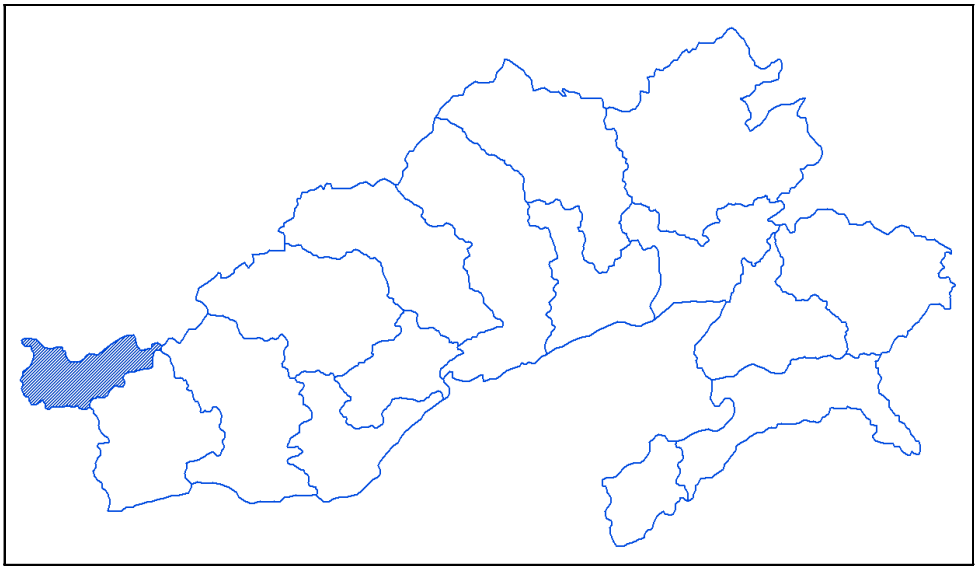
Technical Report Series: D

No:

Ground Water Information Booklet
Tawang District, Arunachal Pradesh



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

September 2013

GROUND WATER INFORMATION BOOKLET

TAWANG DISTRICT,

ARUNACHAL PRADESH

DISTRICT AT A GLANCE

Sl No.	ITEMS	Statistics
1.	GENERAL INFORMATION	
	i) Geographical area (Sq.km)	2172
	ii) Administrative divisions (Sub-division) (As on 2011)	3
	Number of blocks	3
	Number of villages	181
	iii) Population (As on 2011 Census)	4950
	iv) Average annual rainfall (mm)	1389
2.	GEOMORPHOLOGY	
	Major physiographic units	Hilly Gneissic Complex, Low weathered hills with intermon,tane valleys
	Major drainages	
3.	LAND USE (Sq.km)	
	a) Forest area :	5.98
	b) Net area sown	40.18
	c) Cultivable area :	40.18
4.	MAJOR SOIL TYPES	Alluvial and loamey
5.	AREA UNDER PRINCIPAL CROPS (As on2011-12)	7.77 sq.km
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Numbers of Structures)	
	Dugwells	
	Tubewells/Borewells	1(TW)
	Tanks/Ponds	
	Canals	24 Nos.
	Other sources	
	Net irrigated area	0.63 sq.km
	Gross irrigated area	0.63 sq.km
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03-2007) No. of Dug Wells	Nil

	No. of Piezometers	
	PREDOMINANT GEOLOGICAL FORMATIONS	a) Siwaliks (undifferentiated) and Gondowana b) Gneissic Complex
	HYDROGEOLOGY	
	➢ Major water bearing formation ➢ (Pre-monsoon water level during 2006) ➢ (Post-monsoon water level during 2006) ➢ Long term water level trend in 10 yrs(1997-2006) in m/yr	Alluvium
12.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-2007)	No exploration activity of CGW in the district due to approvability problems
	No. of wells drilled (EW< PZ< SH< Total)	
	Depth Range (m)	
	Discharge (liters per second)	
	Storativity(S)	
	Transmissivity (m^2/day)	
13.	Presence of chemical constituents in more than permissible limit	
	Type of water	Fresh and potable
14.	DYNAMIC GROUND WATER RESOURCES (2009) IN MCM	GEC'97 could not be adopted and ground water resources of the district could not be calculated because hill slopes are more than 20% as per GEC'97.
	Annual Replenishable Ground Water Resources	Nil
	Net Annual Ground Water Draft	
	Projected Demand for Domestic and industrial uses upto 2025	
	Stage of Ground Water Development	Safe
15.	AWARENESS AND TRAINING ACTIVITY	
	Mass Awareness Programmes organized	Nil

