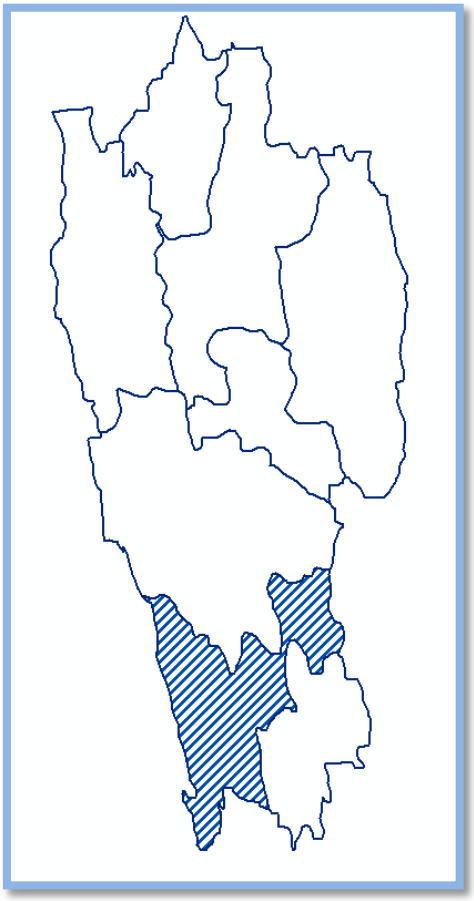
Technical Report Series: D

No:

Ground Water Information Booklet
Lawngtlai District, Mizoram



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

GROUND WATER INFORMATION BOOKLET
LAWNGTLAI DISTRICT, MIZORAM

DISTRICT AT A GLANCE

Sl. No.	ITEMS	STATISTICS
1.	GENERAL INFORMATION i) Geographical Area (sq.km.) ii) Administrative Divisions (as on 2013) iii)Population (as per 2011 Census) iv)Average Annual Rainfall (mm)	 2,258 Two nos. of sub-divisions and two nos. of Blocks 72,620 2,850
2.	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 Denudo Structural Hills with low and moderate linear ridges Thega or Kawnpui, Tuichang and Kaladan or Tuipui river with its tributaries.
3.	LAND USE (sq. km.)	Mostly jhum/Shifting cultivation
4.	MAJOR SOIL TYPES	Colluvial soil, form along the steep side slopes and alluvial soil, in the limited plain areas.
5.	AREA UNDER PRINCIPAL CROPS (sq.km.)	Mainly practiced Shifting or jhuming cultivation.
6.	PREDOMINANT GEOLOGICAL FORMATIONS	Lower Tertiary Formations of Miocene age.
7.	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.
8.	GROUND WATER QUALITY	Chemical constituents are within the permissible limit. Ground water is fresh and potable and suitable for domestic and industrial purposes.
9.	DYANMIC GROUND WATER RESOURCES (2009) in mcm. i) Net annual Ground Water Resources ii) Net Annual Ground Water Draft	 8.13 0.06

	iii) Projected demand for Domestic and Industrial Use upto 2025 iv) Stage of Ground Water Development	0.14 0.79%
10.	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i) Projects Completed by CGWB (No & amount spent) ii) Projects Under technical Guidance of CGWB (Numbers)	 1 no. of Rain Water Harvesting structure has been completed under Central Ground Water Board. Nil
11.	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	 Nil
12.	MAJOR GROUND WATER PROBLEMS AND ISSUES	In spite of good rainfall, there is acute shortage of water especially during the summer.

GROUND WATER INFORMATION BOOKLET
LAWNGTLAI DISTRICT, MIZORAM

1.0 Introduction

Lawngtlai district of Mizoram is one of the administrative districts among other seven districts of Mizoram state. The district was created on the 11th November 1998. It is located in the southern most part of Mizoram having international boundaries with Bangladesh in the west and Myanmar in the east. The district is bounded by Lunglei ans Saiha districts in the north and in the south respectively. It lies in between North Latitude 22º0' to 22º45' ans east longitude 92º30' to 92º54' covering an area of 2258 sq km. lawngtlai is the headquarter of the district and it comprises two administrative sub-divisions and two rural development blocks.

