REPORT ON IMPLEMENTATION AND MONITORING OF RAINWATER HARVESTING AND ARTIFICIAL RECHARGE IN DIMAPUR AND WOKHA TOWN, NAGALAND

GOVT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD
NEW DELHI
2013
CONTENTS

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Particulars</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>INTRODUCTION</td>
<td>1 - 4</td>
</tr>
<tr>
<td>II</td>
<td>OBJECTIVE OF THE PROJECT</td>
<td>4 - 5</td>
</tr>
<tr>
<td>III</td>
<td>JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT</td>
<td>6</td>
</tr>
<tr>
<td>IV</td>
<td>AVAILABILITY OF SURPLUS SURFACE WATER</td>
<td>6 - 7</td>
</tr>
<tr>
<td>V</td>
<td>ROOF TOP RAIN WATER HARVESTING</td>
<td>7 - 8</td>
</tr>
<tr>
<td>VI</td>
<td>ARTIFICIAL RECHARGE TO GROUND WATER</td>
<td>8 - 11</td>
</tr>
<tr>
<td>VII</td>
<td>IMPACT OF THE PROJECT</td>
<td>11</td>
</tr>
</tbody>
</table>

PLATES

11 nos. of Plates showing photographs of Roof-Top Rainwater Harvesting Structures for both Phase I and Phase II.

FIGURES

7 nos. of schematic diagram of the RTRWH structure
I. INTRODUCTION

The State of Nagaland occupies North Eastern part of the Indian sub-continent and falls in the Survey of India Topo-Sheet Nos. 83 G/1, G/2 and 83 J/4 bounded by North Latitudes 25°06’00” & 27°40’00” and East Longitudes 93°20’00” & 95°15’00”. There are eleven district administrative headquarters in the state of which ten including State capital Kohima are located on hill tops. The State receives heavy rainfall ranging from 2000 to 25-00 mm during monsoon with consequential high run off.

Like other hilly States in the region, Nagaland has its distinct physiographic features having almost 95% of its total area covered by hills with limited valley areas. However, the pace of developmental activities and urbanization has been taking its course in spite of its complex physiographic nature and difficult terrain resulting in commensurate growth of population.

Consequently, the demand for fresh water in all sectors has been increasing exponentially. It has also been observed that rainfall in the state has become erratic due to various natural factors, which has obvious bearing on availability of ground water in the sub-surface.

In view of the ever increasing demand for fresh water, it is high time, the development of ground water resource potential of the State be handled in a scientific manner. As such, it has become imperative to adopt rainwater harvesting and artificial recharge towards systematic and judicious management of the ground water resources of the State.

Dimapur town, headquarters of Dimapur district is the hub of all commercial activities in the State of Nagaland. Dimapur valley is one of the most prosperous valleys findings its importance for being a structural valley in the leading edge of the Naga Thrust. The North, South and West of Dimapur valley is bounded by Assam, the eastern part being bounded by Kohima district. It is a close type valley. Groundwater being a more dependable source of fresh water, its development has become inevitable and major requirement of water for all sectors is met through ground water in this commercial hub.

Every house hold also desires to tap ground water for sustenance. With progress of urbanization, major portion in the town area has been covered by concrete structures
leaving behind little space for natural infiltration of rainwater which is evident from
drying up of dug wells and decline in water level in some of the localities during lean
period resulting in scarcity of water.

Rapid urbanization & industrialization will lead to more development of
ground water in Dimapur valley as well as all hilly district headquarters of the state in
the future. Thus, there is always a need for simultaneous recharge to ground water
through artificial recharge especially in Dimapur valley at the first instance. For long
term strategic planning, the department of Directorate of Geology and Mining, Govt. Of
Nagaland proposed to take up project on artificial recharge to ground water through
rainwater harvesting from the roofs/terraces of a few educational, Church buildings and
community halls in and around Dimapur Town and Wokha town, Under Wokha district,
under the project.

**a) Location & Areal Extent**

The proposed project area falls in the State of Nagaland bounded by North Latitudes
25° 54’ 45” & 26° 17’ 06” and East Longitudes 93° 44’ 30” & 94° 15’ 03” in the districts
of Dimapur and Wokha. The area forms part of Dhansiri and Doyang Sub-basins of the
Brahmaputra Basis. The project encompasses educational institutions, Church buildings
and community halls at Dimapur and Wokha towns falling under Medziphema block of
Dimapur district and Chukitong block of Wokha district, Nagaland.