	Water Management Training Programes organized	Nil
14.	EFFORTS OF ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING	Nil
	Projects completed by CGWB	Nil
	Projects under technical guidance of CGWB	Nil
17	GROUND WATER CONTROL AND REGULATION	
	No. of OE blocks	Nil
	No. of critical blocks	Nil
	No. of Blocks notified	Nil
18.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Nil

1.0 Introduction

Tawang district lies between latitudes27^0 52□N and 27□28□ N and longitude between 91^{0}32'E and 92^{0}23'E. The district is bounded by Lower Tibet in the North, Bhutan to the south and West and West Kameng district in the East.

The district is divided into three sub-divisions, three blocks and nine Nos. of circles. The district Head Quarter is situated at Tawang. The river system of the district is a part of the Brahmaputra river basin. The prominent rivers are Tawang –Chu and Nyamjang-Chu. Both the rivers flow in the south-westerly direction.The drainage pattern is generally dendritic to sub-parallel in nature and follows the geomorphological trends of the hills and mountains. Most of the rivers and streams are perennial. In the hilly terrain the rivers have deep narrow gorges along their courses. Both the rivers are tributaries of the Manas river.

The agriculture of the district mainly depends on monsoon rainfall. However irrigation potential has been created for changing 'shifting' cultivation into permanent cultivation in the available land of foothills and valleys. Nos. of minor irrigation projects have been implemented in the district

2.0 Rainfall and Climate

Annual rainfall in the district varies from 1500 mm to 2000mm. The normal annual rainfall in Tawang area is nearly 1600 mm. Most of the rainfall is received during the monsoon period (June to September). Heavy rainfall is received during summer and occasional rainfall/snowfall during winter. January and February are the driest months. The rainfall received during summer is under the spell of South-West monsoon. The onset of South-West monsoon occurs by the end of May or the first week of June and withdraws by late September or early October. The climate of the district is largely influenced by the nature of its terrain. The summer is moderate and extreme cold in winter. However, the mountain peaks are covered with perpetual snow. In winter temperature falls below freezing point.

3.0 Geomorphology and Soil Type

3.1. Geomorphology

Two third of the district constitutes high mountain ranges falling in the Higher Himalayan zone. The northern part of the district is mostly devoid of vegetation, due to heavy snowfall during winter season. The highest mountain peak Kangte in the district is found at an altitude of 7090 m. The valley area is

found along the river Tawang –Chu and Nyamjang-Chu. These two major rivers enter the district from Tibet in the north-east and flow to Bhutan in southwest corner. The district is covered by hard rock terrain and the northern part is snow bound. The drainage density is moderate to low. On the regional scale, the drainage pattern is angular to sub-angular. In the northeastern part of Thingbu circle the drainage pattern is sub-dendritic.

The entire district is hilly mountainous terrain. The hills and mountains have NE-SW or NW-SE trend. The narrow and elongated valleys are topographic depressions between hill ranges. Geomorphology of the district may be divided into two major geomorphological units:-

a) Denudo-structural Hills

These are mainly comprised of metamorphites and some igneous intrusions; with high hills and steep slopes with altitudes varying from 2100-6800m.Around 90% of the total geographical area of the district is occupied by this unit. This unit acts as run-off zone.

b) Valley fills

Within the hill ranges, a few valley fills occurs with limited areal extent. These are covered by recent alluvium. This unit acts as good recharge zone.

3.2 Soil Types

The nature and properties of soil vary with the area. The soils of the valleys are generally loamy or sandy loam mixed with coarser soil particles. Soil in greater part of the district is red sandy soils and skeletal soils. In the forested regions , the soil generally contains high humus and nitrogen due extensive cover of forests. Soils of the mountains are relatively lacking in organic materials. The soil of this category is reddish in colour and acidic in nature. The soil along the foothill areas is alluvial, loamy or sandy loam mixed with gravel and pebble brought down by rain waters from high altitudes. The soil in the valley is clay alluvium and rich in organic content.

The soils of the valleys are favorable for cultivation of kharif and Rabi crops. The soils of the hills are suitable for shifting cultivation and dry paddy, maize etc.

