

CENTRAL GROUND WATER BOARD
Ministry of Water Resources
Government of India

GROUND WATER INFORMATION BOOKLET
JALANDHAR DISTRICT, PUNJAB

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CHANDIGARH 2012

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CENTRAL GROUND WATER BOARD

North Western Region

Our Vision

“Water Security through Ground water Management”

GROUND WATER INFORMATION BOOKLET
JALANDHAR DISTRICT, PUNJAB

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JALANDHAR AT A GLANCE

Geographical Area: 2662 Sq. km

Blocks:

| | | | | |
|---------|---------|----------|----------------|----------------|
| Adampur | Bhogpur | Goraya | Jalandhar East | Jalandhar West |
| Lohian | Nakodar | NurMahal | Phillaur | Shahkot |

| | | | |
|------------------------|-----------|---------|---------|
| Total Population(2011) | | | 2181753 |
| Male | 11,40,536 | Female | 1041217 |
| Decadal growth | 11.16% | Ratio | 913 |
| literacy | 82.40 | Density | 831 |

Rural Population as % of Total Population: 52.52%

Urban Population as % of Total Population: 47.48%

Climate

Normal Annual Rainfall: 701 mm

Normal Monsoon Rainfall: 490 mm

Rainy Days: (Average) 35 days

Temperature:

Mean Max 40.75°C

Mean Minimum 5.15°C

Agriculture area (000ha)

Forests 4

Net area sown 241

Net sown area as % gross sown area 91%

Area sown more than once 177

Total cropped area 418

| | |
|--|---------------|
| Cropping intensity | 178 |
| Area under principal crops | area (000ha) |
| Wheat | 169 |
| Rice | 138 |
| Maize | 12 |
| Yield per hectare | (Kg) |
| Wheat | 4420 |
| Rice | 3365 |
| Maize | 3418 |
| Sugarcane | 4579 |
| Irrigation | area (000ha) |
| Net area irrigated | 241 |
| Percentage of net irrigated area to net area sown | 100 |
| Gross Irrigated area: | 417 |
| Percentage of gross irrigated area to cropped area | 100 |
| No. of tubewells energized | 84757 |
| Electric operated | 66097 |
| Diesel operated | 18660 |
| Area irrigated through canals | 3 |
| Area irrigated through tubewells | 236 |
| Total Area irrigated: | 239 |
| % of net Irrigated area to net sown area: | 100 |
| % of gross irrigated area to gross cropped area: | 100 |
| Total Tubewells energized/ operated: | 69,995 |
| Ground Water Potential (As on 31.03.2009) | |
| Net annual ground water availability: | 118137 ham |
| Gross annual ground water draft: | 270181 ham |
| Net ground water available for future use: | -154060 ham |
| Stage of ground water development: | 229 % |
| Number of over-exploited blocks: | All 10 blocks |

GROUND WATER INFORMATION BOOKLET
JALANDHAR DISTRICT
PUNJAB

INTRODUCTION

The district is named after Jalandhar, a demon king, who finds a mention in the Puranas. According to another version Jalandhar is said to have derived its name from the vernacular term 'Jalandhar' means area inside the water, i.e. tract laying between the two rivers Satluj and Beas, another name of Jalandhar had been Trigartta, as it was waters by three rivers, Satluj, Beas and Ravi.

LOCATION

Jalandhar is located on the intensively irrigated plain between Beas and Sutlej rivers. The city, with has major road and rail connections, is a market for agricultural products. Manufacturing units include textiles, leather goods, wood products, and sporting goods. Jalandhar was the capital of Punjab from India's independence (1947) until Chandigarh was built in 1953. Jalandhar is situated at 71⁰ 31' East and 30⁰ 33' North at a distance of 146 kms from state capital Chandigarh. It is at a distance of 350 Kms from Delhi on Delhi-Amritsar Highway. It is surrounded by Ludhiana district in East, Kapurthala in West, Hoshiarpur in North and Ferozpur in South. It is well connected by road and train.

ADMINISTRATIVE SET UP

The Jalandhar District consists of 5 tehsils 1). Jalandhar-I, 2. Jalandhar II, 3. Nakodar 4. Phillaur and 5. Shahkot , further sub-divided into 10 development blocks, as Jalandhar East, Jalandhar West, Bhogpur, Adampur, Nakodar, Shahkot, Phillaur, Nurmahal, Lohian and Rurka Kalan. According to District Statistical Office, the district has 956 inhabited villages.

