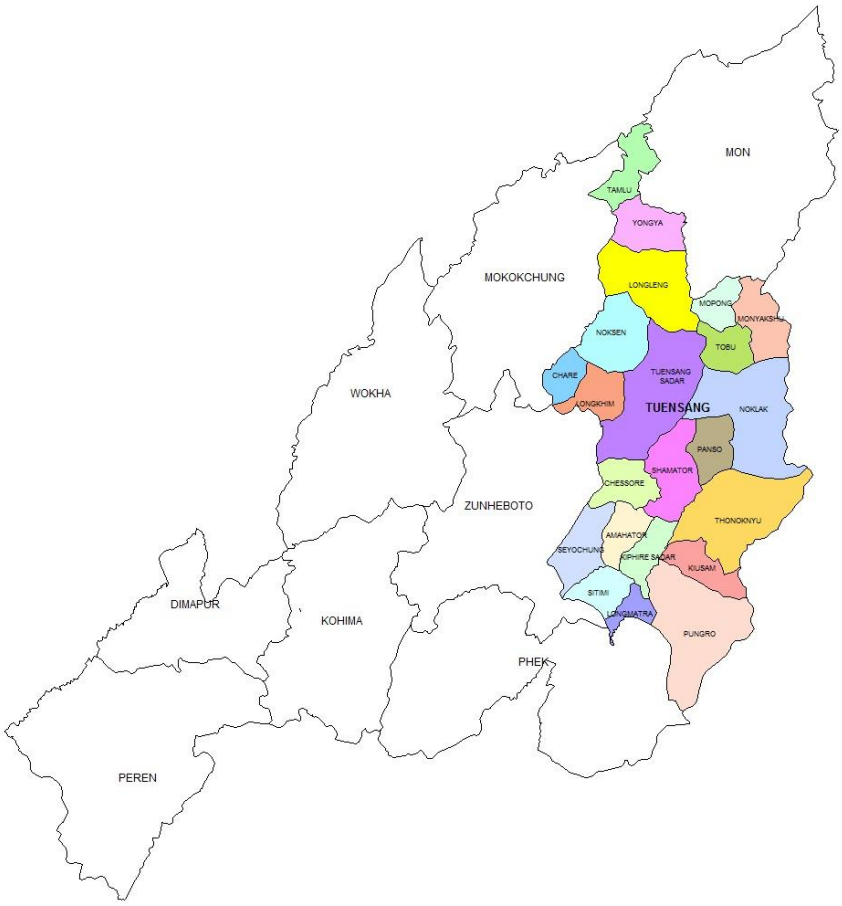
Technical Report Series: D **No:**

Ground Water Information Booklet
Tuensang District, Nagaland



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

September 2013

GROUND WATER INFORMATION BOOKLET
TUENSANG DISTRICT, NAGALAND

DISTRICT AT AGLANCE

Sl. No.	ITEMS	STATISTICS
1	GENERAL INFORMATION	
	i) Geographical Area (sq.km.) a. Headquarters	4228 Tuensang
	ii) Population (as on 2011 Census)	321427
	iii) Climate a. Average Annual Rainfall	 1527 mm
2	GEOMORPHOLOGY i) Major Physiographic Units	 Denudational Hills, Structural Hills, Intermontane valleys
3	LAND USE (sq.km.) i) Forest Area ii) Gross Cropped area	 774.68 sq km 7360 hac
4	MAJOR SOIL TYPES	Alluvial Soil, Non Laterite Red Soil, Forest Soil
5	IRRIGATION (2011 census) i) Net Irrigated area (Ha)	 6476.49
7	PREDOMINANT GEOLOGICAL FORMATIONS	Semi-consolidated rocks of Tertiary age, metamorphic and Ophiolites.
8	HYDROGEOLOGY i) Major Water Bearing Formations	 Semi consolidated formations of Tertiary rocks. Ground water occurs in the form of spring emanating through cracks/ fissures/ joints etc. available in the country rock.
9	DYANMIC GROUND WATER RESOURCES (2009) in mcm i) Annual Ground Water Availability ii) Annual Ground Water Draft iii) Projected demand for Domestic and Industrial Use up to 2025 iv) Stage of Ground Water Development	 49.71 1.34 2.22 2.69
10	AWARENESS AND TRAINING ACTIVITY	Nil
11	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i) Projects Completed by CGWB (No & amount spent) ii) Projects Under technical Guidance of CGWB	Nil
12	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	Nil

