
Success Stories of Roof Top Rain Water Harvesting in North Eastern States

North Eastern region, though endowed with high rainfall, suffers from water shortage during the dry months particularly in hilly areas and urban areas. Rainwater is considered to be a viable means to augment the water supply for domestic water needs. Considering this, roof top rainwater harvesting was taken in North-Eastern Region under Central Sector Scheme during IX Plan in Assam, Arunachal Pradesh, Meghalaya, Mizoram and Nagaland and under Fresh Water Year 2003 in Assam.

Methodology and Design

Rain Water Harvesting is a technique of collection and storage of rain water in surface or in sub-surface aquifer before it is lost as surface run-off. The augmented resource is used in the time of need.

The methodology in harvesting rainwater from rooftop involves collection of rainwater from the roof through properly designed semi-circular gutters. The design and storage are decided based on the water to be harvested from the rainfall. The storage capacity has been decided on the daily requirement basis. The catchment area for the rooftop is taken as the plan area of the roof.

Estimation of the water available from roof top rain water harvesting is based on the catchment's area of the roof top considering. It requires a provision for flushing arrangement for the first showers to drain out the accumulated unwanted materials from roof top such dried and fallen leaves, bird's drop, etc.

From the roof top, water is collected through semi-circular gutters fitted along the edge of the sloping roof. Water from these semi-circular gutters are channelized through down flow pipes to storage tanks kept at the ground/underground. The gutters are fitted in such a way that the slope is maintained towards the storage tank. A bigger diameter of the semi-circular gutter is preferred as it will have a higher carrying capacity and will not overflow during heavy rain.

Excess water may be routed to augment ground water resource. This may be achieved by diverting the excess water to abandoned dug wells or into a recharge pit. The size (or diameter) of the semi-circular gutters depends on the roof top/catchment area and the rain fall intensity. The number of structures constructed state-wise is depicted Table 1.

Table 1 State wise Rooftop Rainwater Harvesting Structures

State	Scheme		Total structures	Cost (in lakhs)
	Central Sector Scheme	Fresh Water Year 2003		
Assam	12	1	13	23.22
Nagaland	42		42	116.43
Arunachal Pradesh	5		5	20.0
Meghalaya	6		6	20.32
Mizoram	35		35	28.0
Total	100		101	207.97

Arunachal Pradesh:

Arunachal Pradesh is occupied mostly by hills (about 85% of the total geographical area) and 15% valley areas. Though it is heavily rain fed area, acute water scarcity is felt during lean period. To augment during lean period Roof Top Rain Water harvesting Scheme was selected the Ruksin Sub division of East Siang district. The details of schemes are given below.

Table 2 Rooftop Rainwater Harvesting Structures constructed in Arunachal Pradesh

Sl. No.	Scheme	Total fund allocated (Lakhs)	Implementing Agency	Status of work	Impact Assessment
1.	Roof Top Rain Water harvesting in Ruksin Sub division in East Siang district	20	IFCD Govt. of Arunachal Pradesh	5 structures completed	Water Tank capacity of each structure is 30,000 ltrs Total 170 persons are benefited through 5 schemes.

Assam:

Under, Central Sector Scheme during IXth Plan, a total of 12 structures was constructed in Kamrup District. Hajo and Sonapur towns in Kamrup District have been selected for roof top rainwater harvesting schemes. 12 schools have been selected in two towns i.e. 6 in each town. The district is bestowed with abundant rainfall of over 2,000 mm spread over 7 months in a year. The salient features of rain water harvesting schemes are furnished in Table 3.

Table –3 Salient features of rain water harvesting in Kamrup District, Assam

Slo. No.	Site	Total Roof Top Area (sq. km.)	Roof Top Area Considered (sq. km.)	Average Rain Fall (m)	80% of Average Rain Fall (m)	Volume of water available annually (cu. m)	Number of Tanks provided	Storage Capacity Created (cu. m)	Rainfall required for filling Tanks (mm)
1.	HAJO								
1.	S.B.S.K.higher Secondary School	773.8	773.8	2.127	1.7016	1316.7	4	12	15
2.	Adarsh Vidyapith High School	741.89	300.00	2.127	1.7016	510.5	2	6	20
3.	Ganestola Prathamik Vidyalaya	116.61	70.00	2.127	1.7016	119.1	1	3	42
4.	Fakirtola Prathamik Vidyalaya	159.39	95.22	2.127	1.7016	162.0	1	3	32
5.	Fakirtola Madrassa High School	87.86	87.86	2.127	1.7016	149.5	2	6	68
6.	Devalaya Prathamik Vidyalaya	247.76	247.76	2.127	1.7016	421.6	2	6	24
II.	SONAPUR								
1.	Kamarkuchi M.E. School	745.00	745.00	2.127	1.7016	1267.7	2	6	8.0
2.	Kamarkuchi L.P. School	206.00	206.00	2.127	1.7016	350.5	1	3	15.0
3.	Ural L.P. School	140.50	140.50	2.127	1.7016	239.1	1	3	21.0
4.	Borkhat L.P. School (No.-1)	268.25	268.00	2.127	1.7016	456.0	1	3	11.0
5.	Borkhat L.P. School (No.-2)	157.70	157.70	2.127	1.7016	268.3	1	3	19.0
6.	Borkhat Janajatia M.E. School	176.00	150.00	2.127	1.7016	255.2	1	3	20.0