4.0 Ground Water Scenario

4.1 Hydrogeology

Major part of the district is occupied by consolidated formation of Sela Group.

The consolidated formations forming the Sella Group include the high and moderate hill ranges and occupy more than 95% of the total area. These formations are mostly comprised of metasediments like gneissic and schistose rocks and fissured formations (phyllites, schist, quartzites etc.) belonging to Archaean and Palaeozoic age. The rocks of this unit are very hard and compact with steep slopes and escarpments. They act basically as run-off zone and has little importance from ground water point of view. However, secondary porosity like cracks, joints, fissures etc, at places aided with thickness of weathered zone and slope factor, may yield good amount of ground water. The limited amount of ground water in this area comes out through the weaker planes in the form of springs. The discharges of the springs in gneissic rocks were found to be 32 to 64m3/day. In the schistose rocks, the discharge were found tobe 14 to 17m3/day and in quartzites 10 to 43m3/day. Spring discharge in gneissic rocks was found to be more due to presence of more fractures and joints. The unconsolidated Quaternary sediments occupy the small valley areas. They are distributed as thin layers in intermontane valleys. Sedimentation pattern is not uniform all over.

4.2 Ground Water Resources

The district is totally covered by hills with slopes more than 20%. So, the methodology of GEC'97 could not be adopted for the computation of dynamic ground water resources in the district. The sub-unit demarcation into command and non- command has not been carried out since the data for the same are not available.

. **4.3 Ground Water Quality**

As per earlier field investigation reports it is found that water sample collected from springs indicates that PH values range between 6.5 and 8.02. Electrical conductivity of the water is found to vary from 18-486 micromhos/cm at 25OC. The concentration of fluoride ranges from 0.7 to 0.44ppm. The range of concentration of calcium and magnesium is in between 2-54 and 1-22ppm respectively. Concentration of chloride ranges from 7 to 14 ppm . In general, the chemical quality of ground water in the district is fresh and potable and can safely be used for domestic and industrial purposes. A few thermal springs have been reported to be present in the district at inaccessible locations.

4.4 Status of Ground Water Development

The entire district is covered by hills of consolidated rocks. The rock types are mostly comprised of metasediments like gneissic and schistose

rocks and fissured formations (phyllites, schist, quartzites etc.). These rocks are very hard and compact. The scope for ground water storage is limited mostly to secondary porosities like cracks, joints, fissures etc. These weaker planes, at places, aided with thickness of weathered zone and slope factor, may yield sufficient amount of ground water. These aquifers are the main source of springs. Ground water emanating in the form of springs are being developed for use as a source for water supply.

Ground water is used mainly for drinking purpose as there is no major industry in the district. Ground water utilization for irrigation may be considered as negligible. Due to hilly terrain, spatial variation of rainfall, nature of soil, non-availability of irrigation facilities, people practice shifting and terraced cultivation.

5.0 Ground Water Management Strategy

5.1 Ground Water Development.

Earlier Hydrogeological investigations carried out by the Central Ground Water Board in the district revealed the occurrence of a good number of perennial springs in different altitudes. The discharges of the springs progressively increase in the lower altitudes. These springs can be developed scientifically for providing safe drinking water to the rural people. Discharge of springs may be increased by widening of fractures and clearing at the openings. Rain water harvesting technique which is well known to the people of the district can also be developed for solving the scarcity of potable water. Large diameter dug wells are also recommended in the valley areas which may provide sufficient water for domestic purposes .