GROUND WATER INFORMATION BOOKLET
TUENSANG DISTRICT, NAGALAND

1.0 Introduction

Tuensang district the largest and easternmost district of Nagaland, a State in North-East India. It is bounded between $94^0 33' 45''$ & $95^0 11' 15''$ East Longitudes and $25^0 35'$ & $26^0 48'$ North Latitudes encompassing an area of 4228 sq. km. The name of the district headquarters is also Tuensang. The District area forms a long slice, of which north-western end (Tamlu-Namsang area) is touching Assam on a narrow strip between Mon and Mokokchung districts and the western end (Kiphire-Pungro area) is forming approximately 180 Kms of international border with Myanmar. On the North lies Mon district. On the South of Tuensang district lies Phek district and on the west are Zunheboto and Mokokchung districts.

As per 2011 census, the total population of the district is 321427. Administratively, the district is divided into twenty two R.D. Blocks. These are Pungro, Tuensang , Sadar, Tamlu, Monyakshu, Chare, Sitimi, Noksen, Tobu, Pangso, Chessore, Kiphire Sadar, Yongya, Mopong, Noklak, Amahator, Kiusam, Longmatra, Shamator, Longleng, Longkhim, Thonoknyu and Seyochung.

Summer is moderately warm and winter is cold. Monsoon sets in by the last week of May and retreats by the end of September.

Tuensang District is inhabited by the tribes of Chang, Sangtam, Yimchunger, Phom, Khiamniungan and part of Sumis. There are people of other tribes living in the district, among whom Ao and Sema are in majority. Apart from the tribal people there are innumerable non-tribal from all over the country and outside as businessman and government employees in the district. Two villages belonging to the same tribe speaks, apart from the common tribal language, Nagamese, different dialects which are quite distinct from each other in all respect. Each tribe has its own religious beliefs and practices. The primitive form of beliefs and practices, however, are now being rapidly replaced by Christianity even in the remote areas. About 90 % of the people of this district has embraced Christianity.

The people of Tuensang District are mostly agriculturists. Jhum, the shifting cultivation is extensively practiced while terrace is practiced in a limited way, because the land form is not suitable for terrace. Moreover, the facilities for irrigating the terrace are not available. Jhum, the shifting cultivation is extensively practiced while terrace is practiced in a limited way, because the land form is not suitable for terrace. Moreover, the facilities for irrigating the terrace are not available. Rice, Millet, Maize, Taro, Pumpkin, Beans, Squash, Mustard Leaf, Potato, Brinjal, Cabbage, Chilli, Garlic, Ginger, Sesame, Cauliflower, Radish, Leaf-Cabbage, French Beans, Soya Beans, Water Guard and other variety of Guards, Sorgum etc are produced. Among fruits, mentioned may be made of Banana, Guava, Orange, Lemon, Pear, Plum, Papaya, Peach, Pine apple, etc which are found in abundance.

Tuensang is blessed with evergreen sub-tropical and temperate coniferous forest which supports a variety of flora and fauna. The forest of the lower range of Tamlu-Namsang area and other parts of the district may be classified as "Tropical Wet Evergreen Forests" mixed with "Tropical Semi-Evergreen Forests". The forests found above 1000 metres of altitude are classified as "Montane Sub-Tropical Forests". Those forests are further divided into "Sub-Tropical Broad Leaved Hill Forests" and "Sub-Tropical Pine Forests". Broad Leaved Hill Forests are found in Longkhim, Tuensang and Noklak areas. Sub-Tropical Pine Forests are found in Shamator, Kiphire and Pungro areas. Important trees found in the district are, Bonsum, Bogipoma, Khasi Pine, Oaks, Amari, Gamari, Hollock, Nahor, Uriam, Alder, Kachnar, Sasi, etc.

