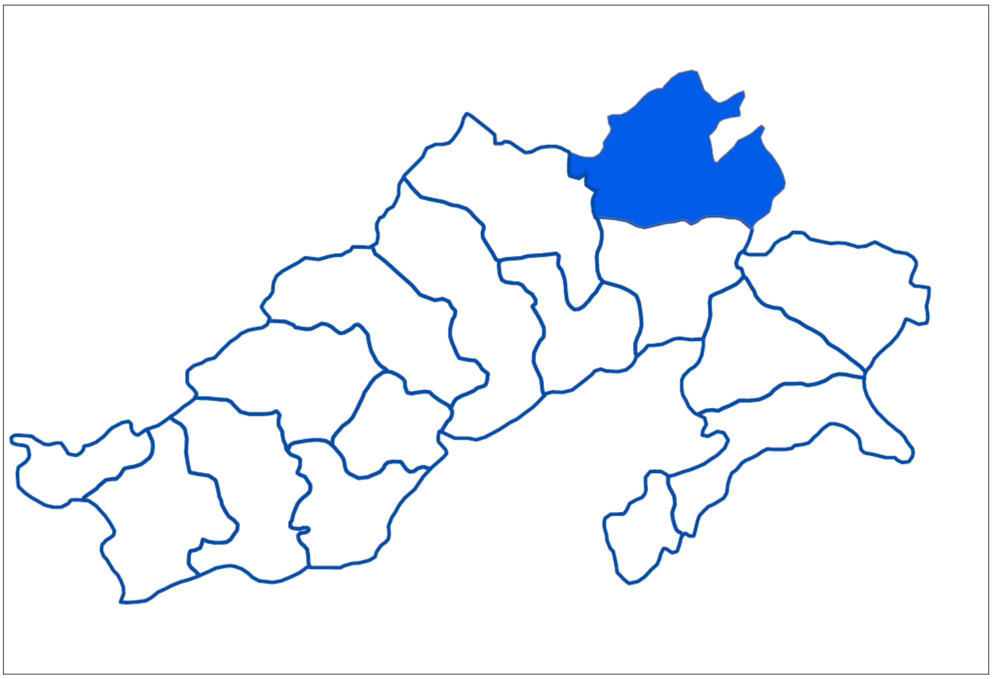
Technical Report Series: D   No:

Ground Water Information Booklet
Dibang Valley District, Arunachal Pradesh



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

September 2013

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DIBANG VALLEY DISTRICT AT A GLANCE

Sl.No	ITEMS	Statistics
1.	GENERAL INFORMATION	
	i) Geographical area (sq. km)	13, 029
	ii) Administrative Divisions (As on 31st March 2003) Number of Tehsils/Block Number of Panchayat/Villages	3 blocks Panchayat: 10 Village: 213
	iii) Population (As on 2011 Census)	7948
	iv) Average Annual Rainfall (mm)	3281.33
2.	GEOMORPHOLOGY	
	Major physiographic units	Denudational Hills
	Major Drainages	Dibang River
3.	LAND USE	
	a) Forest area (Reserved Forest):	4149 sq. km
	b) Net area sown	1334ha
	c) Cultivable area	NA
4.	MAJOR SOIL TYPES	Plain alluvial and hilly soils
5.	AREA UNDER PRINCIPAL CROPS (As on 2005-2006) (in sq. km)	29.0
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and numbers of Structures) (as on 2001)	
	Dug wells	Data NA
	Tube wells	1
	Tanks/ ponds	Data NA
	Canals	Data NA
	Other sources (surface water flow & surface lift schemes)	Nil
	Net irrigated area	170.12ha
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2013) No of Dug Wells No of Piezometers	Nil Nil
8.	PREDOMINENT GEOLOGICAL FORMATIONS	Lower to Middle Paleozoic
9.	HYDROGEOLOGY	Consolidated and unconsolidated formations