CLIMATE

The climate of this district is on the whole dry except during the brief south-west monsoon season. The year may be divided into four seasons. The cold season is from the middle of November to early part of March. The succeeding period upto the end of June is the summer season, July, August and first half of September constitute the

South-West monsoon season. The period from middle September to the middle of November is the post monsoon or transition period.

RAINFALL

The average annual rainfall in the district is 703.0 mm. The rainfall in the district in general increases from the south-west towards the north-east and varies from 551.3 mm at Nakodar to 892.3 mm at Adampur (Aera-obsy). About 70 per cent of the annual normal rainfall in the district is received during the period July to September. The variation in the rainfall from year to year in the district is appreciable. In the 80 year, 1901 to 1980, the highest annual rainfall amounting to 181 per cent of the normal occurred in 1917. The lowest annual rainfall which was 55 per cent of the normal occurred in the year 1905. In the same period, the annual rainfall in the district was less than 80 per cent of the normal in 22 years. On an average, there are 36 rainy days (i.e. days with rainfall of 2.5 mm or more) in a year in the district. The heaviest rainfall in 24 hours recorded at any station in the district was 304.8 mm at Jalandhar on 18 August 1878.

TEMPERATURE

January is generally the coldest month with the mean daily maximum temperature at about 19⁰C and the mean daily minimum at about 6⁰C during the winter season. After February, temperature begins to rise rapidly. June is generally the hottest month with the mean daily temperature at about 41⁰C and the mean daily minimum at about 27⁰C. Scorching dust laden winds blow on many days in the summer season and the day temperatures on individual days may reach above 45⁰C. Due to increase moisture in the monsoon air, the weather is often sultry and uncomfortable, in between these rains. As the monsoon withdraws by mid-September temperatures decrease and night temperature drop rapidly.

GEOMORPHOLOGY

The district is part of Bist Doab Tract, which is inter alluvial plain between Beas and Satluj River. Physiographically, the district is characterised by two distinct features i.e. vast upland plain and Satluj flood plain. The width of the flood plain varies according to the amount of shift experienced by the river. It is widest in the Nakodar tehsil. The

district is mainly drained by the river Satluj and its tributaries –East (White) Bein and West (Black) Bein.

SOILS

Jalandhar district is occupied by two types of soils a) tropical arid brown and b) arid brown soils. Tropical brown soils are found in major parts of the district whereas arid brown soils are found in south western part of the district especially in Lohian and part of Shahkot block. Along the river Satluj, fluvent type of soil is found.

HYDROLOGY

The Bist Doab Canal System is the major source of canal irrigation. The network of Jalandhar branch (irrigate northern and central parts) and Phillaur distributary of Nawashahar branch ((irrigate southern parts of the district). In all there are 41 canals having total length of 604.40 km. of which Best Doab canal is 43 km long. Out of 2,27,423 ha net irrigated area, 26,755 ha is irrigated by canal and rest by ground water. With 'Remodeling of Phillaur distributaries system in Nakodar area and Construction of super passage over Nasrala choe near Adampur will increase the capacity of the channel by 20% and to avoid the damages to the crops and adjoining abadies during flood season.

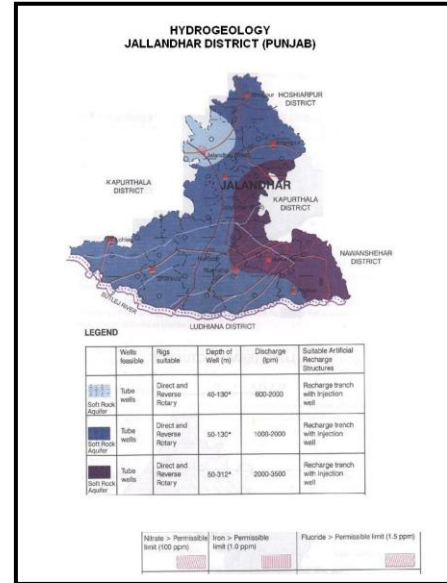
AGRICULTURE

Net area sown in the district is 241000 ha which constitutes 91% of the total area. Area sown more than once is 177000 bringing the total cropped area (Gross sown area) to 418000 ha. Paddy constitutes main kharif crop whereas the wheat is the main Rabi crop. Perusal of historical data reveals that the paddy cultivation has increased about 85 times since 1950-51 against wheat cultivation, which has increased only 1.7 times. Average yield of paddy cultivation has increased from 806 kg/ha to 3948 kg/ha where as wheat crop average yield has increased from 958 kg/ha to 4325 kg/ha over the period of last 50 years. Thus, it has given further stress on ground water.

