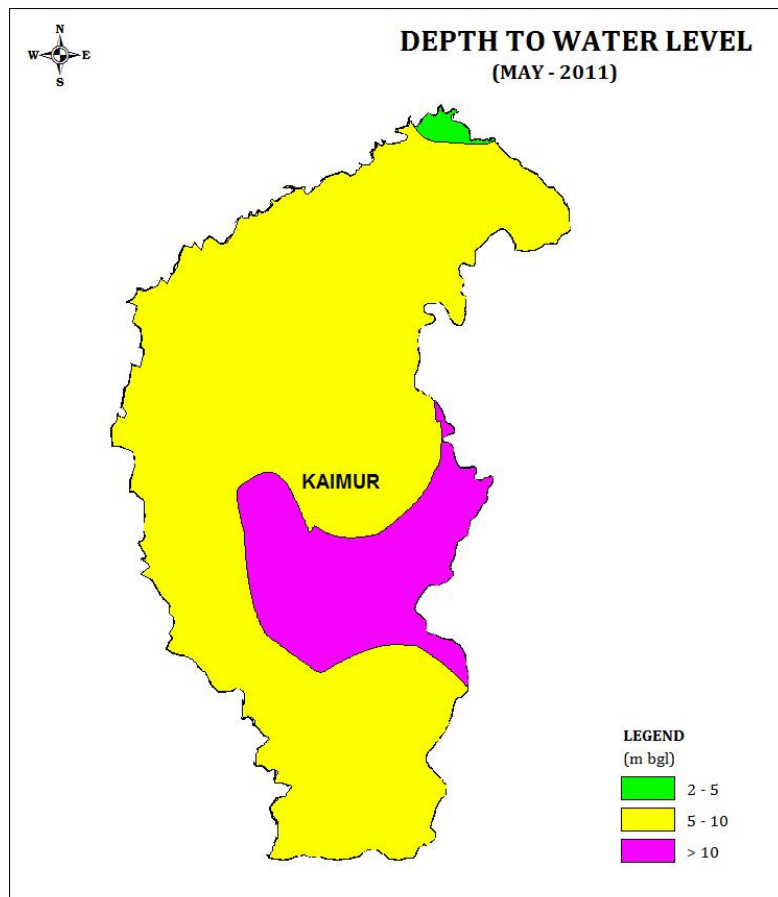


Figure 4: Pre- monsoon 2011 depth to water level contours in Bhabua district, Bihar.

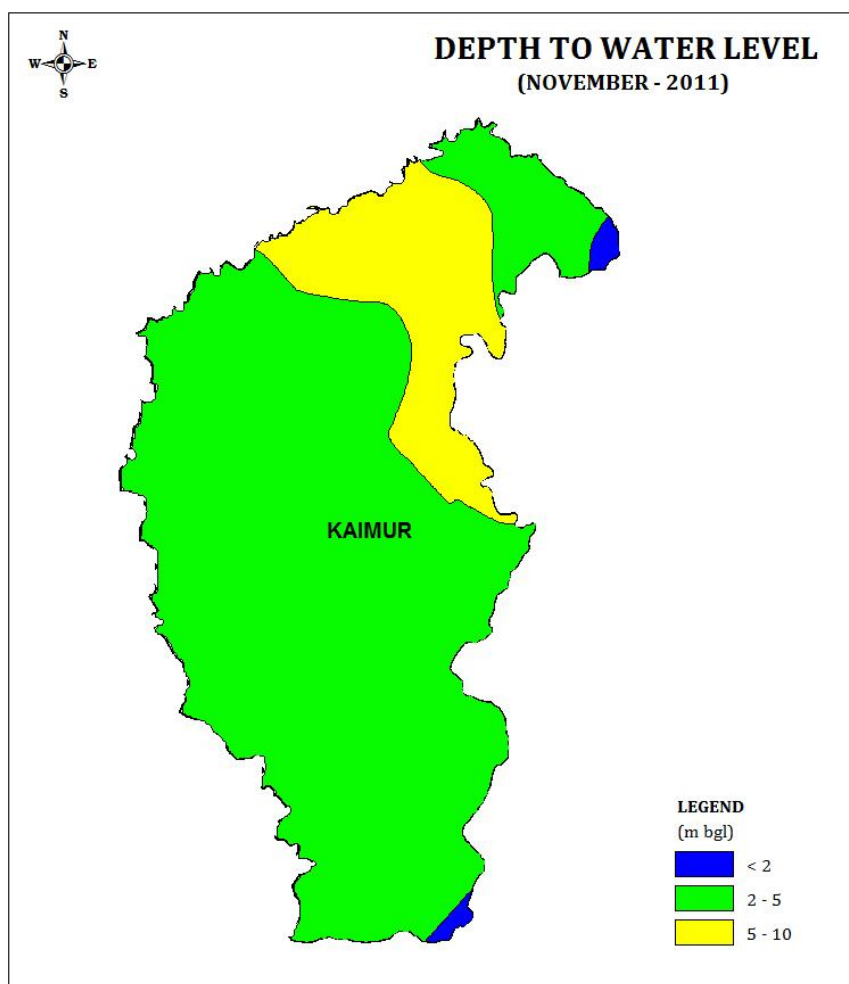


Figure 5: Post- monsoon 2011 depth to water level contours in Bhabua district, Bihar.

