एनटीपीसी
NTPC
A Maharatna Company

Rain Water Harvesting Policy

2018

Contents

1.0 Preamble

Fresh water is turning out to be an increasingly valuable and scarce resource as its demand-supply gap keeps rising at an incredible pace. The availability of both ground and surface water is becoming increasingly difficult owing to the heavy usage for agricultural, industrial and domestic purposes. The recent years have seen a fast changing regulatory landscape with increasingly stricter regulations on the industrial water consumption. This is an increasing risk to the organisations requiring water as their major input. As a frontrunner in the power industry, NTPC owes the responsibility to tackle this issue of water availability by reducing its consumption, thus setting new industry benchmarks on one hand and exploring alternate methods to ensure long term water security. Water Policy 2017 had been formulated to give direction to such efforts.

Rain water harvesting (RWH) is a way of collecting and storing rain water either for reuse or for ground water recharge. It possesses tremendous potential to reduce fresh water consumption and act as a reliable secondary source of water. NTPC shall prioritise surface water storage and reuse over ground water recharge*, because

a) Surface storage and reuse is more useful. Ground water recharge is a slow process and majority of water recharged done is not available for intended use subsequently;

b) It will lead to reduction of burden on other water bodies such as rivers, lakes and ground water sources; indirectly contributing to water table improvement;

To strengthen its water conservation initiatives, NTPC has developed Rain Water Harvesting Policy 2018 which would act as the major guiding document for rain water harvesting. This policy is integral to NTPC Water Policy 2017 and shall be considered as its extension. Considering the importance of water as a shared resource, this policy can be further used as a reference for the various water conservation initiatives taken up by NTPC under CSR/ SD projects.

2.0 Objective

To promote the installation and periodic upkeep of Rain Water Harvesting system in locations of and near to NTPC establishments.

3.0 Applicability & Scope

This policy is applicable to

3.1 All the establishments of NTPC thus including projects, stations, administrative offices, residential townships and guest houses;

3.2 Locations with and without existing rain water harvesting system;

**Artificial Groundwater Recharge systems to be installed in the places where it has been mandated by regulations/ CTOs/ local laws.*

** In case of any conflict of this policy with regulatory and legal compliances, the latter shall prevail.*

4.0 Principles

This Policy is guided by following principles:

4.1 Rain water harvesting (RWH) system, though functional only for a brief duration in a year, is useful as a secondary source of water;

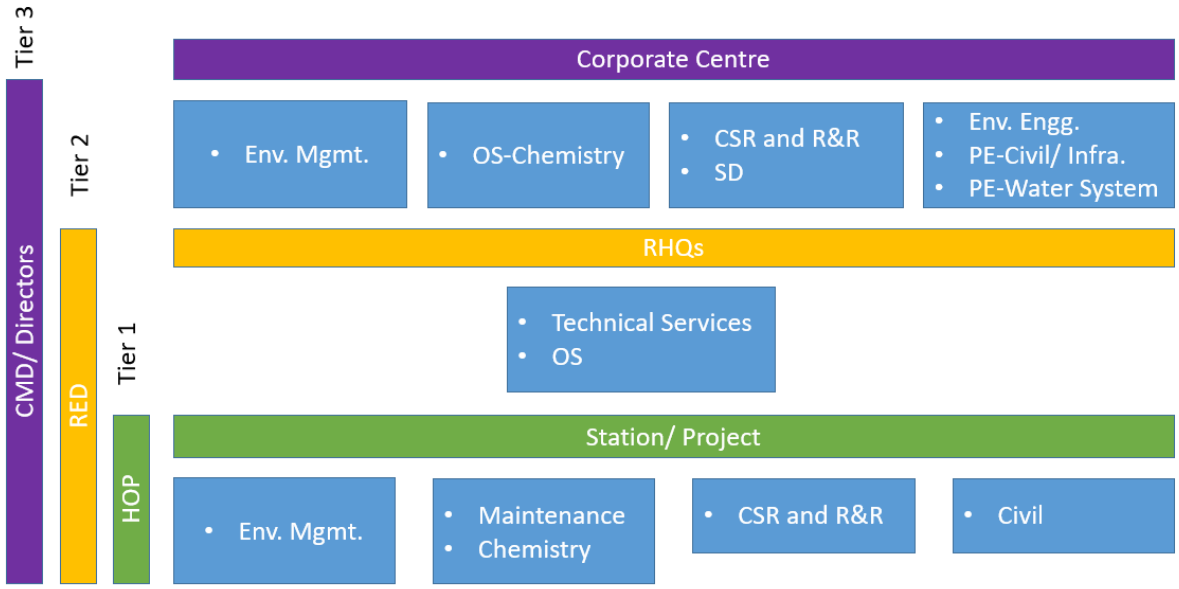
4.2 Adoption of right combination of superior state-of-the-art technologies and global best practices shall increase the quantity and quality of harvested rainwater;

