



MOGA DISTRICT PUNJAB



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

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Our Vision

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

GROUND WATER INFORMATION BOOKLET MOGA DISTRICT, PUNJAB

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MOGA DISTRICT AT A GLANCE

GENERAL

1. Geographical Area : 2071 Sq. Km.
2. Location : North Latitude 30° 28' 30" and 31° 06' 15"
East Longitude 74° 54' 40" and 75° 24' 57"
3. Blocks : 05 (Moga-I, Moga-II, Nihal Singhwala,
Bhagapurana and Dharamkot)

POPULATION (Census, 2001)

	Males	Females	Persons
(a) Rural population	4,05,793	3,62,706	7, 68,499
(b) Urban population	1,18,496	1,05,294	2, 23,790
(c) Total Population	9,92,289		
(d) Percentage of Rural population to total population:			77.45
(e) Percentage of Urban population to total population:			22.55

IRRIGATION

- (a) Gross irrigated area : 382,700 ha
(b) Net area irrigated : 198,000 ha.
i) through canals : 6000 h
ii) through tubewells : 192,000 ha.
(c) Percentage of net irrigated area to net area sown :100 %
(d) Gross cropped area : 383,000 ha.
(e) Percentage of gross irrigated to gross cropped area : 100 %
(f) No. of shallow irrigation tubewells (as on 31.3.2011):
Electric Motor : 57,851
Diesel Engine : 804
Total : 58,655

HYDROMETEOROLOGY

- I.M.D. Normal Annual Rainfall : 498 mm
Rainy days : 24 days
Normal monsoon rainfall : 391 mm
Temperature Mean Maximum : 40.0°C (May), Mean Minimum :5.°C (Jan)

GROUND WATER ASSESSMENT (AS ON 31.3.2011)

- Net annual ground water availability : 69647ham
Net annual ground water draft : 243949 ham
Net resource available for future Irrigation Development: -123953 ham
Stage of ground water development : 177.54 %
No of blocks falling in Dark/ Over Exploited category 05 (ALL)

GROUND WATER EXPLORATION

- Exploratory wells drilling by C.G.W.B. : 2 (Juner and Sosan)
Piezometers : 6

GROUND WATER INFORMATION BOOKLET

MOGA DISTRICT, PUNJAB

INTRODUCTION

Administratively, the district is under control of Ferozpur division and is divided into 3 sub-divisions/ tehsils namely Moga, Bhagapurana and Nihal Singhwala. Dharamkot and Bhadhani Kalan are 2 sub-tehsils of district Moga. Further, the district has been sub-divided into five development blocks i.e. Moga I, Moga - II, Dharamkot, Bhagapurana and Nihal Singhwala. Moga district has 4 towns and 329 villages with a total population of 9,92,289 as per 2011 census. As per 2011 census, 77.45 % population of Moga districts lives in rural areas of villages. The total Moga district population living in rural areas is 768,499 of which males and females are 405,793 and 362,706 respectively. In rural areas of Moga district, sex ratio is 894 females per 1000 males. Child population in the age 0-6 is 79,083 in rural areas of which males were 42,377 and females were 36,706. The child population comprises 10.44 % of total rural population of Moga district. Literacy rate in rural areas of Moga district is 69.04 % as per census data 2011. Gender wise, male and female literacy stood at 72.98 and 64.64 percent respectively. In total, 475,967 people were literate of which males and females were 265,239 and 210,728 respectively.

The district ranks at 11th place in the population size in the Punjab State. Density of population is 444 persons/ sq km which is second lowest in the state.

HYDROMETEOROLOGY

The climate of the district can be classified as tropical and dry sub humid. The normal annual rainfall is about 498 mm which is spread over 24 rainy days. 78% of rainfall occurs during south-west monsoon.

GEOMORPHOLOGY

The district area forms a part of Indo-Gangetic plain and Sutlej sub-basin of Indus basin. The area as a whole is almost flat with a gentle slope towards the Western and Northwesterly direction. The physiography of the district is broadly classified from south to north into four distinct features i.e. Upland plain , Sand dune tract , younger flood plain and active flood plain of Sutlej. The Sutlej is an important perennial river, which forms major drainage of the area and runs parallel to the Northern border of the district.

There are two types of soils viz Sierozem and Desert soils in Moga

District. The sierozem soils are found in major parts of the district and desert soils are comparatively found in a relatively smaller area towards western part of the district.