HYDROGEOLOGY

The area is underlain by Sub- recent to Quaternary alluvium comprising sand, gravel, pebbles, Kankar and clay. Older alluvium occupies the uplands all over the district except along the river Sutlej. It is also found underlying the younger alluvium in the flood plains of Sutlej. The older alluvium belongs to lower to middle Pleistocene age, while

younger alluvium belongs to upper Pleistocene to recent age. Blown sands of recent age also occur as isolated patches in Western part of the district. Ground water is fresh at all levels in the district. Central Ground Water Board has drilled 11 exploratory boreholes along with equal no of observation wells besides 20 piezometers to delineate and determine potential aquifer zones, evaluation of aquifer characteristics etc. Ground water exploration undertaken by CGWB has revealed the presence of 3 aquifer groups down to a depth of 350m. These aquifer groups comprise of fine to medium grained sand. The first granular zone forms the water table aquifer and occurs upto 115 m below ground level. The second aquifer occurs between 130 and 195 m depth, the third exist between 215 and 333 m depth down wards. Total thickness of the alluvium is more because bedrock has not been encountered up to 350 m depth in the district.



| Block | Location | Type of well |
|---------------|---------------|--------------|
| ADAMPUR | Adampur | PZ (Deep) |
| | Adampur | PZ (Medium) |
| | Adampur | PZ (Shallow) |
| BHOGPUR | Kheral Kalan | EW (Deep) |
| | Kheral Kalan | EW (Shallow) |
| | Kheral Kalan | PZ (Shallow) |
| JAL-EAST | Jalandhar | PZ (Deep) |
| | Jalandhar | PZ (Medium) |
| | Jalandhar | PZ (Shallow) |
| | Lallian Kalan | EW (Deep) |
| | Lallian Kalan | EW (Medium) |
| Lallian Kalan | PZ (Shallow) | |
| JAL-WEST | Kartarpur | PZ (Deep) |
| | Kartarpur | PZ (Shallow) |
| LOHIAN | - | - |

| | | |
|-------------|-----------------|--------------|
| NAKODAR | Nakodar | PZ (Deep) |
| | Nakodar | PZ (Medium) |
| | Nakodar | PZ (Shallow) |
| | Jandiala | PZ (Shallow) |
| NURMAHAL | Sarih | EW (Deep) |
| | Sarih | EW (Shallow) |
| | Sarih | PZ (Shallow) |
| PHILLAUR | Garh(Gulamgarh) | EW |
| | Phillaur | PZ (Deep) |
| | Phillaur | PZ (Shallow) |
| RURKA KALAN | Goraya | EW (Deep) |
| | Goraya | EW (Shallow) |
| | Goraya | PZ (Shallow) |
| SHAHKOT | Shahkot | PZ (Deep) |
| | Shahkot | PZ (Shallow) |
| | Malsian | EW (Deep) |
| | Malsian | EW (Shallow) |

Further, in order to understand sub surface disposition and nature of aquifer system Jalandhar district geological sections have been drawn within and across the boundaries of the district.

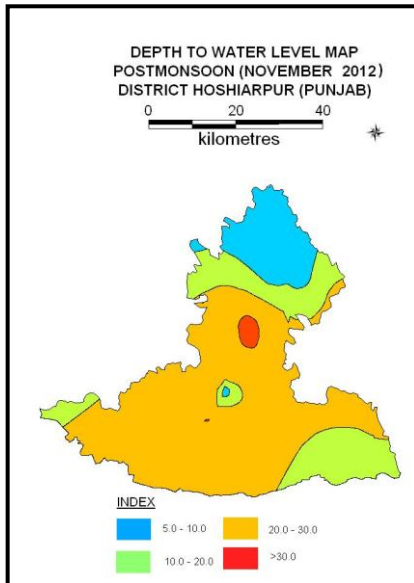
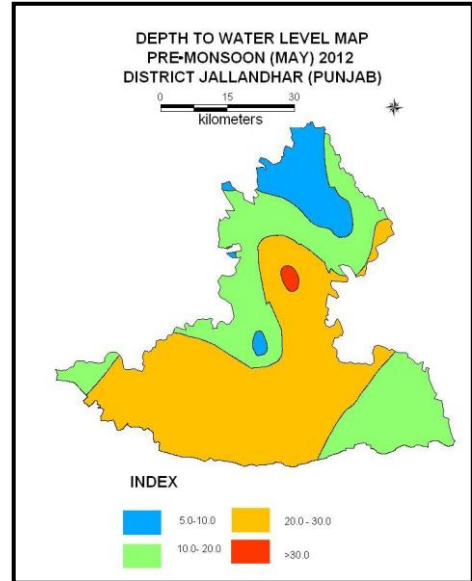
Section A-A' (NE-SW)