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10.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-2013)	Nil
	No of wells drilled (EW, OW, PZ, SH, Total)	
	Depth Range (m)	
	Discharge (litres per second)	
	Storativity (S)	
	Transmissivity (m^2/day)	
11.	GROUND WATER QUALITY	
	Presence of Chemical constituents more than permissible limit	None
	Type of water	Soft and potable
12.	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 Replanishable Ground Water Resources	
	Net annual Ground Water Draft	
	Projected Demand for Domestic and Industrial Uses up to 2025	
	Stage of Ground Water Development	Safe
13	AWARNESS AND TRAINNING ACTIVITY	
	Mass Awareness Programme organized Date Place No of Participants	Nil
14.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	Nil
	Projects completed by CGWB (No & Amount spent)	Nil
	Projects under technical guidance of CGWB	Nil
15.	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	Nil
	No of Critical Blocks	Nil
	No of blocks notified	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	

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1.0 Introduction

The Dibang district of Arunachal Pradesh lies between the Latitudes 23°30'N and 27°05'N, and Longitudes 95°10'E and 96°40'E It is bounded on the north, northeast and east by China, southeast by Lohit district, on west by East Siang and West Siang districts and on south by Lower Dibang Valley district of Arunachal Pradesh (Map: 1). Anini is the lone subdivision of the district, which has three community development blocks. There are 213 villages in the district. As per 2001 census the population of the district is 7948. The Dibang Valley District was divided into two, viz., the Dibang Valley and the Lower Dibang Valley districts.

The Dibang river flows through the district before it confluence to the Brahmaputra river. As such the district is within the Dibang River Basin.

The main river system of the district is the Dibang River. The river originates in the southern slopes of peak 5355 as Adzon Chhu and flows southwards almost in a straight course and debouches into the Brahmaputra plains at Nizamaghat. The Dibang River is the four off spring of Matum River on west and Dri River on east, both originating from the Tibetan plateau and joining a little west of Anini, the district headquarter. The issuing river from this confluence takes the name of Dibang River. There are numerous southerly flowing small rivers and streams tributaries to the Dibang River. The overall drainage pattern of the district is dendritic to sub-parallel. On the northern mountainous portion it is mostly dendritic in nature, while it is sub-parallel on the northern most part.

Major parts of the district are hilly with rugged terrain and there is little development of alluvium. Water Resources Department of Govt. of Arunachal Pradesh, earlier known as Irrigation and Flood Control Department, has constructed one deep tube well for irrigation purposes.

Central Ground Water Board, North Eastern Region, Guwahati had assigned Sri J. K. Verma to carry out hydrogeological survey in the foot-hills part of the then undivided district. Sri M. Borpujari, Scientist-B had carried out Systematic Hydrogeological Survey during 1988 – 90 the then undivided district. However, no drilling was so far carried out in the district mainly due to problem of accessibility in this hilly district.

2.0 Rainfall & Climate

The district falls under heavy rainfall belt, which varies from 3000mm to 5000mm. In 2004, the district HQ Anini recorded average annual rainfall of 3281.33mm. Generally, the monsoon starts from March and continues up to last part of September, but winter rains are not infrequent. However, period from January to February may be considered as pre-monsoon period and October to December as post-monsoon period.

The climate of the district is mainly influenced by orography. It is sub – tropical, wet and highly humid in nature in the foothills and cold in the higher elevations, ranging to freezing point during extremely cold period.

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3.0 Geomorphology & Soil Types

The Dibang Valley district is the Trans Himalayan part of Arunachal Himalaya. The main geomorphic unit of the district is denudational structural hills. Almost the entire district is occupied by denudational structural hills consisting of diorite, tonalite, granodiorite, hornblende granite, pegmatites, gneiss, schist, marble bands, quartzites, etc. of pre Cretaceous to early Tertiary age. The hills are highly eroded fractured and with a weathered zone of 5 to 30m thick. The regional trend of the hills is NW–SE and hills are alternate with deep gorges. Another minor geomorphic unit is the NW-SE trending palaeolake deposit is found near Anini.

