
SUCCESS STORIES ON ARTIFICIAL RECHARGE TO GROUND WATER AND RAIN WATER HARVESTING IN MADHYA PRADESH

The Success Stories on Artificial Recharge to Ground water and Rain Water Harvesting schemes which have been implemented all over India by various Central and State Govt. departments, NGO's and Voluntary Organizations, Panchayats etc. to have feedback information and to encourage implementing agencies to replicate successful models in similar topographic and hydrogeological situations. This report, is an attempt to compile various success stories on artificial recharge Ground water and rainwater harvesting taken up by various organizations / agencies.



ever increasing demand of water for agriculture and rapid growth in urbanization and industrialization, there has been continuous stress on ground water resources. The major part of the area, falling in Western Madhya Pradesh called "Malwa area" is experiencing declining trend of water levels, where ground water development has already reached to semi-critical, critical and over exploited categories. In Madhya Pradesh, there are 19 semi-critical, 5 critical and 24 over exploited blocks, where water level depletion is taken place (Fig. 2). Uncontrolled pumping of ground water from shallow aquifers has caused shortage in water supply and drying up of dug wells which affecting socio-economic conditions of a bulk population of the State. Ground water levels in the phreatic aquifers are noticed declining rapidly and many dug wells are drying up by January and many remains dry throughout the year. As per long-term water level trend analysis (Pre monsoon and post monsoon) for the period between 1997-2006, the districts where high percentage of wells show declining trend (declining > 20 cm/year) during pre monsoon as well as post monsoon periods lies in northern and western parts of the state namely Bhind, Morena, Sheopur, Gwalior, Datia, Shivpuri, Khandwa, Burhanpur, Guna, Rajgarh, Shajapur, Ujjain, Indore

and Barwani, Bhopal, Vidisha and Sehore districts. A total area of 36,335 Sq. Km. shows a declining trend in ground water levels. Maximum decline in ground water was observed in Ratlam, Mandsaur and Neemuch districts. 69 major watersheds have been identified in which declining trend of more than 0.10 m/ year was observed. These watersheds have been identified for construction of suitable artificial recharge structures for augmenting the available ground water resources. Artificial recharge and Rainwater harvesting taken up in some parts of the state in the recent past are showing encouraging results.

Number of Artificial recharge structures, viz. Percolation tanks, Check dams/ Stop dams/ Cement Plugs, De-silting of existing tanks, Recharge shafts, Sub-surface dykes and Gabion structures and also Roof Top Rain Water Harvesting structures etc. were constructed by Central and State Govt. departments, NGO's and Voluntary Organizations / village Panchayats. Artificial recharge studies taken up by CGWB with State Govt. departments, under Central Sector schemes and impact assessment studies were also carried out. A large number of recharge structures were also constructed by various state Govt. organizations with their own funds but their impact could not be established scientifically as the State agencies did not take up such studies. The State Govt., as well as some NGO's undertaken Roof Top Rain Water Harvesting in the State. In Dewas and Jhabua districts, the Roof Top Rain water Harvesting taken up by the NGO's was funded by Ministry of Water Resources. Most of the Artificial recharge and Roof Top Rain Water Harvesting structures in the State were constructed in areas occupied by Deccan Trap basalts.

Artificial Recharge & Roof Top Rain Water Harvesting (RTRWH) taken up Under Central Sector Schemes by CGWB

Details of various artificial recharge structures that were financed by Central Ground Water Board and implemented through various State agencies and results of their impact is also given below.

S.No.	Type of Structures	Location	Expenditure (Rs. Lakhs)	Implementing Agency	Status
1	Sub surface dyke	Bagh Dobhighat, Burhanpur district	1.00	Water Resources Department, Govt. of M.P.	Completed
2	Sub surface dyke	Chintaharan, Burhanpur district	0.925	Water Resources Department, Govt. of M.P.	Completed
3	Sub surface dyke	Barwa Kalan, Rajgarh district	2.0	P H E D	Completed
4	Check Dam, Sub surface dyke, Gabion structure	Londri Nala, Dewas district	3.2	P H E D	Completed