4.3 Provision of accountability for all locations and mechanism to respond to any aberration from the policy objectives shall yield superior results;

4.4 Promotion of RWH through inclusiveness, capacity building and regular knowledge sharing with concerned stakeholders shall result in capturing of increased quantity of rainfall that would have gone unused otherwise;

5.0 Institutional Framework

The three tier organisation structure as illustrated below, indicates the shared responsibility of various departments to plan, develop, operate and maintain the rain water harvesting systems.



6.0 Elements of RWH

A RWH system typically consists of following three elements:

a) Collection system or catchment area
b) Conveyance system and
c) Storage/ recharge system with the provision of treatment system, if required

We have to design our system to capture and store all possible rainfall by covering maximum possible catchment areas with optimum storage capacity through extensive networks of conveyance or storm drains.

6.1 Catchment Areas

6.1.1 It is the first point of contact of rainfall where surface water from rain gets collected, drains towards the common outlet and joins storage tanks, recharge pits, reservoirs etc.

6.1.2 Potential catchment areas for NTPC business units have been tabulated below

S. No.	Unit	Catchment Area
1	Stations/ Projects	Administrative Block 1. Roof top of all buildings including canteen, parking shed etc. 2. Lawns/ Gardens Plant Area 3. Roof top of TG floor, Boiler, ESP, Pump house, Stores shed etc. 4. CHP and Ash pond area 5. Open area Townships 6. Roof top of all houses/ flats, schools, shopping centres, Hospitals etc. 7. Roads/ Pavement 8. Lawns/ Gardens/ Vacant Land
2	RHQs	1. Roof top of all buildings including canteen, parking shed 2. Lawns/ Gardens
3	Corporate offices	1. Roof top of all buildings including canteen, parking shed etc. 2. Lawns/ Gardens

6.1.3 Depending on the pollution levels of different catchment areas and quality of collected rainwater, its subsequent use shall vary as illustrated as below:

6.1.3.1 Medium to good quality

Catchment A: Rooftop area

The quality of water is quite good and can be used to store locally to meet the washing and flushing requirements of concerned building. Buildings with existing dual plumbing system can integrate this easily.

Excess water can be diverted to ground water recharge with overflow connected to storm water drains to feed into raw water reservoir in plants and/ or to natural drains elsewhere.

Catchment B: Hard paved area (Roads)

The quality of water collected from this catchment may be a little inferior to that of catchment A, but better than catchment C. This can be fed into raw water reservoir directly.

Catchment C: Landscape/ vacant land area

This category includes storm water from lawns, gardens and open areas in the stations/ projects. Water collected from these areas contain soil, debris etc. and may need primary level filtration before releasing it into the reservoir.

6.1.3.2 Poor quality

Catchment D: Areas near to coal and ash handling facilities

Surface runoff from the areas near to Coal handling facilities and railway siding areas may be contaminated with coal particles. Similarly, areas near to Ash handling facilities will contaminate the storm runoff with ash. The storm water collected from these areas shall be stored and used locally instead of connecting it to storm water drains.