The nature and properties of soil vary according to the topography and elevation of the area. Soils of the hills and mountains generally contain high humus and nitrogen due to forest cover. In the valleys, it is clayey in nature and is rich in organic matter. The nature of the soil is mainly acidic (pH value varying from 5.26 to 6.32) and the acidity increases with the amount of precipitation and heaviness of the soil.

4.0 Ground Water Scenario

4.1 Hydrogeology

The hydrologeology of the district is controlled by the tectonics, geological formations and the amount of rainfall. Broadly, the district can be divided into two distinct hydrogeological units, *viz*., consolidated and unconsolidated (Map II) formations.

The pre Cretaceous rocks of Tidding suture and the late Cretaceous-early Tertiary rocks of Lohit plutonic complex form the consolidated unit. The Tidding suture is made up of basic volcanics, schist, foliated quartzites and crystalline marble. The NW-SE trending Lohit Plutonic Complex is made up of diorite, tonalite, granodiorite, hornblende granite, pegmatites, gneiss, schist, marble bands. In the vicinity of the thrust zone the rocks are highly sheared, strongly foliated, highly jointed and fractured. Ground water in this unit occurs under water table and semi confined to confined condition and is manifested in the form of springs with discharge varying from 10 lpm to 80 lpm, with a maximum 1.25 m^3/minute. The movement of ground water is towards areas of lesser altitude and makes conduit through interconnected secondary or planar porosity features like fractures and fissures.

Anini palaeolake deposit constitutes the unconsolidated formation along with colluvial and whatever little alluvial deposits developed in the district. The lake deposit is 12 km in length, 5 km wide and nearly 200m thick and is exposed at an altitude of 1650m above m.s.l. The lake sediment is capped by 1 to 1.5m thick lacustrine deposits of peaty clay. The colluvial and alluvial deposits are composed of various grades of sands and gravels. However, the ground water condition of this unconsolidated formation is not known due to lake of ground water abstraction structures.

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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.

4.3 Ground Water Quality

The water samples collected from springs and dug wells were analyized in the Regional Chemical Laboratory, CGWB, NER, Guwahati and the range of chemical constituents are tabulated below:

Source	pH	EC (ms/cm at 25^0C)	Concentration in mg/litre									
			TDS	TH	Ca	Mg	Na	K	Fe	CO_3	HCO_3	Cl
Spring	6.94-7.48	20-59	10-40	20	8	ND	1-5	1	ND	ND	18-24	7-11
Dug well	6.27-6.97	70-159	50-140	25-115	6-24	2-13	1-4	2-7	ND	ND	24-55	5-18

The above chemical quality table shows that the quality of water from springs and dug wells are excellent and suitable for all purposes. However, the water is slightly acidic in nature, which may be due to acidity of the soil through which rain water percolates to enrich the ground water body.

As per the norms of High Technology Mission (1986), the water constituents are within the safe limits for drinking and industrial purposes, except the acidity of the water, which is slightly high. Suitable treatment may be initiated to remove the acidic nature of the ground water.

4.4 Status of Ground Water Development

The high hills occupy major part of the district and as such development practice of groundwater in the hilly portion is different from foothill and valley portion. The habitation in the mountainous terrain is dependent on spring water to mitigate their drinking water need. As per 2001

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census, 97.79% percent of the villages of the district are provided with drinking water facilities. It is found that till 1989, 95% of the village population use water from streams and nalas to fulfill their drinking water needs. However, most of the springs are choked due to dirt, or are over grown with vegetation. It is worthwhile to develop these springs in the lines suggested in the manual of Rural Water Supply. As per the information of Water Resource Department, Govt. of Arunachal Pradesh one deep tube well constructed at Harupahar, which is 15km away from Roing town and is 75m deep. The well discharge is 1800lpm and is energized with diesel operated 2-stage submersible pump.

5.0 Ground Water Management Strategy

5.1 Ground Water Development

The problem of ground water development in the district varies depending upon topographic and geologic conditions. The availability and mode of occurrence of water in the hilly terrain (nearly 90% of the total area of the district) is different from valley portion.

