



# **SUCCESS STORIES OF RAIN WATER HARVESTING AND ARTIFICIAL RECHARGE OF GROUND WATER IN NCT, DELHI**



Bungalow No. 78, Lodhi Estate, New Delhi

**Central Ground Water Board  
Ministry of Water Resources  
New Delhi**

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## **Artificial Recharge to Ground Water Studies Carried out by Central Ground Water Board in N C T, Delhi**

**Introduction:** The high rate of population growth and high level of urbanization in NCT, Delhi has resulted in over-development of ground water resources. Thus in about 75% area of NCT, Delhi ground water levels are declining at an alarming rate of 0.20 m per annum.

In order to increase the natural ground water resource rain water harvesting and artificial recharge to ground water has become increasingly important in ground water management. Therefore Central Ground Water Board had taken up Central Sector Scheme on “Study of Recharge to Ground Water” under VIII & IX Plan to demonstrate the technology available for artificial recharge to ground water and to disseminate the technical know how to government and other organizations.

### **1. ARTIFICIAL RECHARGE TO GROUND WATER STUDIES CARRIED OUT UNDER CENTRAL SECTOR SCHEMES IN NCT, DELHI:**

In NCT, Delhi Central Ground Water Board had taken up 18 projects under Central Sector Scheme during VIII & IX plan in different hydrogeological and agro-climatic conditions. District wise break up of important Artificial Recharge projects undertaken is given below:

#### **1.1 Artificial Recharge projects in New Delhi district of NCT Delhi:**

The recharge projects implemented in Urban environments utilizing runoff generated from roof top, roads, paved area and bare ground are given below:

- a. Artificial Recharge to ground water in **Shram Shakti Bhawan.**
- b. Artificial Recharge to Ground water in **Lodhi garden.**
- c. Artificial recharge to ground water in **Presidents Estate .**
- d. Artificial recharge to ground water in **Prime Ministers Office.**
- e. Artificial recharge to ground water in **Safdarjung Hospital.**
- f. Artificial recharge project at **Tughlak Lane** and Surrounding areas

- g. Artificial recharge project at **Bungalow-5, Janpath Road**, New Delhi
- h. Artificial Recharge project in **Sena Bhawan, New Delhi**
- i. **Kushk Nala** Artificial Recharge Project

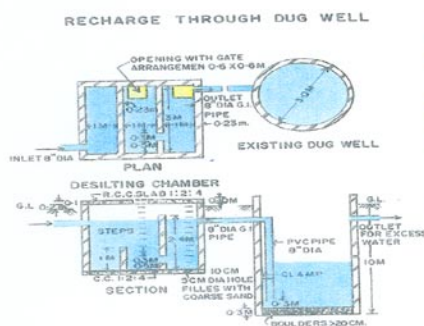
Under these projects runoff generated from urban environments like roof area, paved area, roads, parks and bare grounds has been utilized for recharging depleted aquifers. Under these projects different types of urban recharge structures were constructed. They are recharge shafts, recharge trenches, recharge through abandoned tubewells, recharge through abandoned dugwells. Two typical projects are briefly elaborated below:

In **President Estate Project** runoff generated from 1.3 sq. Km of area is recharged through two abandoned dug wells, one recharge shaft and two trenches with borewells. This has resulted in rise in water levels ranging from 0.66 to 4.10 meters.

### ARTIFICIAL RECHARGE TO GROUND WATER AT PRESIDENT'S ESTATE, NEW DELHI



#### SALIENT FEATURES



- **Campus area:** 1.3 Sq.Km.
- **Source of water:** Rain water & Swimming pool water
- **Av. Annual rainfall:** 712.2 mm
- **Depth to water level:** 6 – 13 m.bgl
- **Water available for recharge:** 31,300 cum
- **Recharge Structures:**
  - Two existing DugWells
  - One Recharge well
  - One Recharge shaft
  - Two Trenches with recharge wells
- **Rise in Water Level during 2003:** Upto 4 m



**The Kushak Nala Project** is on a small nala originating from Birla Mandir and flowing west of Rashtrapati Bhawan. It has effective catchment area of 3.5 Sq.km. Under the artificial recharge scheme two gabion bunds and two nala bunds were constructed to recharge the 110000 Cu.mts of rainfall runoff generated in this watershed.

