



GURDASPUR DISTRICT PUNJAB



CENTRAL GROUND WATER BOARD
Ministry of Water Resources
Government of India
North Western Region
CHANDIGARH
2013

Contributors

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Our Vision
***“Water Security through Ground water
Management”***

GROUND WATER INFORMATION BOOKLET GURDASPUR DISTRICT, PUNJAB

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GURDASPUR DISTRICT AT A GLANCE

S. No	ITEMS	STATISTICS
1	GENERAL INFORMATION	
	i) Geographical area (sq.km)	3513 Sq.Km
	ii) Administrative Divisions (as on 31.03.2011) Number of Tehsil	5 Gurdaspur, Patankot, Dhar Kalan Batala, Dera Baba Nanak,
	Number of Block	
	Number of Panchayat/Villages	14
	iii) Population (as on 2001 Census)	1532
	iv) Normal Annual Rainfall (mm)	744092
2.	GEOMORPHOLOGY	1013mm
	Major Physiographic units	, piedoment (Kandi) alluvial
	Major Drainage	
	Major Drainages	Ravi river and Beas river Patiala Rao, Sirhind Choe, Sirhind canal, Bhakara canal, Narwana branch, Satluj Yamuna link canal
3.	LANDUSE (Sq.Km)	
	a) Forest area	
	b) Net area sown	36
	c) cultivable area	2860
		2850
4.	MAJOR SOIL TYPES	Reddish chestnut soil and tropical arid soil
5.	AREA UNDER PRINCIPAL CROPS (Sq.Km)	2040 rice 2260 wheat
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Numbers of Structures)	Rabi Crops-940
	Tube Wells	
	Canals	1940
	Other Sources	510
	Net Irrigated area	30
	Gross irrigated area	2480
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB No. of Dug Wells	4444

	No. of Piezometers	1
8	PREDOMINANT GEOLOGICAL FORMATIONS	Alluvium
9	HYDROGEOLOGY	
	Major Water bearing formations Pre-monsoon depth to Water Level Post-monsoon depth to water level Long term water level trend in 10 yrs	Sand boulders with sand
10	GROUND WATER EXPLORATION BY CGWB	
	No of wells drilled (EW,OW,PZ,SH,Total)	12+2
	Depth Range (m)	84-375 m
	Discharge (liters per min.)	9731- 4300lpm
	Storativity (S)	1.0×10^{-3} - 4.03×10^{-4}
	Transmissivity (m^2/day)	$142m^2/day$ - $7720m^2/day$
.11	GROUND WATER QUALITY	
	Presence of chemical constituents more than permissible limit	
	EC (micro mhos at 25 ⁰ c)	-
	F (mg/l)	-
	As (mg/l)	0.01-0.02
	Fe (mg/l)	-
	Type of Water	Ca-Mg-HCO ₃
12	DYNAMIC GROUND WATER RESOURCES (2009) in MCM	
	Annual Replenishable Ground Water Resources	1852.56
	Net Annual Ground water Draft	1976.97
	Projected Allocation for Domestic and Industrial Uses upto 2025	90.41
	Stage of ground Water Development	126%
13	AWARENESS AND TRAINING ACTIVITY	nil
14	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	
	Projects completed by CGWB (No. & Amount spent)	-
	Projects under technical guidance of CGWB (Numbers)	One
15	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	8
	Number of Critical Blocks	1

	No. of Blocks notified	Nil
16	MAJOR GROUND WATER PROBLEMS AND ISSUES.	The major problem of the area is decline of water table in 8 blocks about 50% of the total district area shows decline in water levels 1 block is critical 1 block is semi critical whereas 4 are safe.

GROUND WATER INFORMATION BOOKLET

GURDASPUR DISTRICT, PUNJAB

1.0 INTRODUCTION

Gurdaspur district is located in the northern most part of the Punjab state. It shares the boundary with Jammu & Kashmir state and Himachal Pradesh . The district is bounded by river Ravi and Beas . It has a unique characteristic of sharing the international boundary with Pakistan and river Ravi is separating the district from Pakistan , Hoshiarpur Kapurthala and Amritsar are situated on the eastern , southern and western side of the district respectively . It covers an area of 3513km² and forms a part of upper Bari Doab area. Physiographically the area is divided into three units (i) Siwalik Hills lying in NE of the district (ii)Kandi Zone lying immediately south west of foothill zone of Siwalik hills(iii) Alluvial plains lying sw of Kandi.