A number of natural occurrence have been located in the district such as Asbestos, Coal, Limestone, Marble, Magnesite, Chromite, Pyrite, and Oil. Oil seepage has been found near Namsang- Chingchang village of Tuensang – Mon border area.

As per the land use pattern, the gross cropped area is 7360ha with net irrigated area of 774.68 ha. The total forest area is 6476.49ha.

The district receives southwest monsoon with annual average rainfall of 1,527 mm. The rainfall spreads over about 9 months of the year with heavy downpour during the period from July to August. Winter, in this district, is cold and summer is mild.

Geologically, the district is predominantly occupied by Tertiary rocks, comprising sandstone, shale, grit etc. The eastern part of the district is occupied by ultra basic and basic rocks comprising basalt, gabro and granulitic rocks.

Ground water occurs under phreatic condition in the shallow aquifer zone and under semi-confined to confined condition in the deeper aquifer.

The present ground water utilization in the district is mainly for drinking water purposes. Practically, there is no ground water draft for irrigation purposes. The stage of ground water development in the district is 6.17 %.

2.0 Rainfall and Climate

The district enjoys a humid sub-tropical climate. The annual average rainfall of the district is 1527 mm. The maximum rainfall occurs during the months of June and July. Rainfall generally begins from April and continues till the end of September. Annual rainfall recorded during 1998 to 2006 is presented as below.

Annual Rainfall and number of Rainy Days in Tuensang.

Year	Annual Rainfall (mm)	No. of Rainy days
1998	1393.0	129
1999	1714.9	134
2000	1625.3	156
2001	1380.8	162
2002	1529.4	145
2003	1560.5	190
2004	1836.8	175
2005	1503.4	175
2006	1198.8	132
Average	**1526.99**	**155.33**

The area enjoys a cold winter and mild summer. January and February are the coldest months when the night temperature comes down to around 0ºC. In summer also, it is not at all hot, rather it is cold in comparison to the adjoining plains of Assam. During summer also, the temperature does not rise beyond 32ºC and the average summer temperature is 27ºC.

3.0 Physiography and Drainage

Physiographically, Tuensang district is occupied by NE-SW trending northern extension of the Arakan-Yoma hill ranges, with Denudational Hills, Structural Hills, high ridges deep gorges and narrow intermontane valleys and can be divided into two distinct geomorphic units.

1. Alluvial plains
2. High Hill Ranges
    i) Denudational Hills
    ii) Structural Hills
3. Intermontane Valleys

Tamlu-Namsang area is adjacent to plains of Assam and its altitude is about 200m above sea level whereas the other end contains the highest peak of Nagaland called Saramati, with an altitude of 3840m above sea level. In between is situated the Tuensang District Headquarter whose altitude is 1371.60m. Number of perennial streams flow through the district. Dikhu and Tizu are the main rivers of the district.

4.0 Ground Water Scenario

4.1 Hydrogeology

Hydrogeologically, the area is underlain by unconsolidated and semi-consolidated formations ranging in age from Upper Cretaceous to Recent.

Disang Formation comprising shale and sandstone and Barail Formation comprising bedded fine to medium grained compact sandstone and grey shale; Phokphur Formation comprising polymictic conglomerate, tuffaceous greywacke and lithic feldspathic arenite of Middle Eocene age, mainly derived from the underlying ophiolites; Ophiolites comprising Dismembered tectonic slices of serpentinites, cumulates and volcanics associated with cherts and limestones of Lower Eocene age. In these Formations, ground water is restricted to only weathered mantles and fractures. Basically, most of the area being hilly, it acts as run-off zone. At places, ground water emanates as springs.

In between the hill ranges, there are a number of intermontane valleys. These valleys are underlain by assorted and discontinuous aquifers. Ground water yield prospect is low to moderate (10-20 m^3/hr).

4.2 Ground Water Resources

Ground water resource of the district has been estimated by Central Ground Water Board, North Eastern Region based on GEC'97. Due to lack of ground water structures, resource estimation was carried out based on Rainfall Infiltration Factor Method.