The only railhead and airport of the State is located in Dimapur, the district
headquarter. The National Highway 39 connects the State capital Kohima and the
neighbouring States of Assam, Manipur, Tripura and Mizoram.

**b) Population (as per Census 2001)**

<table>
<thead>
<tr>
<th>District</th>
<th>Area Sq.km.</th>
<th>Population</th>
<th>Density per sq.km.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimapur</td>
<td>927</td>
<td>Total 379,769 Rural 182,492 Urban 197,277</td>
<td>410</td>
</tr>
<tr>
<td>Wokha</td>
<td>1628</td>
<td>Total 166,239 Rural 131,254 Urban 34,985</td>
<td>102</td>
</tr>
</tbody>
</table>

Source : Statistical Handbook of Nagaland 2012
c) Landuse and agriculture

As 95% of the total area of the State is covered by hills, shifting and terrace cultivations are practiced in the State of Nagaland. However, in relatively flat stretches of land in Dimapur valley, irrigated fields have been developed. Most areas of the State are covered by dense forest. Rain fed agriculture is practiced in the State and the ground water withdrawal for irrigation purpose is practically nil. However, there are a total of 144.44 km² net irrigated areas in Dimapur district from surface water sources. Dimapur district has 8.12 km² of areas covered by forest.

d) Soil type & cropping pattern

Soils in the project area are derived from Tertiary group of parent rocks being sandstones, shale, siltstone and mudstone. Soils are generally acidic, very rich in organic carbon, poor in available phosphate and potash content. Soils are fertile and can be categorised into Alluvial and Residual Soils. Available Soils are classified into two categories.

a) Recent Alluvial Soils (Entisols) : These occur in the valleys and form continuous sheet along the banks of streams and rivers. The soil comprises of clay, silt and sand and found mainly in the Dimapur valley.

b) Older Alluvial Soils (Oxisol and Ultisol) : These are found to occur in the foothill areas and intermontane valleys. They are comprised of sand, gravel, pebble, boulder with clay, silt and their admixture. The foothill areas of Dimapur valley show abundance of Older Alluvial Soils.

Residual Soils are classified into following three groups – Lateritic Soils (Oxisol and Ultisol), Brown Forest Soils (Mollisol and Inception and Podzolic Soils (Spodisol).

e) Hydrometeorology

The State of Nagaland enjoys sub-tropical humid climate with maximum temperature reaching up to 36°C and minimum temperature going down to 3.2°C. Humidity is very high ranging from 74 to 87%. Nagaland experiences phenomenal influence of the South-West tropical monsoon which persists from May to September with occasional winter showers. The average annual rainfall of the State is recorded to be 2000 to 2500 mm. The average number of rainy days in the state is around 135 days, varying from 60 to 190 days. In comparison to other districts, Dimapur receives the lowest rainfall. The average annual rainfall for the last seven years recorded for
Dimapur district is 1101.79 mm with 623.6 mm average rainfall and 62 no. of rainy days recorded for the year 2009.

**f) Physiography**

The project area forms a part of the intermontane alluvial plain in the North of Naga hill ranges. The land surface possesses a general slope from South to North with considerable local undulations.

The area around Dimapur lies in front of the outermost overthrust block of the Naga hill ranges. The Naga Thrust can be traced trending NE-SW near Nichuguard, about 10 km SSE of Dimapur. The rocks of the Surma Series are seen exposed near Nichuguard on the Kohima road. North of it up to Dimapur, the Younger Quaternary sediments form the undulating plain. Tipam Series of rocks are exposed in the low hills West and Northwest of Dimapur. The rocks of the Quaternary age have variable thicknesses. Around Dimapur, the thickness of these sediments exceeds 120 metres. Dhansiri, Diphu and Dayang Rivers from the major drainage Sub-basins of the mighty Brahmaputra. The rivers are fed by a number of 2\(^{nd}\) and 3\(^{rd}\) order streams emerging from the hills in the South forming conspicuous dendritic pattern flowing to the North. A number of patches of swampy land are observed in the Southeast and Southwest parts of the area.

**g) Ground water**

Geologically the State is covered by rocks ranging in age from Pre-Cretaceous to Recent. The rock sequence comprises the geosynclinal facies, represented by the Disang Group, Barail Group, Surma Group, Tipam Group, Namsang Formation and the Dihing Group. While the Disang and Surma Groups of rocks are mainly argillaceous, the Barail and Tipam Groups are arrenacious. The Girujan Clay Formation overlying the sandstones of Tipam Formation is characterised by typical blue, mottled clay and argillaceous sandstone bds. Older rocks occupy southern parts of the State whereas younger rocks are exposed in the northern parts. Narrow, intermontane and open valleys are found to occur in the part bordering Upper ridges of Brahmaputra flood plains of Assam. The valleys are mostly structurally controlled. Rock types found in valley areas comprise of clay, sand, pebble, cobble and boulder assemblages of unconsolidated nature.