A geological section has been drawn trending NE-SW (Adampur, Jalandhar, Lallian kalan, Malsian, Shahkot and (Moga) (Fig1). It is seen that as the topography changes from steeply sloping in the NE to almost flat in the centre and SE the disposition of the subsurface layers also follows the same pattern. The study of the cross section shows that persistent clay beds occur at various depths. The first clay bed occurs at the depth of 10- 30m below ground level varying in thickness from 5 to 15 m. clay is plastic and brown in colour with little Kankar. Second prominent clay bed occurs between 25 to 65 m and the third at 65 – 120 m below ground level. The second and third clay beds are very thick at Nakodar and Jalandhar and almost merge together, separated only by thin layers of sand. Between these two places there is another fourth clay zone within the drilled depth. The clay is sticky, white buff in colour mixed with little kankar and fine sand. The first unconfined aquifer is encountered at the depth around 4-6m below ground level. The aquifer is comprised of medium to coarse sand with gravel around Nakodar. The thickness of the aquifer diminishes towards south - west direction. However its average thickness is around 20m. Within the first aquifer occurs a clay bed which is persistent in nature. The thickness of this clay bed is about 20m all along except at Nakodar where it thins out. Thus the first aquifer itself is divided into two aquifers. One occurring above the clay bed and widely developed through open wells and shallow tubewells and the second below the clay bed, extensively exploited through cavity wells. This lower aquifer is extensively used reservoir in the area, 15-30m thick and comprises of fine sand. Below this is a 40 m thick aquifer which divides into two thin zones of about 5 -10 m thickness in the SW side. A third aquifer occurs down to the depth of 160m in the SW part comprising fine sand.

WATER LEVEL BEHAVIOR

PRE-MONSOON

During the pre-monsoon period depth to water in the district varies from 6.22m bgl at Allawalpur (Adampur block) to 31.59m bgl at Jallandhar (Jallandhar East block). The depth to water level less than 10m occurs the Northern parts of district covering parts of Adampur and Bhogpur blocks. Whereas in parts of phillore and Rurka Kalan, Jallandhar west Adampur blocks it ranges between 10 to 20m.



In southern parts of district (Lohian, Shahkot, Nakodar, NurMahal) and central parts Rurka kalan and Jallandhar-East blocks water level still becomes deeper (>20m).

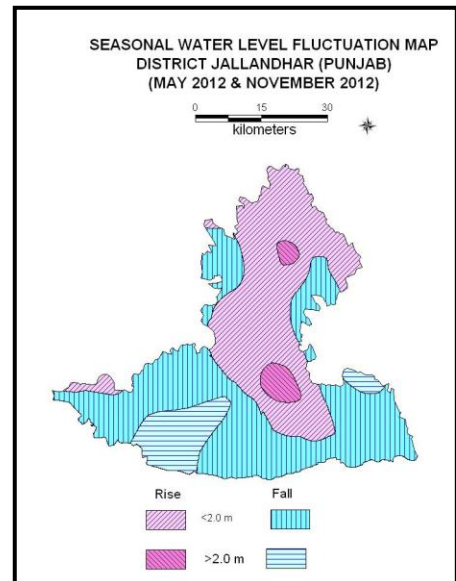
POST-MONSOON

During the post-monsoon period depth to water in the district varies from 7.28m bgl at Udhopur (Adampur block) to 31.86m bgl at Jallandhar (Jallandhar East block). The depth to water level less than 10m occurs the Northern parts of district covering parts

of Adampur and Bhogpur blocks. Whereas in parts of Adampur, Bhogpur and phillore blocks it ranges between 10 to 20m. In southern parts of district (Lohian, Shahkot, Nakodar, NurMahal) and central parts Rurka kalan and Jallandhar-East blocks water level still becomes deeper (>20m).