5	Check Dam, Gabion Structure, Sub surface dyke	WALMI campus, Bhopal	2.26	WALMI	Completed
6	Sub surface dyke	Kasrawad, Khargone district	2.38	Water Resources Department, Govt. of M.P.	Completed
7	Percolation Tank	Sikhedi, Mandsaur district	8.27	Water Resources Department, Govt. of M.P.	Completed
8	1000 RTRWH filters	Dewas	6.00	Collector, Dewas	Completed
9	Recharge Shafts	Dewas district	9.15	Water Resources Department, Govt. of M.P.	Completed
10	RTRWH in PHED Colony, Musakhedi	Indore City	6.94	PHED	Completed
11	Check Dams and Gabion Structures	Tumar watershed, Mandsaur district	23.48	Water Resources Department, Govt. of M.P.	Completed
12	RTRWH in District Hospital	Dewas city	3.37	Water Resources Department, Govt. of M.P.	Completed
13	Check Dams, Sub surface dyke, percolation tank, Recharge shaft, Gabion structures, RTRWH	Choti- Kalisindh water shed, Sonkutch and Bagli Blocks, Dewas district	49.06	PHED	Completed
14	Check Dams, Percolation tank, Desilting of existing Tanks/Recharge shaft.	Bel water shed, Amla & Multai blocks, Betul district	99.81	PHED	Completed

1. Artificial Recharge Structures sub surface dykes at Dhobighat and Chintaharan in Utawali Watershed, Burhanpur district, M.P

District : Burhanpur, M. P.

Location :

1. Dhobighat and
2. Chintaharan in Utawali Watershed,

Type of Structures: Sub surface Dykes



Cost: Rs. 1.925 lakhs

Sub Surface Dyke at Chintaharan District Burhanpur

Implementing Agency: Water Resources Department, Govt. of M.P.

Geology : Alluvium and basalt

Impact : To prevent the drainage of alluvial aquifer, subsurface dykes were constructed across the Utawali stream in its downstream section before the contact of alluvium and basalt. The subsurface dykes effectively arrested the base flow from the area and helped in conserving ground water outflow. Due to construction of subsurface dykes, the base flow at Dhobighat has been completely stopped while at Chintaharan the rate of base flow has been reduced by 75%. The ground water level has also registered a rise in the dug wells in the upstream side of the dykes.

2. Artificial Recharge Structures (Sub surface Dykes) in Rajgarh district, M.P

District: Raigarh, M. P.

Location : Barwa Kalan, Ajnar sub basin, Rajgarh district

Type of Structure : Subsurface Dykes

Cost: Rs. 2.0 lakhs

Implementing Agency: Public Health Engineering Department, Govt. of M.P.



Geology : Alluvium and basalt

Subsurface Dykes Barwa Kalan, Ajnar sub basin, Rajgarh district

Description: To arrest the subsurface out flow of ground water to the river Ajnar, in the form of base flow, subsurface dykes were constructed near Barwa Kalan village.

Impact: After the construction of the dykes, water level in the nearby dug wells registered a rise ranging from 0.80 to 3.80 metres. In the hand pumps, the rise was in the range of 6.0 to 12.0 meters. Due to rise in water level and the increased water column, the yield of dug wells showed a marked increase of 50% to 100%. Wells, which were dry by January end, now sustain pumping till April end. The Rabi crop area has increased from 97 to 121 Hectares. The number of irrigation wells, which were only 38, has increased to 102 irrigation wells.

3. Artificial Recharge Structures (Sub surface Dyke, Boulder Check Dam and Gabion structure) in Londri Nala, Dewas district

District : Dewas, M. P.

Location : Londri Nala. Sonkotch Block, Dewas district, M.P

Structures : Subsurface Dyke, Boulder Check Dam and Gabion

Cost: Rs. 3.2 lakhs

Implementing Agency: Public Health Engineering Department, Govt. of M.P

Geology: Alluvium and basalt



Sub Surface Dyke at Londri Nala, District Dewas.

Description : In Londri watershed, heavy base flow was occurring. To conserve this base flow, a subsurface dyke was constructed across the Londri nala. In addition, a boulder checks dam and gabion structure were also constructed.

Impact: Due to these structures, the dug wells have shown a rise of 0.30 to 2.00 meters in water level.

