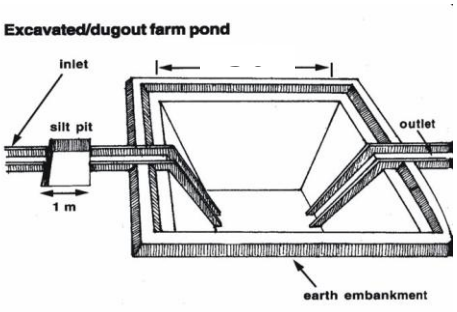
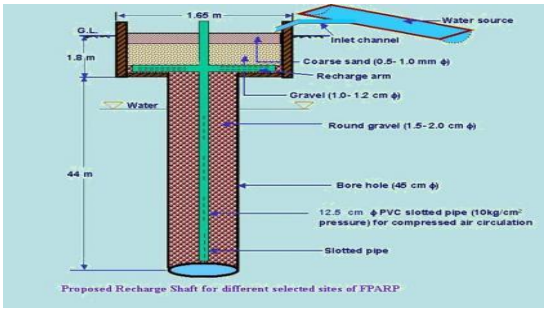
CENTRAL GROUND WATER BOARD

MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF SINDHARI BLOCK, DISTRICT BARMER, RAJASTHAN

Western Region, Jaipur
December 2016

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF SINDHARI BLOCK, DISTRICT BARMER

Plan at a Glance

1.	**Area of the Sindhari Block**	**3115.73 sq.km.**
2.	**Area identified for Artificial Recharge**	**1078.13 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**43.61 MCM**
	Annual Ground Water Draft	**41.62 MCM**
	Stage of Ground Water Development	**95.44%**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**1.612 MCM** **1.222 MCM** **--**
5.	**Volume of unsaturated aquifer zone available for recharge**	**2357.37 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**36 shafts in 36 Nos. of existing village ponds** **--** **300 ha**
	Expected Annual GW recharge	**0.98 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24 MCM**
	Total recharge/ saving of ground water	**1.22 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**3.623 crore** 1.80 crore 1.50 crore 0.15 crore 0.173 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF SINDHARI BLOCK, DISTRICT BARMER

Introduction

The **Sindhari Block, district Barmer** is one of the critical blocks of Rajasthan and provides favourable conditions for artificial recharge, with stage of ground water development of 95.44 %. 1078.13 sq. km. area is potential zone area and thus feasible for artificial recharge.

Location of the block

The Sindhari Block of Barmer District covering an area of 3115.73 Sq. Km. falls in central-eastern part of Barmer District and is located between North latitudes 25°14' & 25°52' and East longitudes 71°24' & 72°11'.

Surface Water Availability

As per the studies carried out by Water Resources Department (WRD), Government of Rajasthan there is very little surplus water available for further development at 75% dependability. Based on the data made available from GWD, the surplus runoff available at 75% dependability level has been worked out for the zones as part of watershed within the block. The nature of aquifer (Alluvium/ Hard rock) is also considered while computing the number of Artificial Recharge structures feasible.

Accordingly about 1.612 MCM has been considered for recharge plan in the block. Optimum utilization of rainwater runoff depends on availability of land, feasible conditions, etc. Volume of Aquifer available for Artificial Recharge is given in **Table.1**

Supply Side Management

Feasible Artificial Recharge and Water Conservation Structures

About 0.035 mcm/year surplus has been considered for each recharge shaft and 0.2 mcm/year for percolation tank wherever feasible. The areas with shallow water level (<5m) have not been considered for construction of Artificial Recharge Structures

The number of Recharge Shaft is decided based on the number of suitable ponds available within the zone. If still some surplus remained unallocated, than few Percolation tanks are proposed at suitable locations. However, in some of the blocks entire available surplus cannot be utilized due to non availability of ponds for Recharge shaft or suitable location for Percolation tanks. Zone wise number of Recharge Structures proposed to be constructed is given in **Table 2**.