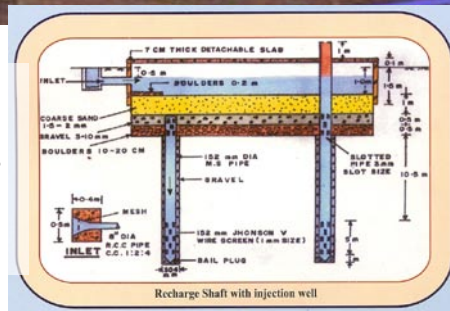
From all the above projects it is estimated that about 225670 Cu.mts of runoff water is recharged to ground water from about 3.678 Sq.Km. of catchment area. The total cost of the above eight schemes is Rs: 60.12 lakhs.



Rainwater runoff: 3325 m<sup>3</sup>

Recharge Structures  
Trench & recharge wells: 3

Year of construction: 2001



Average Recharge:  
3000 m<sup>3</sup>/Year

↑ (Rise) in water levels  
Aug '07: 1.68 - 3.33 m

Cost : Rs 4.10 Lakh

Rain water harvesting system at Shram Shakti Bhawan

## **1.2 Artificial Recharge projects in South, South West and West districts of NCT Delhi:**

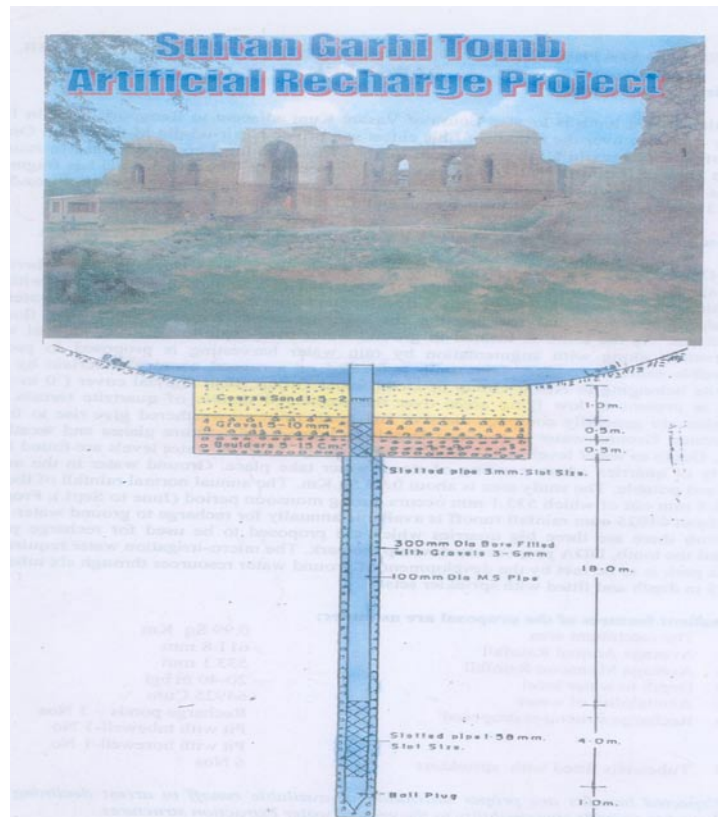
The details of different projects under various hydrogeological setting is given below:

### **A. HARD ROCK TERRAIN:**

**JNU – IIT - Sanjay Van Project:** Under this project four check dams and one roof top rain water harvesting structure was constructed with the cost of 43.58 lakhs. Total reservoir capacity created in four check dams is 49048 Cu. mts.

The total capacity utilization of the created storage capacity is about 368% by repeated filling of the check dams. The total recharge to ground water is about 75.72 TCM which resulted in rise in water levels to the tune of about 13.70 m. Included in this project was the roof top rain water harvesting scheme taken up in Block-VI of IIT, Delhi campus. The rain water harvested was recharged to ground water through construction of injection wells and abandoned dugwell. It is seen that about 830 Cu. mt of rain water is recharge from the 1660 Sq. mt of roof area which resulted in rise in water level to the tune of about 2.29 to 2.87 m in one hectare of area.