4. Artificial Recharge Structures (Sub surface Dyke, Nala bund, contour trenches) in WALMI farm, Bhopal

District : Bhopal, M. P.
Location : WALMI farm, Bhopal, M.P
Structures : Subsurface Dyke, Nala bund, contour trenches.
Expenditure : Rs. 2.26 lakhs
Implementing Agency: WALMI, Govt. of M.P.
Geology : Basalt

Description : WALMI had constructed a rainwater collection tank, for irrigation purposes, in its farm. However, due to unscientific site selection, water was seeping out from the vesicular basalt, which formed the base of the tank. A subsurface dyke has been constructed at the lower end of the rainwater collection tank to prevent the subsurface outflow of water. In addition, about 460 metres of contour trenches and a sand bag nala bund have been constructed in the catchment area of the rainwater collection tank to increase the inflow.

Impact: Due to the construction of the subsurface dyke, the average rate of water depletion reduced from 10 cm/day to 6 cm/day, the nala bund retained 500 cubic meters of water and recharged the pheratic aquifer.

5. Artificial Recharge Structures (Subsurface dykes) at Choti Kasrawad, Khargone district

District : Khargone
Location : Choti Kasrawad, Khargone district, M.P
Structures : Subsurface Dykes
Cost : Rs. 2.38 lakhs
Implementing Agency: Water Resources Department, Govt. of M.P.
Geology : Basalt

Description: It was observed that ground water seepage as base flow was very high in nalas due to steep gradient. Ground water level in the area was declining very fast after monsoon and ground water availability was also not adequate for irrigation.

Impact: After construction of the sub-surface dykes, the base flow was considerably reduced and as a consequence, rise in ground water level was recorded which ultimately increased the yield of the dug wells located in the vicinity of the dykes.

6. Artificial Recharge Structures (Percolation Tank, Check dams, Cement plug & Gabion structures) in Tumar watershed, Mandsaur district

Location : Tumar Watershed, Mandsaur district, M.P

Structures :
- Sikhedi Percolation tank
- Roopawali check dam
- Kheda check dam
- Afzalpur Cement plug
- Gabion structures (19 nos)

Expenditure : Rs. 23.48 lakhs

Implementing Agency: Water Resources Department, Govt. of M.P.

Geology : Basalt

Impact: To study impact of these structures, water levels were recorded from June, 2000 to 2005, and it was found that Afzalpur observation well has shown a rise in post-monsoon water level of the order of 15 cm / year. Water level trend analysis of observation wells located at village Roopawali reveals that there is a rise in water level in both pre & post –monsoon periods with rising rate 15cm/year and 22 cm/ year respectively. Water level at village Kheda shows a rising trend of 14cm/ year during post-monsoon.

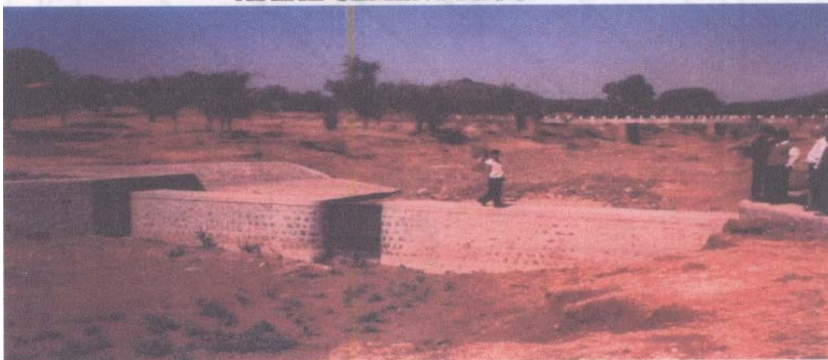
KHEDA CHECK DAM



ROOPAWALI CHECK DAM



AFZAL CEMENT PLUG



Kheda Check Dam, Roopawali Check Dam and
Afjal Cement Plug, District Mandsaur.