The district is divided into five tehsils and 14 development blocks for the purpose of administrative control.

The area is irrigated by tubewells and a strong net work of canals of Upper Bari Doab canal system from river Ravi near Madhopur (about 11km from Pathankot on Jammu road) About 25000 hectare of area is irrigated by canals and about 200000 hectare of area is irrigated by tubewells >Pathankot block , Dhar kalan block , Narotjaimalsingh block & Bamial block are mainly irrigated by tubewells only.

The perennial Ravi and Beas rivers alongwith their tributaries from the main drainage of the area. A dam has been constructed at the foot hills at Shahpur kandi . Chakki Khad and Sakki nala are the major tributaries of Beas and Ravi rivers respectively.

Central Ground Water Board has carried out reapprised hydrogeological surveys of the district during the FSP -1998-99 . Ground water exploration has also been carried out . Exploratory drilling is going on during the current FSP 2012-13

2.0 RAINFALL AND CLIMATE

The normal annual rainfall of the area is 1113mm which is unevenly distributed over Gurdaspur district. The south western monsoon (July to Sept) contributes about 80% of the rainfall and rest 20% occur during the non monsoon period. The rain fall in the district increases from south west to north east. The highest annual rainfall of 1443mm i.e, 30% more than the normal was recorded in 1988 and lowest 615mm i.e. 44% less than the normal was experienced 1989.

INDEX MAP

GURDASPUR DISTRICT, PUNJAB

Km. 10 5 0 10 15 Km.



INDEX

- | | | | |
|---|-----------------------|--|------------------------|
|  | EXPLORATORY WELL |  | INTERNATIONAL BOUNDARY |
|  | BLOCK HEAD QUARTER |  | DISTRICT BOUNDARY |
|  | DISTRICT HEAD QUARTER |  | BLOCK BOUNDARY |

The climate of the district is tropical type with four well defined seasons. The maximum temperature is 41^o and minimum is 6^oC.

3.0 GEOMORPHOLOGY AND SOILS

River Ravi , Beas , Chakki Khad and Sakki nala are the main drainage features of the district . Apart from the above small local nalas and called choes are the frequent features in the northern side of the district which ultimately in the northern side of the district which ultimately meets the main khads and aluminates ultimately to the rivers Beas and Ravi. The district can be divided into three geomorphological types-Hilly area, Piedmont zone and alluvial plain. Hilly area are predominately on the NE part of the district and called Siwalik which are mainly clays and clay with boulders. Dharkalan block is predominantly covered by hilly terrain, Piedmont comprises pebbles , cobbles drain from the Siwalik along with sand of medium to coarse grained gravel. The alluvial plain is sand intercalated with little clays deposited by mean dry rivers of Ravi and Beas.

4.0 GROUND WATER SCENARIO

4.1 HYDROGEOLOGY

The main aquifer group of the area is thick granular zones alternate with thick or thin clay lenses . The fresh aquifer is water table and extends all over the area is composed of coarser sediments . In the north eastern and northern part , there are 5-6 aquifers within 300m depth and ranges in the thickness from 20-65 m . These granular zones are laterally extensive in nature and composed of medium to coarse sands with gravel and pebbles cobbles etc. The clay beds area 5-12 m thick.

In the central part 5-6 prominent granular zones have been encountered within the depth of 375m bgl . The thickness of granular zones is variable from 20-95m and the clay beds varies from 3-14m thick.

Water levels of the area in pre monsoon period varies from 2.39(Khani Khui) to 18-93 . The shallowest water level area in the eastern and north eastern portion of Gurdaspur town. The deepest water levels are around Shri Hargobindpur and Fatehgarh Churrian. In the same way the post monsoon water levels are variable from 1.70m (Behram pur) to 16.76(Sri Hargobindpur) By comparing the pre monsoon and post monsoon water levels , it is seen that area above 10m depth to water is quite reduced around Kalanaur and Sri Hargobindpur but the area of Dhar kalan block does not show much changes in the water levels because of Kandi /Siwaliks system and Hilly terrain. In the same way the area under water level in range of 2-5 m around Guurdaspur, Dinanagar, Narot Jaimal Singh is increased . It shows that there is extensive recharge by Ravi and Beas during monsoon.