The consolidated formations are confined to the south eastern part of the State along the Burma (Myanmar) border and the unconsolidated alluvial plains in the northern part of the state.
Hydrogeologically, the state is underlain by two distinct groups of rocks i.e. semi-consolidated and valley fill deposits where ground water occurs under water table to confined conditions. The water-bearing formations are identified as unconsolidated alluvial deposits, Upper Tertiary formations of Dihing and Tipam Groups and fractured zones of semi-consolidated & consolidated formations.

Groundwater occurs both under water table and semi-confined to confined conditions. The general depth to water level varies between less than a metre to 15 m below ground level (bgl). The major part of the State is covered by hilly terrains having more than 20% slope comprising of semi-consolidated/consolidated rocks and act primarily as run-off zone.

The ground water resource potential of the State has been computed as 0.36 BCM by CGWB as on 2009. Rain fed agriculture is practiced in the State and the ground water withdrawal for irrigation purpose is practically nil. For domestic utilisation, most of the populations depend upon spring water and the ground water draft for domestic use as such is meagre viz. 0.008 BCM. For collecting even a bucket of water, people inhabiting the hill tops has to toil to travel a few kilometres.

However, rapid urbanization commensurate with growth of population in the valley areas especially in Dimapur valley has led to increasing development of ground water.

The ground water potential of the State is found to be poor to moderate, which require proper augmentation of the resources in a scientific manner so that over-development in the future can be avoided.

II. OBJECTIVE OF THE PROJECT

Replenishment and storage of ground water in the sub-surface is a function of rainwater percolating through various geological formations. However, the amount of percolation varies significantly from place to place depending upon other variables like the amount and pattern of rainfall, characteristics of rocks in terms of porosity and network of joints etc, the nature of terrain, and other climatic factors like temperature and humidity. As a result, there is always a spatial variation in terms of availability of water in the sub-surface. In localities, where availability of utilizable surface water is less due to interplay of a number of factors as stated above, people have to depend largely on groundwater for domestic, agricultural and industrial uses. The problem is compounded by urbanization, which drastically reduces open surfaces for natural
recharge to ground water. In order to improve ground water condition, it is necessary to artificially recharge the depleted aquifers. The available techniques are easy, cost-effective and sustainable. Many of these can be adopted by individuals and village communities with locally available materials and manpower.

As has been discussed earlier, Nagaland comprises of 95% hilly areas where groundwater potential of the State is poor to moderate which necessitates proper augmentation of the resources in a scientific manner so as to avoid over development in the future. It has been observed that rainfall in the state has become erratic during the last few years resulting in drying up of dug and shallow wells during lean periods in and around Dimapur town. Apart from that, due to large scale urbanization in Dimapur valley, open surface areas for replenishment of subsurface aquifers by way of infiltration are always on the wane. Moreover, it is quite pertinent that people residing in the hill tops at times has to toil to travel a few kilometres for collecting even a bucket of freshwater.

Under the said circumstances, State DGM. Nagaland has prepared a Detail Project Report with the under mentioned multi-objectives.

i. To promote the simple techniques of rain water harvesting to every individual and community using advanced technology.

ii. To conserve and maintain the ground water balance adopting suitable techniques of artificial recharge through rain water harvesting.

iii. Organising public awareness campaign, workshops on rain water harvesting techniques and artificial recharge to augment groundwater through rain water harvesting. And

iv. To promote awareness for judicious uses and conversion of fresh water resources.

III. JUSTIFICATION OF THE ARTIFICIAL RECHARGE PROJECT

Following are the main justifications towards adopting artificial recharge to augment ground water recharge in the project area.

1. No large structures are needed to store the water. Structures required are small and cost-effective.

2. It will enhance the dependable yield of dug wells and hand pumps.

3. There will be negligible loss as compared to loss in surface storage.

4. Improvement of water quality due to dilution of harmful constituents may be achieved.
5. No adverse affects like inundation of large surface areas and loss of crops will occur.
6. No displacement of local population shall be there.
7. There will be reduction in cost of energy for lifting of water especially where rise in ground water level is substantial.
8. It will utilize the surplus surface runoff which otherwise drains off.

