



## **SANGRUR 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 SANGRUR DISTRICT, PUNJAB**

## **CONTENTS**

### **SANGRUR DISTRICT AT A GLANCE**

- 1.0 INTRODUCTION
- 2.0 RAINFALL AND CLIMATE
- 3.0 GEOMORPHOLOGY AND SOILS
- 4.0 GROUND WATER SCENARIO
  - 4.1 HYDROGEOLOGY
  - 4.2 GROUND WATER RESOURCES
  - 4.3 GROUND WATER QUALITY
  - 4.4 STATUS OF GROUND WATER DEVELOPMENT
- 5.0 GROUND WATER MANAGEMENT STRATEGY
  - 5.1 GROUND WATER DEVELOPMENT
  - 5.2 WATER CONSERVATION AND ARTIFICIAL RECHARGE
- 6.0 GROUND WATER RELATED ISSUES & PROBLEMS
- 7.0 AWARENESS AND TRAINING ACTIVITY
- 8.0 AREA NOTIFIED BY CGWA
- 9.0 RECOMMENDATIONS

## SANGRUR DISTRICT AT A GLANCE

<u>S. No</u>	ITEMS	STATISTICS
1	GENERAL INFORMATION	
	i) Geographical area (sq.km)	5020Sq.Km
	ii) Administrative Divisions (as on 31.03.05) Number of Block	9. Ahmedgarh, Sangrur, Bhawanigarh, Malerkotla Dhuri Sherpur, , Sunam Lehragage, Andana
	iii) Population (as on 2011 Census)	- 1654408
	iv) Normal Annual Rainfall (mm)	552
2.	GEOMORPHOLOGY	
	Major Physiographic units	Sirhind Canal
	Major Drainage	Ghaggar river
3.	LAND USE (Sq.Km)	
	a) Forest area	70
	b) Net area shown	4400
	c) cultivable area	--4440
4.	MAJOR SOIL TYPES	
5.	AREA UNDER PRINCIPAL CROPS (Sq.Km)	2020 rice 2270 wheat Rabi Crops-940
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Numbers of Structures)	
	Tube Wells	4110 km <sup>2</sup> / 1,27236
	Canals	290 km <sup>2</sup> / Sirhind canal & its tributaries
	Other Sources	-
	Net Irrigated area	4400 km <sup>2</sup>
	Gross irrigated area	8710 km <sup>2</sup>
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB	
	No. of Dug Wells	12
	No. of Piezometers	04
8	PREDOMINANT GEOLOGICAL FORMATIONS	Quaternary Alluvium
9	HYDROGEOLOGY	
	Major Water bearing formations	Sand
	Pre-monsoon depth to Water Level	8.77-23.89
	Post-monsoon depth to water level	9.95-24.52

10	Long term water level trend in 10 yrs	0.47- 0.76m Decline
	GROUND WATER EXPLORATION BY CGWB	
	No of wells drilled (EW,OW,PZ,SH,Total)	8 EW ,12 Pz are constructed
	Depth Range (m)	500
	Discharge (liters per min.)	$3.24 \times 10^{-4}$ - $7.5 \times 10^{-2}$
	Storativity (S)	1670m <sup>2</sup> /day
	Transmissivity (m <sup>2</sup> /day)	
.11	GROUND WATER QUALITY	
	Presence of chemical constituents more than permissible limit	Daska-4710, Khandebad-3540, Hyen-3210, Bhulen-6990
	EC (micro mhos at 25 <sup>0</sup> c)	
	F (mg/l)	Badbar-1.55,Daska-1.76, Birkalan1.71, Khandebad-2.33, Chotian-2.49, Malerkotla-1.95, Ghorens-11.3
	As (mg/l)	Pakhoke-2.321, Tapper-1.563, Barnala-1.633
	Fe (mg/l)	
	Type of Water	Ca+Mg-HCO <sub>3</sub> and NA mixed anion
12	DYNAMIC GROUND WATER RESOURCES (2004) in MCM	2282.16
	Annual Replenishable Ground Water Resources	4140.55
	Net Annual Ground water Draft Projected Allocation for Domestic and Industrial Uses upto 2025	52.66
	Stage of ground Water Development	183%
13	AWARENESS AND TRAINING ACTIVITY	2
	Place	Sangrur & Malerkotla
	Date	29 <sup>th</sup> March, 2004 & 28 <sup>th</sup> March, 2006
	No.of participants	250 & 300
14	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	2
	Projects completed by CGWB (No. & Amount spent)	
	Projects under technical guidance of CGWB (Numbers)	NA
15	GROUND WATER CONTROL AND REGULATION	

