Technical Report Series: D **No:**

Ground Water Information Booklet
Mon District, Nagaland

Central Ground Water Board
North Eastern Region
Ministry of Water Resources
Guwahati

September 2013

MON DISTRICT
AT A GLANCE

Sl No.	ITEMS	*STATISTICS*
1.	GENERAL INFORMATION	
	a) Geographical area (sq.km) b) Administrative division Blocks Circles Villages	1789 6 14 111
	c) Population (2011 census)	250671
	d) Density of population	145/sq.km
	e) Average annual rainfall (cm)	200-300 cm
2.	***GEOMORPHOLOGY***	
	Major physiographic units	High hills/ ridges with deep gorges and narrow valleys.
	Major Drainages	Dikhu, Tizu, Tizit, Tehok, Tekang, Tapi, Kaimang etc
3.	Forest area (ha) 2011	41702
4.	**MAJORS SOIL TYPES**	Red sandy soil
5.	**AREA UNDER PRINCIPAL CROPS (area in Ha)**	Cereals (23980), Pulses (2700) and Oilseeds (6860)
6.	**IRRIGATION DATA** (ha) 2011	Mainly by surface water i. Gross irrigated area under crop- 2332
7.	**NUMBERS OF GROUND WATER MONITORING WELLS of CGWB** No of dug wells No of Piezometers	 01 Nil
8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	Alluvial, Tipam, Barial and Disang formations
9.	**HYDROGEOLOGY**	
	Major water bearing formation • Pre-monsoon depth to water level during 2012 • Post-monsoon depth to water level during 2012	Tipam sandstone, Alluvial formation 4.87 mbgl 1.42 mbgl
10.	**GROUND WATER EXPLORATION BY CGWB** (as on 31.12.2013)	Nil
11.	**GROUND WATER QUALITY**	

	Presence of chemical constituents more than permissible limits	Nil
	Type of water	Good and suitable for domestic irrigation and industrial purposes
12.	**DYNAMIC GROUND WATER RESOURCES** (2009) mcm	
	Net Ground Water availability	20.28
	Annual Ground water draft	0.83
	Projected demand for domestic and industrial uses up to 2025	1.37
	Stage of Ground Water Development	4.09%
13.	**AWARENESS AND TRAINING ACTIVITY**	
	Mass awareness Programme Organized	Nil
	Water Management Training Programme Organized	Nil
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**	
	Project Completed by CGWB (No. & amount spend)	Nil
	Project under technical guidance of CGWB (nos.)	Nil
15.	**GROUND WATER CONTROL & REGULATION** (No. of OE blocks / Critical blocks/ Semi-critical blocks/ Notified areas)	Nil
16.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	Ground water related problem is its availability. Major part of the district is hilly which has resulted in limited natural recharge creating water deficient areas in the district.

1. Introduction:

Mon district is the northernmost district of Nagaland and is the home of Konyak Nagas. Mon town is the district headquarter. It was a part of North East Frontier Agency till 1957 and later joined the Naga Hills. It is bounded on the north by Sibsagar district of Assam, on the south by Tuensang district of Nagaland and Myanmar, on the east by Myanmar, on the west by Longleng and Mokokchung districts of Nagaland and on the north east by Tirap district of Arunachal Pradesh. The total geographical area of the district is 1786 sq.km. As per 2011 census, the total population is 250671. The district is having 6 RD blocks, 14 circles and 111 villages as per 2011 census. The rural development blocks in the district are Mon, Chen, Wakching, Tizit, Tobu and Phomching.

Agriculture

Agriculture is the main occupation of the people in the district. Cereals like paddy, maize, millets, jowar etc and pulses like arhar, mong, peas, lentils etc are grown extensively with seasonal vegetables and fruits. Besides, oilseeds like Soya bean, groundnut, mustard and commercial crop like sugar, cotton, jute, potato, tea etc are cultivated.

Agriculture in the district is mostly practiced by using old traditional cultivation methods with primitive tools. As the terrain is hilly, people practice jhum or shifting cultivation (slash and burn type) posing great environmental degradation. Terrace cultivation is also practiced to a lesser extend in moderately sloping areas. Moreover, the mountainous topography limits the scope for utilization of ground water resources for irrigation purposes. Irrigation in the district is still at nascent stage. Most of the irrigation is done tapping only the surface water with no contribution from ground water.

The above table reflects that there has been significant increase in total irrigated area by surface water. Moreover, there is scope for irrigation through ground water.