**Sultan Garhi Tomb Artificial Recharge Project:** This project was implemented around Sultan Garhi Tomb. Under this project, the three big quarries present in the tomb area were converted into recharge ponds by construction of proper bunds and diversion channel to divert runoff from Vasant Kunj-D block. Three recharge ponds were created. In order to increase the recharge rate, one recharge pit with tubewell and one recharge pit with borewell filled with gravel were constructed in these ponds. About 65000 Cu.mts of runoff is diverted to the recharge ponds from 0.99 Sq.km of catchment area. The total cost of the scheme was Rs. 6 lakhs.



## B. OLDER ALLUVIUM, WEATHERED AND FRACTURED HARD ROCK TERRAIN:

Four Artificial recharge projects were implemented in this hydrogeological environment. They are:

- Artificial Recharge to ground water in Vayusenabad-Residential area of Tughlkabad Air Force Station.
- Artificial Recharge to ground water in Meera Bai Politechnic, Maharani Bagh, New Delhi.
- Artificial Recharge to ground water in Central Park, D-Block Vasant Vihar, New Delhi.
- Artificial Recharge to ground water DTC Central Workshop-II, Okhla, New Delhi.

Under these projects also runoff generated from the urban environments like roof area, paved area, roads, parks and bare grounds present in these projects areas has been utilized for recharging the depleted aquifers. Recharge shafts with tubewells, recharge trenches with tubewells, lateral shafts with

tubewells were constructed. It is estimated that about 42410 Cu.mts of runoff water is recharged to ground water from about 321325 Sq.mts of catchment area. The total cost of the above four schemes is Rs: 17.11 lakhs.

### **C. OLDER ALLUVIUM :**

Two artificial recharge projects are implemented in this hydrogeological environments. They are located at:

- Artificial Recharge Project at Deen Dayal Upadhyaya Hospital, West district, Delhi.
- Artificial Recharge Project at Abhiyan Co-operative Group Housing Society Ltd., Plot No.15, Sector-12, Dwarka , South West district, Delhi.

In these two projects runoff generated from the complete campus i.e roof area, paved area, roads and other areas has been utilized for recharge purpose. It is estimated that about 8270 Cu.mts of runoff is being recharged from the 21970 Sq.mts of area. The total cost of these two schemes is Rs. 5.535 lakhs.

## **2. TECHNICAL GUIDANCE GIVEN TO GOVERNMENT AGENCIES:**

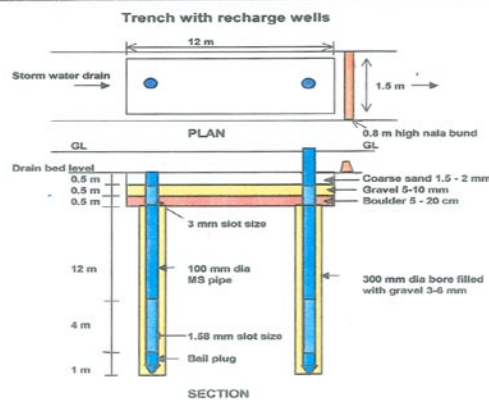
The technical guidance was provided to government agencies for implementations of recharge projects in Government buildings and other establishments like Airports, Schools, Flyovers, parks and other areas. The technical guidance was provided to Central Public Works Department, PWD (Govt. of NCT, Delhi), DDA, NDMC, MES, Irrigation and Flood Control Department, Central Universities like IGNOU, JNU, Jamia Milia Islamia, AAI, Colleges present in NCT, Delhi, NTPC, etc. About 450 schemes were prepared and submitted for implementation in NCT, Delhi. In all these schemes runoff generated from complete urban areas like roof tops, roads, parks, paved areas and bare grounds is utilized for recharging to the ground water scheme. Technical designs were provided to governmental residential colonies like Pushp Vihar, RBI Colony located in R.K.Puram, Vasant Vihar, Hazkhas and SBI

colonies located in different parts of NCT, Delhi. Technical designs were provided to 33 flyovers located in NCT, Delhi. The projects and schemes are located in different hydrogeological environments and are working efficiently. Details of few of the Important projects located in different hydrogeological environments are as follows:

**a. Artificial Recharge to ground water in Indira Gandhi International Airport:**

The area is underlain by alluvium of varying depths consists of clay, silt and silty sand mixed with kankar. Depth to water level is about 20 to 25 m bgl. In a catchment area of 5.59 Sq.km, the available runoff of 6144125 Cu.m. of water was utilized for recharging the ground water. 24 trenches with recharge tubewells are constructed at different locations in different drains which enabled no surface ponding of water. A rise of water level upto 1 m was recorded after monsoon 2003.