	Number of OE Blocks	9
	Number of Critical Blocks	-
	No. of Blocks notified	-
16	MAJOR GROUND WATER PROBLEMS AND ISSUES.	Declining of water level and Quality

# **GROUND WATER INFORMATION BOOKLET**

## **SANGRUR DISTRICT, PUNJAB**

### **1.0 INTRODUCTION**

Sangrur District falls in the southern part of the Punjab State and is bounded by latitudes  $29^{\circ} 44' 45''$ (N) and longitude  $75^{\circ} 14' 45''$ (E) . The area falls in the Survey of India Toposheet Nos. 44N 44O 53B and little area in 53C . The district has 12 community development blocks Sangrur, Bhawanigarh, Malerkotla-I, Malerkotla-II , Dhuri, Sherpur, Barnala, Sehna Mehalkalan, Sunam Lehargage Andona and 4 sub divisions namely Malerkotla, Barnala, Sunam Dhuri and Moonak. The district is by shares its boundary with Ludhiana district in North, Patiala district in East, Bathinda district in the West, Moga district in North West ,Mansa district in South West and Hissar district of Haryana in its south. The district is well connected with rail and road with the all parts of the state. The main townships of the districts are Dhuri , Ahemdgargh . Malerkotla , Barnala , Tappa , Sunam Lehragage. The district is very densily populated . The population as per censuses 2001 is 2000173 and population density is 400 person per sq;km.

### **2.0 RAINFALL AND CLIMATE**

The precipitation in the area occurs mainly due to south west and north east monsoon . However most of the precipitation is received through south westerly monsoon. A little but significant from agriculture point of view , rainfall occurs during the winter season due to North westerly monsoon. The normal annual rainfall of the district is 558 mm about 75% of the rainfall occurs during last week of June to mid Sept. July and August are the wettest months . The rest of the rainfall (25%) occurs during non monsoon period. By going through the data of last 30 years indicates that highest rainfall was 1012 mm in 1983 and lowest rainfall 121mm was experienced in 2002.

The climate of the district is characterized by the dryness of the air an intensely hot summer and cold winter . The year may be divided into four seasons. The cold season starts by late November and extends to the middle of March. It is followed by hot season which continues to the end of June when the south-west monsoon arrives over the district. The post monsoon season period is from October to December.

### **3.0 GEOMORPHOLOGY AND SOILS**

The area forms a part of Indo gangetic plain. The country is more or less flat except towards its north western part which is profusely dotted with sand

dunes. The elevation of the land in the area varies from 251m in the south western to 236m above mean sea level in NE. The master slope of the area is towards the south west.

There is no well defined material drainage system in the area but for the southern part of the district , which is drained by the Ghaggar river . This river causes floods when heavy rainfall occurs in the catchment area. Three main canals pass through the area-Ghaggar branch in south western part , Kotla branch in the central part and the Bathinda branch in the northern part . All these canals run in the south westerly or westerly direction. The entire canal belongs to Sirhind canal system of Bhakhra main canal.soils of the district is loamy sand and sandy loam kaller land is also spotted at a few places . The soil is sandy/brown blown sand clay the boarder of Faridkot, Moga district.

## **4.0 GROUND WATER SCENARIO**

### **4.1 HYDROGEOLOGY**

The district is occupied by Indo-genetic alluvial plain of Quaternary age and falls in Ghaggar sub-basin . The ground water occurs in alluvial formations comprising fine to coarse sand which forms the potential aquifers. In the shallow aquifers upto 50m ground water occurs under unconfined /water table conditions where as in deeper aquifers semi confined /confined conditions exists.