GEOLOGY

The district is occupied by geological formations of Quaternary age comprising of Recent alluvial deposits. These alluvial formations are overlain by Aeolian sands, except in the area falling in proximity of Satluj River. Geological setting, distribution of rainfall and geological formations constituting the aquifers, essentially controls the hydrogeological framework of any district.

The general geological successions encountered in the area is given below:

GROUP	GEOLOGICAL AGE	STRATIGRAPHIC UNITS	DESCRIPTION
Quaternary	Upper Pleistocene to Recent	Sand Ridges	Medium to fine grained, buff colored dunes over the alluvium.
		Newer Alluvium	Unconsolidated sand, silt, clay and gravel deposited along the Satluj in the flood plains (Active, cover & abandoned).
	Lower to middle Pleistocene	Older alluvium	Semi consolidated, fine to medium grained sand (grey colored) and clay (brown colored, sticky & hard) occasionally mixed with Kankar.
Tertiary		Sand Stone/ Shale sequences	Reddish maroon and buff coloured.
Achaeans		Granites/ Gneisses	

AGRICULTURAL AND IRRIGATION

The crops grown in the district are divided into two main categories i.e. Rabi and Kharif. The major Rabi crops are wheat and oil seeds (sunflower and mustard) and others are barley, maize and gram. The major Kharif crops are cotton and paddy, minor ones are sugarcane & Jowar. The Rabi crops are sown in Oct-Nov and harvested from mid March to Mid May. The Kharif crops are sown in Jun-Aug. and are reaped from September to December.

Moga district has 383,000 hectares as gross irrigated area and 198,000 hectare as net irrigated area. Out of 198,000 hectare, canals irrigate approximately 6000 hectare, which is 3.03% of net irrigated area, whereas 96.97 % of net irrigated area is irrigated by tubewells. Tubewells are more important in comparison to canals as far as percentage of area irrigated by these two methods is taken into consideration. There were 65,558 shallow and deep tube wells owned by farmers.

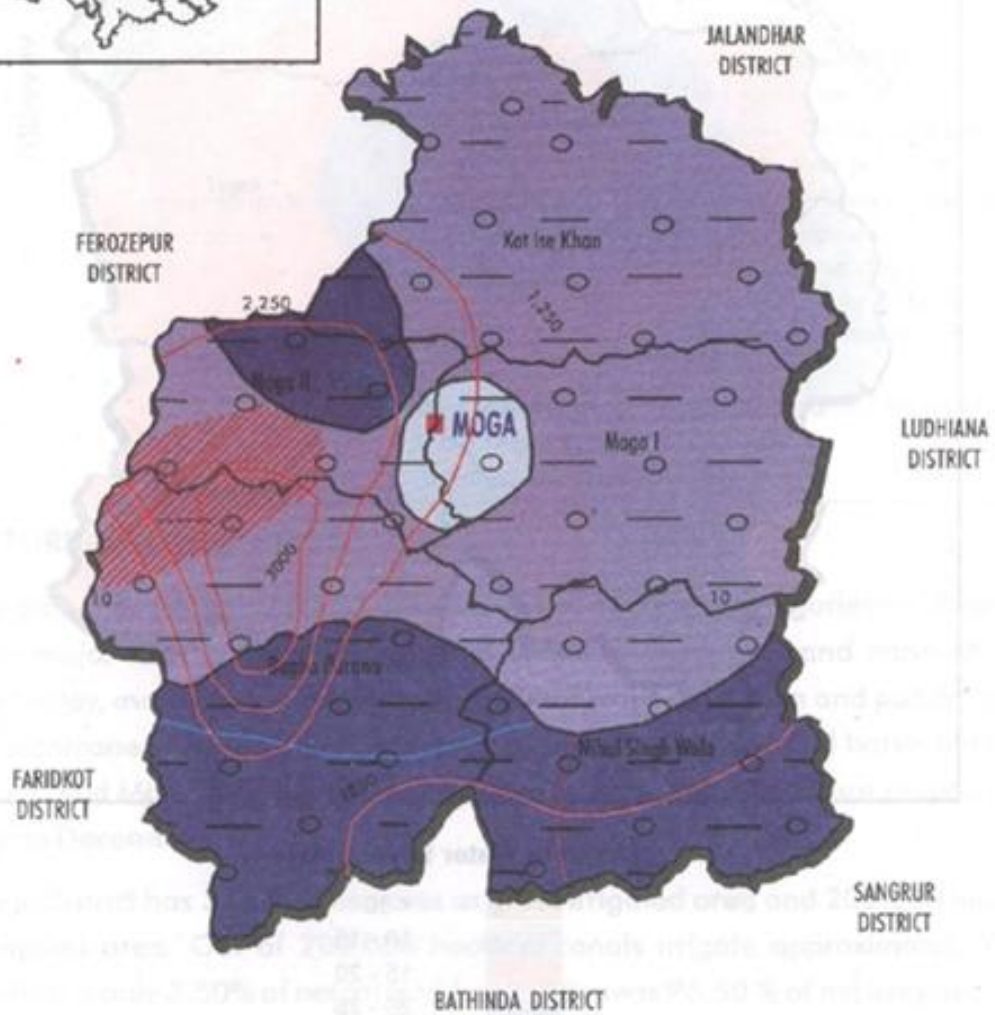
The district is traversed by network of canal. The main canals in the area which feed the various distributaries, minors, sub-minors & field channels (water courses) are Sirhind feeder and Sidhwan Branch and Abohar canal which partly irrigate southern part of the district and leaves Moga to irrigate parts of Bhatinda, Muktsar and Ferozpur districts.