Catchment E: Areas with possibility of oil contaminations

Rain water collected from areas near to transformers, waste oil storage, drainage near machines etc. should not be connected to storm water drains. They may be connected to ETP drains instead of storm water drains or first treated before connecting it to storm water drains.

Rain water collected from rooftop, paved or ground run-off near hospitals, health centres etc., dealing with Bio-medical waste, shall be designed with utmost safety and hygiene.

6.2 Conveyance through separate storm water drain

As envisaged in the ZLD guideline, all NTPC stations/ projects have to create a separate drain system to capture the storm water mainly from the rainfall in the catchment A, B and C. It has to be ensured that the sewage water or industrial waste water does not seep into storm water drain resulting into contamination of storm water.

Intermediate retention pits may be required to be created depending on the topography of the area to hold the storm water and then further pump it to next elevated area. Finally, all the storm water would be diverted to the final holding pond either through gravity or pumping. This water can be further treated with some basic filtering mechanism to be finally released into raw water reservoir. Widened and deepened channel with provision of pumping and other necessary arrangements will be part of holding pond arrangements. Overflow from holding pond will be diverted to natural drains connecting the nearby river bodies such as lakes, rivers etc. The flow diagram for RWH from above described catchment areas has been placed at Annexure 1.

6.3 Surface storage

As mentioned above, the collected rain water shall be finally released into raw water reservoir for surface storage, the same shall be facilitated through creation of holding ponds, pump houses and network of pipes according to the need of specific locations.

6.3.1 Plant Locations

As rainfall pattern varies from location to location owing to the varied topography, different strategies for water storage have to be adopted for different areas. The different NTPC locations along with their average annual rainfall and water data has been tabulated in Annexure 2. The different establishments have been further classified into the following zones depending on the average annual rainfall data.

Zone A: High rainfall area with rainfall more than 1000 mm

Rainfall in this area can be a reliable source of water throughout the year. Hence, the focus should be on storing water in the existing raw water reservoir with modifications or through creation of additional storage. The stored water will be used in plant processes with minimum intake from outside sources.

Zone B: Medium rainfall area with rainfall between 500 mm to 1000 mm

These areas will capture less rainfall compared to zone A areas and hence existing reservoir can be modified to the extent which will be able to capture the average rainfall. Additional storage may be created in cases where enough water can be stored for a substantial period of time with good amount of use.

Zone C: Low rainfall area with rainfall less than 500 mm

These areas will capture less rainfall compared to zone A and zone B and existing reservoir would be able to store the rain water, if any.

In all of the above cases, rainfall captured in residential colonies may be diverted to plant for storage and reuse. Also, additional storage may be preferably created in lowest elevation area subjected to the availability of space. There shall be a provision of channelling out the excess water beyond storing capacity to outside (natural catchments of nearby river, lakes etc.) to avoid flooding.

6.3.2 Office Locations

NTPC owned buildings located pan India including corporate centres, RHQs etc. may install rain water harvesting system in the available space through either overhead or underground storage for meeting their daily water requirement especially in rainy season. Also, the catchment area available would be mainly rooftop area and as this water is quite pure, it can be stored and filtered for domestic usage. The sizing of storage structure shall be done on the basis of water demand, average annual rainfall, number of rainy days etc.

6.4 Ground Water Recharge

Ground water recharge incorporates many factors such as topography, hydro-geology, water table, quality of water etc. There is no benefit of creating artificial ground water recharge system if water table is already high or soil permeability is very less in the concerned area. Central Ground Water Board/State Ground Water Board may be consulted for proper scheme wherever it is mandatory under conditions of Environmental Clearance/Consents.

6.4.1 Plant Locations

There is some possibility of contamination from surface and air pollutants, typical to a coal fired power station, to ground water recharge system. Also, water table may be estimated to be good in high rain fall areas (zone A and B areas). Hence, ground water recharge shall not be preferred over surface storage and reuse in NTPC plant premises. But the same can be implemented in solar and wind power plants, all townships and community areas (as part of CSR/SD) provided it meets other criteria.