The traditional dug wells tapping the shallow aquifers are not in use and most of them have been abandoned , however the aquifer is being tapped by the hand pumps and shallow tubewells which are widely used for domestic purposes . The deep wells have been constructed by the CGWB which has drilled 8 exploratory borehole and 15 piezometers to delineate and determine potential aquifers zones , evaluation of aquifer characteristics . The deepest borehole was drilled upto the depth of 537.20m at Akbarpur (30<sup>o</sup>10'00" 75<sup>o</sup>00' 05" ) The permeable granular zone comprising of fine to medium grained sand and occasionally coarse grained sand and gravel. The borehole data reveals that clay group of formations dominate over the sand group in the district area. Ground water occurs in the district under water table and semi confined /confined conditions.

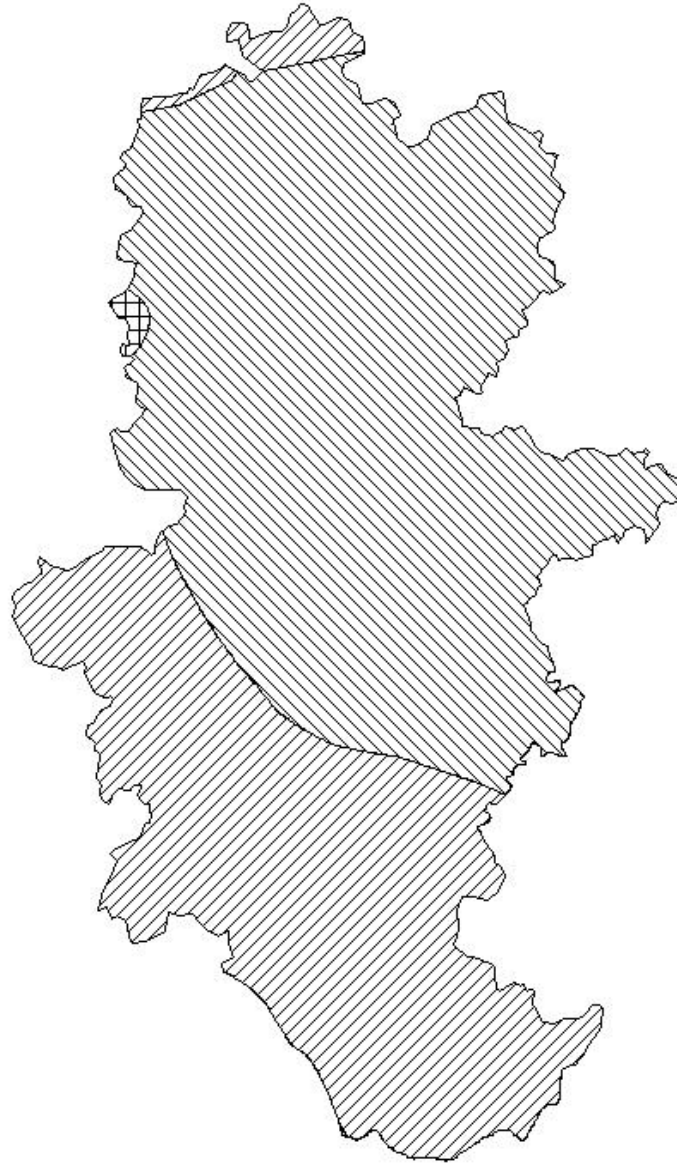
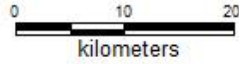
The discharge of deep tubewells in the area varies between 1067 to 3330 lpm. The transmissivity values ranges from 1020 -1670m<sup>2</sup>/day and storativity ranges from 3.24x10<sup>-4</sup> to 7.5x10<sup>-2</sup>

#### **Water level Behavior :-**

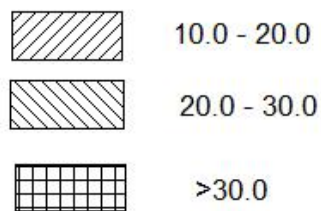
The depth to water level ranges from 12.25 to 29.60 m during the pre monsoon period and 13.80 m to 30.15m bgl during post monsoon period, The seasonal fluctuation varies from 1.05 m to 5.32m in the area. The long term fluctuation trend indicates have a fall of 065m/year