Hydrogeology:













Geological formation encountered within the district comprises of unconsolidated alluvial deposits of Quaternary age. Aquifer material comprises chiefly of fine to medium grained sand. In general shallow aquifers in the area can be grouped into two classes; one unconfined/ semi confined aquifer down to depth of 80.0 m in the district and being in the depth range of 100.0 to 111.0m. These two aquifers are separated by a clay layer almost uniformly present in the district. The aquifer down to depth of 50.0 m is being tapped by shallow tubewells for purpose of irrigation and drinking. However, few deeper tubewells down to depth of 125 m are being tapped by Government agencies for drinking purpose and by some farmers for irrigation purpose.



MOGA DISTRICT HYDROGEOLOGY



LEGEND

	Wells feasible	Rigs suitable	Depth of Well (m)	Discharge (1pm)	Suitable Artificial Recharge Structures
 Soft Rock Aquifer	Tube wells	Direct and Reverse Rotary	40-300*	1300-3000	Recharge trench with Injection well
 Soft Rock Aquifer	Tube wells	Direct and Reverse Rotary	45-350*	1000-3000	Recharge trench with Injection well
 Soft Rock Aquifer	Tube wells	Direct and Reverse Rotary	50-100*	1000-2000	Recharge trench with Injection well
Depth to Water level, m (Pre-monsoon decadal mean, 1993-2002) 	Electrical Conductivity (Micro mhos/cm at 25° C) 		Major river / Drain 		
Nitrate > Permissible limit (100 ppm) 	Iron > Permissible limit (1.0 ppm) 		Fluoride > Permissible limit (1.5 ppm) 		
State boundary	District boundary		Block boundary		
Block headquarter 	District boundary 		Over exploited block 		

* - Limited upto depth explored i.e. deeper prospects yet to be found

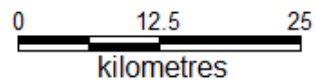
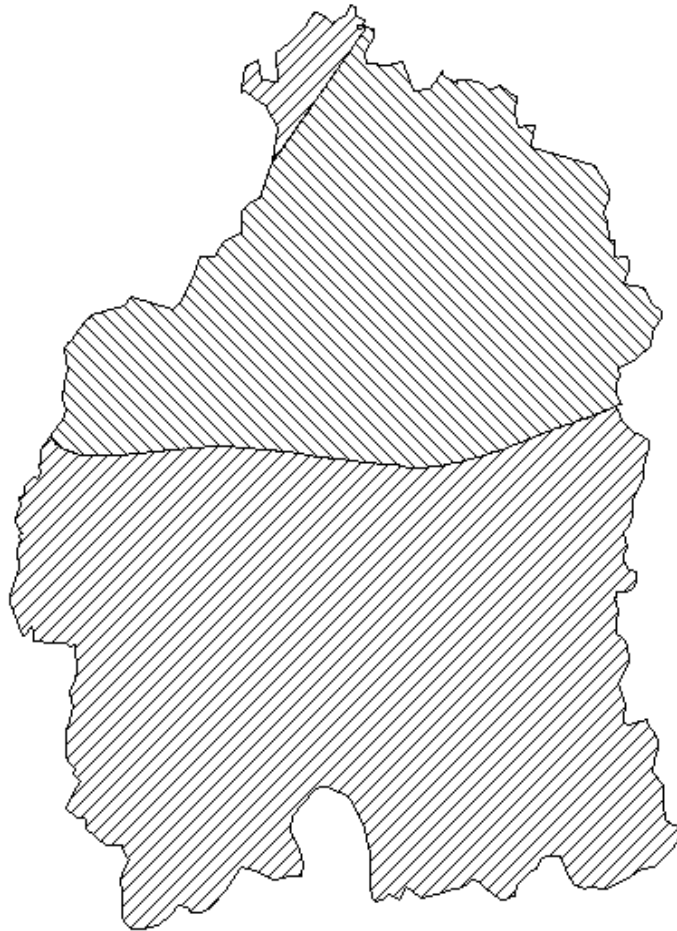
Central Ground Water Board has drilled two deep exploratory wells in Moga district up to the depth of 350.0 m. Aquifer details which has been deduced from deep drilling by Central Ground Water Board at village Juner in Kot Ise Khan Block indicate that at least four aquifer groups can be identified in Northern part of the district as given in table. Tubewell constructed up to the depth of 217.0 m has given average discharge of 3000 lpm with drawdown of 5 to 6 m.

