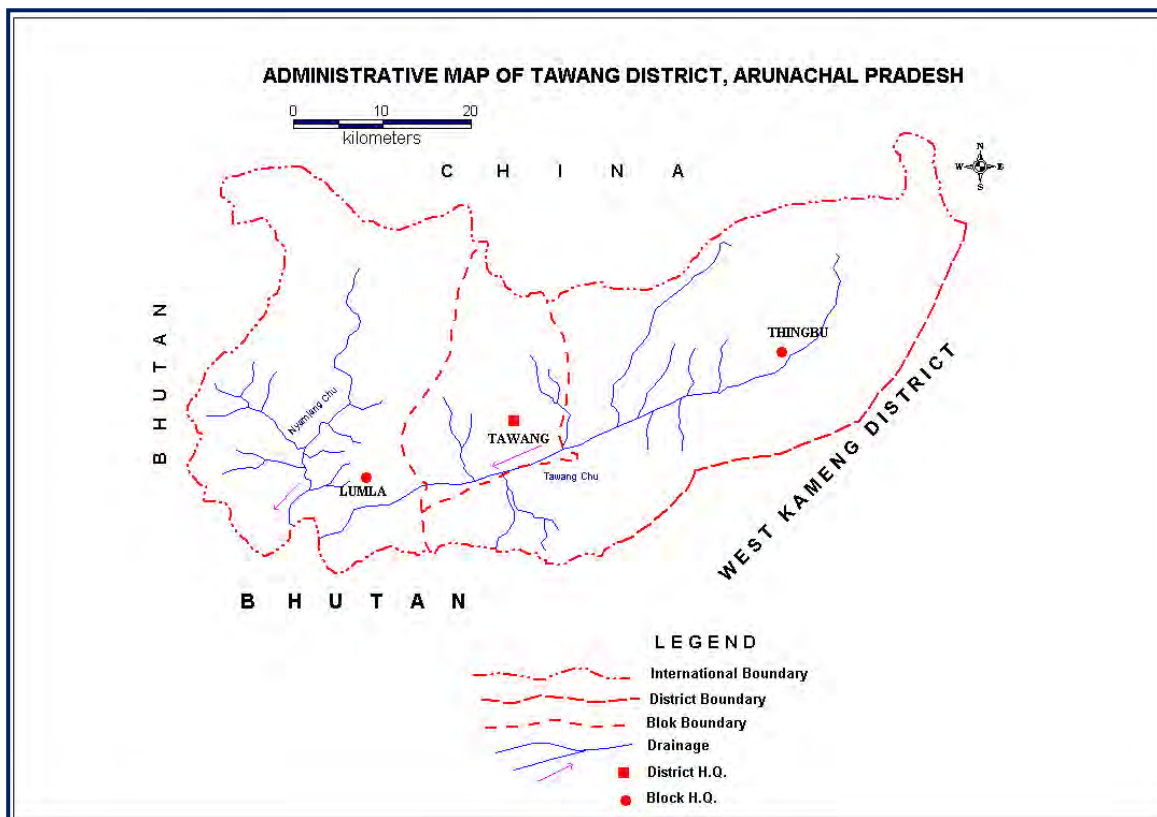




Ground Water Information Booklet Tawang District, Arunachal Pradesh



Central Ground Water Board
North Eastern Region
Ministry of Water Resources
Guwahati
August 2009