As the area is hilly with steep slopes, it has little prospect for ground water infiltration and large-scale ground water development may not be possible here. For providing drinking water facilities in these areas local perennial springs should be developed in a balanced way. Since most of the spring flow is porous and shallow, the area around the spring should be cleaned and should dig out to ensure a good flow. Digging should continue until the impermeable layer is reached. An impervious layer makes a good foundation for the spring box and provides a better surface to arrest underflow. Proper gravel packing is necessary to reduce siltation in the spring box. Wherever possible, trench of proper size should be constructed above the stream to catch surface flow from rains. Moreover, wherever possible horizontal boring may be carried out to fit slotted pipe to enhance the discharge. Proper sanitary protection measurement is to be undertaken to avoid bacteriological pollution. To make spring water supply sustainable, community participation should be encouraged.

Ground water structures can be constructed in those areas where the crystalline rocks are sheared, jointed, fractured and weathered. For selection of sites for such structures a lineament map will be very useful. In such areas, dug wells of 5-6m diameter tapping the full thickness of fractured/weathered zone and bore wells of 150cm diameter of 100m depth are suggested to exploit ground water. However, the yield potentiality of such ground water structures are limited, e.g., for such dug well a yield of 5 –10m^3/day and in case of bore well 50-150lpm yield can be expected.

5.2 Water Conservation and Artificial Recharge

There is no water conservation and artificial recharge structure in the district a as there is little scope of recharge to the aquifers.

As the district is almost entirely hilly, there is limited scope of groundwater development and the scope of groundwater recharge in the hilly

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terrain requires a more rigorous study encompassing the hydrogeological as well as water requirement aspects of the area. In the hilly terrain the population density is sparse. The water requirement of the hilly populace can be fulfilled by spring water and rainwater can be conserved for utilization in the lean period when springs are either dried out or their discharge drops. As such artificial recharge structures can be constructed careful hydrogeological investigation.

6.0 Ground Water related issues & problems

7.0 Awareness & Training Activity

7.1 Mass awareness programme (MAP) & Water Management Training programme (WMTP) by CGWB

CGWB has not organized any Mass Awareness (MAP) and Water Management Training Programme (WMTP) in the district.

7.2 Participation in Exhibition, Mela, Fair etc.

In the district ground water related exhibition, mela, fair, etc. are not organized.

7.3 Presentation & Lectures delivered in public forum/ Radio/ T.V./ Institution of repute/ Grassroots associations/ NGO/ Academic institutions etc.

8.0 Areas notified by CGWB/ SGWA

Nil.

9.0 Recommendations

a) In the hilly terrain spring water should be effectively tapped to mitigate the drinking water need of the scattered hamlets and the urban as well as rural populace. For providing drinking water facilities in these areas, local perennial springs can be developed in a balanced way. Since most of the spring flow is porous and shallow, the area around the spring should be cleaned and should dig out to ensure a good flow. Digging should continue until the impermeable layer is reached. An impervious layer makes a good foundation for the spring box and provides a better surface to arrest underflow. Proper gravel packing is necessary to reduce siltation in the spring box. Wherever possible, trench of proper size should be constructed above the stream to catch surface flow from rains. Moreover, wherever possible horizontal boring may be carried out to fit slotted pipe to enhance the discharge. Proper sanitary protection measurement is to be undertaken to avoid bacteriological pollution. To make spring water supply sustainable, community participation should be encouraged.

b) In the mountainous region, dug wells of 5-6m diameter tapping the full thickness of weathered zone and bore wells of 150cm diameter of 100m depth are suggested to exploit ground water. However, the yield potentiality of such ground water structures are limited, e.g., for such dug