Aquifer Group	Depth Range in m
First	29.00 - 47.00
	60.00 - 80.00
Second	100.00 - 111.00
Third	143.00 - 160.00
	182.00 - 230.00
Fourth	264.00 - 336.00



Water Level Behavior:

Two ground water regime in the district can be identified which are separated by ground water divide running North of Northeast and South of Southwest direction. Elevation of ground water table varies from 198.0 to 212.0 m amsl. In the Northern part of the district ground water gradient is 0.30m/km in comparison to southern part of the district, where it is more than a meter per km. Most of the observation stations in Moga district show decline with varying degree of decline over last three decades .Rate of decline varies from 53 cm/year (Samal sari) to 79 cm/year (Damru Khurd). Steep decline of water levels has been observed in last one decade than earlier years. Depth to water level in the district varies from 15.78 mbgl to 21.17 mbgl during pre-monsoon and 17.13 to 22.15 mbgl in post-monsoon period. Except Northern and Southwestern part of the district all other areas are reported to have deeper water levels. Water levels in the Nihal Singhwala block are deepest among all blocks.

DEPTH TO WATER LEVEL PRE MONSOON (MAY 2011)

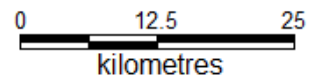
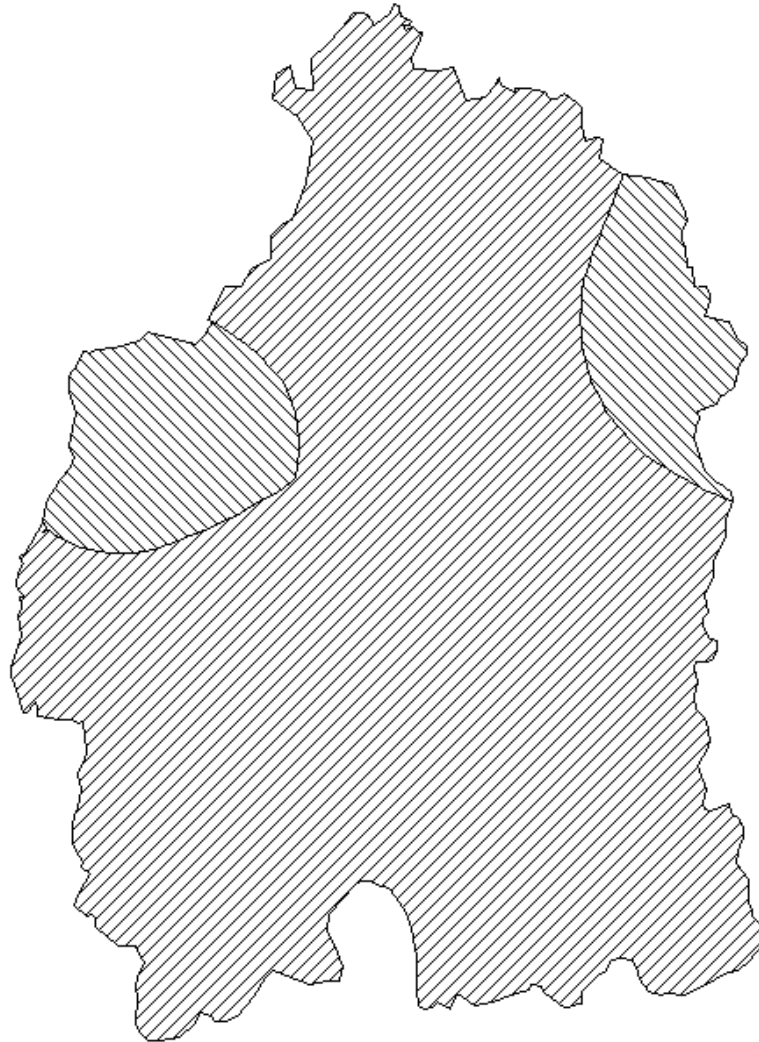