IV. AVAILABILITY OF SURPLUS SURFACE WATER

The predominant source of water in the area is surface water, in river, streams, ponds and natural springs and sub-surface water occurring as ground water. Nagaland being a special tribal state, authority over land and its resources is largely vested with the communities and the government totally depends on their permission. Attempts at convincing the communities to share the water resources have been met with limited success. Local conflicts and quarrels over water is a rising phenomenon across the state.

The number of villages having protected water supply sources in 1963 was only 59. Now there are 1010 number of villages provided with the drinking water supply. However, the existing infrastructures for supplying water in the urban areas in the state are unable to cater to the increasing population. In the absence of alternative sources, to augment water supply, much of the population in the urban areas are linked under water scarcity.

The water resources in the state are facing silent death. The natural hydrological cycle has been altered due to destruction of the catchment areas and headwaters. This has resulted in reducing the absorbing capacity and the crucial link feeding the sources of the rivers, streams and underground aquifers is being lost. Apart from these, pollution from untreated sewerage, industrial effluent, agricultural run-off etc. are also contaminating the water sources. The demand for water continues to escalate emphasizing the need to focus on activities for harnessing rainwater and recharge of ground water inequalities and inefficiencies in the distribution system lead to water supply falling short of the demand in both urban and rural areas for all sectors.

Table-2. Status of water supply in Dimapur and Wokha Districts, Nagaland

<table>
<thead>
<tr>
<th>Source</th>
<th>Location</th>
<th>Quantity</th>
<th>Period of Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall</td>
<td>Dimapur Town Station, Nagaland</td>
<td>1101.785</td>
<td>For the year 2003 to 2009</td>
</tr>
<tr>
<td>Annual</td>
<td></td>
<td>2000 to 2500</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>Rainfall in Wokha</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Station, Nagaland

RIVER

<table>
<thead>
<tr>
<th>River</th>
<th>Brahmaputra and Dhansiri River</th>
</tr>
</thead>
<tbody>
<tr>
<td>It flows through a distance of 352 km from south to north before joining the Brahmaputra on its south bank. Total catchment area is 1220 km²</td>
<td></td>
</tr>
</tbody>
</table>

RESERVOIR

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Doyang Reservoir at Wokha Sadar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1220 M cum covering an area of 3487 Ha</td>
<td></td>
</tr>
<tr>
<td>The commercial operation of the DHEP started from 1/07/2000</td>
<td></td>
</tr>
</tbody>
</table>

V. ROOF TOP RAIN WATER HARVESTING

Rooftop rain water harvesting is the process of capturing and storing rainfall from roof tops of housing complex of varied dimensions. This process facilitates prevention of run-off evaporation loss, reduction in soil erosion, improvement of ground water quality etc. towards conservation and efficient utilization of the water resources. The augmented resource can be harvested in the time of need.

Rainwater harvesting and conservation of freshwater is now a national slogan in India. National Water policy envisages optimal utilization of surface and ground water to meet the demand of the growing population and for all round development. Massive rain water harvesting is promoted all over the country and the result is gaining more and more popularity as the demand for water in all sectors is always on the rise.

In Nagaland, most of the rural areas follow old methods of rain water harvesting and has been in vogue till today for want of fresh water. Some of the State Govt. departments have successfully implemented rainwater harvesting schemes which are found to be very encouraging and beneficial to the hilltop establishment in particular. In hilly and undulating terrain like Nagaland, rainwater harvesting has been recognized to have high potential for optimum utilization. The availability of fresh water is becoming scare day by day. Rainwater harvesting being simple and cost effective has been emerging as the most powerful tool to augment freshwater using advanced technologies. The importance of harnessing rainwater and its social obligations must reach all levels of the society through model projects and Awareness programmes. The department of DGM has implemented a scheme of rooftop rainwater harvesting at few locations and observed that this scheme has facilitated conservation of ground water and minimum power consumption during rainy season.
VI. ARTIFICIAL RECHARGE TO GROUND WATER

Artificial recharge to ground water is a process of augmenting natural infiltration of rainwater or surface runoff into the sub-surface aquifer through artificial means. It is a process by which the ground water reservoir is augmented at rate exceeding the one under natural conditions of replenishment.

Various methods and structures are suggested for artificial recharge to ground water. The choice and effectiveness of any particular method and structure is governed by local hydrogeological conditions. Nature replenishes the ground water resources by way of seasonal rainfall land infiltration through different geological formations. Present day scenario reveals that urbanization has drastically reduced available land surfaces exposed for natural recharge in many areas. In order to maintain the hydrodynamic equilibrium between availability and utilization of the ground water resource potential, Govt. of India has introduced projects on rain water harvesting cum artificial recharge to ground water for implementation.