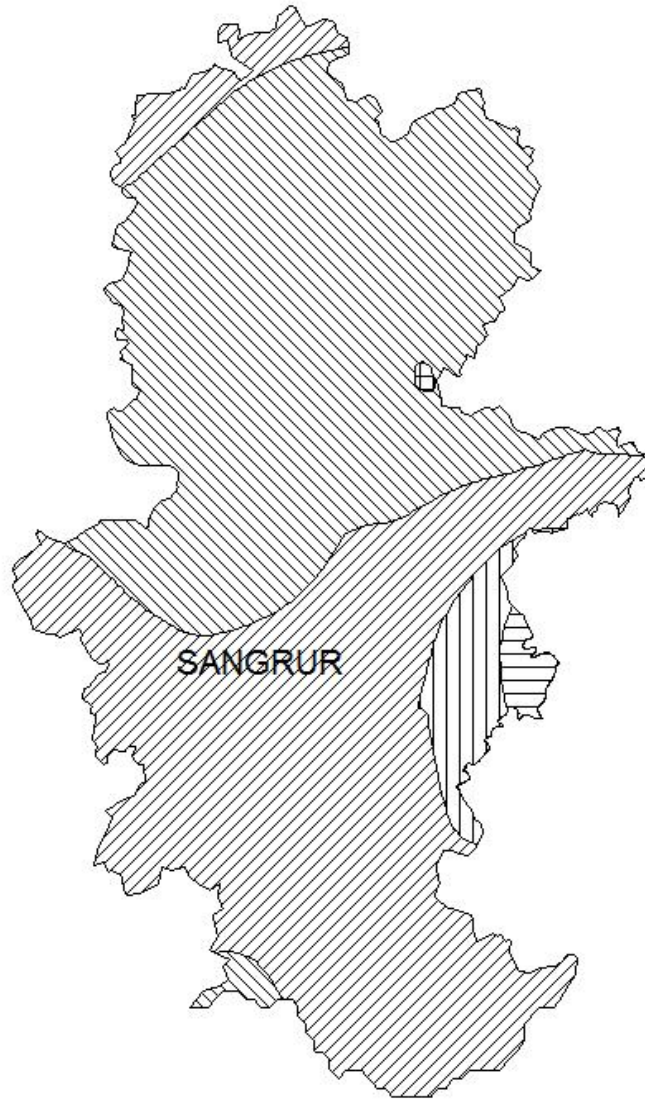
# DEPTH TO WATER LEVEL MAP SANGRUR MAY 2011








Depth to water level (m bgl)



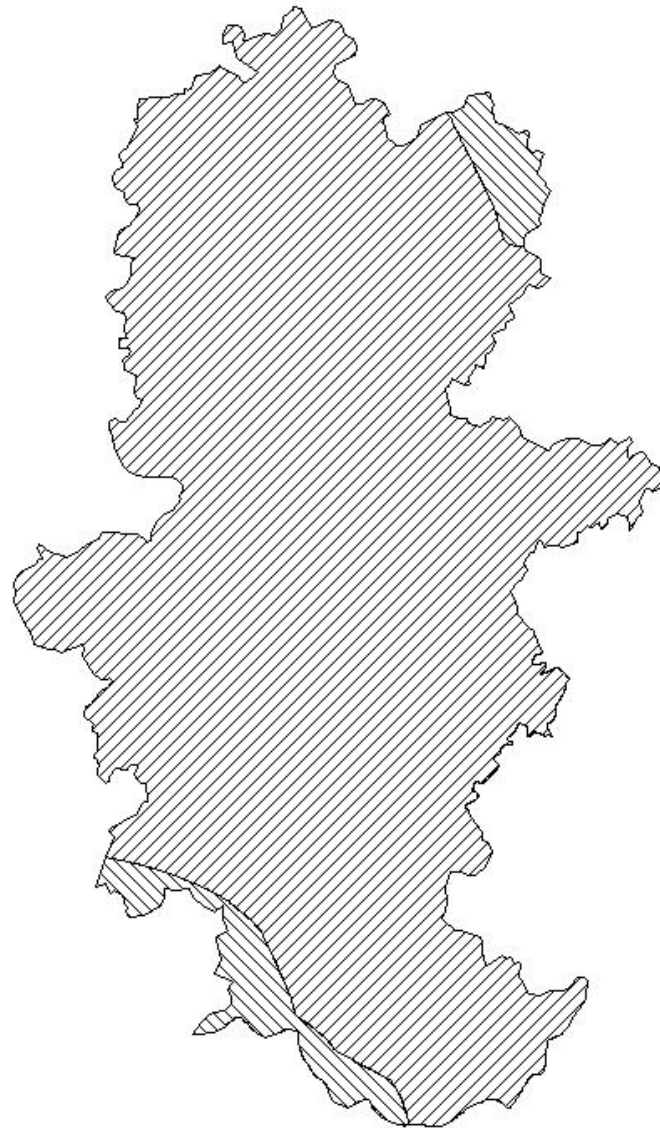
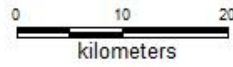
DEPTH TO WATER LEVEL MAP  
SANGRUR  
NOVEMBER 2011