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
MAP SYMBOL	DTW Range(m. bgl)
	10.00 - 20.00
	20.00 - 30.00



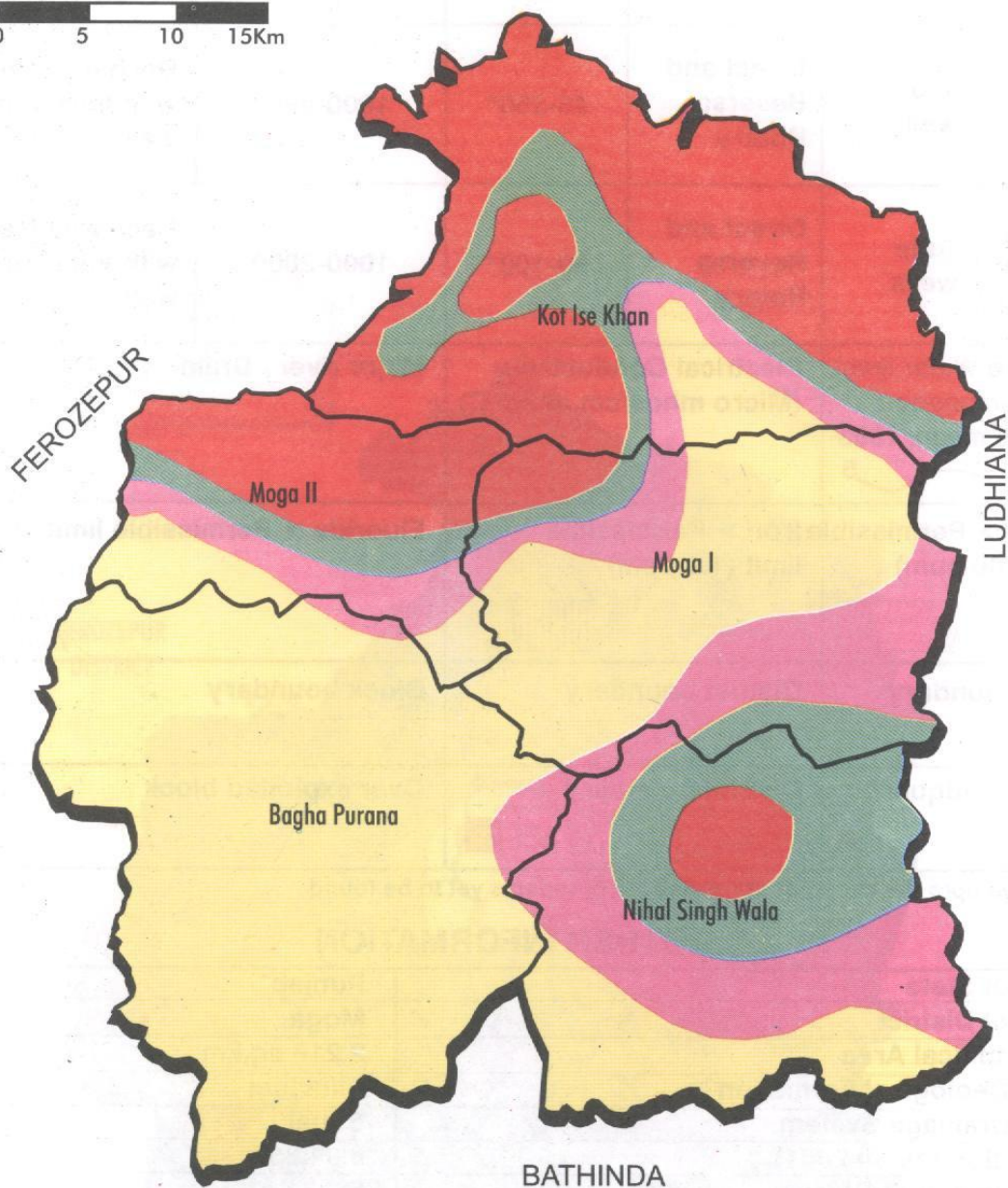
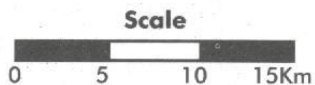
DEPTH TO WATER LEVEL POST MONSOON (NOVEMBER - 2011)