At this juncture, as the demand for ground water in the State of Nagaland is growing fast, particularly in Dimapur valley where development of ground water has taken place to a considerable extent. It is necessary to initiate measures for artificial recharge to ground water at hydrogeologically favorable locations so as to achieve its noble objectives. This measure will also ensure reliable and sustainable ground water resources and supplement domestic and industrial need of this commercial hub of the State.

Directorate of Geology and Mining has implemented projects on rainwater harvesting for its efficient utilization such that the non-committed surplus rainfall is recharged to ground water adopting suitable techniques. Owing to drying up of dug wells in some localities in and around Dimapur, the department has taken up a pilot project on artificial recharge to ground water through rainwater harvesting from the rooftop of Govt. College, Dimapur and started monitoring groundwater recharging system. The deterministic approach showed a positive response in terms of rise in water level.

While conducting hydrogeological investigation for exploration and development of ground water resources in and around Dimapur town, the Department also undertook feasibility studies for rooftop rainwater harvesting and artificial recharge to
groundwater and selected few educational institutions and villages to take up under demonstrative project. It was observed that many educational institutions and villages are running shortage of sufficient water supply and needs assured facilities of drinking water supply as well as associated amenities. As such, the educational institutions, church building and community halls are proposed to be covered under the scheme.

In total 64 nos. of structures were constricted in Dimapur and Wokha Districts, Nagaland. In the First Phase 30 nos. of structures were taken the detail of the location is given in Table-3

**Table-3 Details of location of Rainwater Harvesting and Artificial Recharge scheme**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Locations</th>
<th>No. of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aoyimkum Community Hall and Church Cantonmetn Rangapahar, Dimapur</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Hindi College at Oriental Colony, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Table Tennis Stadium at Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>St. Paul Higher secondary School, Lumti Colony, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>St. Paul Higher Secondary School Hostel, Lumti Colony, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>MGM Higher Secondary School and Church Building at Midland Dimapur</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Don Bosco School, Higher Secondary School Buildings, Dimapur</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Don Bosco Auxillium Women’s Development Centre &amp; Hostel for Girls and Integral Development Action Centre (DBHSS) AIDA Building, Dimapur</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Dimapur Ao Mission School and Higher Secondary School Circular Road, Dimapur</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Assisi Women Working Centre and Evening School, Near Naga Cemetery, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Assisi Convent Building, Near Naga Cemetery, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Assisi Convent (USF Tabor) Building Complex, Mount View Colony, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Pilgrim School hostel at Nagarijan, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Golden Music center at Nagarijan, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Aoimti Church and Church Office, 3rd Mile, Near Air port, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Carmel Higher Secondary School at 4th Mile, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Dzuku Water Treatment Plant at Savomi Village, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Daeshin Academy School Hostel and Office Building at Dipuphar ‘B’ Village</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Redeemer Health center and Hostel at Chumukedima, Dimapur</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>Chumukedima Village Community Hall and Angami Church, Dimapur</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td>Lakuti Village Community Building Church’s and DBS Building at Wokha</td>
<td>4</td>
</tr>
</tbody>
</table>

In second phase 34 nos. of structures were taken for implementation of the schemes. The details of location is given in Table-4
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Locations</th>
<th>RWHS</th>
<th>Recharge well/pit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Christian Higher Secondary School complex, Nyamo Lotha Road Dimapur</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Eden Higher Secondary School, Building Circular Road, Dimapur</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Pentecostal Church Building complex, Lingrijan, Dimapur</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Lima Aier Higher Secondary School complex, Lingrijan, Dimapur</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Rilan Village Baptist Church Building complex, Rilan Colony, Dimapur</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Sarbura Govt. High School Building complex, Kashiram, Dimapur</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>Dr. Motsuo Memorial District Hospital complex, Wokha Town</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Don Bosco Higher Secondary School complex, Wokha Town</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
ARTIFICIAL RE-CHARGE TO GROUND WATER THROUGH ROOF TOP RAIN WATER HARVESTING OF
PENTECOSTAL CHURCH OFFICE BUILDING AT LINGRIAN, DIMAPUR

CHURCH OFFICE

Roof area - 447 Squ.m or 4850 Sq.ft.
PVC Half round pipe - 7", 8".
PVC Drain - 110 mm or 5".
All Dimensions are in Meter.
Not to Scale