The area suitable for ground water recharge has been worked out by excluding the areas with more than 20% slope. Out of a total district area of 2,026 sq.km, only 109 sq.km area was taken as area suitable for ground water recharge. Though, there is ground water recharge, the possibility of ground water extraction is very limited, owing to its hilly terrain; difficult accessibility and fine nature of the most of the aquifer material. The detail of estimated ground water recharge through rainfall is given as follows.

Table 1 Ground Water Resource potential of Tuensang District, as on 31st March, 2011(in mcm)

Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for Domestic & Industrial	Existing Gross Ground Water Draft for all uses	Allocation domestic & industrial requirement supply upto 2025	Net annual ground water availability for future irrigation development	Stage of Ground Water Development (%)
49.71	0	1.33	1.33	2.22	47.49	2.69

Tuensang district is under the **SAFE** category.

4.4 Status of Ground Water Development

As on date practically, there is no ground water development in the district. Ground water extraction is also difficult. Most of the district area being hilly with high slope, the rainfall infiltration is very limited. Though, there is a good amount of rainfall in the area, most of it goes out as surface run-off. In this type of hilly terrain, the scope for ground water storage is limited to mostly secondary porosity developed due to structural features like fractures and faults etc. Ground water emanates in the form of springs which is the only source of water for drinking.

As there is little use for irrigation in this district, ground water is mainly used for drinking purposes. People of the area mostly practise Jhum cultivation due to hilly terrain, spatial variation of rainfall, nature of soil, non-availability of irrigation.