6.4.2 Office Locations

NTPC owned buildings located pan India may consider artificial ground water recharge only or in combination with surface storage and reuse, whichever is suitable to the concerned locations.

7.0 Quality Monitoring Systems

Proper quality monitoring system has to be created to regularly check the quality of collected storm water into the holding pond before it is finally released into raw water reservoir. The quality checks shall be done by Chemistry department in plants and by competent authority/ professionals in other locations.

8.0 Measurement

The rain water harvesting potential of an area can be estimated through the following formula:

Water captured (L) = Catchment area (m^2) X annual average rainfall (mm) X run-off coefficient

Surface run-off coefficient is a dimensionless parameter and related to the amount of runoff to the amount of precipitation received. The surface run-off coefficient for different types of possible catchment within NTPC are tabulated in Annexure 3.

9.0 Maintenance of RWH system

Periodic maintenance of rain water harvesting system is mandatory to ensure its functionality resulting into availability of good collected rain water both in terms of quality and quantity.

9.1 Catchment

Before the onset of rainy season all the catchment areas A, B & C including the roof of all buildings, roads, vacant lands need to be cleaned thoroughly to remove debris, twigs, plant/tree residues, plastic etc.

9.2 Conveyance system of pipes and drains

All pipes/ joints need to checked for any leakages. Storm water drains to be cleaned and freed of silt, sludge, debris etc. to avoid any possibility of obstruction in flow. All drains need to covered with the provision of storm water entrance, to prevent the contamination and any safety hazard.

9.3 Pumps and electrical systems

Timely maintenance of various pumps, auto-on/off switches, earthing system etc. to be checked and ensured.

9.4 Storage and filtering

All the storage areas need to be cleaned for sludge etc. In case of presence of a filter unit, it has to be regularly cleaned and washed or replaced.

9.5 Recharge systems

If there is any recharge system in plants, townships, RHQs, corporate offices, the same has to maintained by removing the silt deposited at the bottom of structure.