7. Roof Top Rain Water Harvesting Studies in Dewas City, Dewas district

Location	:	Dewas City, Dewas district, M.P
Structures	:	One Thousand On-line filters
Expenditure	:	Rs. 6.0 lakhs
Implementing Agency:		Collector, Dewas
Year of completion	;	2000
Geology	:	Basalt

Dewas city, located in the Malwa region of M.P., is one of the highly water scarce area. In the past, water was even brought by special trains. To overcome this situation, a people's movement, 'Bhujal Samvardhan Mission', was launched under the leader ship of the Collector. A low cost filter, for roof top rainwater harvesting, was developed as per CPHEED specifications. CGWB agreed to subsidize the cost of 1000 filters provided that the beneficiaries registered their ground water abstraction structure with CGWA.

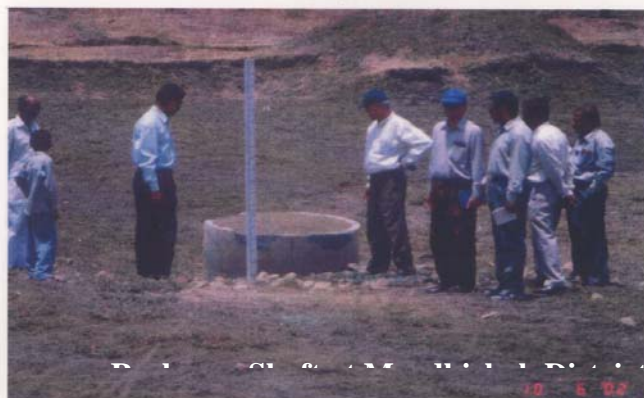
Impact : After the installation of these water filters, there was a marked increase in the discharge of tube wells and an improvement in quality was also noticed.

8. Artificial Recharge Structures (Recharge Shafts) in Dewas district, M.P

Location	:	5 village tanks in Dewas and Tonkkhurd blocks,
District	:	Dewas
Structures	:	Recharge shafts
Expenditure	:	Rs. 9.15 lakhs
Implementing Agency :		Water Resources Department, Govt. of M.P.
Geology	:	Basalt

At some places in Dewas district it was found that dug wells in the vicinity of the village tanks were either dry or had very deep water levels due to heavy siltation. Alternatively, when the tanks were de-silted before the onset of monsoon, no surface storage could be created for longer period of time as these tanks served as good percolation tanks. Hence, it was decided that recharge shafts should be constructed in these tanks keeping the top of the recharge shaft at 50% R.L of the tank so that there should be recharge to ground water as well as storage water for 'Nistar' purposes.

Impact: After the construction of theses recharge shafts, the water levels in the dug wells have show a rise in water levels.



9. Roof Top Rain Water Harvesting in PHED Colony, Musakhedi, Indore city

Location	:	PHED Colony, Musakhedi, Indore city, M.P
Structures	:	Roof Top Rain Water Harvesting
Expenditure	:	Rs. 6.94 lakhs
Implementing Agency:		Public Health Engineering Department, Govt. of M.P.
Geology	:	Basalt

Indore city is highly urbanized and developed with high percentage of paved area resulting in reduction of natural ground water recharge, increase in runoff, decline in water level and decrease in yield of ground water abstraction structures. In PHED colony, Musakhedi, a total roof area of 2710 sq. m was utilized for roof top rain water harvesting. The roof top rainwater was diverted to a recharging well through troughs into collection chambers and then through a filter chamber. A piezometer of 60 m depth was drilled and equipped through DWLR to assess the impact of roof top rainwater harvesting.

Impact: Studies conducted have shown that there is a rise in water level of almost 4 – 5 metres after the monsoon. Dry hand pumps in the Colony have started to yield water.



10. Roof Top Rain Water Harvesting in Dewas district Hospital, Dewas city

Location	:	District Hospital, Dewas district, M.P
Structures	:	Roof top rain Water Harvesting
Expenditure	:	Rs. 3.37 lakhs
Implementing Agency	:	Water Resources Department, Govt. of M.P.
Geology	:	Basalt

The purpose for construction of roof top rainwater harvesting structure was to recharge the ground water and to improve the water quality.

Impact: After the construction of the roof top rainwater harvesting structure, the nitrate content, in the borehole in hospital campus, which was earlier more than 100 mg/l had reduced to less than 45 mg/l.