5.1 Rainwater harvesting structures constructed under centrally sponsored scheme. Nil.

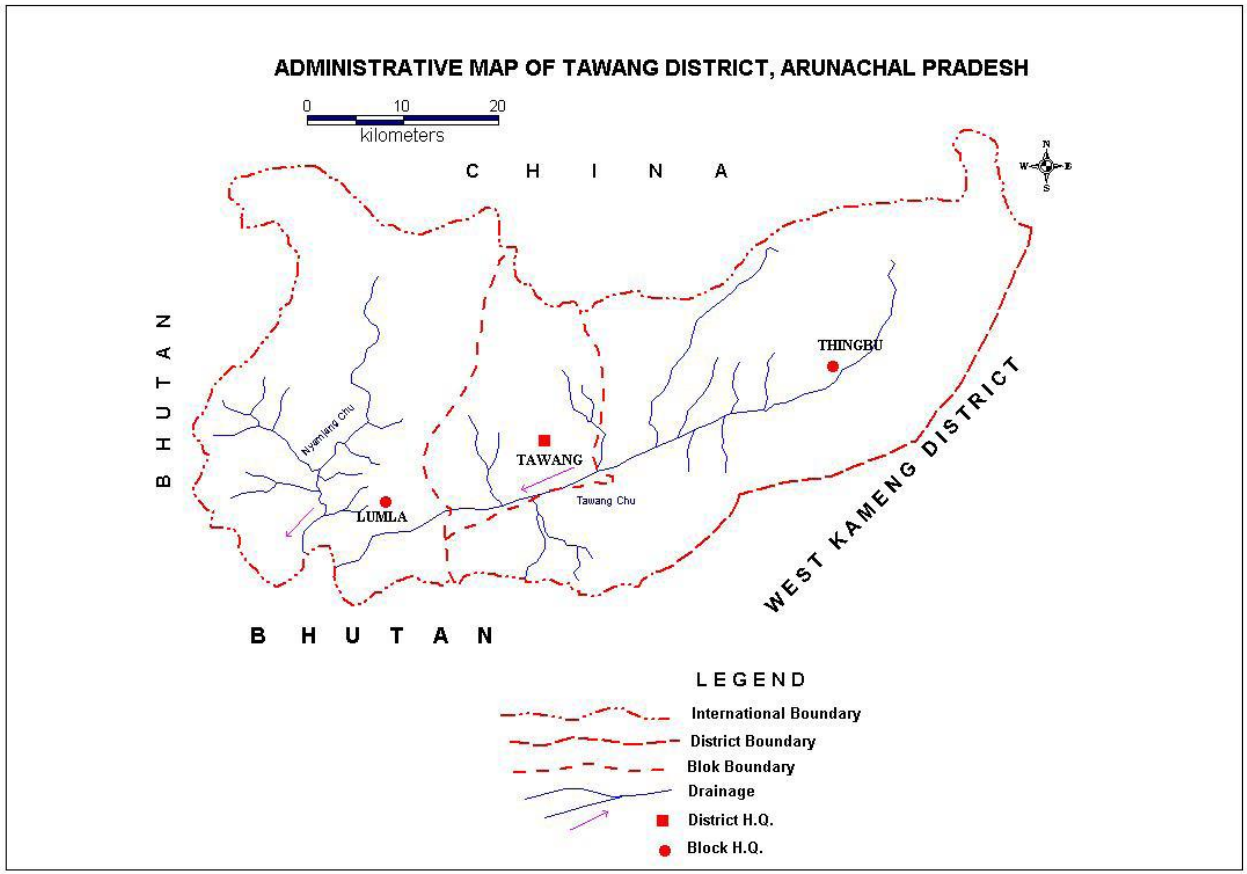
6.0 Awareness and Training Activity

6.1 Mass Awareness Training Programme :

Nil.

7.0 Recommendations

Existing hydrogeological set up indicates the limited ground water development prospects. From the hydrogeological point of view, the entire area of the district can be classified into consolidated formation. Ground water prospect is very much limited in this unit and is confined mainly to secondary porosities developed due to joints, fractures etc.In this unit the only source of development of ground water is through springs. The perennial springs may be developed by constructing sumps with concrete and widening the joints and fractures, if necessary, The sumps or the collector structure should be well protected from surface contamination. However, rain water harvesting technique may be adopted in the district for adequate water supply.


ADMINISTRATIVE MAP OF TAWANG DISTRICT, ARUNACHAL PRADESH
0
10
20
kilometers
C H I N A
B H U T A N
THINGBU
TAWANG
Nyamjang Chu
LUMLA
Tawang Chu
WEST KAMENG DISTRICT
B H U T A N
LEGEND
International Boundary
District Boundary
Blok Boundary
Drainage
District H.Q.
Block H.Q.

HYDROGEOLOGICAL MAP OF TAWANG, ARUNACHAL PRADESH

LEGEND

Annotation	Geomorphic Unit	Age	Formations	Lithology/Land use/Hydrogeological Characters	Ground Water Potential
	High denudo-structural hills	Archaean to Precambrian	Sella,Bomdila Group	Quartzite, schist, gneiss etc./Jhum, snow cover, forest,settlement/ Run-off zone	Poor, Spring development (Yield 14-43m3/day)
	Snow field				