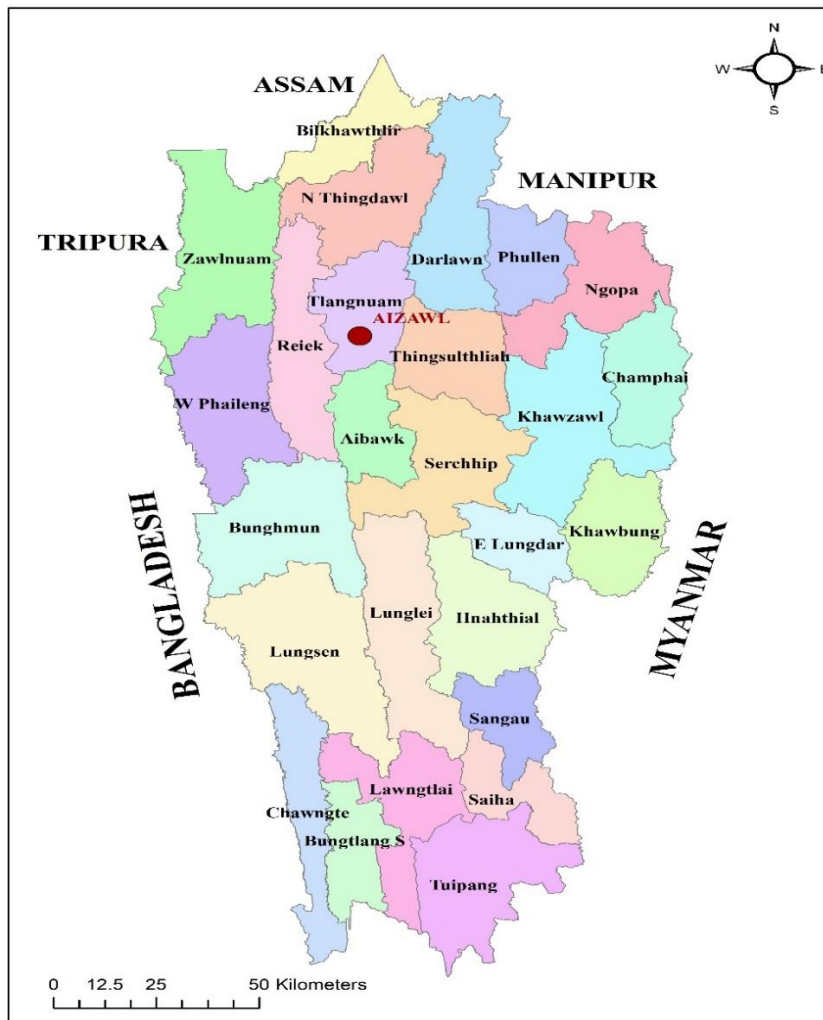




GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
DEPARTMENT OF WATER RESOURCES, RIVER
DEVELOPMENT & GANGA REJUVENATION
CENTRAL GROUND WATER BOARD



DYNAMIC GROUND WATER RESOURCES
MIZORAM
(March 2023)

NORTH EASTERN REGION
GUWAHATI
November 2023

PREFACE

Mizoram is in the northeastern part of India and is one of the most sparsely populated states of the country. More than three-fourths of the land area of Mizoram is forested. Agriculture is the dominant economic activity of the state, engaging more than two-thirds of the workforce. Geologically, the Mizo Hills form a part of the Rakhine (Arakan) Mountains, a series of compact parallel ridges with a north-south axis formed of sandstone, limestone, and shales-all Cenozoic rocks. The ridges, separated by narrow river valleys, rise to about 2100 meters.

Extraction of groundwater in the state is practically negligible. Rainfall is abundant in the state but there is acute shortage of water during the summer as majority of the rain is lost as surface run-off. Extraction of groundwater resources will help in the overall sustainable development of the State and its people and bring about agricultural revolution in this tribal state.

For a scientific planning of extraction of dynamic ground water resource potential, estimation of ground water resource has been done based on the latest methodology as recommended by Ground Water Resource Estimation Committee-2015(GEC-2015) and duly approved by Govt. of India. The report on dynamic Ground water resource potential has been assessed based on the field data generated by Central Ground Water Board and statistical information collected from other State Departments. The annual ground water recharge, net ground water availability and existing gross draft on irrigation and domestic uses, etc., have been estimated for the state. The report also highlights on the net annual ground water availability for future use.

The total annual ground water recharge in the state of Mizoram is 0.22 BCM. The Annual Extractable Ground Water Resources of the state is 0.20 BCM after deducting the natural discharge. Present Ground Water Extraction is 0.007 BCM all of which is on account of annual domestic extraction. The annual allocation for Domestic and Industrial uses up to 2025 has been made as 0.008 BCM based upon the population data projected up to year 2025. The over-all stage of ground water development of the state is a meager 3.7 %.

I strongly believe that the report with its technical data will help in understanding present ground water scenario in Meghalaya State and prove valuable to policy makers, technical experts, professionals, and user agencies for management of ground water development in the state in planned manner.



