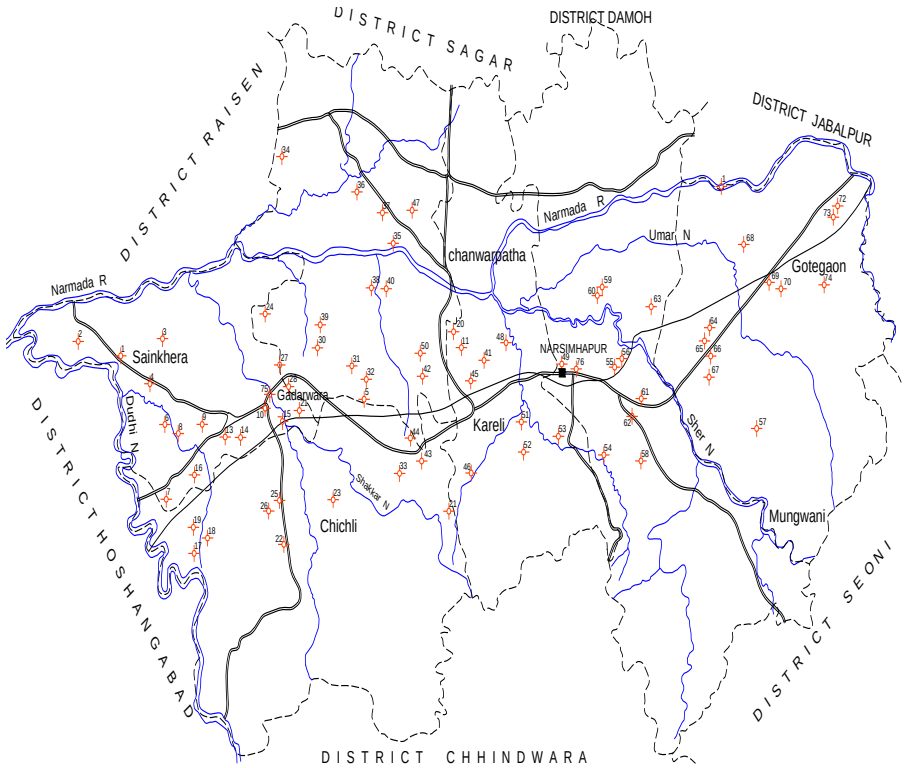
DISTRICT GROUND WATER INFORMATION BOOKLET

NARSINGHPUR DISTRICT
MADHYA PRADESH



Ministry of Water Resources
Central Ground Water Board
North Central Region
Government of India
September, 2009

NARSINGHPUR DISTRICT AT A GLANCE

S.No.	Items	Statistics	
1.	**General Information**		
	Location	Latitude (N) 22º36'- 23º16' Longitude(E) 78º27'- 79º40'	
	i) Geographical area	5,133 km^2	
	ii) Administrative Divisions (As on 2006)		
	Number of Tehsil/Blocks	4/6	
	Number of Panchayats/Villages	457/1052	
	iii) Population (Census 2001)	9,57,646	
	iv) Average Annual Rainfall (mm)	1192.1	
2.	**Geomorphology**		
	1. Major Physiographic Units:	Southern Satpura hill range Narmada Alluvium plain and Northern Vindhyan Range	
	2. Major Drainage:	Narmada, Shakkar and Dudhi	
3.	**Land Use (In Km^2)**		
	i) Forest area:	1362.07	
	ii) Net area sown:	3036.99	
	iii) Cultivable area:	3884.15	
4.	**Major Soil Types**		
		Alluvium	
5.	**Area under Principal Crops (June'2006)**		
		3884.15 km^2	
6.	**Irrigation By Different Sources**	**No.**	**Area irrigated km^2**
	Dugwells	25895	927.66
	Tube wells/Bore wells	4730	772.1
	Tanks/Ponds	1	0.8
	Canals	13	10.95
	Other Sources	-	0
	Net Irrigated Area	-	1777.57
	Gross Irrigated Area)	-	1784.89
7.	**Number of Ground Water Monitoring Wells of CGWB (As on 31.3.2007)**		
	No. of Dug Wells	17	
	No. of Piezometers	6	
8	**Predominant Geological Formations**		
		Alluvium, Deccan Trap basalts, Gondwana , Vindhyan sandstone, Bijawars and Archeans	
9	**Hydrogeology**		
	Major Water Bearing Formation	Alluvium,Weathered/vesicular basalt, flow contacts and fractured sandstone.	
	Pre-monsoon depth to water level during 2007	4.3 – 22.5m bgl	
	Post-monsoon depth to water level during 2007	2.8 – 20.72m bgl	