**RAIN WATER HARVESTING AT INDIRA GANDHI INTERNATIONAL AIRPORT NEW DELHI**



**Salient Features**

- Catchments area : 5.59 Sq.Km.
- Average annual rainfall : 793.9 mm
- Geological Formation : Alluvium
- Water availability : 6,14,125 Cum.
- Recharge structures : Trench with recharge Wells – 24
- Rise in water level : Upto 1 m

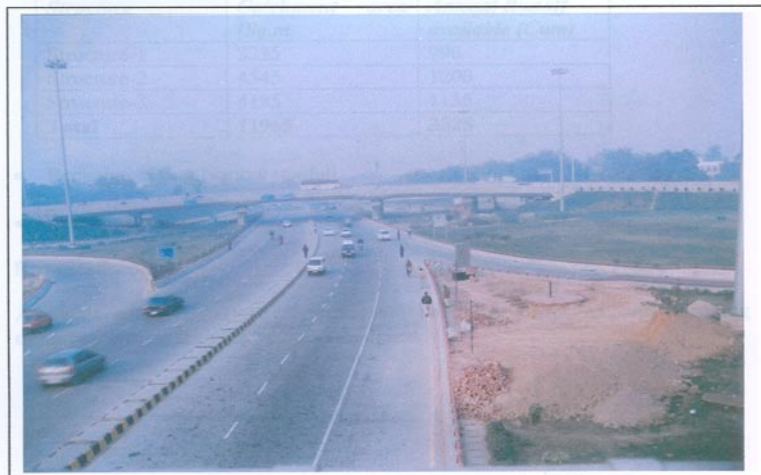
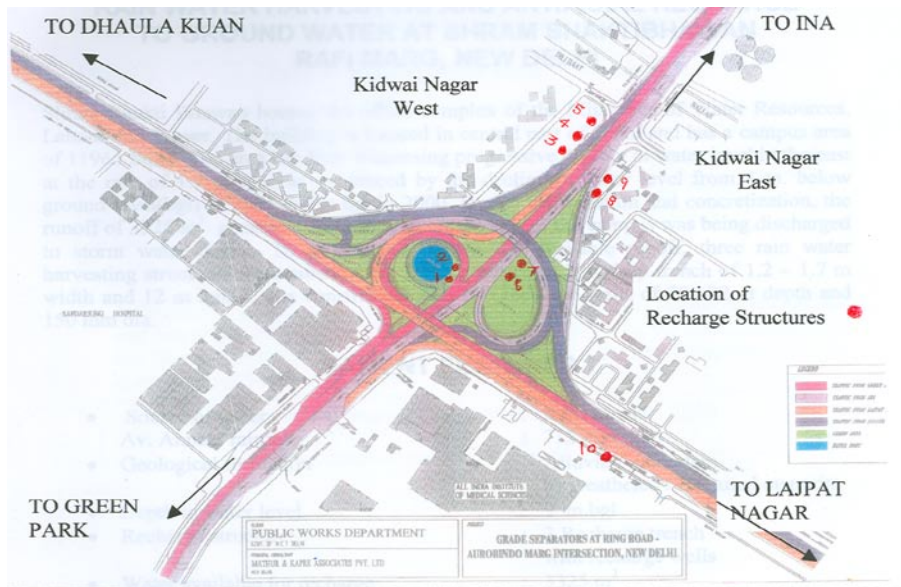


***b. Artificial Recharge to ground water at Link Road connecting NH-8 to Dwarka:***

DDA has constructed 60 m wide road to connect Dwarka with N.H.-8. The runoff generated from the road is being collected in a drain constructed adjacent to the road. A series of shafts were constructed to recharge the runoff generated from the road. The shafts were constructed at a spacing of 250 to 300 m distance on both sides of the road.