**GROUND WATER INFORMATION BOOKLET
TAWANG DISTRICT, ARUNACHAL PRADESH**

AT A GLANCE

Sl No.	ITEMS	Statistics
1.	GENERAL INFORMATION	
	i) Geographical area (sq. km)	2172
	ii) Administrative divisions (Sub-division)	3
	Number of blocks	3
	Number of villages	181
	iii) Population (As on 2001 Census)	38,924
	iv) Average annual rainfall (mm)	
2.	GEOMORPHOLOGY	
	Major physiographic units	Hilly Gneissic Complex, Low weathered hills with intermontane valleys
	Major drainages	Tawang Chu and Nyamjang Chu
3.	LAND USE	
	a) Forest area :	2239.6 (598 ha with unclassified forest)
	b) Net area sown	4495 ha
	c) Cultivable area :	6205 ha
4.	MAJOR SOIL TYPES	Alluvial and loamy
5.	AREA UNDER PRINCIPAL CROPS (As on 2005-06)	4160 ha
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Numbers of Structures)	
	Dugwells	-
	Tubewells/Borewells	Nil
	Tanks/Ponds	Nil
	Canals	26 Nos.
	Net irrigated area	53 ha
	Gross irrigated area	60 ha
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03-2009)	
	No. of Dug Wells	Nil
	No. of Piezometers	Nil
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Gneissic Complex
9.	HYDROGEOLOGY	
	➤ Major water bearing formation	Alluvium
10.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-2009)	
	No. of wells drilled (EW< PZ< SH< Total)	Nil
	Presence of chemical constituents in more than	

	permissible limit	
	Type of water	Fresh and potable
11.	DYNAMIC GROUND WATER RESOURCES (2004) IN MCM	
	Projected Demand for Domestic and industrial uses up to 2025	0.23 mcm
	Stage of Ground Water Development	Safe
12.	AWARENESS AND TRAINING ACTIVITY	
	Mass Awareness Programmes organized	Nil
	Water Management Training Programmes organized	Nil
13.	EFFORTS OF ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING	
	Projects completed by CGWB	Nil
	Projects under technical guidance of CGWB	Nil
14.	GROUND WATER CONTROL AND REGULATION	
	No. of OE blocks	Nil
	No. of critical blocks	Nil
	No. of Blocks notified	Nil
15.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Nil

GROUND WATER INFORMATION BOOKLET TAWANG DISTRICT, ARUNACHAL PRADESH

1.0 INTRODUCTION

Tawang district lies between North latitudes 27° 52' and 27° 28' and East longitudes between 91° 32' and 92° 23'. The district is bounded by Lower Tibet in the north, Bhutan in the south and West Kameng district in the East.

The district is divided into three sub-divisions, three blocks and nine circles. The district Headquarters 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 follow 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. A number of minor irrigation projects have been implemented in the district

2.0 RAINFALL AND CLIMATE

Annual rainfall in the district varies from 1500 to 2000 mm. 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 it 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 which are as follows.

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- 6800 m. 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 to extensive coverage 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 clayey alluvium and rich in organic content.

The soil of the valleys is favourable for cultivation of Khariff and Rabi crops. The soils of the hills are suitable for shifting cultivation for paddy, maize etc.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

Major part of the district is occupied by consolidated formation of Sella 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 (phyllite, schist, quartzite 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 have 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 discharge of the springs in gneissic rocks was found to be 32 to 64 m³/day. In the schistose rocks, the discharges were found to range from 14 to 17 m³/day and in quartzite, it varies from 10 to 43 m³/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 entire district is occupied by hill ranges with very steep slopes that are more than 20%. Moreover, no details about the recharge potential in these hills are available. As per GEC, 97 these hilly areas are not taken into account for resource computation. Due to lack of

data especially on population, number of ground water structures, draft and other important parameters on watershed basis, the smallest administrative unit, i.e. the R.D. Block has been taken as the unit of computation. Water level trend is also not available due to lack of ground water abstraction structures, hence the annual ground water recharges of all the assessment unit have been computed by the Rainfall Infiltration Factor method.

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

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 25^oC. The concentration of fluoride ranges from 0.7 to 0.44 ppm. The range of concentration of calcium and magnesium is in between 2 and 54 and 1 and 22 ppm 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 (phyllite, schist, quartzite 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 practised 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.

5.2 Rainwater harvesting structures constructed under centrally sponsored scheme

Nil.