Table 1: Volume of Aquifer available for artificial recharge

District	Block	Area of Block (Sq.km.)	Potential area suitable for recharge (Sq.km.)	Type of Aquifer	Area feasible for artificial recharge (Sq km)	Sp Yield	Average DTW (mbgl) NOV 2013	Thickness of unsaturated zone 3 m below ground level (m)	Volume of sub surface storage space available for artificial recharge (MCM)
Barmer	Sindhari	3115.7	1078.13	Al	357.81	0.1	32.84	29.84	1067.71
				Old-Al	720.32	0.06	32.84	29.84	1289.66

Table 2: Number of recharge structure

ZoneCode	Sub_ Basin	Type of Aquifer	Zone-Area (sq. km.)	Total Surplus (mcm)	Water Level >5m	Feasible_ RS_Prop	Feasible_ PT_Prop
Luni_Luni_065_RJ0505_AL	Luni	SR	383.712	0.058	Y	2	0
Luni_Luni_068_RJ0505_AL	Luni	SR	164.657	0.301	Y	9	0
Luni_Luni_069_RJ0505_AL	Luni	SR	183.259	0.022	Y	1	0
Luni_Luni_070_RJ0505_AL	Luni	SR	129.281	0.106	Y	1	0
Luni_Luni_071_RJ0505_AL	Luni	SR	336.188	0.197	Y	1	0
Luni_Luni_072_RJ0505_AL	Luni	SR	34.321	0.013	Y	0	0
Luni_Luni_073_RJ0505_AL	Luni	SR	422.097	0.149	N	1	0
Luni_Luni_074_RJ0505_AL	Luni	SR	0.160	0.000	Y	0	0
Luni_Luni_075_RJ0505_AL	Luni	SR	84.235	0.023	Y	0	0
Luni_Luni_077_RJ0505_AL	Luni	SR	1247.061	0.742	Y	21	0
				1.612		**36**	**0**

Recharge Shaft

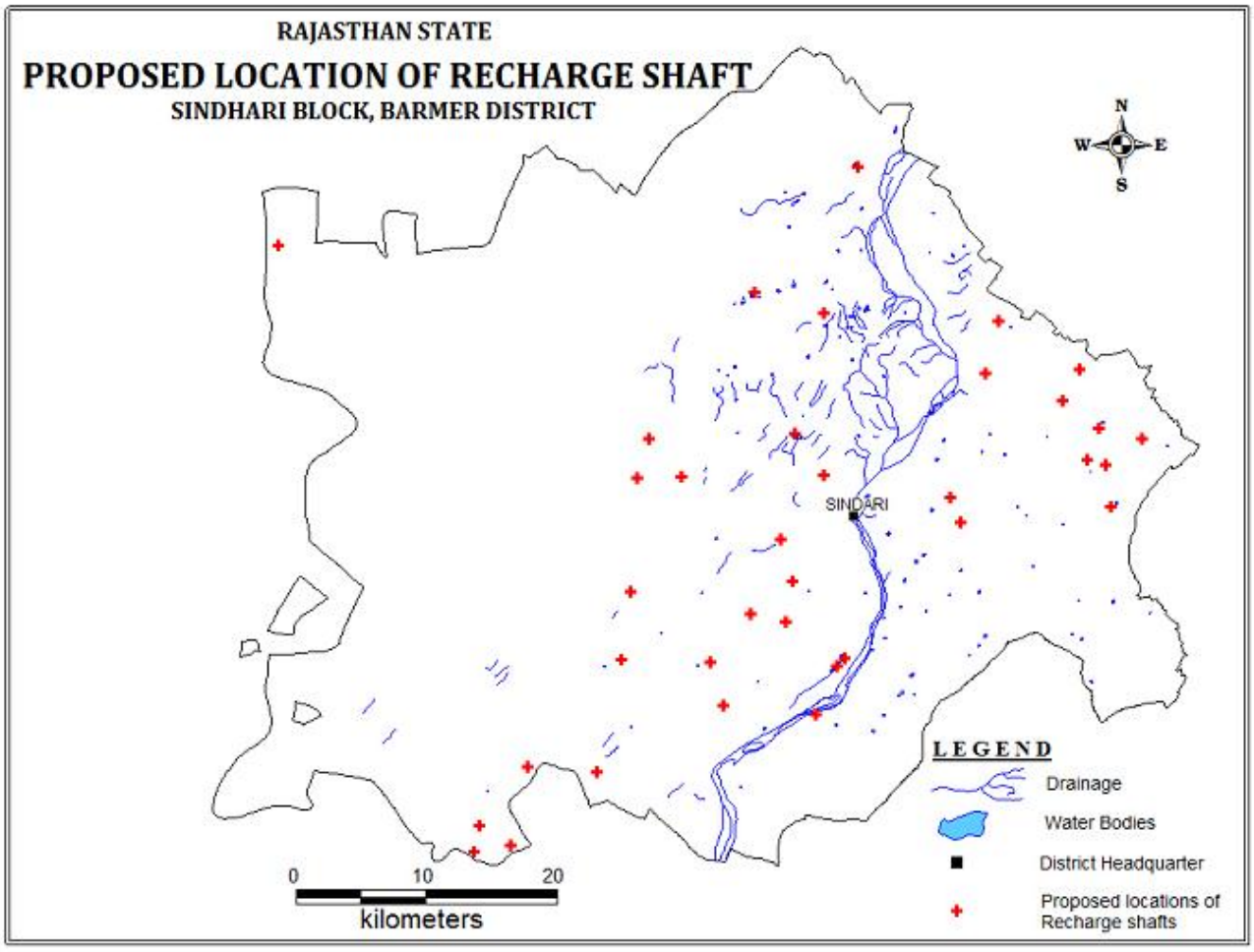
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 1 and Table 3.