As per 2011 census, the total population of the district is 73,685. Slope cultivation locally called shifting or jhuming is the main agriculture system in the district.

The district receives heavy rainfall during May to late September with an average annual rainfall of 2850 under the influence of southwest monsoon.

Physiographically, the district is mostly represented by North-South trendind hill ranges with moderately steep slopes, in the southeastern part of the district, the relief is comparatively lowerand the slopes are moderate to steep.

Thega or Kawnpui, Tuichang and Kaladan or Tuipui river with its tributaries drain the district.

Geologically, the district is occupied by shale, siltstone, and sandstone Surma Formations of Miocene age.

Groundwater stored in the hill slopes emanates in the form of springs, which are being used as a source of water supply.
From quality point of view, most of the chemical constituents are within permissible limits in groundwater.

The estimated gross annual dynamic groundwater resource is mcm while net groundwater availability for future irrigation development is mcm. The stage of development is %. Future provision for domestic and industrial use is mcm.

The present ground water utilization is for domestic and to some extend for agriculture purpose as there is no major industry in the district.

2.0 Rainfall and Climate

The district experiences moderate climate with highest relative humidity of 85% occurring during south west monsoon. Heavy rainfall is usually received during the month from May to September. The temperature ranges from 15º C to 25º C during winter. The average annual rainfall of the district is 2850 mm. the rainfall is mainly due to the monsoons

from early May to late September. The hottest period starts from the month of March up to August every year.

3.0 Geomorphology and soil type

3.1 Geomorphology

3.1.1 Denudostructural Hills

The district is mostly occupied by denudo structural hills which is predominantly argillaceous. These are north-south trending parallel to sub-parallel hill ranges with synclinal narrow valleys. The hills are steep and separated by rivers, which flow either to north or to the south, creating deep gorges. Basically these are structural hills. The denudation and weathering is still under-going in response to various processes. One of the dominant processes of the formation of such landform is running water. Based upon relief, drainage, lithology and structural pattern; it has been classified as follows: i) Low linear ridges, ii) Moderate linear ridges.

Low linear ridges

These are low elevated hills and occur in the western part of the district along the Bangladesh border. They have gentle to moderate slopes and possess gully erosion. In between these, north-south trending longitudinal valleys are common. The main rock types are shales with siltstone alterations of Bokabil formations.

Moderate linear ridge

This unit occupies almost entire area of the district. They trend in north-south directon. The main constituents are hard and compact sandstone, shale and siltstone alterations of Bhuban formations. The ridges show serrated top and hogback pattern, which are highly dissected and separated by intervening 'V' shaped narrow valleys. The major drainage shows parallel and trellis pattern forming deep gorges and water gaps.

3.2 Soil types

The soils of the district, are the products of the weathered ferruginous sandstone, shale followed by limited alluvial and colluvial materials transported by river/streams etc. In general, the soil formations have been categorized into following groups:

i. Colluvial soil, formed along the steep side slopes because of accumulation of material on slope surface.
ii. Alluvial soil, restricted to the plain areas along the river/stream cources.
iii. Terraces, these are thick and deep soils susceptible to erosion because of their topography.

Soils occur as a mixture of colluvial and alluvial materials. It is restricted to the rolling valleys along the river cources.

4.0 Ground Water Scenario

4.1 Hydrogeology

Almost the entire area of Lawngtlai district is occupied by semi-consolidated formations of denudostructural hills belonging to Bhuban group of rocks of Miocene age. The Bokabill group of rocks comprising shales with siltstone alterations occur in the western part of the district along the Bangladesh border. The main constituents are mixture of arenoargilaceous assemblage such as shale, siltstone, mudstone and fine grained hard compact sandstones. The unit is characterized by low permeability and infiltration. It acts as run off zone. Ground water potential is low, localized potential is limited way can be attributed through development of secondary porosity through cracks. The plain areas in the western part of the district along the Bangladesh border is underlain by limited thickness of alluvial materials. The shallow ground water structures may be attempted in the suitable locatios in the areas.