SEASONAL FLUCTUATION

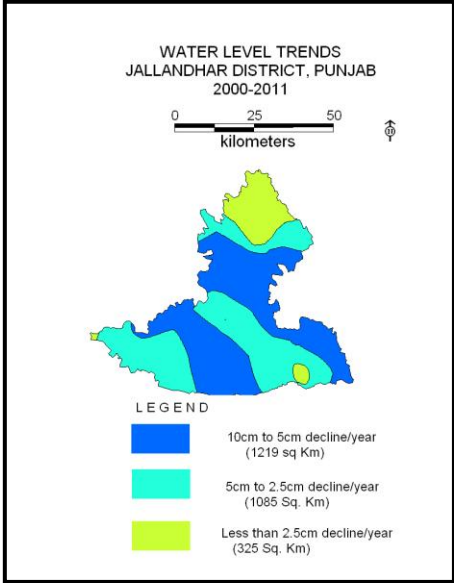
Water level rise upto 2m has been observed in elongated strip passing through central of the



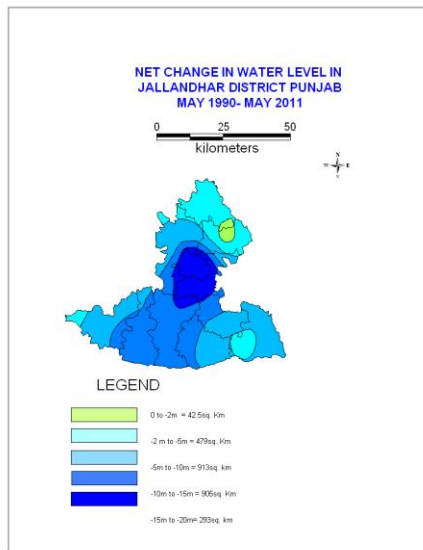
district covering parts of Adampur, Bhogpur, Jalandhar East Jalandhar west and Rurka Kalan blocks of the district. South central part covering parts of Lohian, Shahkot, Nakodar, NurMahal and phillore blocks have observed water level decline upto 2m. Part of Shahkot block has observed decline more than 2m.

LONG-TERM WATER LEVEL TREND

The long-term (10 years) water level trends between (2003-2012) indicate that the pre monsoon water level rise ranges 0.0140m/year at Kartarpur and



0.4794m/yr at



Jalbhe, whereas, decline ranges from 0.0156m/yr at Allawalpur to 1.1338m/yr at Jalandhar. During post-monsoon water level water level rise ranges 0.1670m/year at Allawalpur and 0.5743m/yr at Jalbhe, whereas, decline ranges from 0.0150m/yr at Phillaur to 1.1667m/yr at Jalandhar. Annual water level trends indicate that water declined at rates of 0.0290m/yr to 1.1398m/y. Maximum decline has been noticed in Jalandhar city.

NET CHANGE IN WATER LEVELS

Net change in water levels Long-term net change of water levels indicates a general decline (negative change) in the large part of the district and it is up to 8.18m. The maximum fall is observed in parts of Nakodar and Shahkot blocks.

GROUND WATER FLOW

Elevation of the water table in the district varies from 205m to 240m above mean sea level. Average gradient of the water table is of the order of 1.08 m/km. Overall flow of ground water is towards south-west direction.

Drinking water supply

Entire drinking water supply to all the rural as well as urban sectors of the district is based on only ground water through deep tubewells drilled down to the depth of 150 m. These tubewells tap aquifer zones from a depth range of 55 m to 143m. On an average 35m thick aquifer is tapped for extracting Ground water.

Tubewell irrigation

There are 92,734 shallow tubewells ranging in depth from 25 to 60m and provide irrigation to 200349 ha area which constitutes about 88.09% of the total irrigated area. Discharge of these shallow tubewells ranged between 100 and 800 lpm with a drawdown of 1.0 to 3.5m. A large number of shallow tubewells generally exist in the blocks lying in southern parts and deep tubewells exist only in Shahkot and Lohian blocks of the district. This is primarily due to occurrence of relatively finer grained sediments in these blocks

GROUND WATER QUALITY

Data of chemical quality of water from shallow (Phreatic) and deep aquifers indicates that all the chemical parameters i.e. major cations (Ca, Mg, Na & K) and major anions (CO₃, HCO₃, Cl & SO₄) are well within the permissible limits set by the BIS, 1991 except fluoride and nitrate concentrations which has been found in shallow ground water at some places to be higher than permissible limits. The fluoride point values of some of the places are Kittan Sadan (2.98), Alhawalpur (2.24), Mawai (2.84), Rurki (2.90), Phillaur (2.40) etc. By and large, the quality of ground water is suitable for domestic /irrigation purposes.