Out of 12 structures, one structure i.e. Devalaya Prathamik Vidyalaya in Hajo was executed by CGWB, NER at the cost of Rs 84,252/-. However, other structures were executed by WAPCOS under overall supervision of CGWB, NER.

Rooftop Rainwater Harvesting under Fresh Water Year 2003

Under Fresh Water Year 2003, rooftop rain water harvesting structure was constructed in Govt. building of Dept. of Geology and Mining in Dakshingaon, Kahilipara, Kamrup district, Assam. The structure with an underground storage capacity of 12,000 litres was constructed covering total roof area of 1134.69 sq. m at the total cost of Rs. 9.17 lakhs. 89,600 litres rainwater is harvested during monsoon period catering 390 persons for drinking, sanitation etc purposes.

Meghalaya:

Meghalaya is predominantly a hilly terrain with limited valley areas at places. The average annual rainfall in the state is around 2,050 mm. Though, the state is endowed with the plenty of rainfall, it experiences shortage of drinking water during the summer. This may be due to high surface run off, as the area is hilly with steep slopes. The main water supply is dependent on spring, streams and waterfalls. To augment water supply, Central Ground Water Board has provided technical guidance for construction of six roof top rainwater harvesting structures in East Khasi Hills district. Out of these six, three schemes are in schools and three schemes in Govt. buildings. The details of schemes are given below.

Table 4 Roof Top Rain Water Harvesting schemes in Meghalaya

Sl.No	Location of Schemes	Total Roof Area(sq. m)	Total fund allocated (Lakhs)	Implementing Agency	Water Harvested (cu. m)	Persons benefitted	Purposes
1.	State Guest House	186.2	20.32	WAPCOS	357	-	Washing & cleaning
2.	Circuit House	137.6			264.19	-	Gardening & washing
3.	State Central Library	1103.2			2118.4	15	Drinking, washing & cleaning laboratories,
4.	Auxilium Convent	520.5			999.36	2000	drinking, gardening & washing Laboratories &
5.	Pine Mount School	973.3			1868.73	1500	drinking Laboratories

6.	All Saints Diocesan H.S. School	613.4			1177.73	2100	
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Mizoram:

The state constitutes a mountainous terrain with rugged topography represented by high longitudinal, parallel to sub parallel trending North South hills with moderate to steep slopes and narrow valleys. The hills are steep and separated by rivers creating deep gorges.

The average annual rainfall in the states is 2200 mm. The major part of rainfall is lost as surface run-off. In spite of good rainfall in state there is acute shortage of water especially during the summer. Considering the physiography, rainfall, some suitable structures like check dams can be constructed for harvesting the surface run off. The present water resources of Mizoram can be augmented through development of springs and by constructing rain water harvesting structures. The Central Ground Water Board has provided funds for construction of Rain Water harvesting structures of 35 selected sites in Aizawl district, Mizoram. The details of allocation of funds and schemes are given below.

Table 5 Roof Top Rain Water Harvesting schemes in Mizoram

Sl. No	Scheme	Total fund allocated (Lakhs)	Implementing Agency	Total Schemes	Impact Assessment
1	Roof Top Rain Water harvesting in Mizoram	28	Directorate of Rural Development, Mizoram.	35 schemes completed.	Total 5,53,000 ltrs. Harvested. 59,153 persons benefited.

Nagaland:

Nagaland is basically hilly terrain with small-elongated valleys constituting about only 6 percent of total geographical area. Acute scarcity of drinking water occurs during the lean period mainly in hilly areas, which comprise about 94 % of total area of the state. In order to augment water supply, construction of rainwater harvesting structures in 47 sites covering Kohima and Mokokchung districts have been done. The details are as follows.