Table 3: Tentative locations of village for village pond with recharge shaft

S.No.	Village	Long	Lat	Watershed	No of Shafts	Unit cost (Rs in lac)	Total cost (Rs in lac)
1	Somesara Naya	71.911	25.800	Luni_Luni_065_RJ0505_AL	1	5	5
2	Sodhon Ki Dhani	71.835	25.712	Luni_Luni_065_RJ0505_AL	1	5	5
3	Dakhan	72.110	25.569	Luni_Luni_068_RJ0505_AL	1	5	5
4	Chodhariyon Ki Dhani	72.105	25.598	Luni_Luni_068_RJ0505_AL	1	5	5
5	Dakhan	72.092	25.602	Luni_Luni_068_RJ0505_AL	1	5	5
6	Chodhariyon Ki Dhani	72.133	25.617	Luni_Luni_068_RJ0505_AL	1	5	5
7	Uchiya	72.101	25.624	Luni_Luni_068_RJ0505_AL	1	5	5
8	Dakhan	72.072	25.642	Luni_Luni_068_RJ0505_AL	1	5	5
9	Dakhan	72.085	25.664	Luni_Luni_068_RJ0505_AL	1	5	5
10	Bhooka Bhagatsingh	72.012	25.660	Luni_Luni_068_RJ0505_AL	1	5	5
11	Bhooka Thansingh	72.021	25.696	Luni_Luni_068_RJ0505_AL	1	5	5
12	Dandali	71.887	25.699	Luni_Luni_069_RJ0505_AL	1	5	5
13	Bakaniyon Ka Was	71.469	25.736	Luni_Luni_070_RJ0505_AL	1	5	5
14	Nehron Ki Dhani	71.739	25.456	Luni_Luni_071_RJ0505_AL	1	5	5
15	Nehron Ki Dhani	71.723	25.378	Luni_Luni_073_RJ0505_AL	1	5	5
16	Chootoo	71.631	25.320	Luni_Luni_077_RJ0505_AL	1	5	5
17	Adel Panji	71.670	25.380	Luni_Luni_077_RJ0505_AL	1	5	5
18	Khoobri Beri	71.659	25.325	Luni_Luni_077_RJ0505_AL	1	5	5
19	Chootoo	71.634	25.338	Luni_Luni_077_RJ0505_AL	1	5	5
20	Panyla Khurd	71.818	25.425	Luni_Luni_077_RJ0505_AL	1	5	5
21	Neembali	71.808	25.455	Luni_Luni_077_RJ0505_AL	1	5	5
22	Dangawa	71.889	25.421	Luni_Luni_077_RJ0505_AL	1	5	5
23	Bamni	71.988	25.573	Luni_Luni_077_RJ0505_AL	1	5	5
24	Bamni	71.996	25.556	Luni_Luni_077_RJ0505_AL	1	5	5
25	Kamthai	71.868	25.615	Luni_Luni_077_RJ0505_AL	1	5	5
26	Sindari @ Ber	71.890	25.586	Luni_Luni_077_RJ0505_AL	1	5	5
27	Ed Sindari	71.859	25.541	Luni_Luni_077_RJ0505_AL	1	5	5
28	Samdaron Ka Tala	71.782	25.583	Luni_Luni_077_RJ0505_AL	1	5	5
29	Jogasar	71.748	25.582	Luni_Luni_077_RJ0505_AL	1	5	5
30	Sarnoo Bhimji	71.756	25.609	Luni_Luni_077_RJ0505_AL	1	5	5
31	Neembali	71.869	25.512	Luni_Luni_077_RJ0505_AL	1	5	5
32	Meethiyawas	71.745	25.503	Luni_Luni_077_RJ0505_AL	1	5	5
33	Neembali	71.865	25.484	Luni_Luni_077_RJ0505_AL	1	5	5
34	Dangawa	71.909	25.460	Luni_Luni_077_RJ0505_AL	1	5	5
35	Dangawa	71.904	25.455	Luni_Luni_077_RJ0505_AL	1	5	5
36	Neembali	71.838	25.489	Luni_Luni_077_RJ0505_AL	1	5	5
				Total	**36**		**180**