GROUND WATER RESOURCES

Blockwise ground water resource potential of the district has been assessed as per GEC-97. The ground water development in all the blocks has exceeded the available recharge, thus all the blocks have been categorized as over exploited. Stage of ground water development ranges from 163 %(Adampur -block) to 338 %(Shahkot Block). Net replenishable ground water availability in the district has been assessed as 1181.37 mcm. Gross ground water draft for all uses in the district is 2701.81mcm, thus leaving shot-fall (over draft) of 1540.60 mcm. Stage of ground water development in the Jalandhar district has been assessed to be 229%.

| Assessment Unit | 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 (11+12) | Provision for domestic, and industrial requirement supply to 2025 years | Net Ground Water Availability for future irrigation development (10-11-14) | Stage of Ground Water Development 13/10*100 (%) | Category of assessment unit |
|-----------------|--------------------------------------|--|--|--|---|--|---|-----------------------------|
| ADAMPUR | 12513 | 20056 | 303 | 20359 | 434 | -7976 | 163 | OE |
| BHOGPUR | 10845 | 26187 | 263 | 26450 | 377 | -15718 | 244 | OE |
| RURKA KALAN | 10273 | 21083 | 18 | 21101 | 18 | -10827 | 205 | OE |
| JALANDHAR-EAST | 9436 | 20480 | 2265 | 22745 | 3310 | -14355 | 241 | OE |
| JALANDHAR-WEST | 17515 | 31581 | 25 | 31606 | 25 | -14091 | 180 | OE |
| LOHIAN | 8693 | 21590 | 258 | 21848 | 372 | -13270 | 251 | OE |
| NAKODAR | 13185 | 45326 | 433 | 45759 | 619 | -32760 | 347 | OE |
| NUR MAHAL | 14313 | 28990 | 266 | 29257 | 386 | -15063 | 204 | OE |
| PHILLAUR | 15501 | 30747 | 494 | 31240 | 684 | -15930 | 202 | OE |
| SHAHKOT | 5862 | 19554 | 261 | 19816 | 378 | -14071 | 338 | OE |
| TOTAL | 118137 | 265594 | 4587 | 270181 | 6603 | -154060 | 229 | OE |

Due to the rampant ground water exploitation in the district, the Central Ground Water Authority had notified all ten blocks of the district for registration of tubewells from ground water management point of view.

ARTIFICIAL RECHARGE STUDIES

CGWB has also taken up artificial recharge studies on experimental basis. Salient features of the projects are enumerated below:

- a). Artificial recharge to ground water in Channian village of Jalandhar district (1998-99). The cost of the project was Rs. 9, 89,384/-. The spare canal water and surface runoff generated during monsoon, accumulated in the village ponds was recharged through existing dug well.
- b). Pilot project for artificial recharge to ground water from Bist – Doab canal System in NurMahal area, District Jalandhar (1999-2000). The cost of the project was Rs. 11, 62,000/-. In NurMahal block water level has declined between 5 to 6 m in last 17 years. The spare water of Phillaur and Sarih distributary during monsoon period was recharged to the ground through 6 vertical shafts. Annual water available for recharge was around 1.62 mcm.
- c). Scheme for rainwater harvesting to recharge to ground water in D.C. Office Complex, Jalandhar city (2004-05). The cost of the project was Rs. 4, 80,000/-.

RECOMMENDATIONS

Following remedial measures are recommended to minimize the declining ground water trend in parts of the Jalandhar district as safeguard against environmental degradation.

- a). It is necessary to notify the district for regulation of all ground water abstraction structures and construction of any tubewell especially in southern part of the district, prior permission should be sought from the Central Ground Water Authority.
- b). 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, Shahkot and Nakodar blocks are strongly recommended for artificial recharge practices.
- c). Study of Flood plains of river Satluj may be taken up for safe ground water exploitation.
- d). Local populace to be educated regarding consequences of mining of ground water and need for its effective/economic use.