Table 6 Details of Rain Water Harvesting Structures in Nagaland

Sl. No.	Schemes	Total fund allocated (Lakh)	Implementing Agency	Completed Schemes	Households Benefitted in use for drinking & domestic purposes
1.	RTRWH in Kohima, Mokokchung district, Nagaland	55	Soil & Water Conservation Deptt. Nagaland	33 Structures completed (15 in Kohima, 18 in Mokokchung district)	551
2.	RTRWH in Rengma area, Nagaland	10.96	Soil & Water Conservation Deptt. Nagaland	4 Structures completed	60
3.	RTRWH in Mokokchung district, Nagaland	50.47	IFCD	11 Structures completed	378

Table 7 Details of Roof Top Rain Water Harvesting Structures Implemented by the Soil & Conservation Department, Rengma, Nagaland

Sl.No.	Location	Estimated Cost Rs. P	Storage capacity (Litres)	No. of persons benefited
1.	2.	3.	6.	10.
1.	Tsosisenyu	2,83,000	24,580	109
2.	Sendenyu	2,69,000	70,687	315
3.	Nsunyu	2,73,000	24,580	109
4.	Tesophenyu	2,71,000	34,622	154
TOTAL		10,96,000	1,54,469	687



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**ROOF TOP RAIN WATER HARVESTING
STORAGE SYSTEM**



ROOF TOP RAIN WATER COLLECTION POINT

Demonstration of Rain Water Harvesting from Rooftops of Remote Govt. Rural Schools for Collection of Rainwater by Constructing Storage Tank for Drinking and Use in Two Toilets for Girls in Govt. Schools in Rural Areas

In North Eastern Region, 36 Govt. schools have been covered in 4 states i.e. Assam, Manipur, Meghalaya and Nagaland in Phase-1. In Phase-11, 45 Govt. schools have been covered in those states. The details are summarized below.

Table 8 Details of Roof Top Rain Water Harvesting Structures Implemented by NGO

Name of State	Name of NGO	No. of Schools covered				No. of students benefited
		Phase-1	District	Phase-11	District	
Assam	Bosco Reach out, Guwahati, Kamrup	5	N.C. Hills	—	—	NA
	Centre for Youth & Rural Development, Chirang.	6	Chirang/ Udalguri	—	—	NA
	Subungni Najanai, Kokrajhar	5	Kokrajhar	15	Kokrajhar	NA
Manipur	Volunteers for village development, Ukhrul	5	Ukhrul	10	Ukhrul	772
Meghalaya	Bethany Society, Laitumkhrah, Shillong	6	East Khasi Hills	2 1 1	West Garo Hills East Garo South Garo	836
Nagaland	Prodigals Home, Dimapur	5	Dimapur	10	Dimapur/Peren	2068
	Naga Mothers Association, Kohima	5	Kohima	10	Kohima	NA
	Total	36		45		3676

Bhoomial Samvardhan Puruskar – 2007

Bethany Society, Meghalaya was the only recipient of 'Bhoomijal Samvardhan Puruskar 2007 in North Eastern States. Ten Rooftop Rain Water Harvesting Tanks have been constructed in ten schools located in the East Khasi Hills, East, West and South Garo Hills district, Meghalaya. Twenty low cost toilets have been constructed, two in each school. There are separate toilets for girl students.

Benefits accrued

- A total of 3,00,000 litres rainwater has been conserved in 10 tanks.

- 20 low cost toilets, 2 in each school.
- 836 students are availing of safe drinking water and sanitation facilities in the 10 schools.
- Village community came together to solve an urgent problem, Village community was trained to implement all aspects of a programme such as planning, purchase of materials, payment to workers, monitoring, social auditing, maintenance of records, share benefits according to norms set by the community.
- Awareness levels regarding water and sanitation were raised and community is demanding such services from their local representatives.
- Village community and school community were motivated to take charge of the programme and ensure its sustainability.

Type of innovative methodology/technology adopted

- Involvement of the community for the total implementation of the project.
- Gender sensitivity in formation of village level implementation committees.
- Transparency in all monetary transactions.
- Demonstration of both underground and above ground rainwater harvesting tanks.
- Use of rooftop rainwater harvesting technology.
- Use of two-pit low cost sanitation toilets.
- Use of social audit for monitoring.
- Collaboration among Ministry of Water Resources, CGWB, National Level NGO, Local NGO and local community to implement the programme.
- The scheme is under the direct charge of the Headmaster and Managing Committee of the respective school.

Benefit-cost ratio

- Approximately Rs. 80,000/- was spent on the construction of the tanks. Hence, the cost of per litre of water conserved has been worked out to be Rs. 2.66.
- The maintenance cost is almost negligible.

Sustainability

- The tanks have a life of 20 years and the only maintenance required is to ensure that the channels from the rooftops are well maintained and the tanks are cleaned and necessary chemicals are used for purification.
- The school and village communities were made the primary stakeholders.