The occurrence of ground water in such a terrain is mainly restricted to weak zones such as fractures, lineaments and weathered residuum. These tectonic elements create seepage conduits, which are sources of springs. These springs are utilized as the main source of water supply to the population. The existing water supply for drinking purposes is mainly from those springs tapped through gravity drainage. A good number of springs were inventoried during earlier field investigations and results indicated that a large number of springs are perennial. In general, discharges of the springs are meager in high altitudes which progressively increase towards lower latitutudes.

4.2 Ground Water Resources

The ground water resources of the district have been calculated based on rainfall infiltration factor method. The method is considered because of lack of data especially on population, number of ground water structures, draft and other important parameters on watershed basis.. 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 Rainfall Infiltration Factor Method.

The smallest administrative unit, i.e. RD block has been taken as the unit of computation. The ares is mostly occupied by hills with very steep slopes that are more than 20%. As per GEC, 97 these hilly areas are not taken into account for resource computation. The ground water resources of the district is calculated as follows:-

Table 1(in ham)

Sl. no	Block	Rainfall recharge during monsoon season (ham)	Recharge from other sources during monsoon (ham)	Recharge from rainfall during non-monsoon season	Recharge from other sources during non-monsoon season	Total annual ground water recharge	Natural discharge during non-monsoon season	Net annual ground water availability
1	2	3	4	5	6	7	8	9

	Chawntai	98.43	Negligible	50.76	Negligible	149.19	14.92	134.27
	Lawngtlai	437.69	Negligible	225.71	Negligible	663.40	66.34	597.06
	District total	536.12	0	276.47	0	812.59	81.26	731.33

Sl. No.	Blocks	Net annual ground water availability	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic and industrial	Existing gross ground water draft for all uses	Allocation domastic and industrial requirement supply uo to 2025	Net annual ground water availability for future irrigation development	Stage of ground water development (%)
1	2	3	4	5	6	7	8	9
1	Chawntai	134.27	nil	1.58	1.58	6.63	127.64	1.18
	Lawngtlai	597.06	nil	4.20	4.20	7.40	589.66	0.70
	District total	731.33	nil	5.78	5.78	14.03	717.30	1.88

The estimated gross annual dynamic groundwater resource is 812.59 ham while net annual ground water draft is 5.78 ham. The stage of groundwater development is1.88 %. Natural discharge during non-monsoon season is negligible. Future provision for domestic and industrial use is14.03 ham and for irrigation use, it is717.30. ham

Lawngtlai district is under the **'SAFE'** category.

4.3 Ground Water Quality

Water samples collected for chemical analysis from spring during field seasion programme (1986-87) shows that iron content of water ranges between 0.4-0.6 ppm, which is within the permissible range of drinking water. The other constituents like ph, EC etc. have been considered based on hydrogeological studies in the state during 1985-86. In the adjacent district, p^H values range between 6.9 and 8.3. Electrical conductivity of the water is found to vary from 31-249 micromhos/cm at 25^{o}C except at few places. The concentration of bicarbonate ranges from 12 to 158 ppm.

In general, the chemical quality of ground water in the district is fresh and potable and is suitable for domestic and industrial purposes.

4.4 Status of Ground Water Development

The entire district is covered by hills of semi-consolidated rocks of Tertiary age. The main constituents are mostly hard and compact sandstone, shale, siltstone alteration. Because of steep slopes of the hills that are more than 20%, most of the rainwater flows out as surface run-off. Hence, there is axcute shortage of water during summer. In this type of hilly terrain the scope for groundwater storage is limited to mostly secondary porosity and structural

control in the higher elevation aquifer. 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 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 jhum cultivation.