	Long Term water level trend in 10 years (1997-2007) in m/yr	**Pre-monsoon** 0.4-0.34m/annum fall **Post-monsoon** 0.21-0.3m/annum rise and 0.07-0.4 m/annum fall
10.	**Ground Water Exploration By CGWB (As on 31.3.2007)**	
	No of wells drilled (EW,OW,PZ,SH, Total)	77
	Depth Range (mbgl)	43 to 403.25
	Discharge (liters per second)	0.20 to 52.42
	Storativity	$2.01x10^{-6}$ to $1.15 x10^{-3}$
	Transmissivity (m^2/day)	23- 2400
11.	**Ground Water Quality**	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	Ec-632-1758**µScm^{-1}**
	Type of Water	potable
12	**Dynamic Ground Water Resources (2004) in MCM**	
	Annual Replenish able Ground Water Resources …… Net Annual Ground Water Draft…… Projected Demand for Domestic and Industrial uses up to 2025…… Stage of Ground Water Development….	1152.51 720.32 30.73 63%
13	**Awareness and Training Activity**	
	Mass Awareness Programmes organised Water Management Training Programmes	Nil Nil
14	**Efforts of Artificial Recharge & Rainwater Harvesting**	
	Projects completed by CGWB (No. & Amount Spent) Projects under technical guidance of CGWB (Numbers)	Nil Nil
15	**Ground Water Control and Regulation**	
	Number of OE Blocks Number of Critical Blocks Number of Notified Blocks	Nil Nil Nil
16	**Major Groundwater Problems and Issues**	
		Declining of water levels

1.0INTRODUCTION

Narsinghpur district, spanning over an area of about 5133 km^2, lies in the south central part of the state of Madhya Pradesh. There are four tehsils fall under this district namely Narsinghpur, Gotegaon, Gadarwara & Kareli and the district further divided into six administrative blocks namely Saikhera, Babai Chichali, Chawarpatha , Kareli, Narsinghpur & Gotegaon .

The district is bounded by Seoni district on the southeast, Chhindwara in South, Hoshangabad & Raisen in the west, Jabalpur in the northeast and sagar in the North. The district lies between North latitude $23^o16'$ and $24^o36'$ and east longitude $78^o27'$ and $79^o40'$, falling in Survey of India topo sheet No. 55/I, 55/J, 55M & 55/N. Narsinghpur is well connected with all parts of country by Rail and roads. It lies on Mumbai- Varasi and Bhopal - Bilaspur main railway line. National Highway no.12 , 26 and state Highway no.22 passes through the district. Important town and villages are connected by pitch road.

The index map of Narsinghpur district is shown in Figure-1. As per 2001 census, the population of Narsinghpur district is about 9,57,646 with rural population of about 8,04,536 and urban population of 1,53,110. Thus the district is primarily a rural district. For administrative purposes the district is divided into 4 tehsil and 6 blocks. It has five city (Narsinghpur, Kareli, Gotegaon, Gadarwara & Babai Chichali), and 1052 villages. The details of administrative units are given in table 1.

Table - 1: Administrative units of Narsinghpur district, M.P.

S.No	Tehsil	Area Km^2	No of Villages	No of City/Towns	Rural Population	Urban Population
1.	Narsinghpur	1193.37	200	1	135873	56203
2.	Kareli	654.87	143	2	113428	25043
3	Gotegaon	923.85	244	1	150621	23420
4	Gadarwara	2364.42	465	2	319735	48444

The classification of the total area of the district reflects the extent of development of agricultural activities in the district and also represents the potential of cultivation of the area. The area under different land use and their percentage to the reported area of the district for the year 2006 is given in table-2.