DEPTH TO WATER LEVEL
PRE MONSOON
GURDASPUR DISTRICT, PUNJAB

Km. 10 5 0 10 15 Km.



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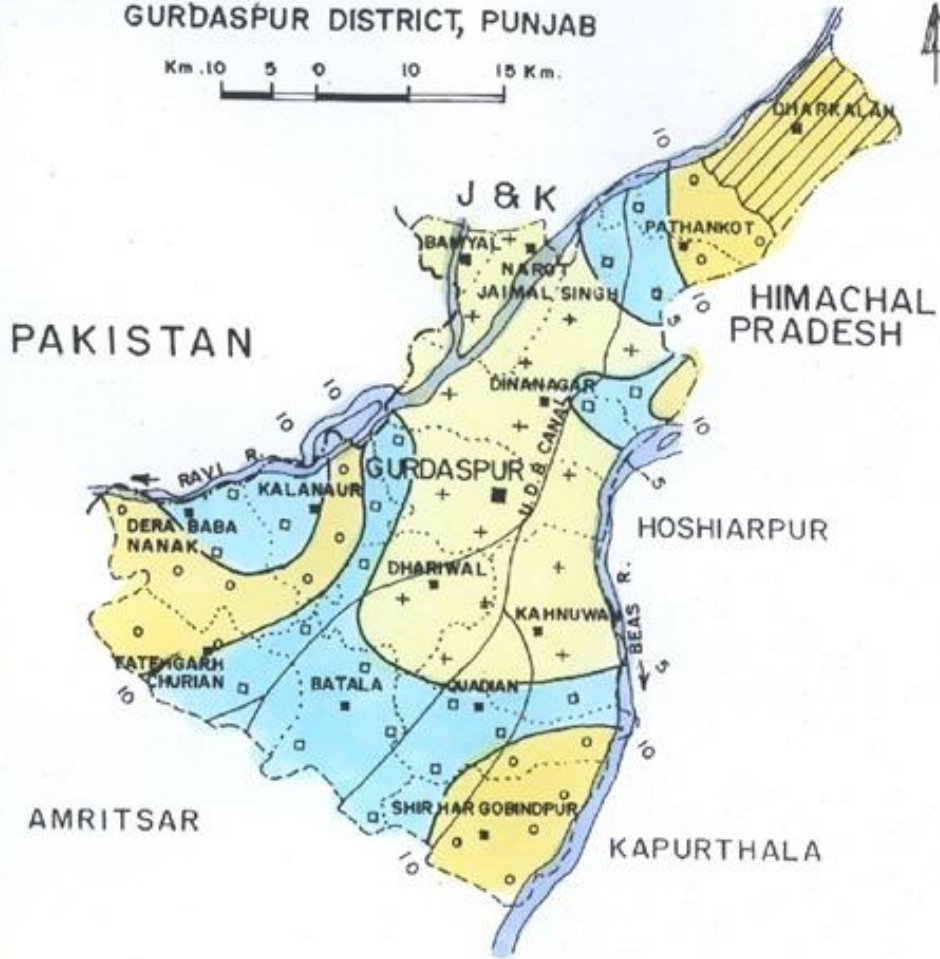
DEPTH TO WATER LEVEL IN m.b.g.

	LESS THAN	5
	5 -	10
	MORE THAN	10

DEPTH TO WATER LEVEL
POST MONSOON

GURDASPUR DISTRICT, PUNJAB

Km. 10 5 0 10 15 Km.



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DEPTH TO WATER LEVEL IN m.b.g.l.