5.0 Ground Water Management Strategy

Hydrogeological investigations carried out by the Central Ground Water Board during 1984-85 & 1985-86 in the entire state and pilot project studies under Technology Mission on drinking water and related water management in parts of Mizoram state revealed the occurrence of a good number of perennial springs in different altitudes. A good number of perennial streams alsi exist in the district. 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. Rain water harvesting which is well known to the people of the district can also be developed for solving scarcity of potable water.

5.1 Rainwater harvesting structures constructed under Centrally Sponsored Schemes

Village wise volume of water used and number of persons benefited are detailed below;

Sl. No.	Name of district/block	Name of Village	Volume of water used (litres)	No. of persons benefited
1	Lawngtlai/Lawngtlai R.D.Block	Lawngtlai	15,800	3,101

6.0 Recommendations

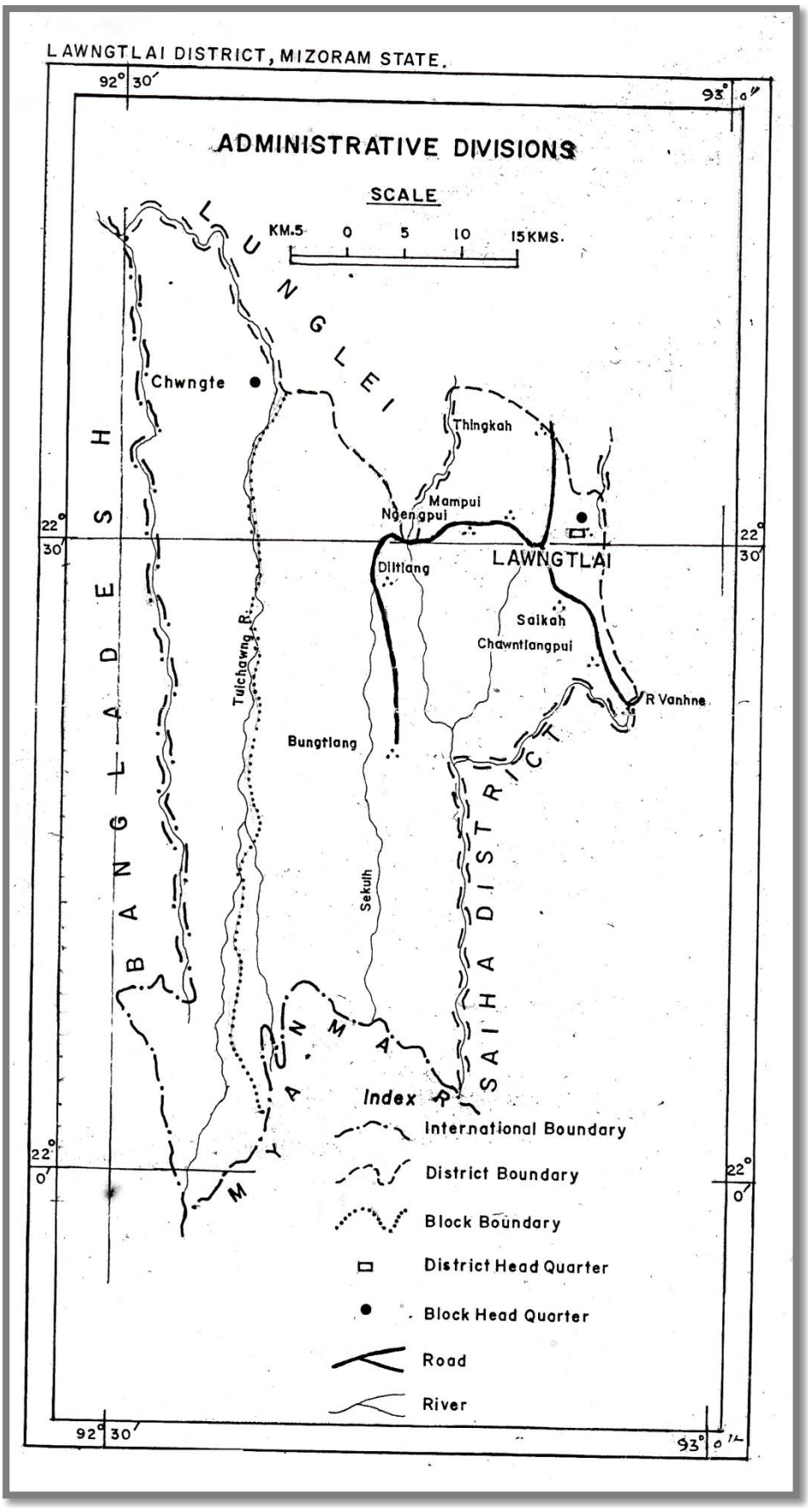
Ground water development prospects occur in the very limited areas in the western part of the district. In the plain areas adjacent to Bangladesh, the thickness of alluvium is very limited (within 10-15 m). Though the valleys are underlain by sandstone, shale, siltstone, part of which may be saturated and can support dug wells. Ground water structures do not exist at present. Based on prevailing hydro geological condition, ring well with 2-3 mm diameter and 10-15 m depth below ground level may be constructed in the areas. These wells may be constructed with half baked bricks keeping weep holes in the sandstone layers.