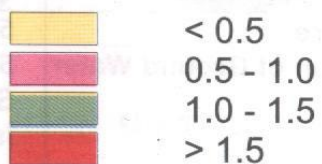
LEGEND

MAP SYMBOL	DTW Range (m.bgl)
	10.00 -- 20.00
	20.00 -- 30.00

Moga District Iron Distribution



Iron Concentration (mg/l)



GROUND WATER QUALITY:

Ground water qualities of shallow aquifers indicate that ground water quality is fresh to marginally saline. Concentrations of different chemical parameters are within permissible limits for safe drinking water as per BIS norms 2007. A many anions bicarbonate is the dominant anion and among cations Na one dominant. 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 water, it is observed that the ground water fall under classification C3 S4 and C3 S1. These waters are not suitable for customary irrigation as they may cause salinity and high sodium hazards. The shallow groundwaterer aquifer in the district is of Na Hco₃

Flouride concentration is higher than permissible limit in most of the area. Iron concentrations have been found in shallow ground water at some places to be higher than permissible limits in South Eastern, North Western and in areas adjoining river Satluj. Combined effect of Sodacity and Salinity hazard has been reported to be alarming in parts of block Moga-II and Bhagapurana. By and large, the quality of ground water is suitable for domestic /irrigation purposes in major part of the district.

GROUND WATER RESOURCES:

Ground Water Resources estimation of the district was done as on 31.03.2011 as per GEC-1997 for each individual block. Stage of ground water development in the district is 202%. The ground water development in all the blocks of the district has exceeded the available recharge and thus all the blocks have been categorized as “over exploited”. Moga-I, Moga-II and Nihal Singhwala are showing more than 200% of ground water development. Block Bhaga Purana has relatively less development of ground water among all blocks i.e. 167% .

The blockwise ground water resource potential in the district has been assessed as per GEC-97 and is shown in the above table.

The ground water development is primarily due to the present cropping pattern which lays excessive demand for ground water

Block Name	Net Annual Ground Water Availability (Ham)	Existing Gross Ground Water Draft for irrigation (Ham)	Existing Gross Ground Water Draft for all uses (Ham)	Allocation domestic industrial up to next 25 years (Ham)	Net Ground Water Availability for future irrigation development (Ham)	Stage of Ground Water Development (%)	Category of Block
BHAGA PURANA	36917	61378	61801	581	-25042	167	OVER-EXPLOITED
DHARAMKOT (KOT ISA KHAN)	31558	57616	57959	472	-26529	184	OVER-EXPLOITED
MOGA I	19555	45792	46357	777	-27014	237	OVER-EXPLOITED
MOGA II	15746	34413	34616	279	-18946	220	OVER-EXPLOITED
NIHAL SINGH WALA	16796	42948	43217	269	-26422	257	OVER-EXPLOITED
TOTAL	120572	242148	243949	2378	-123953	202	OVER-EXPLOITED

in the absence of assured canal irrigation and less rainfall. Net ground water availability of the district is 120572 ham.

RECOMMENDATIONS

The following remedial measures are recommended to minimize the declining ground water trend in parts of the Moga district and also as safeguard against environmental/ natural resources degradation.

1. It is necessary to notify more blocks of the district for regulation of all ground water abstraction structures and construction of any tubewell especially in southern part of the district, seeking prior permission from the Central Ground Water Authority. Moga-I and Moga-II blocks have already been notified for the same purpose.
2. Artificial recharge to ground water should be taken up in the urban and rural area to avert the further lowering of ground water level since natural recharge to the aquifer system is not adequate to support such heavy ground water withdrawal. In this context, all the blocks are strongly recommended for adopting artificial recharge practices.
3. The study of Flood plains of river Satluj may be taken up for safe ground water exploitation and its impact on adjoining aquifer system.
4. Local administration need to be encouraged to cooperate and participate with CGWA for enforcement of ground water regulation.
5. Local populace to be educated regarding consequences of mining of ground water.