+ +	LESS THAN	5
□ □ □	5 -	10
○ ○ ○	MORE THAN	10

The monitoring of long term fluctuation for ten years reveals that in the pre monsoon period overall trend is declining in the ranges of 0.10(Dinanagar) to 2.40m/yr (Quandian where as in post monsoon the trend is declining to the tune of 0.66m(Pardori talab) to 6.39m(Dhianpur) The pre monsoon trend of 0.10 - 2.4m/yr is very very nominal and in the post monsoon 6.6cm/yr to 64cm/yr . From the above trend it seems that the Ravi & Beas are continuously recharging the area during pre monsoon period because of perennial nature and in post monsoon the flow of the river is less here less recharge showing decline in water levels

4.2 GROUND WATER RESOURCES

According to the data available for ground water resources on 31.3.2004 , the net ground water available in the district is 1852.56mcm and gross draft for all uses is 1976.97mcm hence the stage of development is 107% . Amongst all the blocks 8 blocks are over exploited, 4 blocks are safe and one is critical and one is semi critical. The details of the ground water of development is tabulated below block use.

Ground Water Resources if Gurdaspur district, Punjab as on 31.3.2009

S.No	Block	Total Replenishable Ground Water resource (ham)	Utilizable ground water Resources for irrigation (ham)	Existing ground water draft For Domestic, industrial and other uses (ham)	Gross draft (ham) as on 31.3.09	Allocation for future up to next 25 years for domestic and industrial uses	Net ground water availability for future irrigation development	Stage of ground water development %	C A T E G O R Y
1	Bamial	1679	1307	41	1348	60	312	80	Safe
2	Batala	17038	25528	985	26514	1326	-9816	156	Over exploited
3	Dhar kalan	6170	881	379	1261	561	4728	20	Safe
4	Dinanagar	10194	11285	394	11679	573	-1665	115	over
5	Fatehgarh Churian	12917	24611	385	24996	535	-12229	194	Over exploited
6	Gurdaspur	16443	14979	889	15868	1192	272	97	semi critical
7	Kahnuwan	17892	25304	313	25618	462	-7875	143	Over exploited
8	Kalanaur	10870	17427	215	17642	317	-6874	162	Over exploited
9	Pathankot	19723	11239	1281	12520	1756	6727	63	Safe
10	Qadian	11827	15221	293	15513	425	-3819	131	Over exploited
11	Sri Hargobindpur	12809	17546	354	17900	491	-4949	137	Over exploited

12	Dera Baba Nanak	13088	24563	336	24899	478	-9374	159	Over exploited
13	N.J.Singh	5878	5094	195	5289	289	494	90	Semi critical
14	Dhariwal	18545	23311	395	23706	577	-5343	128	Critical
	Total	177929	218298	6455	224753	9041	-49410	126	

4.3 GROUND WATER QUALITY

The ground water in the district is alkaline in nature with low mineralisation. The pH value ranges from 7.77 to 8.25 indicating a weak base type characteristic. Specific conductance, a measure of total dissolved solids present in water, ranges from 235 to 1640 micromhos/cm at 25°C. Chloride values in the area are directly proportional to the specific conductance of the water samples. The fluoride concentration in the entire district is within the permissible limit of 1.5 mg/L for drinking water of BIS and it ranges from 0.12 to 1.16 mg/L. Nitrate values are below the permissible limit with an exception at two villages, i.e. Batala (138 mg/L) and Kalanaur (146 mg/L). Iron, essential for plant and animal growth, is below 1.0 mg/L in the entire district. Arsenic above the prescribed BIS permissible limit of 0.01 mg/L is found in well waters located at Nishayra (0.015 mg/L), Behrampur (0.0113 mg/L), Galri (0.0201 mg/L) and Sri Hargobindpur (0.010 mg/L).