2.0 Rainfall &Climate:

The climate of the district is directly controlled by the southwest monsoon originating from the Bay of Bengal and the Arabian Sea. The climatic conditions vary substantially from place to place due to wide differences in altitude. The district is having four conspicuous seasons viz., winter, summer, rainy and autumn.

The average rainfall of the district is about 2000 to 3000 mm. Most of this rainfall is received from May to October. Winter is very cold with minimum temperature falling down to 4°C. December and January are the coldest months of the year. Summer is

moderately warm with temperature ranges from 21° up to 40°C. The average temperature is 24.4°C and the relative humidity is 76%.

3.0 Geomorphology, Soil Type and Drainage

The distric is mainly hilly with steep slopes. Geomorphologically, the district comprises of high hills with steep gorges and limited intermontane valley. The foot hills lie adjacent to the plains of Assam i.e., the Tizit and Naganimora areas. The hills ranges extend from the foothills to the slopes of Naga hills and Patkai range in the eastern part of the district. Shawot, the highest peak in the district has an altitude of 2414 metres above MSL. The altitude of Mon district headquarters is 897.64 metres above mean sea level. Topographically, the district can be divided into two regions namely:

a. Upper Region: Its comprise of Longching, Chen, Mopong and Tobu areas
b. Lower Region: It comprises of Mon, Tizit and Naganimora area.

Soils

Soils have been derived from the tertiary group of rocks. Several types of soils are found to occur in the district as the provenance differs widely. The most common type of soil is red sandy soil. They are mineral rich, fine-grained loamy type of soil and rich in Aluminium and Iron.

Drainage

The main rivers in the district are Dikhu, Tizit, Tehok, Tekang, Tapi, Kaimang, Yityong, Telangsao etc.

4.0 Ground Water Scenario:

4.1 Hydrogeology:

Hydrogeologically the district is covered mainly by semi consolidated tertiary formations comprising of Disang, Barail and Tipan formation and unconsolidated (Alluvium) formation and is shown in fig. I.

4.1.1 Disang Formation: This formation consists of rocks like shale, sandstone. The shales are grey in colour and splintery in nature interbeded with hard and compact sandstone. The sediments of Disang group represent trench facies with an age of Upper Cretaceous to Middle Eocene. Due to tectonic activity experienced during past geological

periods, the rocks are fractured and jointed. This forms secondary porosity and recharge to ground water takes place through this fractures.

4.1.2 Barail formation: This formation consists of massive sandstone, shale and sandy shale. The rocks are of Upper Eocene to Oligocene in age. The top of the Barail formation is marked by a pronounced unconformity indicating upliftment and erosion. The rocks have developed secondary porosity and fissured medium holding ground water.

4.1.3 Tipam formation: This formation comprises of rocks like clay, shale, coarse to gritty ferruginous sandstone and conglomerate. They form moderate structural hills and the valleys underlain by Tipam sandstones form good yielding aquifer zones at greater depths.

4.1.4 Alluvial formation: This formation is found in the northern part of the district and along Assam border. These are valley fills and consist of clay, silt, sand, gravel and boulders. This formation is feasible for ground water development. Tubewell within a depth of 100-150 m depth are expected to yield 15 to 45 m^3/hr.

Thus from hydrogeological point of view the occurrence of ground water in the semi-consolidated formations is related to the formation of secondary porosity and the fissured medium. They are found to form moderate yielding aquifer in the valley areas. Tipam sandstones form good aquifer with high to moderate yield. Alluvial formation forms good aquifer with high yield. Dugwell with 20 m depth and 4-5 m diameter will have yield prospect of 10m^3/day and tube well within a depth of 100-150 m depth are expected to yield 15-45 m^3/hr.

4.2 Ground Water Resources:

The Ground water resource estimation has been computed based on the guidelines and recommendations of GEC 97. The hilly areas with slope greater than 20% have been excluded from the computation, as they are not worthy of ground water recharge. As there is no poor quality, command/non command areas, so computation for ground water resource is done only for monsoon and non-monsoon season.

Recharge from sources other than rainfall such as ground water irrigation, recharge from ponds and tanks, check dams, nalla bunds is taken as nil for the district. The total annual recharge is obtained as the arithmetic sum of recharge from rainfall and the recharge from sources other than rainfall. Thus Ground water Resource Potential for the district of Mon, Nagaland (2009) in ham is as follows (Table 4).