11. Artificial Recharge Studies (Demonstrative Projects) in Choti Kali Sindh watershed, Sonkutch and Bagli blocks, Dewas district, M.P taken up under Central Sector Schemes. (On going, 2006-08)

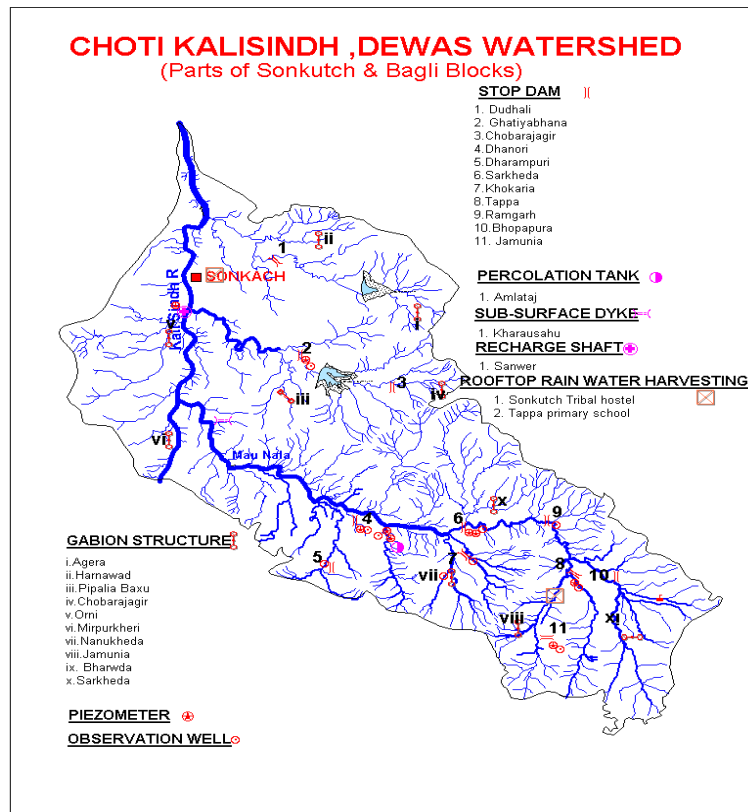
Location	:	Choti Kali Sindh watershed, Sonkutch and Bagli blocks, Dewas district, M.P
Structures	:	Percolation tank (1), Stop dams (11), Recharge shaft (1), Gabion structures (10), Roof top rain water harvesting (2), Subsurface dyke (1)
Sanctioned amount	:	Rs. 49.06 lakhs
Implementing Agency:		Public Health Engineering Department, Govt. of M.P.
Amount of water likely to be harnessed (Estimated)	:	158.24 TCM (in one year)

Choti kalisindh Watershed in Dewas district comprises an area of 294.9 Sq. Km and falls in Survey of India Topo Sheet No. 55A/8 and 55B/1,5, & 9 and is bounded between N Lat. 76°17'04" and 76°32'04"; and E long: 22°43'08" and 23°02'04". The major area of this watershed falls in Sonkutch block and some parts of western Tonkkhurd block and northern part of Bagli block. The area exhibits broad, flat shallow valleys with lateral erosion. Kali sind river drains the area. The average annual rainfall is 1021 mm. Deccan Trap basalts occupy the area. Long-term water level study reveals a declining trend ranging between 0.40 and 0.60-m/ year. A total 127 number of villages located in the area are declared "Water Scarcity villages" by the state PHED (Fig 8).

On the basis of field survey and local conditions, 26 Sites for artificial recharge structures and 15 sites for Piezometers (For monitoring water levels) were selected in consultation with implementing agency, PHED, Dewas as follows:

- Stop dam (Masonry) –6
- Stop dam (Masonry Weir) –5
- 3. Gabion structure –10
- 4. Percolation tank-01
- 5. Sub-surface dyke – 01
- 6. Recharge shaft – 01
- 7. Roof top rain water harvesting – 02
- Piezometers – 15

Impact: All the structures were constructed and at present impact assessment studies are going on. Initial observations indicate that hand pumps, which were dried up, have started yielding and water levels in Piezometers and key observation wells are showing rising trend ranging between 5.00 and 12.00 m in pre monsoon period (2007, pre monsoon to 2008, pre monsoon).



Drainage system of Chhotikali Sindh watershed with locations of artificial recharge structures.