Table , Range of concentration of Chemical Constituents

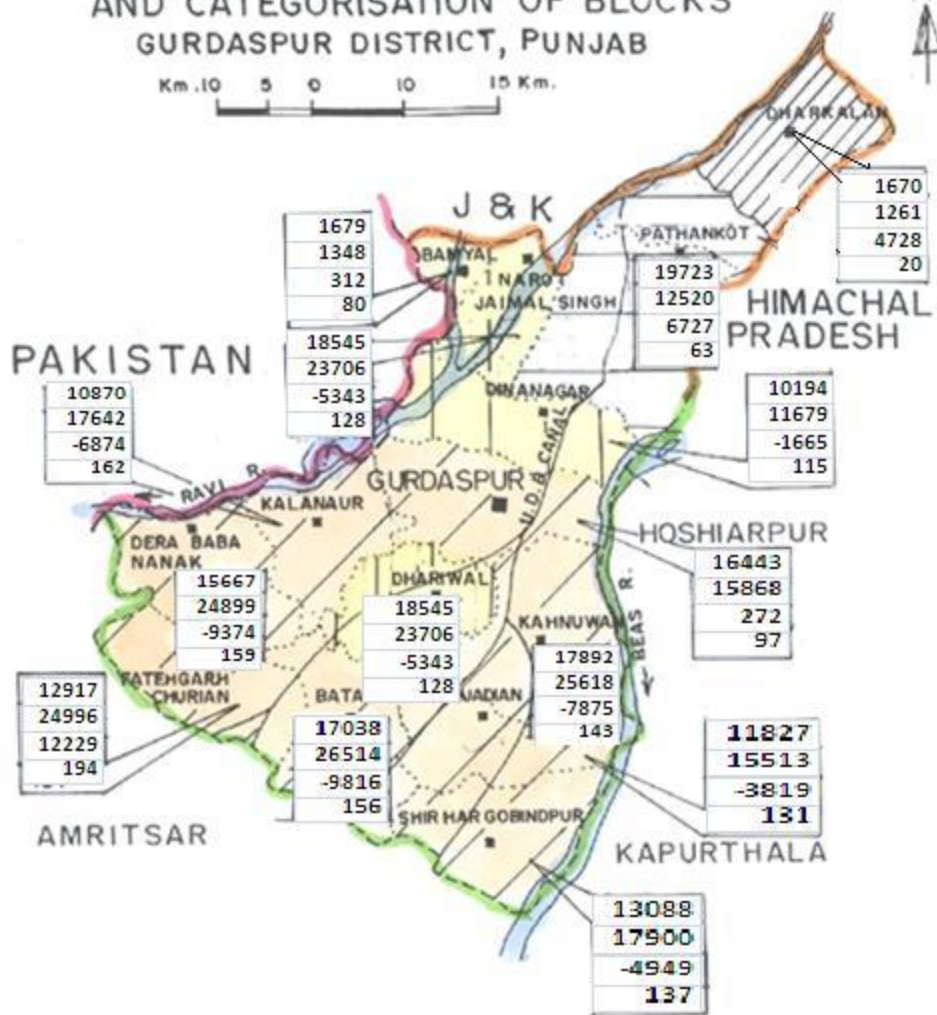
pH	7.77	8.25
Specific Conductance (in micromhos/cm at 25°C)	235	1640
CO ₃ (in mg/L)	NIL	
HCO ₃ (in mg/L)	113	350
Cl (in mg/L)	7.0	179
NO ₃ (in mg/L)	1.0	146
F (in mg/L)	0.12	1.16
Ca (in mg/L)	14	65
Mg (in mg/L)	10	56
Na (in mg/L)	8.0	155
K (in mg/L)	1.0	260
Total Hardness as CaCO ₃ (in mg/L)	122	274

Type of Water

The shallow ground water in the district is alkaline in nature with low mineralisation. The ground water is Ca-Mg-HCO₃ type in 65% of the area and

GROUND WATER DEVELOPMENT POTENTIAL AND CATERGORISATION OF BLOCKS GURDASPUR DISTRICT, PUNJAB

Km. 10 5 0 10 15 Km.



INDEX

18545	NET ANNUAL GROUND WATER AVAILABILITY (HAM)
23706	EXISTING GROUND WATER DRAFT (HAM)
-5343	NET GROUND WATER AVAILABILITY (HAM)
128	STAGE OF GROUND WATER DEVELOPMENT %
	OVER EXPLOITED
	SAFE
	CRITICAL

such waters impart temporary hardness. 35% of the well waters have mixed type of water with no ion being dominant.

Suitability of water Domestic

Concentration of various chemical parameters in most of the water samples is within the permissible limit except for nitrate. In general the water is safe for drinking purposes.