Table 4: Ground Water Resource Potential (mcm)

Net ground water availability	Annual Ground Water Draft			Projected Domestic & industrial uses up to 2025	Ground water availability for future irrigation	Stage of ground water development (%)
	Irrigation	Domestic & Total Industrial uses	Total			
20.28	0	0.83	0.83	1.37	18.90	4.09%

4.3 Ground Water quality:

Generally, the water is good and suitable for drinking, irrigation and industrial purposes. There is no report of poor water quality in the district. However, scientific approach is required by different Government agencies to carry out water analysis of different sources to form a database on water quality.

4.4 Status of Ground Water Exploration and development:

Ground Water Exploration has been initiated in Nagaland but Central Ground Water Board has not carried out any drilling in the district. Most of the water supply is met through springs and streams.

5.0 Ground Water Management Strategy:

The ground water development is mostly confined to the valley portion. As the valley portion in the district is negligible so the development of ground water is also in nascent stage. Development in hilly and steep areas is yet to pick up. Approachability in the rough and rugged terrain is one of the main constrain that is hindering the ground water development in the district. However, the steep slopes can be targeted for water and soil conservation methods that will aid in storing run off as well as intercepting the base flow.

Spring can play a vital role in meeting the water requirement. Proper development and scientific approach is required to augment the existing spring water supply. Moreover, rainwater can be harvested through construction of suitable rainwater harvesting structures.

6.0 Ground Water Related Issues and Problems

The district being hilly with negligible valley area the scope for ground water exploration and development is negligible and marginal. The district receives good

amount of annual rainfall but due to steep slopes most of this rainwater goes as surface runoff. This resulted in very limited natural recharge to ground water. One of the major problems in the hilly district is utilization and management in the steep slopes. The accessibility of the hamlets and villages is a difficult task, which is another major impediment in developing the ground water resources.

7.0 Recommendation

i) The district is a hilly one with negligible valley areas. In such tough and rugged terrain, studies of satellite imageries and aerial photographs can be of great help. Lineaments such as faults, fractures that are not identifiable on the ground can be of great importance in ground water prospecting, if they are studied on imageries in conjunction with morphometric studies.

ii) In the hills where most of the precipitations get wasted as surface runoff, the area can be effectively utilized for augmentation of ground water by constructing conservation structures such as gully plugging, check dams, check weirs and contour bunding.

iii) In the district, Tiru valley having an area of 70 sq.km and Tizit valley with an area of 120 sq.km may have good prospect for ground water development. These valleys are likely to have moderate ground water potential.

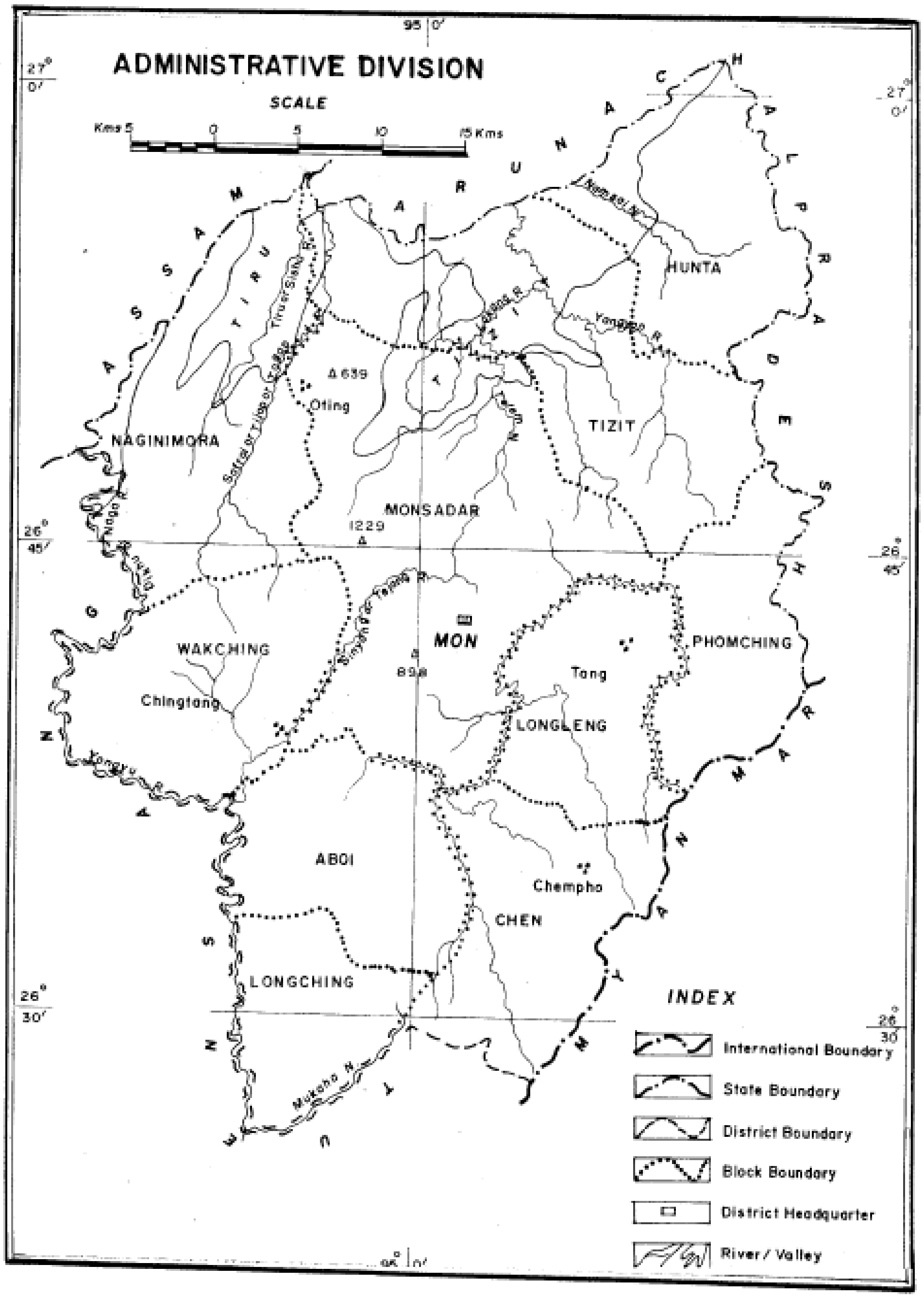
iv) As the district is not covered under ground water exploration programme, scientific studies in tandem with modern sophisticated equipments are essential for selection of sites for bore well. Potential fractures zones must be confirmed by electrical resistivity survey before deploying suitable drilling rigs.