Awareness Generated

- Awareness has been generated in all the ten villages and also some of the neighbouring villages

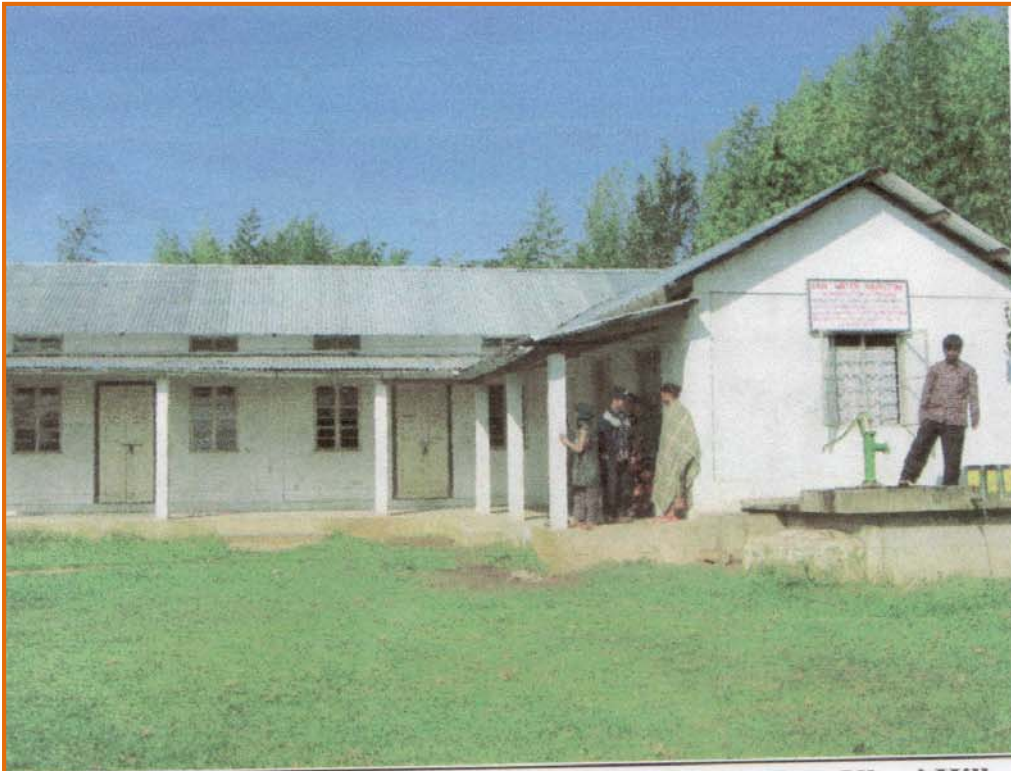
on the value of rainwater harvesting, importance of portable drinking water and sanitation.

- Bethany Society has been approached by many villages and local community groups to expand the programme.

The details of implementation by Bethani Society are depicted Table 9.

> **Table 9 Details of Implementation by Bethani Society, Meghalaya**

S.No.	Name of School & Address	Block & District	Volume of Water Conserved (Litres)	No. students benefitted
1.	Rombagre Upper Primary School. Rombagre Village.	Rongram Block West Garo Hills	30,000	75
2.	Rongkhon Dilnigre Govt. L.P. School.. Dilnigre Village	Gambegre Block West Garo Hills	30,000	55
3.	Megapgre Govt. L.P. School Village Mepagre	Samanda Block East Garo Hills	30,000	150
4.	Dagal Songittal L. P. School. Village Khakiza	Chokpot Block South Garo Hills	30,000	40
5.	Mawlyngad Presbyterian L.P. School Village Mawlyngad	Mawryngkneng Block East Khasi Hills	30,000	140
6.	Laitkseh Govt. L.P. School. Village Laitkseh	Mawryengkneng Block. East Khasi Hills	30,000	64
7.	R C L.P. School Village Madan Thangsning	Mawkynrew Block' East Khasi Hills	30,000	45
8.	Kong BaiT Secondary School. Kharang Village	Mawkynrew Block East Khasi Hills	30,000	163
9.	Sohrarim Presbyterian L.P. School. Village Sohrarim	Laitkroh Block East Khasi Hills	30,000	63
10.	Khutmadan RC Govt. Aided School. Village Khutmadan	Sheila Bholagunj Block. East Khasi Hills	30,000	41



Laitkseh Govt. L.P. School, Mawryngkneng Block, East Khasi Hills
School Building has been extended over the tank



RC LP School, Madan Thangsning, Mawkynrew, East Khasi Hills