Irrigation

The suitability of groundwater for irrigation purpose is generally ascertained by considering salinity (EC), Sodium Adsorption Ratio (SAR) and Residual Carbonate (RSC). These parameters range from 235 to 1640 μcm at 25°C, 0.28 to 4.36 and -2.29 to 8.38 meq/L, respectively. As per USSL classification of irrigation waters indicates that all ground waters fall under C2S1 class. These well waters will cause neither salinity nor sodium hazards when used for customary irrigation. Thus it can be concluded that ground water is suitable for irrigating all types of soils.

4.4 STATUS OF GROUND WATER DEVELOPMENT

In whole of the district tubewells are the main source of withdrawal . The depth of tubewells ranges between 50 and 150m bgl. The tubewells in the blocks of Bamial , N.J.Singh are of shallower depth i.e upto 50m or so. In part of Bamial block artesian conditions exist. The discharge of the tubewells is of 150m depth with larger dia wells with 12" dia assembly and 6 to 8 " dia submersible pump is 2000 lpm. Whereas the local tubewell 50m deep are giving discharge to the range of 50-100 lpm and there are drawn with the ordinary pumps The drawdown of the area ranges from 3-10m depending upon the discharge. The tubewells are not required to be deepened periodically as the ground water availability is good and decline is nominal. In different blocks where the strata is bouldry and the farmers are unable to drill tubewells , the state Government has drilled tubewells for irrigation purposes in Dher Kalan , Narot Jaimal Singh , Bamial , Dhariwal , Dinanagar , Kahnowan and Pathankot blocks. The depth range of these tubewell is 150m approximately with a discharge of around 2000 lpm.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

In the blocks falling in safe category more tubewells can be drilled and can yield sufficient discharge . The water withdrawn can be taken into the over exploited block in the form of canals and can be utilized for irrigation and other purposes . A

HYDROGEOLOGY

GURDASPUR DISTRICT, PUNJAB

Km. 10 5 0 10 15 Km.



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	WELLS FEASIBLE	RIGGS SUITABLE	DEPTH OF WELL (m)	DISCHARGE (lpm)	SUITABLE ARTIFICIAL RECHARGE STRUCTURES
	TUBE WELLS	REVERSE / DIRECT ROTARY	65 - 330	2000-3000	RECHARGE SHAFT WITH INJECTION WELL
	TUBE WELLS	REVERSE / DIRECT ROTARY	40 - 95	1000- 2000	RECHARGE SHAFT WITH INJECTION WELL
	TUBE WELLS	REVERSE / DIRECT ROTARY	30 - 60	800-1000	RECHARGE SHAFT WITH INJECTION WELL
ELECTRICAL CONDUCTIVITY (MICROMHOS/CM AT 25°C)	ARSENIC		> PERMISSIBLE LIMIT 70.0 mg/l		
	IRON		> PERMISSIBLE LIMIT 1.0 ppm		

well design of about 25m low carbon galvanized slots may be used in the tubewells of 100m depth . Further tubewells in the blocks may only be constructed in safe blocks for ground water development and no further tubewells be constructed in over exploited blocks

5.2 Water Conservation And Artificial Recharge

No rainwater Harvesting and artificial recharge structures have been constructed in the district. However there is scope of rainwater harvesting structure in the over exploited blocks where a net work of canal is existing. The rain fall of the district is highest in the State. Rainwater along with surplus water of the canal during rainy season can be utilized for recharging ground water . Moreover water from Ravi and Beas rivers can also be used for recharging by making some unlined canals.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

There is problem in drilling in the northern and north eastern parts of the district where the bouldery formations exists and drilling is possible by percussion method. The farmers are unable to drill tubewell on their own and depend upon the Govt.agencies to drill tubewells. The district as a whole is over exploited and eight blocks fall in over exploited category .Two blocks are critical and semi critical . This indicates problem of over development of ground water in the district

7.0 RECOMMENDATIONS

1. Some area is prone to water logging with water levels between 2.39-4.43. Necessary precaution must be taken in these areas and ground water withdrawal may be increased.
2. The over exploited blocks may be taken up for rain water harvesting , artificial recharge and water conservation measures.
3. The authorities and public may be made aware of over development, rainwater harvesting and artificial recharge to ground water . This is the right time for creating awareness before the situation deteriorates and heavy water level declines set in.