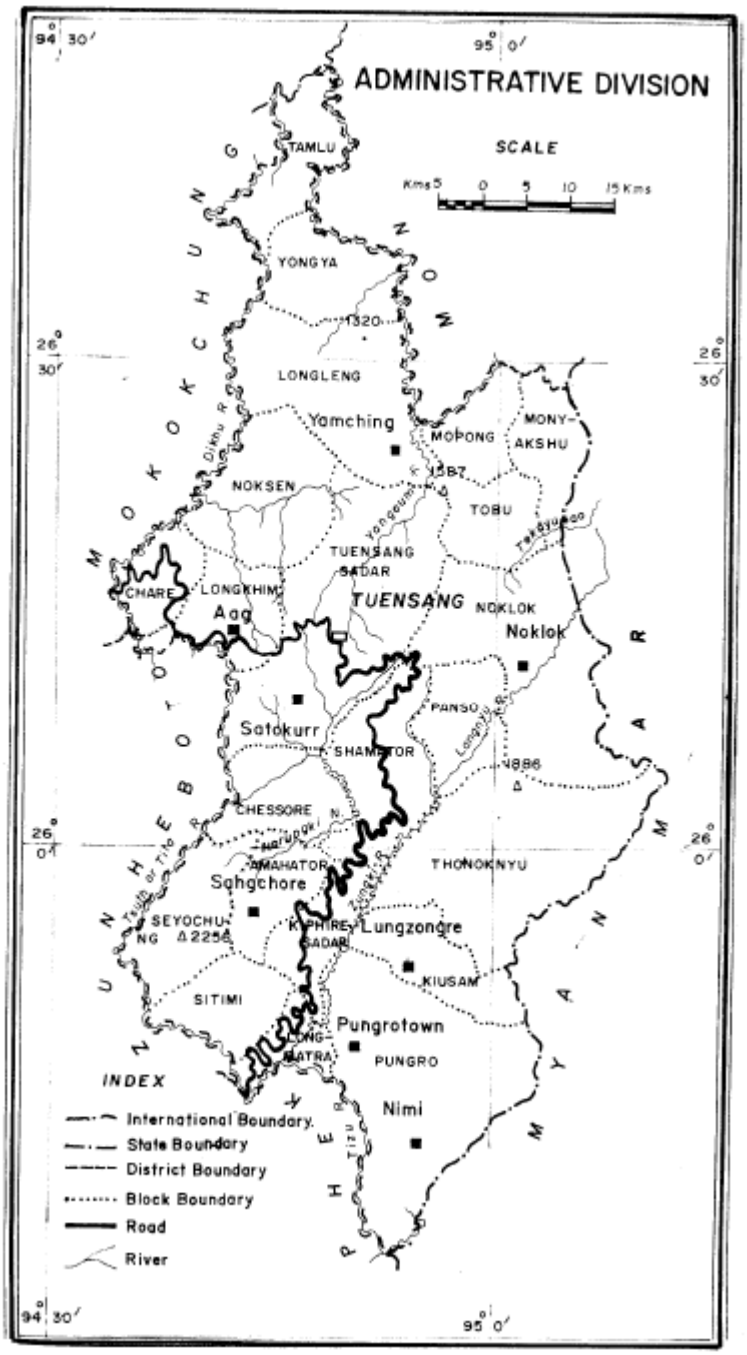
5.0 Ground Water Management Strategy

Ground water survey carried out in the district reveals that there is little scope for ground water development. However, detailed investigation has to be carried out in the area to assess the ground water resources, especially in the intermontane valleys. Accessibility is the main hindrance for the ground water exploration in the area. Only suitable source is springs. There area many perennial springs in the hills of this district. These springs can be scientifically developed for both drinking and local irrigation purposes. Suitable artificial recharge structures viz. Nala bund, Gabion structures, Contour bunding may be constructed for both irrigation and recharge to ground water.