Table-2: Land use pattern of Bhopal district.

S.No.	Type	Area in km^2
1	Forest	1362.07
2	Not available for agriculture	257.12
3	Other non agricultural land	238.69
4	Agricultural land	146.22
5	Waste land	92.38
6	Total sown area	3864.15
7	Double crop area	847.17

The agricultural activity in Narsinghpur district is mainly dependent on the vagaries of monsoon. Irrigation aims at making good the deficiencies of rainfall, thereby bringing more land under plough. At present the main source of irrigation in the district are Canals & tubewells. After the reorganization of states in 1956 there was a gradual increase in surface water development.

Central Ground Water Board (CGWB) Activities-

In the most part of the district, the comprehensive hydrogeological surveys were conducted during 1984-85, 87-88 and 92- 93.

a- Sh. L.N. Mothgare, conducted systematic hydrogeological surveys in district during 1984-85. Sh P. Srinivasan, conducted systematic hydrogeological surveys in the remaining part of the district during 1987-88. Reappraisal survey of the area was carried out by Sh. Parvinder Singh and Ku. A.Bhatia during1992-93.

b- Central Ground Water Board has drilled 77 exploratory wells in the district. all boreholes were drilled in alluvium, Basalt and sand stone terrain.

c- In Narsinghpur district neither mass-awareness nor groundwater management-training programme have been organized by CGWB.

2.0 RAINFALL AND CLIMATE

The climate of Narsinghpur district is generally dry except the southwest monsoon season. The year can be divided in to four seasons. The winter commences from middle of November and lasts till the end of February. The period from March to about first week of June is the summer season. May is the hottest month of the year. The southwest monsoon starts from middle of June and lasts till end of September. October and middle of November constitute the post monsoon or retreating monsoon season.

The normal annual rainfall of Narsinghpur district is 1192.1mm.District received maximum rainfall during south west monsoon period i.e. June to September . About 91.3 % of the annual rainfall received during monsoon season. Only 8.7 % of the annual rainfall takes place between October to May period. Thus surplus water for ground water recharge is available only during the south west monsoon period.

The normal maximum temperature received during the month of May is 42.5^0 C and minimum during the month of January is 8.2^0 C . The normal daily mean monthly maximum temperature is 33.2^0 C and daily mean minimum temperature is 18.1^0 C.

The summer season is the driest period of the year. The relative humidity generally exceeds 90% in the month of August. In the rest of year is drier. The driest part of the year is summer, when relative humidity comes down lowest in 39% in the month of April. It varies between 39% and 90% at different time in different seasons. The wind velocity is high during the monsoon period as compared to pre and post monsoon.

The wind velocity is highest in June around 8.0 km/hr and lowest is 2.0 km/hr in November. The average normal annual wind velocity of the district is 4.2 km./hr. Normal climatological parameter of Narsinghpur district is given below:

S. N.	Parameter	Jan	Feb.	Mar	Apr.	May	June	Jul.	Aug	Sep.	Oct	Nov.	Dec	Annual
1	Max.Tem	26.8	30.3	35.3	40.3	42.5	38.1	31.4	29.7	31.9	33.5	30.7	27.3	33.2
2	Min.Tem	8.2	11.1	15.6	21.4	25.9	26.1	23.9	23.1	22.5	17.9	12.4	8.6	18.1
3	Rela.Hum	74	64	50	40	39	66	85	90	84	70	70	76	67
4	Wind vel.	2.4	3	3.8	4.4	5.9	8	6.8	6	3.8	2.2	2.2	2	4.2
5	Rainfall	11	17.3	12.1	6.2	7	168.9	334.8	423.6	160.8	23.5	14.3	12.6	1192.1

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3.0 GEOMORPHOLOGY & SOIL TYPES

Physiographically, the district area can be broadly divided into three sectors-namely 1) Narmada Valley alluvial plain, 2) satpura range in the south and 3) the Vindhyan range in the north. The vast alluvial plain of Narmada valley stretches from east to west throughout the district on the both side of the Narmada river. The regional slope of the area is westward.