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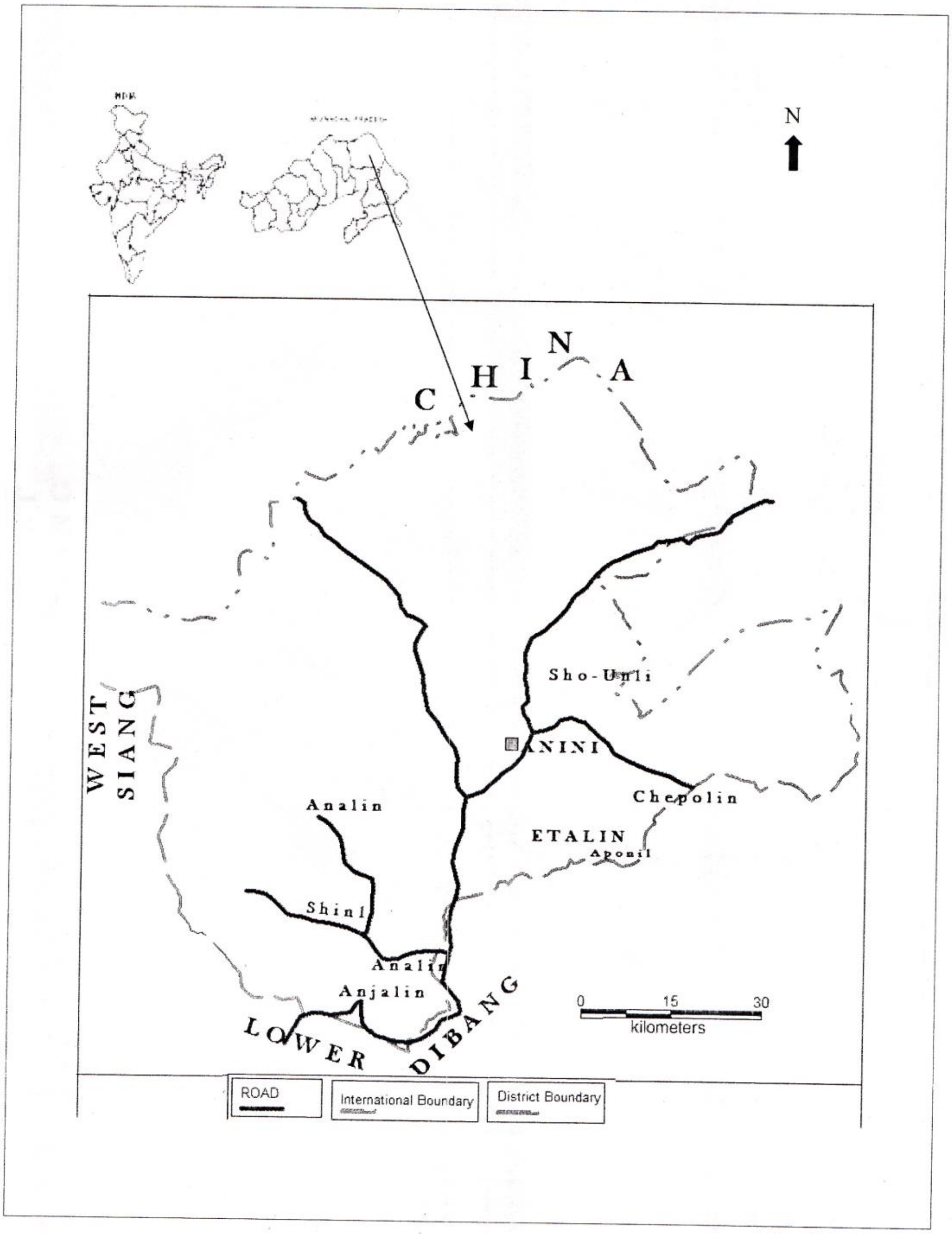
well a yield of 5 –10m^3/day and in case of bore well 50-150lpm yield can be expected. A lineament map is also required for selection of sites for successful groundwater structures.