6.0 AWARENESS AND TRAINING ACTIVITY

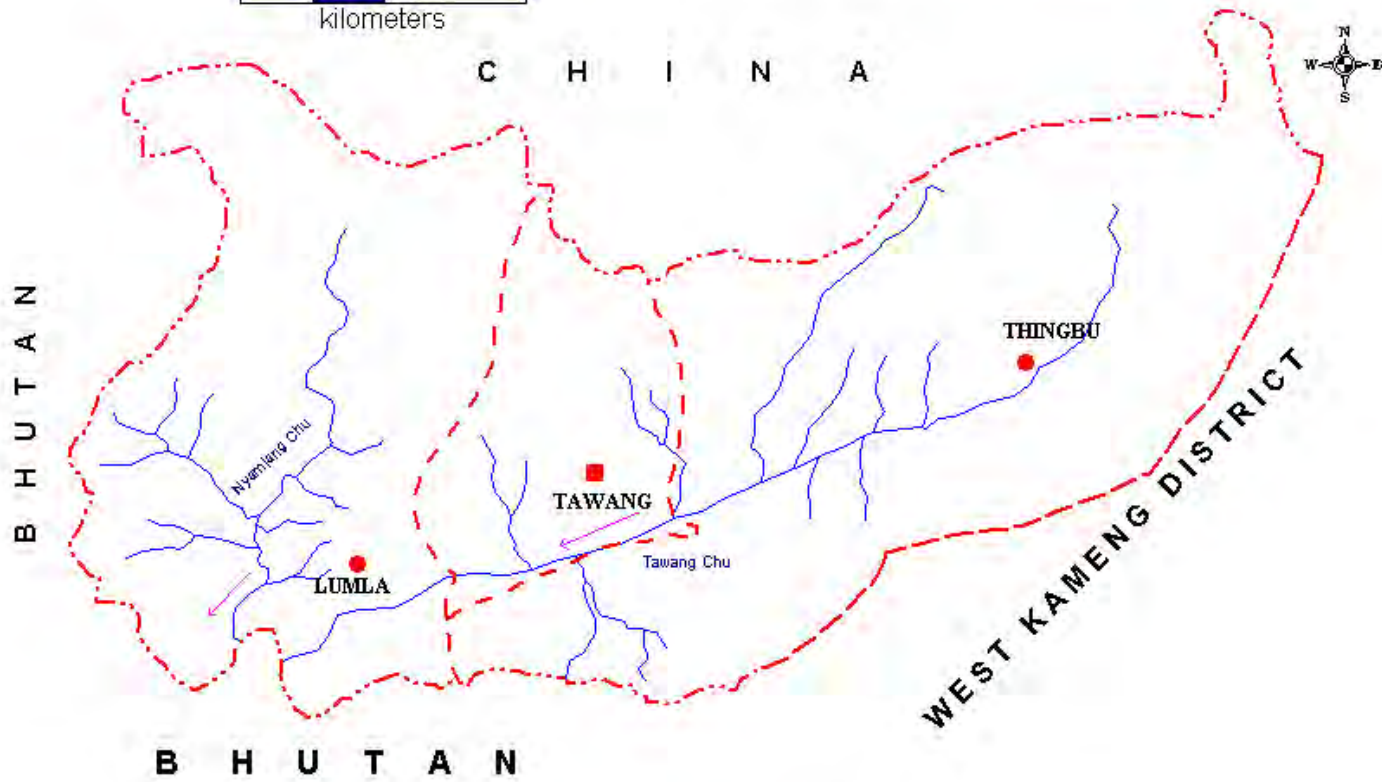
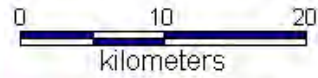
6.1 Mass Awareness Training Programme

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.

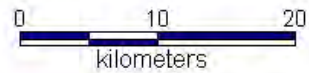
ADMINISTRATIVE MAP OF TAWANG DISTRICT, ARUNACHAL PRADESH



LEGEND

-  International Boundary
-  District Boundary
-  Blok Boundary
-  Drainage
-  District H.Q.
-  Block H.Q.

HYDROGEOMORPHOLOGY OF TAWANG DISTRICT, ARUNACHAL PRADESH



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 14-43m ³ /day)
	Snow field				