***c. Artificial Recharge to ground water at Rajiv Gandhi Setu (AIIMS Crossing Flyover) New Delhi:***

Central Ground Water Board in NCT, Delhi, has provided technical designs for 33 flyovers. Intersection of Ring road and Aurobindo marg at AIIMS crossing is one of the most important flyovers in NCT, Delhi. Runoff from this green flyover is utilized for recharging to the aquifers. The total runoff available in this flyover is about 35000 cu.m., which is recharged to the aquifers through 10 recharge shafts constructed at different locations of the flyover. The shafts are associated with recharge tubewells of depth 25 m to recharge the ground water aquifers.



**Artificial Recharge Structure at AIIMS Fly-over**

A number of artificial recharge to ground water schemes are being implemented by different agencies in NCT, Delhi. NDMC has implemented the scheme in different buildings and parks like Talkatora garden and Nehru Park etc. MES has implemented the scheme in Delhi cantt. area, Subroto park area and in its establishment in Gurgaon (Air Force Station Gurgaon, Mohammdpur Air Force Station etc). Thus a good number of artificial recharge schemes are being implemented as per guidance of Central Ground water Board in NCT, Delhi.

***d. Rain Water Harvesting and Artificial Recharge to Ground Water at 12 Akbar Road, New Delhi***

The main objective of the study was solving waterlogging problems in the premises. Further, it would help in increasing the soil moisture and help in sustaining the green areas, arrest the declining ground water level and sustain the existing nearby ground water abstraction structures. The total area of the bungalow as per the plan is about 9521 sq km and about 6555 sq km of area was considered for estimating run-off from rooftop, paved and green area available for recharging. Two recharge pits are constructed. First structure is being constructed in front lawn of the premises having dimension 2mx2mx4m filled with 2.25 m of graded material along with two number of filter chambers. Second structure is having dimension 5mx2mx4m filled with 2.25 m of graded bedding along with four numbers of filter chambers.



**e. Rain Water Harvesting and Artificial Recharge to Ground Water at Gandhi Smriti Bhawan, Tees January Marg, New Delhi**

The main purpose of this project was to solve the twin problems of declining water level and limited water logging in the area. The total catchment area providing runoff for rain water harvesting is 20400 sq. m. The total roof top area considered for surface runoff calculation is 4650 sq m, the total paved area considered for surface runoff calculation is 8700 sq m and the total green area considered for surface runoff calculation is 7050 sq m. The annual water harvesting capacity calculated as 6895 cum. The recharge structures constructed are trenches with recharge wells-5.



***f. Rain Water Harvesting and Artificial Recharge to Ground Water at Bungalow No. 78, Lodhi Estate, New Delhi***

The main objective of this particular project is to propagate the concept of rainwater harvesting through a live demonstration project. The total area of the bungalow is 2810 sq m. The complex consists of main building, guesthouse, servant quarters, paved areas, roads and green lawns. Out of the total area of 2810 sq m, 2500 sq.m has been considered for effective rainwater harvesting through artificial recharge to ground water.



### **3. TECHNICAL GUIDANCE GIVEN TO GENERAL PUBLIC:**

The technical guidance is provided to private institutions, residential colonies, Group Housing Societies, Industries, and Individual houses. Nearly 2000 such technical guidance for rainwater harvesting and artificial recharge to ground water has been provided by State Unit Office, Delhi. The schemes are prepared utilizing the runoff generated from roof top areas, roads, paved areas and green belts. Based on the technical guidance rendered by CGWB, and the approved designs of recharge schemes are being financed by Delhi Jal Board to the tune of about 50% of expenditure incurred subjected to maximum of Rs. 50,000. Technical guidance is provided to individual persons who are interested to implement the scheme. Moreover the schemes based on the technical guidance provided by CGWB were also sponsored by Coca-cola India Ltd. The technical guidance has been provided for implementation of artificial recharge to ground water to important colonies like Vasant Vihar, Vasant Kunj, C.R. Park, Anand Lok Colony, Shanti Niketan, R.K.Puram Sector-12, Push Vihar, Few Pockets in Saket, G.K-I, East Kailash colony and other so many residential colonies in NCT, Delhi. Numbers of Group Housing Societies located in Dwarka, I.P Extension and other parts of NCT, Delhi have also implemented the schemes based on the technical guidance prepared by CGWB. Schemes are also prepared for a number of colleges like Venkateswara College and other colleges located in South campus. Important schemes prepared for the hotels are those of Hotel Ashoka, Hotel Grand Hyat etc. Thus a number of schemes are implemented with active technical guidance provided by CGWB.