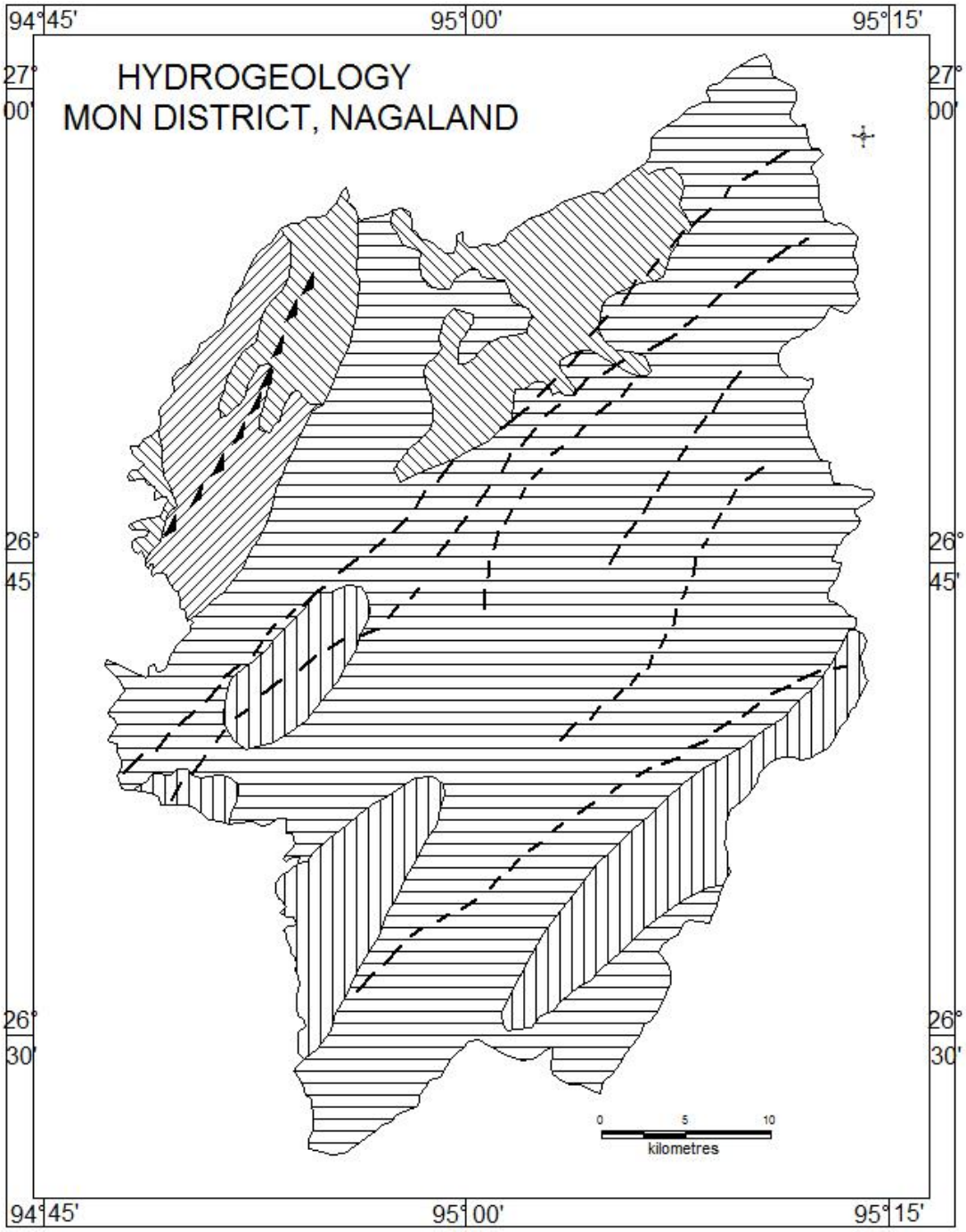
v) Common people are to be educated in the field of roof top rainwater harvesting. General awareness is to be created among the local people about the natural hazards of shifting cultivations like land, soil and environmental degradations. Terraced cultivation is to be popularized in place of shifting cultivation.