ARTIFICIAL RE-CHARGE TO GROUND WATER THROUGH ROOF TOP RAIN WATER HARVESTING OF
LIMA AHER HIGHER SECONDARY SCHOOL HOSTEL AT LENRIAN, DIMAPUR

HIGHER SECONDARY SCHOOL BUILDING

Roof area - 540 Squ.m or 5810 Sq.ft.
PVC Half round pipe - 7", 8".
PVC Drain - 110 mm or 5".
All Dimensions are in Meter.
Not to Scale
ARTIFICIAL RE-CHARGE TO GROUND WATER THROUGH ROOF TOP RAIN WATER HARVESTING OF RILAN VILLAGE ANGANWADI CENTRE AT RILAN, DIMAPUR

ANGAWADI CENTRE

PLAN

Roof area 40 Sqr.mtr or 450 Sqr ft
PVC Halfround pipe - 7" - 8"
PVC Drain - 110 mm or 5'
All Dimension are in Meter
Not To Scale
VII. IMPACT OF THE PROJECT

The department of DGM, Nagaland who was the implementing agency had constituted a team consisting hydrogeologists and Engineer (civil construction) to oversee and supervise the implementation of the project. A technical team has been constituted to monitor and conduct Impact Assessment of the project periodically. Accordingly, on completion of the project, the technical team had carried out the impact assessment of the demonstrative project on Artificial Recharge through Rain Water Harvesting from Roof Top in and around the area.

It has been assessed that:
1. Total volume of 37,200 m³/annum rain water has been harvested from the total roof area of about 30,000 sq.m with an average annual rainfall of 1100 mm in Dimapur and 2000 mm in Wokha area.
2. All the structures constructed/installed are well maintained by the beneficiaries and the structures are functioning well.
3. The water in dug wells/shallow wells in and around the recharge wells were not dried up unlike earlier lean period and water levels remain stable. This indicates satisfactory recharging and proper functioning of the recharge structures/wells.
4. The project has immensely benefited to the institutions /Centers/ Hospital/Communities and created awareness to public at large on Rain Water Harvesting with up-graded equipments & accessories.
5. The project was implemented with the participation of the people. Conservation and enhancing ground water through artificially recharging to ground water from rain water was a new scheme which was appreciated by the beneficiaries.
6. The project had benefited to scores of needy people institutions/ centers/hospital/community halls & church as they started availing the facilities of rain water harvesting and storage tanks.
7. Public in general around the project have realized the importance of rain water harvesting with advance equipments & materials as well as conservation of ground water through artificially recharging which was the objective of the project.
8. The beneficiaries had expressed deep appreciation and acknowledged to the department of Central Ground Water Board, Ministry of Water Resources, Govt. of India for selecting the institutions/centers under this project and to the DGM Nagaland through which the project was implemented successfully.
PHOTOGRAPHS OF RAINWATER HARVESTING-CUM-ARTIFICIAL RECHARGE STRUCTURES CONSTRUCTED UNDER PHASE I BY DGM, NAGALAND DURING 2011-12

DLSC Stadium, Dimapur

Recharge tank

Aoyimkum village Rangapahar, Dimapur

MGM H.S. School, Dimapur

St. Paul H.S. School, Dimapur
Recharge tank

DLSC Stadium, Dimapur

Aoyimkum Community Hall, Rangapahar, Dimapur.

Aoyimkum Baptist Church, Rangapahar, Dimapur.

St. Paul Higher Secondary School, Dimapur.

St. Paul High school Building, Dimapur

Music(Golden) Crown College, Nagarjan, Dimapur
Pilgrim School Hostel, Nagarjan, Dimapur

Dzukou Water Treatment Plant, Sovima, Dimapur

Generation Countdown Youth Ministry Centre, Sovima 'E', Dimapur

Daeshin Academy, Diphupar 'B', Dimapur

Holy Redeemer Hospital, Chumukedima, Dimapur.

Chumukedima Village Council Hall-cum-Indoor Stadium, Dimapur.
PHOTOGRAPHS OF RAINWATER HARVESTING-CUM-ARTIFICIAL RECHARGE STRUCTURES
CONSTRUCTED UNDER PHASE II BY DGM, NAGALAND DURING 2012-13
Meeting with the beneficiaries/Heads of institutions at DGM office, Dimapur on 19.07.12

Christian Higher Secondary School, building

Covenant Hall, CHS School complex

Christian High School, building

Covenant Hall, CHSS complex