10.0 Budget

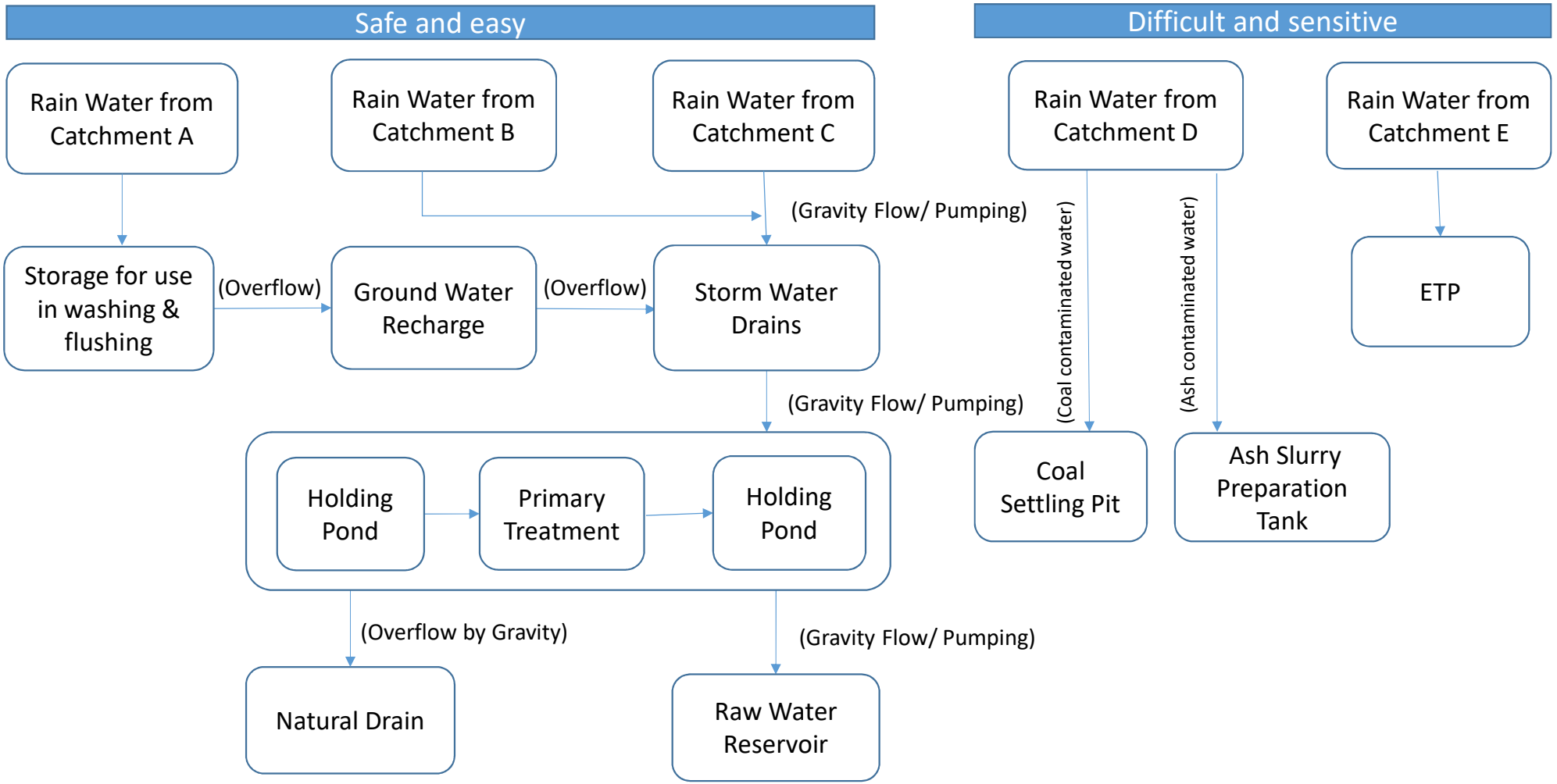
Suitable budget may be allocated for installation and renovation of RWH system at NTPC locations. RWH projects under CSR/ SD will be funded by CSR/SD funds.

11.0 Review

11.1 The review of effectiveness of a rainwater harvesting systems in all NTPC locations shall be done during water audit annually.

11.2 This policy shall be reviewed at opportune time, but not later than once in three years.

Annexure 1: Flow Diagram of RWH System



Annexure 2: Rainfall and Groundwater level details

Groundwater level (m)

S/N	Station	District/ State	PREMONSOON	MONSOON	POST MONSOON KHARIF	POST MONSOON RABI
1	Dadri (Bisrakh)	GAUTAM BUDDHA NAGAR	28.61	28.61	29.05	27.18
2	Faridabad	FARIDABAD	17.9	--	18.35	--
3	Jhajjar	JHAJJAR	4.14	3.26	--	3.71
4	Anta	BARAN	5.73	6.87	--	3.54
5	Jhanor	BHARUCH	2.08	3.2	--	2.01
6	Kawas	SURAT	5.74	4.87	--	5.56
7	Solapur	SHOLAPUR	11.66	8.43	--	4.05
8	Mouda	NAGPUR	9.79	4.25	6.05	6.65
9	Sipat	BILASPUR	2.12	0.7	--	1.41
10	Korba	KORBA	6.5	1.43	--	5.65
11	Lara	RAIGARH	2.37	1.5	--	1.85
12	Simhadri	VISHAKHAPATNAM	7.16	4.37	--	3.53
13	Ramagundam	KARIMNAGAR	5.15	4.55	--	3.88
14	Vellure	TIRUVALLUR	6.05	3.8	0.71	2.85
15	Kayakulam	ALAPUZHA	1.5	1.05	1.14	1.26
16	Tanda	AMBEDKAR NAGAR	6.32	--	--	6.69
17	Auriya	AURAIYA	7.4	1.78	--	6.76
18	Singrauli	SONBHADRA	7.63	3.79	--	5.13
19	Vindhyachal	SINGRAULI				
20	Rihand	SONBHADRA	7.8	3	5.45	--
21	Unhahaar	RAE BAREILLY	7.2	4.25	--	4.45
22	Barh	PATNA	4.3	0.63	--	5.81
23	Kahalgaon	BHAGALPUR	12.5	3.03	--	3.62
24	Meja	ALLAHABAD	5.86	3.01	--	4.78
25	Talcher-Th	ANGUL	9.45	9.4	--	10.3
26	Talcher-K	ANGUL	9.45	9.4	--	11.3
27	Bongaigaon	BONGAIGAON	--	1.78	2.75	2.34
28	Farakka	MURSHIDABAD	6.58	2.95	--	5.63