Table 1: Summarised details of monitoring carried out in Bhabua district during 2011-12

District	Month	No. of HNS Wells measured	Depth to water level (m bgl)		0-2 m		2-5 m		5-10 m		10-20 m	
			Min.	Max.	No.	%	No.	%	No.	%	No.	%
BHABUA	May 2011	9	5.96	12.30	0	0.00	0	0.00	8	88.89	1	11.11
	August 2011	8	2.58	6.02	0	0.00	6	75.00	2	25.00	0	0.00
	November 2011	6	3.62	6.35	0	66.67	4	66.67	2	33.33	0	0.00
	January 2012	4	3.74	6.54	0	0.00	2	50.00	2	50.00	0	0.00

4.3 Ground Water Quality

Ground water quality monitoring from the hydrograph network stations of CGWB is carried out by CGWB once every year during the pre-monsoon season (May). The quality is thus representative of the phreatic aquifers in the area. The groundwater quality data for the year 2011 is presented in table as under. The groundwater is by and large suitable for irrigation and drinking purpose, however, higher EC (> 2000 micro-siemens) and chloride (> 250 mg/l) has been recorded from Chainpur. A possible reason for high EC and chloride at Chainpur may be due to improper upkeep and maintenance of dugwell and its contamination through sewage waste.

Table 2: Summarised details of ground water quality of the shallow aquifer

SN	District	Location	EC ($\mu\text{s @25}^\circ\text{c}$)	pH	CO ₃ ²⁻	HCO ₃ ⁻	Cl ⁻	Ca ²⁺	Mg ²⁺	TH	Na ⁺	K ⁺
					(in mg/lit)							
1	Bhabhua	Bandipur	894	7.53	0	342	46	62	51	365	32	3
2	Bhabhua	Chainpur	2200	7.35	0	641	379	54	178	866	75	20
3	Bhabhua	Chand in p.s.	1305	7.48	0	336	234	46	7	145	220	4
4	Bhabhua	Mohania	1235	7.61	0	366	170	32	61	330	81	35
5	Bhabhua	Nuawan	780	7.37	0	378	46	88	23	315	30	3
6	Bhabhua	Rajandih	520	7.50	0	299	7	16	18	115	65	2

The range of the various chemical constituents in groundwater from shallow aquifer in Bhabhua district is as under

Electrical conductance	: 520 to 2200 micromhos/cm at 25 ⁰ C
pH	: 7.37 to 7.61
Total Hardness as CaCO ₃	: 115 to 866 ppm
Calcium	: 16 to 88 ppm
Magnesium	: 7 to 178 ppm
Sodium	: 30 to 220 ppm
Potassium	: 2 to 35 ppm
Chloride	: 7 to 379 ppm
Carbonate	: NIL
Bicarbonate	: 299 to 641 ppm

Fluoride : Maximum concentration reported is 2.83 mg/l from Bhagwanpur in Bhagwanpur Block

Nitrate : Maximum concentration reported is 154 mg/l from Chainpur in Chainpur Block :

4.4 Ground Water Resource of Bhabua (As per 31st march 2009)

Ground Water Resources

The net annual replenishable ground water resource as on 31st March 2009 works out to be 78947 ha.m. The gross annual draft for all uses works out to be 25294 ha.m. Allocation of ground water for domestic and industrial use for 25 years works out to be 4005 ha.m. The stage of ground water development is 31.6%. The stage of ground water development is highest in Kudra (44.6%) and lowest in Adhaura (19.5%). As stages of ground water development in all the blocks are less than 70%, and there is no long-term decline in water levels, all the blocks are under safe category. The block-wise ground water resource is given in Table 3 and stage of ground water development is depicted in Fig 5.

Table 3: Blockwise Dynamic Ground Water Resource of Bhabhua district (2008-2009)								
								(in hectare meter)
Sl. No	Assessment Unit/District	Net Annual Ground water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground water Draft for Domestic and Industrial Water Supply	Existing Gross Ground Water Draft For all Uses (10+11)	Allocation for Domestic and Industrial Requirement supply upto year 2025	Net Ground Water Availability for future irrigation development (9-10-13)	Stage of Ground Water Development (12/9)*100 (%)
1	2	9	10	11	12	13	14	15
1	Adhaura	7001	1281	81	1362	136	5584	19.5
2	Bhabhua	9900	3326	440	3766	806	5768	38
3	Bhagwanpur	4557	940	120	1060	201	3415	23.3
4	Chainpur	9812	2049	263	2313	443	7320	23.6
5	Chand	7133	1416	183	1600	308	5409	22.4
6	Durgawati	7402	2190	201	2391	338	4874	32.3
7	Kudra	8973	3773	231	4004	388	4812	44.6
8	Mohania	8528	2824	317	3141	533	5171	36.8
9	Nuaon	5935	2120	177	2297	297	3518	38.7
10	Ramgarh	5406	1935	189	2124	317	3154	39.3
11	Rampur	4299	1095	142	1236	238	2967	28.8
	Total	78947	22951	2344	25294	4005	51992	31.6