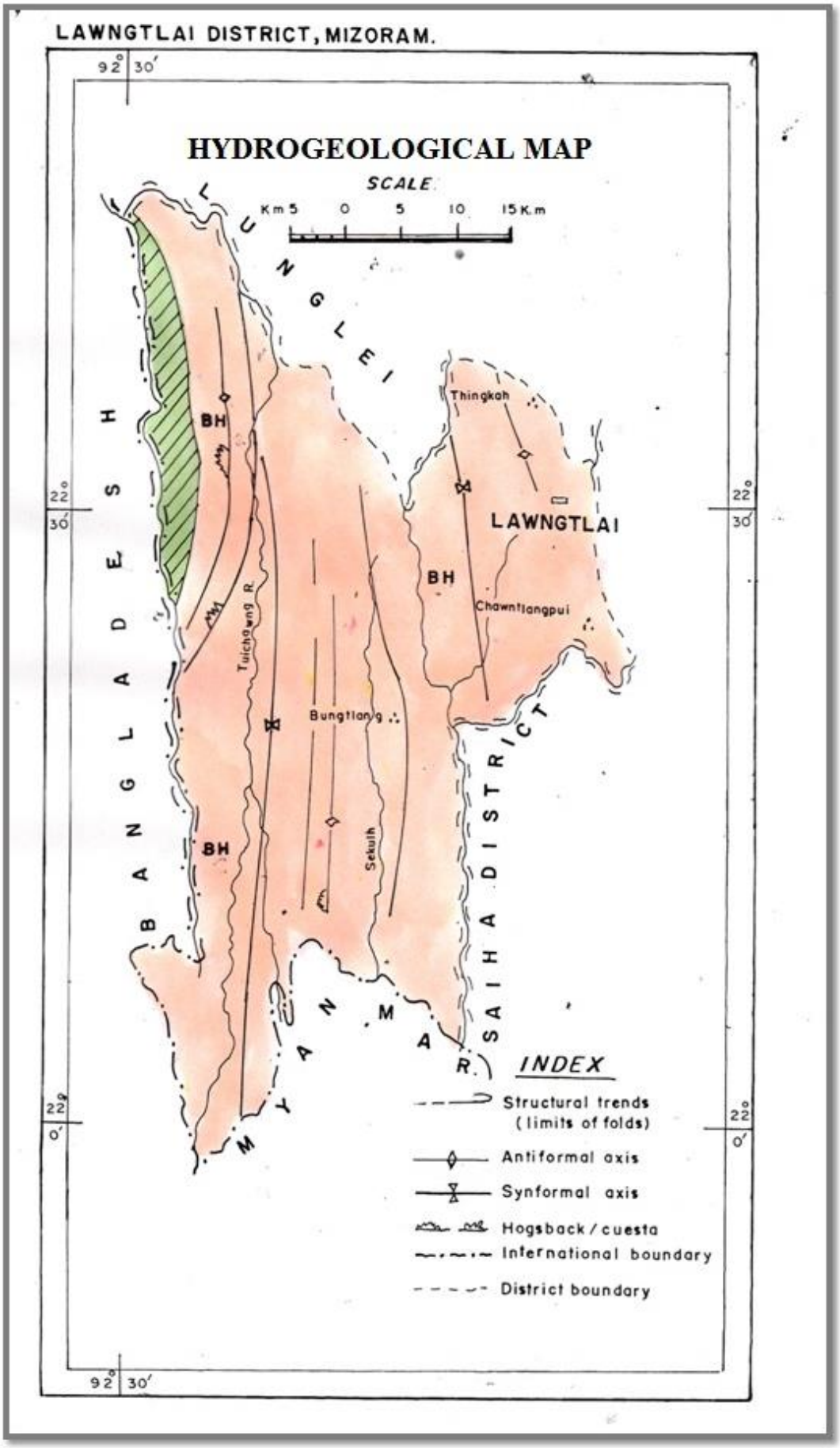
The ground water manifests in the form of springs. A large no. of springs are perennial. Spring examined in the villages of the district can be developed scieltifically for providing safe drinking water to the rural people.