* Data taken from reports of Ground Water Board

Rainfall (mm)							
S/N	Station	District/ State	WINTER	Pre-monsoon	Monsoon	Post Monsoon	Annual
1	Dadri	GAUTAM BUDDHA NAGAR	0	4	313	13	330
2	Faridabad	FARIDABAD	0	54.3	628	20	702.3
3	Jhajjar	JHAJJAR	0	34.6	437.4	0.3	472.4
4	Anta	BARAN	4.8	8.1	1161.1	33.6	1207.6
5	Jhanor	BHARUCH	0	1.6	414	66.4	482.1
6	Kawas	SURAT	0	1.9	977.1	114.3	1093.3
7	Solapur	SHOLAPUR	0.7	19.2	514	75.2	609.1
8	Mouda	NAGPUR	17.8	26.3	795.6	68.3	908
9	Sipat	BILASPUR	24.4	131.8	911	59.5	1126.6
10	Korba	KORBA	30.5	49.4	1208.2	26.7	1314.8
11	Lara	RAIGARH	10.3	8.5	1189.1	44.5	1252.3
12	Simhadri	VISHAKHAPATNAM	4.1	182	829.4	103.8	1119.2
13	Ramagundam	KARIMNAGAR	0.3	99.2	1016.1	89.8	1205.4
14	Vellure	TIRUVALLUR	1.2	158.6	406.8	247.8	814.3
15	Kayakulam	ALAPUZHA	62	366.2	1134.7	208.4	1771.2
16	Tanda	AMBEDKAR NAGAR	8	73	712	5	798
17	Auriya	AURAIYA	7	14	398.1	27.2	446.3
18	Singrauli	SONBHADRA	21.1	44.4	1319.6	34	1419.2
19	Vindhyachal	SINGRAULI	21.7	17	1156.6	103	1298.3
20	Rihand	SONBHADRA	21.1	44.4	1319.6	34	1419.2
21	Unhahaar	RAE BAREILLY	2.7	19.7	481.3	18.7	522.4
22	Barh	PATNA	2.6	82.6	859.6	52.3	997.1
23	Kahalgaon	BHAGALPUR	24.5	100.7	857.3	27.1	1009.5
24	Meja	ALLAHABAD	10.4	28.4	842.4	29.4	910.5
25	Talcher-Th	ANGUL	25.2	75.1	929	96.1	1125.3
26	Talcher-K	ANGUL	25.2	75.1	929	96.1	1125.3
27	Bongaigaon	BONGAIGAON	7	833.8	1858.1	106.2	2805.1
28	Farakka	MURSHIDABAD	48.5	120	820.4	57.3	1046.2

* Data taken from reports of India Meteorological Department

Annexure 3: Run-off Coefficient

Run-off coefficient for different types of catchment

Catchment	Type of material	Run-off coefficient
Roof	Tiles	0.8-0.9
	Metal	0.7-0.9
Paved area Driveway/ courtyard, roads	Concrete	0.6-0.8
	Brick	0.5-0.6
Unpaved area garden, playground	10 % sand	0.0-0.3
	Hard compact	0.2-0.5
	Lawns	0.1

Source: Pacey, Arnold and Cullis 1989, Rainwater harvesting, the collection of rainfall and run-off in rural India, Intermediate Technology Publications