LEGEND  
RANGE (MBGL)

	2.0 - 5.0		20.0 - 30.0
	5.0 - 10.0		>30.0
	10.0 - 20.0		

SEASONAL WATER LEVEL FLUCTUATION MAP  
SANGRUR  
MAY 2011 & NOVEMBER 2011



LEGEND  
FLUCTUATION RANGE (MBGL)

FALL

RISE



2.0 - 0.0



## 4.2 GROUND WATER RESOURCES

The block wise ground water resources potential in the district has been assessed as per GEC -97 as on March 2009. The stage of ground water development ranges between 206% (Lehragaga) to 360% (Sunam) . The net ground water resources of the district have been estimated to be 1393.22 MCM and gross ground water draft of the district is 3672.44 MCM. leaving behind a short fall of 2292.99 MCM . The stage of ground water development in the district is 264%.

### Ground Water Resources & Development Potential of Sangrur district, Punjab

Block	Net annual ground water availability (ham)	Existing gross ground water draft for irrigation (ham)	Existing gross ground water draft for all uses (ham)	Provision for domestic & industrial requirement supply to 2025 (ham)	Net annual ground water availability for future irrigation development (ham)	Stage of ground water development (%)	category
AHMEDGARH	14523	40399	40649	366	-26242	280	OVER-EXPLOITED
ANDANA	11633	25095	25252	229	-13692	217	OVER-EXPLOITED
BHIWANIGARH	18004	38754	39014	382	-21132	217	OVER-EXPLOITED
DHURI	11755	31763	32030	392	-20399	272	OVER-EXPLOITED
LEHRAGHAGA	14296	29186	29467	411	-15302	206	OVER-EXPLOITED
MALER KOTLA	18958	49147	49599	663	-30852	262	OVER-EXPLOITED
SANGRUR	19964	46683	47129	653	-27373	236	OVER-EXPLOITED
SHERPUR	9996	31261	31460	293	-21558	315	OVER-EXPLOITED
SUNAM	20193	72008	72645	934	-52749	360	OVER-EXPLOITED
Total	<b>139322</b>	<b>364296</b>	<b>367244</b>	<b>4324</b>	<b>-229299</b>	<b>264</b>	OVER-EXPLOITED

### 4.3 Ground Water Quality (Irrigation and drinking point of view)

The shallow ground water of the district is alkaline in nature (pH 7.68 to 9.04) and is moderate to highly saline (EC 894-6990 $\mu$ S/cm. at 25<sup>0</sup>C). Among anions, either bicarbonate is the dominant anion or none of the anion dominates, whereas among cations, sodium is generally the dominant cation.

Comparing the concentration values of major ions with the desirable and permissible concentration limits for drinking water, as recommended by Bureau of Indian standards, more than half (56 %) of the ground waters are not suitable for drinking purposes either due to salinity or fluoride or nitrate concentration beyond the permissible limit of safe drinking waters.

Salinity (EC), Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the basic parameters considered for ascertaining the irrigational suitability of ground water. Based on the plot of EC and SAR on USSL diagram for rating irrigation waters, it is observed that most of waters fall under C<sub>3</sub>S<sub>1</sub> and C<sub>3</sub>S<sub>2</sub> Classes. Such waters are likely to cause medium to very high salinity hazards, but no sodium hazards when used for customary irrigation. However, some waters falling under class C<sub>4</sub>S<sub>4</sub> classes may cause sodium and salinity hazards when used for customary irrigation. It would be better if such waters were used with appropriate amount of gypsum. RSC values are generally high and it ranges from -2.05 to 15.90 indicating that use of these waters for irrigation on normal soils may cause alkalinity hazards.