Fig: 1: Tentative location of Recharge Shaft



Demand Side Management

Efficient Irrigation:

In Flood/ furrow irrigation method more than 50% of applied water is wasted through seepage to deeper levels, local inundation causes loss through evaporation and it leaches out the nutrients from the plants. While through drip and sprinkler irrigation method, wastage through irrigation loses could be minimized. Ground water usage can be minimized drastically by using HDPE pipes. Initially the scheme can be proposed to be started in 300 ha area, which is worst affected showing deepest water level and declining trends. The area is to be finalized based on land holdings, willingness of farmers and No Objection certificate from the land owner.

Impact Assessment and Monitoring

Assessment of impact of the artificial recharge schemes implemented is essential to assess the efficacy of structures constructed. It helps in identification of cost-effective recharge mechanisms for optimal recharge into the ground water system. It also helps to make necessary modifications in site selection, design and construction of structures in future.
It is proposed to construct 25 piezometers, at suitable locations for monitoring of water levels, in the vicinity of proposed recharge structure.

Revival, Repair of Water Bodies

The existing ponds and tanks with time loose their storage capacity as well as the natural ground water recharge through these water bodies has also become negligible due to siltation and encroachment by farmers for agriculture purposes. There are several such villages where ponds/ tanks are in dilapidated condition. These existing village tanks, which are normally silted and damaged, can be modified to serve as recharge structure in case these are suitably located to serve as percolation tanks. Through desilting, coupled with providing proper waste weir, the village tanks can be converted into recharge structure.

Financial Outlay of the Plan

The total estimated cost of the Plan is Rs. 3.623 cr. The tentative cost estimates of the various activities of the Plan are shown in Table 4 & 5. The unit rates are as followed by the Govt. of Rajasthan (BSR).

Table 4: Cost of the recharge structures

Cost Recharge Shaft Rs in crs (Unit cost Rs 0.05 cr for alluvium and Rs 0.026 cr for hard rock)	Cost of Percolation Tank in Rs in crs (Unit cost Rs 0.4 cr)	Cost of Sprinkler irrigation in Rs (Unit cost 0.005 cr/ha)
Soft rock – 1.80	-	1.50

Table 5: Tentative cost of different activities

Feasible Artificial Recharge & Water Conservation structures/ activities	Tentative Design	Quantity (in nos. or area in ha)	Rainwater harvested (mcm) or No. of sprinklers (/ha)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs lakh)	Expected Annual GW recharge/ conservation (mcm) @ 0.8 mcm/structure
Recharge Structures/ Activities						
Recharge shaft within the pond /tanks	Alluvium – Depth 80m, Dia: 10-12" with filter pit	36	1.222	5	180	0.98
	Hard rock: Depth –60m, Dia 10-12"with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	-	-	-	-	-
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**330**	**1.22**
Impact assessment & Monitoring						
Piezometer	50 – 80 m	25		0.6	15	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					17.25	
TOTAL					**362.25**	**1.22**

Note: Type, number and cost of structure may vary according to site after ground verification