It is observed that people are to walk long distance in rugged terrain to fetch drinking water. Tapping perennial springs in such areas and supply water would benefit the rural population.

Rainwater harvesting is another suitable age old and time tested technology for augmenting water for the drinking water supply and can be one of the appropriate and

economical measures for solving the scarcity of potable water in such areas. It involves relatively low cost, less time or implementation and provides almost entirely safe water at doorsteps. In most of the rural areas hamlets are small and therefore can provide a small catchment area.


LAWNGTLAI DISTRICT, MIZORAM STATE.
92° 30′
93° 0′
ADMINISTRATIVE DIVISIONS
SCALE
KM.5 0 5 10 15KMS.
LUNGLEI
Chwngte
Thingkah
Mampui
Ngengpui
22° 30′
LAWNGTLAI
Diltlang
Saikah
Chawntlangpui
R Vanhne
Tuichawng R.
Bungtlang
Sekulh
BANGLADESH
MYANMA
SAIHA DISTRICT
22° 0′
Index
International Boundary
District Boundary
Block Boundary
District Head Quarter
Block Head Quarter
Road
River


LAWNGTLAI DISTRICT, MIZORAM.
92° 30'
HYDROGEOLOGICAL MAP
SCALE
Km 5 0 5 10 15 K.m
LUNGLEI
BANGLADESH
MYANMAR
SAIHA DISTRICT
Thingkah
LAWNGTLAI
Chawntlangpui
Tuichawng R.
Bungtlang
Sekuih
BH
BH
BH
22° 30'
22° 0'
INDEX
Structural trends (limits of folds)
Antiformal axis
Synformal axis
Hogsback / cuesta
International boundary
District boundary

MIZORAM STATE (LAWNGTLAI DISTRICT.)

LEGEND

AGE	FORMATIONS		GEOMORPHIC		HYDROGEOLOGICAL CHARACTERS
	SERIES	GROUP	UNIT	FORMS	
MIOCENE	SURMA	BOKABILL	Low linear ridges	Cuesta	Consists of shales with siltstone alternations. Permecbility and infiltration law, Act as run-off zones.
		BHUBAN (BH)	Moderate linear ridges	Hogs back	Consists of hard and compact sandstone, shale, siltstone alternation. Permecbility is very low and infiltration is neglible. (Act on run-off zone. Ground water potential low, localised potential in limited way can be attributed through develament of secondary porosity through crack.)
				Cuesta	