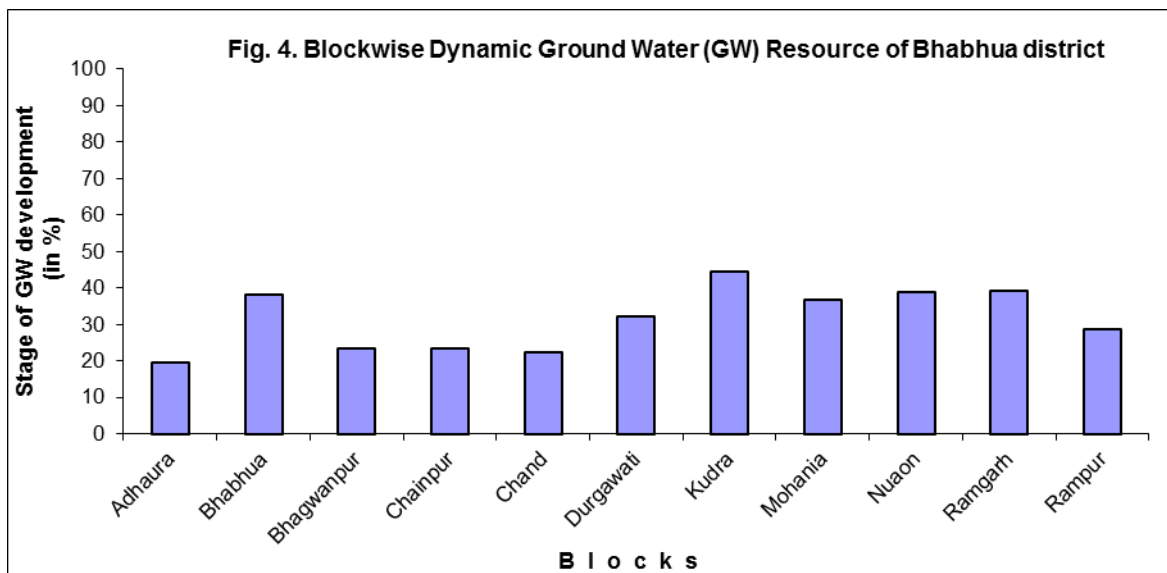


Figure 5 Stage of ground water development of Bhabua district, Bihar.

4.5 Status of ground water development

As far as stage of ground water development is concerned, all the blocks in the district fall under safe category as per the norms of GEC, 1997. The highest Stage of development is 44.6% for Kudra Block.

As per available statistics for the year (Statistical handbook of Bihar, 2010) the area irrigated by different sources constitute 86.6 % of the net sown area for the year 2008-09. Groundwater irrigation covers 32.8 % of the irrigated area while the remaining 67.2% was covered by canals and tanks. Groundwater based irrigation can be increased in the northern part of the district falling under the alluvial tracts.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground water Development

As per the resource evaluation (31st march 2009) the average stage of ground water utilisation in the district is 31.6 % and none of the blocks in the district comes under semi-critical/critical or over exploited category. The present infrastructural facilities yield 22951 ham of ground water for irrigation and there is a vast surplus replenishable ground water potential of 51992 ham to be tapped.

5.3 Water Conservation and artificial recharge:

No projects of water conservation and artificial recharge have been taken up by CGWB in the district, however, considering the scarcity of water during the lean seasons in the Blocks

located in the southern parts of the State on the Bhabua Plateau, initiatives for water conservation and rain water harvesting need to be taken .

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS:

The major issues are groundwater scarcity during the lean season in the southern part of the district and reportage of fluoride and nitrate above the permissible limit in some parts of the district.

7.0 MASS AWARENESS AND TRAINING PROGRAMME:

Nil

8.0 AREA NOTIFIED BY CENTRAL GROUND WATER AUTHORITY/ STATE

GROUND WATER AUTHORITY

Since all blocks of the district come under safe category from ground water development point of view, hence no area is notified either by Central ground water authority or State ground water authority till date.

9.0 RECOMMENDATIONS

- Sufficient scope exists for development of groundwater for agricultural development in the district as the overall stage of development is just 31.6%.
- Exploitation of ground water in the northern part of the district can be done through both Shallow and Deep tube wells. While the small and marginal farmers can opt for shallow tube wells, farmers' co-operative can opt for high discharge deep tube wells.
- Fluoride concentration has been reported from Bhagwanpur (2.86 mg/l) in Bhagwanpur Block, Nuwan (1.83 mg/l) in Nuwan Block and Bandipur (1.72 mg/l) in Ramgarh blocks of the district. In the affected localities, water supply should be made after treatment. In addition a thorough screening for fluoride in groundwater is also warranted from these three blocks.
- Water conservation and rainwater harvesting needs to be taken up in the southern parts of the district falling in the Bhabua Plateau range to tide over the water scarcity issues in these areas during the lean season.