Soil Characteristics

The area is Northwest, East and Southeast of Narsinghpur district is generally covered with black soils derived from Traps rocks varying in the depth from 0.33m to over a meter. They are usually clayey to loamy in texture with calcareous concretions invariably present They are sticky and in summer, due to shrinkage, develop deep cracks .

They generally predominate in montmorillonite and beidellite type of clays .In rest of alluvial areas , mixed clays , black to brown to reddish brown , derived from sandstones and traps is observed which is sandy clay in nature with calcareous concretions .Near the banks of the rivers and at the confluence ,light yellow to yellowish brown soils are noticed which were deposited during the recent past .The se soils are clayey to silt in nature . The soils near the foots hills are gravelly with good porosity .

4.0 GROUND WATER SCENARIO

4.1 Geology

The general geological successions in the district are given in table-4.

Table-4: General Geological successions of Narsinghpur district.

Age		Stratigraphic Unit	Lithology
Recent Pleistocene			alluvium & soil cap comprising clays, sand, gravel etc.
---------- Unconformity ----------			
Cretaceous to Eocene		Deccan trap and intertrappeans	Basaltic lava flows and intertrappean bed comprising red bole.
---------- Unconformity ----------			
upper cretaceous		Lametas	sandstones, arneceous silt stones , limestones & Marls
Permian to upper cretaceous	Upper Gondwana	Jabalpur series, (Jabalpur stage, chaugan stage)	soft porous sandstones and light coloured shales & clays
		Mahadeva series (Bagra stage & Denwa stage)	pebble beds & conglomerates white & yellow sandstones and shales
---------- Unconformity ----------			
upper carboniferous to Permian	lower Gondwanas	Danuda series, Barakar stage	white to lava coloured sandstones & grits with occasional conglomerates and shales
		Talchir series, Talchir stage	green boulder with clays & shales
---------- Unconformity ----------			
Cambrian	Vindhyan	Upper Bhander series	reddish purple to buff coloured sandstones and quartzites.
---------- Unconformity ----------			
upper to middle Precambrian	metamorphic	calcareous crystalline quartzite phylites & schist bijawars granitic gneiss	dolomite lime stone & calcareous shales quartz tic &cal-granulites phylites & various schist marbles and banded ferrigenous quartzites granites & granitic gneiss

4.2 Hydrogeology

Groundwater is the principal source of irrigation in the district and all the alluvial deposits of narmada valley in the district form very potential aquifer.

Aquifer System

The Archaean schists and phyllites form phreatic aquifers wherever weathered /jointed . In general this aquifer has a poor potential and very few dug wells occur in the area occupied by Schist \Phyllites . the yield of these dugwells range from 1 to 2 lps.

The dolomitic limestones of the Bijawars have a high potential and the aquifer formed by solution cavities and fractures /joints sustain a good yield of the order of 7 lps, wherever solution cavities are encountered directly e.g. around Chanwarpatha village , [55 I /16 ,55M /4] and a moderate potential if the structure is located in jointed fractured rock . The yield of these structures range from 3 to 5 lps.

The fractured Vindhyan sandstones shales occurring in the northern part of the district form poor phreatic aquifers and dug wells taping these formations sustain only 2 to 3 hours of pumping daily . The vindhyans encountered in some bore holes at depth ranging between 50 to 80 m. bgl do not form aquifers as such but their upper contact with overlying rocks yield 2 to 3 lps water .

The phreatic aquifers of Gondwana formations , occupying the southern part of the district are formed by weathered zone of shales and fine to medium grained vindhyan sanstones and Gondwana formations have moderate potential . The yield of these dug wells range from 2 to 3 lps .