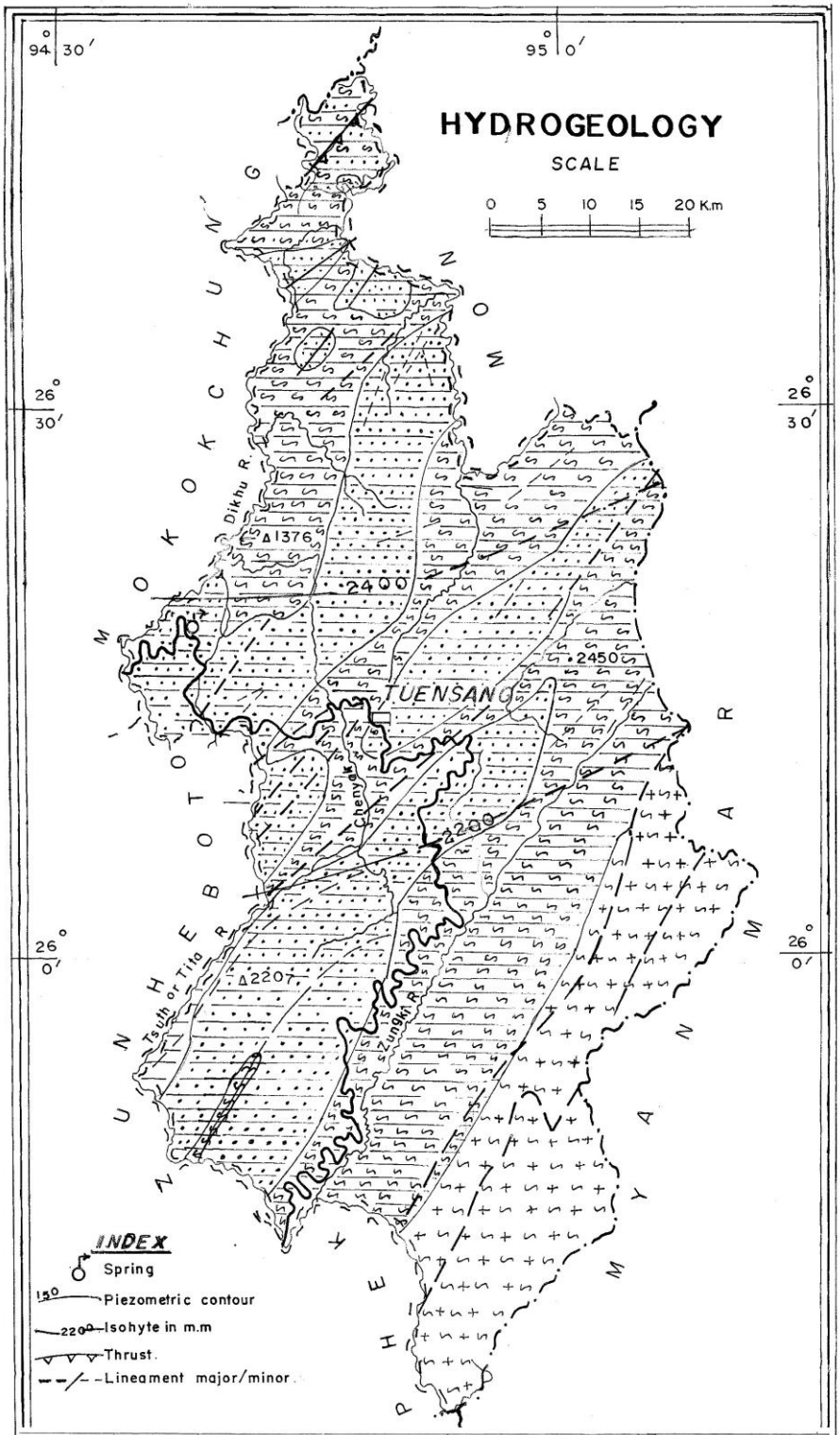
6.0 Recommendations

Existing hydrogeological set up indicates the limited ground water development prospects in the linear intermontane valleys and foot-hill areas. Though, the valleys are underlain by shale, siltstone and sandstone; the intercalated sandstone layers may be productive for construction of shallow ground water structures. Thus, ring well with 2-3 m diameter and 10-15 m depth below ground level may be constructed in the suitable locations. These wells may be constructed with half baked bricks keeping weep holes.

In the major part of the district, perennial springs are the main sources for water supply to the local population. The spring should be properly developed and protected wherever they are used for domestic purposes. Some of the spring waters in lower altitudes can be impounded in some structures and pumped again to supply water.


ADMINISTRATIVE DIVISION
SCALE
Kms 5 0 5 10 15 Kms
94° 30′
95° 0′
26° 30′
26° 0′
TAMLU
YONGYA
1320
LONGLENG
Yamching
MOPONG
MONY-AKSHU
1587
NOKSEN
TOBU
TUENSANG SADAR
TUENSANG
CHARE
LONGKHIM
Aag
NOKLOK
Noklok
Satokurr
PANSO
SHAMATOR
1886
CHESSORE
AMAHATOR
Sohgchore
THONOKNYU
SEYOCHU-NG Δ2256
KIPHIRE SADAR
Lungzongre
KIUSAM
SITIMI
Pungrotown
LONG-MATRA
PUNGRO
Nimi
INDEX
International Boundary
State Boundary
District Boundary
Block Boundary
Road
River
MOKOKCHUNG
UNGMA
MYANMAR

TUENSANG DISTRICT, NAGALAD.



AGE	FORMATION	LITHOLOGY (With geomorphic unit)	AQUIFER DISPOSION	GROUND WATER POTENTIAL
UNCONFORMITY				
UPPER AND MIDDLE MIOCENE	TIPAM	Moderate structural hills, consisting of clay shale, coarse to gritty ferruginous sand stone and conglomerate.	The valleys underlain by Tipam sandstones from good aquifers	Good recharge zone for high and moderate yield aquifer system at deeper depth.
UPPER EOCENE TO OLIGOCENE	BARAIL	Denudo–structural hills, Long linear ridges and highly dissected round to flat topped hills consisting of bedded compact, fine to medium grained sandstone mostly less susceptible to erosion.	Ground water restricted to weathered mantle and fracture development	
UPPER CRETECEOUS–MIDDLE EOCENE.	DISANG	High structural hills, linear, curvilinear and at places irregular hill ranges and narrow montane valleys consisting of shale and sandstone.	DO	Run off zone, Ground water occurs as spring in filtration to ground water is controlled by development of secondery porosity in rocks caused due to action of tectonic elements
PRE-CRETACEOUS	ULTRA BASIC / BASIC ROCK	Irregular moderate to high hill range consisting mostly of Basalt, gabbro and granulitic rocks. The phyllite, Serpentinite are also common.	DO	

Semi-Consolidated

Consolidated