#### 4. CHIEF MINISTER'S DELHI BEST RAIN HARVESTERS AWARD, 2007

To enthuse people to adopt rainwater harvesting and acknowledge the efforts of those who have adopted rainwater harvesting, the Chief Minister's Best Rain harvester award to be given annually was constituted in 2006 by Delhi Jal Board. The award is given in two categories as follows:

Institutional category -	First prize Rs. 2 lakhs
	Second prize Rs. 1 lakh
Individual category -	First prize Rs. 1 lakh
	Second prize Rs. 50,000/-

Each prize is accompanied by a citation and a plaque. Announcements and details for inviting nominations is made through advertisement in newspapers. The awards for 2006 were given by the Hon'ble Chief Minister, Delhi on 2 Feb, 2007. Recipients of awards for 2006 were as under-

##### **Institutional Category**

1. Jamia Hamdard University- 1st Prize Rs. 2.00 Lakhs
2. Janki Devi Memorial College- 2nd Prize Rs. 1.00 Lakh
3. Mandakini G.K.-IV RWA- Special Commendation- Rs. 25,000/-
4. Mother's International School, Aurbindo Marg-Special Commendation-Rs. 25,000/-.

##### **Individual Category**

1. Sh. Baljeet Singh Tyagi- 1st Prize Rs. 1.00 Lakh
2. Ms. Ruchi Singhal – 2nd Prize Rs. 50,000/-
3. Ms. Divya Sehgal- Special Commendation- Rs. 25,000/-
4. Sh. Ajay Kharbanda- Special Commendation – Rs. 25,000/-
5. Ms. Madhu Bhatnagar- Special Prize – Rs. 1.00 Lakh

For the year 2007, 27 Nominations were received for the Chief Minister's Best Rain Harvester's Award-2007. Out of this 7 awardees have been short-listed.

**a. Anand Lok Residents Association, August Kranti Marg, New Delhi.**

The total 8 recharge pits with recharge bores have been constructed. Total Area is about 94,400 sq m and catchments area is about 59,798 sq m. Roof Top/Paved/Pucca Area is 46,298 sq. m (including road area). Open/Green Area is 13,500 sq m (9000+4500 for green area of individual plots). Annual Runoff is 20,600 cubic meters.



**b. Resident Welfare Association, J-Block, Saket, New Delhi**

The recharge structures constructed are 3 recharge pits with 3 recharge bores. Total Area is about 80,000 sq m and total catchment area is about 50,000 sq m. Total roof top area is 25,000 sq m approx. Annual runoff is 12,200 sq m. One recharge structure was constructed in 2004 and two in 2007.





**c. Mira Model School, B-2 Block, Janakpuri, New Delhi.**

The recharge structures constructed are 5 recharge pits with recharge shaft. The total catchment area is 16700 sq m. The total roof top area is 7493 sq m. The Annual runoff is 4466 cubic metre.



**d. Som Vihar Apartment Owners Housing Maintenance Cooperative Society, Major Shamnath Sharma Marg, R.K. Puram, New Delhi.**

The recharge structures constructed are 6 recharge pits with 6 recharge bores. The total catchment area is 28, 000 sq m. The total roof top area is 25,500 sq m. Annual runoff is 11000 cubic meter.



**e. Resident Welfare Association, Mandakini Enclave, Alaknanda, New Delhi.**

The recharge structures constructed are 6 recharge pits with 5 recharge bores and one abandoned tubewell. The total catchment area is about 80,000 cubic meters. The total roof top area is 45,000 sq m. Annual runoff is 20,235 cubic meter.



**f. Ms. Madhu Malik, D-403, Defence Colony, New Delhi.**

The recharge structure constructed is 1 recharge pit with a recharge bore. The total catchment area is 335 sq m. The roof top area is 200 sq m. The annual runoff is 95 cubic meter.



**g. Shri M. K. Daga, Freesia Farm, Khasra No. 1534, New Delhi**

The recharge structures constructed are 6 recharge trenches with 12 recharge shafts. The total catchment area is 20,400 sq m. Roof top area is 500 sq m. Annual runoff is 1410 cubic meters.



**For details, contact:**

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