Presence of chemical constituents more than the permissible limits

A.	Chemical Constituent	Total wells	Limit	No. of wells beyond limit	Location
	EC	18	>3000 $\mu$ S/cm.	4	Daska (4710) Khandabad (3540) Haryao (3210)
	Fluoride	18	>1.5mg/L	7	Bhulan (6990) Badbal (1.55), Daska (1.76), Birkalan (1.71) Khandabad(2.33), Chotian (2.49), Malerkotla (1.95), Ghorenab (11.3)
	Arsenic	17	>0.01mg/L	0	-
	Iron	14	>1.0 mg/L	3	Pakhoke (2.321) Tappa (1.563) Barnala (1.633)

## **B. Type of water - Mainly Na-HCO<sub>3</sub> and Na-mixed Anion**

### **4.4 Status Of Ground Water Development**

The drinking water supply is mainly through ground water in the district. The short fall in water supply to the towns, cities and villages is met with the installation of hand pumps /shallow motorized tubewells by the public individually as spot and convenient source of water. The shallow tubewells tap unconfined aquifer and depth varies from 30-70m. The tubewells constructed by the Municipal Committees/ Nagar Panchayats and other agencies have been constructed tapping deeper aquifer down from 100-150m . The shallow tubewells irrigate about 4110 km<sup>2</sup> in the district . Most of these shallow tubewells are either run by diesel or electrical motors. The discharge of these tubewells varies from 600-2500 lpm.

## **5.0 GROUND WATER MANAGEMENT STRATEGY**

### **5.1 Ground Water Development**

The stage of ground water development for the district is 264% and all the 9 blocks fall in the over exploited category. This means the ground water is under great stress and ground water levels are declining. There is no scope of further ground water development . Only measures should be taken to reduce on the dependence on ground water and to enhance the ground water resources.

### **5.2 Water Conservation and Artificial Recharge**

In Sangrur district 2 number Pilot Project were undertaken and same were completed successfully . The scheme is Dhuri Drain and Dhuri Link Drain in which surface run off was recharged.

## **6.0 GROUND WATER RELATED ISSUES & PROBLEMS**

In the district the main issues of concern related to ground water is the depleting ground water resources which is being reflected through the declining ground water level. The stage of ground water development for the district is 264%. That means the net annual withdrawal is more than the net annual recharge. During the last 10 years the ground water levels has declined in almost whole of the district and the average decline is 65cm per year. Individually all the blocks are over exploited. These blocks need macro analysis and there is urgent need for conservation of ground water in the district.

## **7.0 AWARENESS AND TRAINING ACTIVITY**

Two mass awareness programme were conducted at Sangrur in the premise of agriculture deptt. In this programme the then Deputy Commissioner was the chief guest and ADC (D) was the guest of honour. Chief Agriculture Officer , Sangrur and District Development and Panchayat officers were also present as the guest.

The second mass awareness programme was organized at Malerkotla in this Deputy Commissioner Sangrur , Shri Hussan Lal , IAS was the Chief Guest and jSDM , Malerkotla was the guest of honour.

Apart from the above officers of CGWB also assessed the panches and sarpanch of Mahalkalan block and awared all the panches and sarpanch to get the registration done at Mehalkalan . The programme was organized in the premises of BDO office.

## **8.0 AREAS NOTIFIED BY CGWA**

Mahalkalan , Sangrur And Malerkotla-I blocks of Sangrur district have been notified by CGWA.

## **9.0 RECOMMENDATIONS**

1. The stage of ground water development for the district at present is 183% and all the blocks fall in the over exploited category which leads to constant decline of water levels so no further ground water development is recommended.
2. The contribution of surface water for irrigation may be increased or replaced by ground water i.e. canal irrigation may be increased to release the stress on ground water
3. Change in cropping pattern is recommended to reduce the heavy pumping of ground water.
4. Ground water pumping from deep aquifers is recommended to reduce stress on shallow aquifers.
5. A dam at Ghaggar river may be proposed to collect the water and supply the same for irrigation purposes.
6. The construction of roof top rain water harvesting and artificial recharge to ground water structure should be made mandatory in bye laws for urban area.
7. Cleaning and construction of pond in every village is recommended.