Gondwana formations occurring at depth below alluvium form confined to semi-confined aquifers which are not very productive and yield less than 5 lps water . In the exploratory bore holes drilled by CGWB during Narmada Project , granular zones in the Gondwana were encountered at Dabkia , Bikrampur , Dhamna , Singhpur etc.

The Lametas , occurring only in North Western part of the district are weathered on surface and dug wells in the weathered portion yield a poor discharge ranging from 1to 2 lps .

Deccan traps in the Northern part of the district overlie the Lametas and occur at the hill tops where no ground water structure exists . However in the South Eastern part of district , Deccan traps form moderate to good phreatic aquifers and dug wells sustain a good discharge ranging from 2 to 5 lps .

The alluvial aquifer system is most extensive one in the district . Two to three and places more number of granular zones are encountered in the alluvium ,comprising fine to medium to coarse grained sand ,gravel and kankar separated by clay lenses .The top phreatic aquifers in general ranges in thickness from 2 to 10 m. and its top is encountered at a depth range of 5 to

20 bgl . The yield of dugwells tapping the phreatic aquifer ranges from 7.5 to 12 lps.

Aquifers Parameters

The results of the pumping tests shows that the transmissivity of the alluvial aquifers tapped by dug wells ranges from 57 to 400m^2/day while the hard rock aquifer have very low transmissivity of the order of 19 m^2/ day

Exploratory wells tapping multi-aquifer system . The transmissivity of these confined to semiconfined aquifers ranges 23 to 2400 m^2/day.Storativity values ranges from 2.01 x 10^{-6} to 1.15 x10^{-3} indicating confined to semi confined nature of deep aquifers .

4.3 Water Levels

4.3.1 Pre-monsoon (May 2007)

The pre-monsoon depth to water level (figure-3) in Narsinghpur district ranges between 4.3 m bgl at Deori in Saikheda block and 22.35m bgl at RamKhira in Narsinghpur block. The most part of the district have water level in the range of 06-9m bgl during the pre monsoon.

4.3.2 Post-monsoon (November 2007)

During post-monsoon period of the same year, November 2007, (figure-4) the water levels varies from 2.8 m bgl at Deori in Saikheda block to 21.72 m bgl at Barman in Chanvarpatha block. It is observed that in most part of the district the water level lies between 3 to 6 m bgl during this period.

4.3.3 Decadal Average Water Level (May 1997 - 2007)

Decadal average water level is an average of water levels of a particular monitoring station for the last 10 consecutive years. This gives a more realistic picture of the area as the water level of any particular year depends on rainfall and groundwater draft and may vary widely during the particular year. The 10-year average water level for the pre monsoon period is between 4 to 20 m bgl over a large area of the district. The 10-year average water level for the post monsoon period is between 2 to 19 m bgl over a large area of the district. It is evident from the analysis of the data that the unplanned groundwater abstraction is going on in the district.

4.40 Status of Ground Water Development

Ground water resource estimation of Narsinghpur district has been computed for the base year 2004 on block wise basis . All the 6 blocks of Narsinghpur district falling under safe category The stage of ground water development varies 47 to 88% in non command area and 17% in commmand area of Gotegoan block . The Block wise ground water resources are given in table :-