vi) Ground water quality monitoring programme may be initiated in the district.

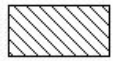
vii) Spring occurring in the slope of hill ranges can play a pivotal role in meeting the water requirement for drinking and irrigation purposes. These springs can be developed scientifically for providing water and efforts should be made to make it pollution free. A systematic and scientific approach is required in this direction.

viii) Development of ground water in the district is still at its nascent stage. Thus there is sufficient scope for ground water development for drinking, irrigation and industrial purposes in the district.


ADMINISTRATIVE DIVISION
SCALE
Kms 5 0 5 10 15 Kms
ARUNACHAL PRADESH
ASSAM
NAGALAND
MYANMAR
HUNTA
TIZIT
NAGINIMORA
Oting
MONSADAR
WAKCHING
MON
PHOMCHING
Tang
Chingtang
LONGLENG
ABOI
Chempho
CHEN
LONGCHING
INDEX
International Boundary
State Boundary
District Boundary
Block Boundary
District Headquarter
River / Valley


HYDROGEOLOGY
MON DISTRICT, NAGALAND
94° 45'
95° 00'
95° 15'
27° 00'
26° 45'
26° 30'
0
5
10
kilometres

LEGEND



AGE	FORMATION	LITHOLOGY	AQUIFER DISPOSITION	GROUND WATER POTENTIAL
RECENT TO SUB-RECENT	Alluvium	Valley fills, consisits of clay, coarse sand gravel and boulders	Fanshaped alluvial deposits having gentle slope in broad intermontane valleys	Porous Media - Openwell with 20m depth and 4-5m dia will have yield prospect of 10m3/day.Open well constructed with 15m depth and 2-2.5 m dia will have yield propect of 3m3/day. Tube well within 100-150m depth are expected to yield 15-45m3/hr
UNCONFORMITY				
UPPER TO MIDDLE MIOCENE	Tipan	Moderate structural hills consisting of clayshale, coarse to gritty ferrugenous sandstone and conglomerate	The valley Underlain by Tipan sanstone form good aquifers	Good recharge zone from high to moderate yield at deeper depth
UNCONFORMITY				
UPPER EOCENE TO OLIGOCENE	Barial	Denudo-structural hills, long linear ridges and highly dissected round to flat topped hills consisting of bedded compact fine to medium grained sanstone mostly less susceptible to erosion	Ground water restricted to weathered mantle and fracture	Fissured Media --Runoff zone, ground water occurs as spring. Infiltration to ground water movement is controlled by development of secondary porosity in rocks cause due to action of tectonic element
UPPER CRETACEOUS TO MIDDLE EOCENE	Disang	Highly structural hills, linear, curvilinear and at places irregular hill ranges and narrow inter-montane valleys consisting of shale and sandstone		

LINEAMENT

THRUST