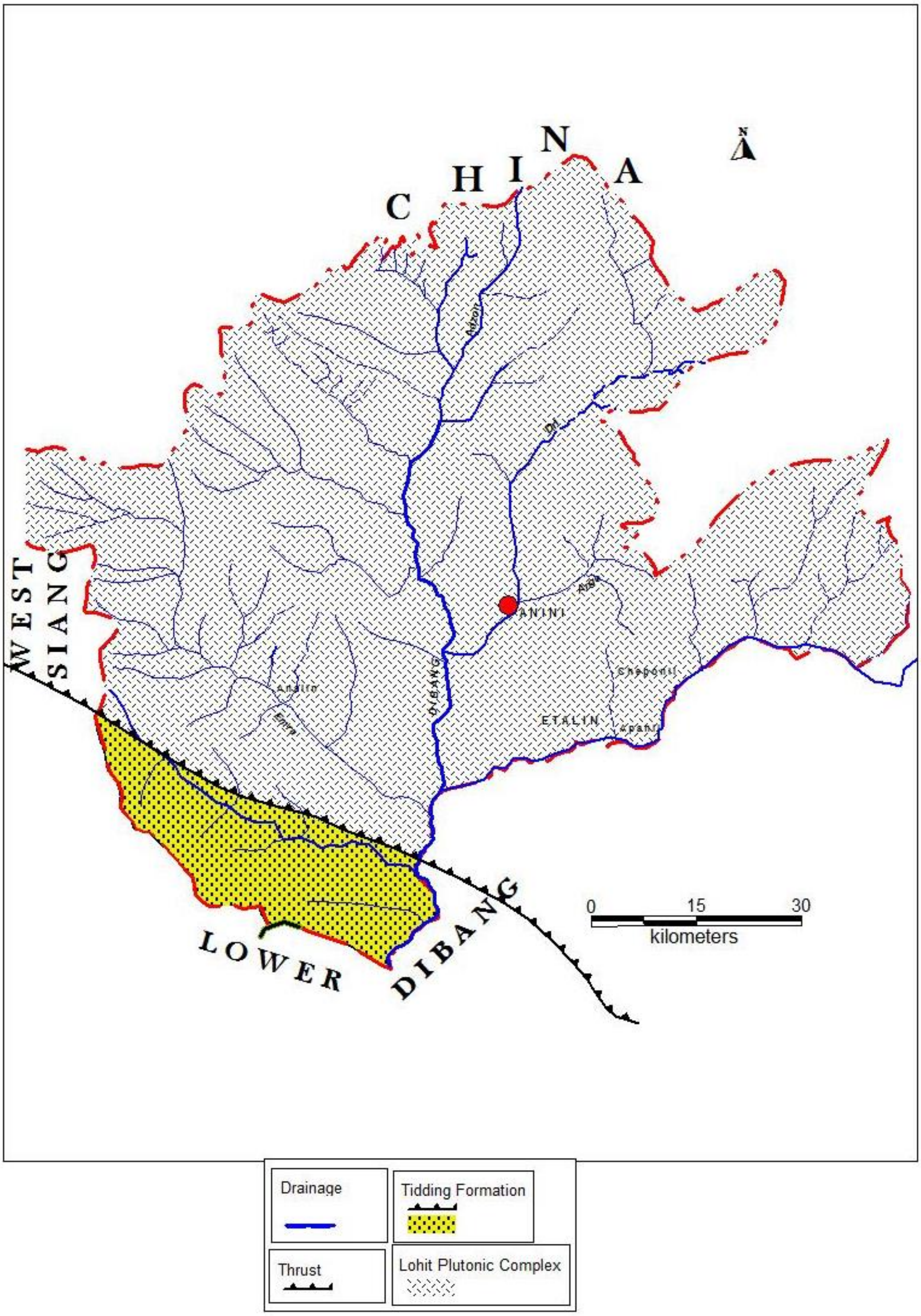
c) Roof top rainwater harvesting should be practiced in the hilly area and surplus rain water can be conserve to mitigate the drinking water problem during lean period when spring discharge drops considerably. In general the valley portion where population density is high there is abundant ground water and there is little scope for groundwater recharge. As such artificial recharge structures can be constructed in the northern part after careful hydrogeological investigation.

Plate -I

INDEX MAP OF DIBANG VALLEY DISTRICT, ARUNACHAL PRADESH



HYDROGEOLOGICAL MAP OF DIBANG VALLEY



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