GROUND WATER RESOURCES OF NARSINGHPUR DISTRICT, MADHYA PRADESH								
Assessment Unit/ District	**Command/ non-Command/ Total**	**Net Annual Ground water Availability**	**Existing Gross Groundwater Draft for Irrigation**	**Existing Gross Groundwater Draft for Domestic & Industrial water Supply**	**Existing Gross Groundwater Draft for All uses (11+12)**	**Allocation for domestic & industrial requirement supply upto nest 25 years**	**Net Groundwater Availability for future irrigation development**	**Stage of Groundwater Development {(13/10)*100} (%)**
1	2	3	4	5	6	7	8	9
In MCM								
Kareli	Command							
	Non-Command	171.06	110.42	2.47	112.89	4.46	56.19	66
	Block Total	**171.06**	**110.42**	**2.47**	**112.89**	**4.46**	**56.19**	**66**
ChanwarPatha	Command							
	Non-Command	242.88	146.26	3.51	149.77	4.91	91.71	62
	Block Total	**242.88**	**146.26**	**3.51**	**149.77**	**4.91**	**91.71**	**62**
Gotegaon	Command	45.04	2.56	4.99	7.54	5.54	36.94	17
	Non-Command	154.18	124.82	3.14	127.96	3.49	25.87	83
	Block Total	**199.22**	**127.38**	**8.13**	**135.51**	**9.03**	**62.82**	**68**
Narsinghpur	Command							
	Non-Command	143.31	123.24	2.92	126.16	4.51	15.56	88
	Block Total	**143.31**	**123.24**	**2.92**	**126.16**	**4.51**	**15.56**	**88**
Chichli	Command							
	Non-Command	227.06	102.92	2.77	105.69	4.57	119.57	47
	Block Total	**227.06**	**102.92**	**2.77**	**105.69**	**4.57**	**119.57**	**47**
Saikheda	Command							
	Non-Command	168.97	87.78	2.52	90.30	3.26	77.93	53
	Block Total	**168.97**	**87.78**	**2.52**	**90.30**	**3.26**	**77.93**	**53**
	District Total	**1152.51**	**698.00**	**22.33**	**720.32**	**30.73**	**423.78**	**63**

4.5 Ground Water Quality

Quality of ground water for drinking

Ground water quality in Narsinghpur district is assessed annually by CGWB on the basis of analysis of ground water samples collected from 19 no. of hydrograph stations in the district. On the basis of examination of data for the year 2006 , the water quality is described as follows.

The pH value of water samples of all the stations (ranging in between 7.40 to 7.94) did not show significant variations since all the values were of alkaline in nature and within permissible limit (6.5 to 8.5) as set by BIS (1991). The EC values were found to be in the range of 632 and 1758 µS/cm. The EC values exceeding BIS limit (1000 µS/cm) were noticed at eight villages named Deoribadwani(highest 1758 µS/cm), Betli(1500µS/cm), Sarsala(1235 µS/cm), Sundernagar(1200 µS/cm), Gadarwara(1128 µS/cm), Salichuka(1092 µS/cm), Narsinghpur(1060 µS/cm), and Gundarai-II(1026µS/cm) itself.

The anion chemistry shows that the concentration of NO_3^- exceeding 45 mg/l (BIS, 1990) were reported in 36.8 % wells with highest as 163 mg/l of Betli village. The NO_3^- has little lithological source and represents a pathway/origin process, involving recharging water. Thus higher concentration of NO_3^- can be expected from the other sources and is an indicative of man made pollution. A scrutiny of data shows that none reported to have fluoride greater than 1.5 ppm of BIS (1990) limit. No arsenic content was detected in the ground water of district.

Quality of Ground Water for Irrigation Purpose: In classification of water for irrigation purpose, it is assumed that the water will be used under average conditions with respect to soil texture, infiltration rate, drainage and climate. The chemical data of all the water samples pertaining to Narsinghpur district was plotted on U.S. Salinity Laboratory diagram. It is clear that nearly 31.57% wells of study area namely Tendukhera (5), Jhoteswar (6), Dangidhana (11), Gundarai-I (12), Mugwani (13) and Ramkhina (15) were observed under C_2-S_1 Class (Medium Salinity & Low Sodium) which means that these waters can be used for irrigation purpose without any fear for most of the crops with no chances of development of soil salinity. The remaining 68.42% ground waters representing the wells of Barman (1), Dobhi (2), Gadarwara (3), Gundari-II (4), Manegaon (7), Betli (8), Kareli (9), Baghai (10), Narsinghpur (14), Sarsala (16), Sundernagar (17), Deoribadwani (18), and Salichuka (19) were grouped under C_3-S_1 (High Salinity & Low Sodium) class. These water can be used on soils with restricted drainage. Special management practices are required for salinity control. Salt tolerance crops may be grown.

It may be concluded that with few exceptions, the sodium concentrations are low in all the samples hence the study area (Narsinghpur district) is without any risk of sodification.

Quality of Water for Irrigation

High SAR is not good as it lead to sodium hazard water samples in the district fall in C_2S_1, C_3S_1 classes of US salinity diagram. However, groundwater in the district is generally safe for irrigation but proper drainage system is required where EC is more than 1500 µ Scm^{-1}.

Geo-genic Problems

Fluoride in the district is generally below 1.5 mg/l. The groundwater is safe for drinking. More than 1.5 mg/l is responsible for bone deformation. No arsenic has been detected in the district.

Ground water Related issues

Ground water is the main source of irrigation in entire Narsinghpur district .Till 1960 , farmers depended mostly on monsoon rainfall and very few dugwells existed . The deeper aquifers were not explored . Originally the work of groundwater exploration was taken up in 1955 and the Exploratory Tubewell Origination drilled four successful tubewells at Kauria, Gadarwara, Kherua and Sainkhera.

This pioneering work unfolded that the area of Narmada belt in the district is rich in groundwater and in 1963-64 groundwater development programme started in the district with full swing and now the density of tubewell in the district has increased to such an extent that a tubewell is found operational at every 400 m distance or even nearer in maximum villages.

Ground Water Development and Management

The Groundwater availability for irrigation in the district is 1,15,251 Ham and the ground water development in the district is 63% However this rate is bound to increase in the future and may lead to a situation where annual withdrawal of groundwater may exceed the natural recharge in a normal monsoon year . This may happen since the cropping intensity and the number of groundwater abstraction are likely to increase . It is thus essential that the available resources are utilized judiciously .

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Water conservation and Artificial Recharge

Groundwater is declining due to heavy pumping by Dug –cum bore wells and tube wells in the area near Narsinghpur Kareli and Gadarwara . The main crops in these area are Sugarcane , Soyabean, Tuar , Sunflower, Gram and Wheat etc .

Need for water conservation and artificial recharge of groundwater is felt in the area .North of Narmada river and West of Shakker river which is outside the Bargi canal command .

6.0 RECOMMENDATIONS

For a fertile and prosperous district like Narsinghpur management of groundwater is utmost necessity .There is urgent need for regulating the indiscriminate boring and withdrawal of groundwater in order to arrest the depleting trend of groundwater and over exploitation . The following recommendations are made to curb the declining water level trend in the district.

1. To ensure sustainable development , the level of groundwater extraction is to be kept at a level reasonably lower than the absolute maximum The normal irrigation practices followed by the cultivators of flood irrigation should be curbed ., Although the district authorities are promoting use of sprinklers by subsidising the prices , the use of sprinklers for irrigation should be made mandatory ;

2. The Southern part of the study area is occupied by Basaltic lava flows and Gondwana sediments . These areas are in general forested ,some good percolation tank can be constructed in both the formation. The excessive run off in hilly and forested area can be stopped by constructing percolation tank in higher reaches which would enable the recharge of Phreatic aquifer .

3. Need for water conservation and artificial recharge of groundwater is felt in the area north of Narmada river and west of Shaker river , which is outside the Bargi Canal .Command Tentative locations for recharge structures have been proposed at Magarmuha on Chitarewa nadi and near Imaliya on Umar nadi , and near Bilhara on Dagasia Nala of Pandajhir Nadi . The phreatic aquifer upstream of these sites has been de-saturated and there is scope for recharging it by construction of percolation tanks

4. Based on the availability of groundwater for future irrigation , feasible groundwater abstraction structures have been worked out as 28,813 additional dug wells and 14,406 additional tube wells . The dug wells should be of depth 10-20 m and of diameter 4 - 8 m, where as the tube wells should be of depth of 30-100 m. Some times failure of monsoon led to crisis of even drinking water in district. A serious thought should be given to plan future development of groundwater on scientific lines. For a planned and coordinated development of groundwater resources it is essential that detailed hydrogeological, remote sensing and geophysical investigation should be carried out before taking decision on finalization of sites for drilling wells for irrigation and domestic use. The lithological details along with aquifer wise yield records should be maintained for future inferences.

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