(Biplab Ray)
Regional Director (I/c)

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Estimation of ground water resources of Mizoram involved contribution from different agencies such as CGWB, Govt. of India, PHED, MIRSAC, WR, Agriculture Department and Directorate of Economics and Statistics Planning (Statistics) Department of Govt. of Mizoram. PHED, Govt. of Mizoram made available most of the basic data required for the computations. The computation of resource estimation is done through INGRES software and preparation of the report is done by Mr. Arijit Mitra, Sc -C (Hydrogeology).

1. INTRODUCTION

Perching on the high hills of North Eastern corner, Mizoram is a storehouse of natural beauty with its endless variety of landscape, hilly terrain, meandering streams deep gorges, rich wealth of flora and fauna. Flanked by Bangladesh on the west and Myanmar on the east and south, Mizoram occupies a long international boundary of 722 Kms (404 kms with Myanmar and 318 kms with Bangladesh). It has common boundary with Assam (123 kms), Tripura (277 kms) and Manipur (95 kms). The state lies between North latitudes $21^{\circ}58'$ and $24^{\circ}35'$ and East longitudes $92^{\circ}15'$ and $93^{\circ}29'$. The total geographic area of the state is 21081sq.km with the population of 10,91,014 (2011 Census). The state has been divided into 8 districts and 26 blocks.

1.a Background for re-estimating the ground water resources of the state.

The previous assessment of groundwater resources of Mizoram was carried during 2021-22. The ground water resource of the state has been re-estimated by Central Ground Water Board, North Eastern Region based on GEC 2015 methodology for the assessment year 2022-23. Census figures for population as per 2011 Census and data for the year 2022-23 provided by Government of Mizoram have been used to update and revise the assessment of groundwater resources of Meghalaya.

During the year 2021-22, the annual groundwater recharge of the state was 0.22 BCM and the annual extractable ground water recharge was 0.20 BCM after deducting the natural discharge. The groundwater extraction estimated in 2021-22 was 0.007 BCM and the overall stage of groundwater was 3.96 %.

1.b Constitution of state level committee for ground water resources estimation.

Government of Mizoram has constituted a state level committee under the Chairmanship of the Commissioner & Secretary, Public Health Engineering Department (PHED) for ground water resource estimation with the following committee members.

- | | | |
|-----|--------------------------------|-------------------|
| i) | Commissioner & Secretary, PHED | -Chairman |
| ii) | Regional Director, CGWB, NER | -Member Secretary |

- iii) PCCF, Environment Forest & Climate change department - Member
- iv) Engineer in Chief, PHED - Member
- v) Chief Engineer, Zone-I, PHED -Member
- vi) Chief Engineer, Zone-II, PHED -Member
- vii) Chief Engineer, Hqtrs & WR, PHED -Member
- viii) Director PMU (JJM), PHED - Member
- ix) Chief Engineer, Irrigation & WRD -Member
- x) Director, Agriculture Department -Member
- xi) Director, DGM, Commerce & Industries Department -Member
- xii) Director, Land resource, Soil & Water conservation Department-Member
- xiii) General Manager, NABARD -Member
- xiv) Chief Scientific Officer, Directorate of Science & Technology – Co-opted Member
- xv) Hydrogeologist, PHED. – Co-opted Member

2. HYDROGEOLOGICAL CONDITION OF MIZORAM

2.a Description of rock types with area coverage

Geologically the area is underlain by repetition of arenaceous and argillaceous sediments. The arenaceous and argillaceous group of rocks occurs in relatively higher and lower grounds respectively. These have deformed into a series of anticlinal and synclinal folds trending NNW-SSE to NNE-SSW with plunging direction is either towards north or south.

The state is occupied mainly by the rocks of the Tertiary formation ranging in age from Oligocene to Miocene to Recent. The general stratigraphic succession of the state is as follows:

AGE	SERIES	LITHOLOGY
RECENT	Alluvium	Clay, sands with pebbles conglomerate and gravels.
----- Unconformity -----		
MIOCENE	Tipam	Sandstone medium to coarse grained, ferruginous, friable with clay, shale mottled.
	Surma	Bokabil
		Shale with siltstone, sandstone and mudstone in alternation.
		Bhuban
		Sandstone fine grained, compact, Massive to well bedded with laminated siltstone, shale
----- Unconformity -----		
OLIGECENE	Barail	Shale, siltstone with sand of sandstone fine grained.
----- Base not exposed -----		

The Barails form the lower most rock units comprising siltstone and bands of soft and hard fine grained sandstone with strings of carbonaceous material. The Barail formation occurs in the north eastern part of the state mostly covering Champhai district. The Surma is divided into two formations, Bhuban and Bokabil. The Bhuban is made up of grey sandstone and shale. Lower Bhuban is more arenaceous while the middle formation is more argillaceous and the Upper Bhuban is a combination of both and is soft in nature. The Bhutan formation occupies the major part of the state all along the length of the state. The Bokabil is predominantly argillaceous. The Bokabil formation mostly occurs along the western part of the state. The Tipam sandstone is of semi consolidated in nature comprising medium to coarse grained sandstone with

subordinate shale. The Tipam formation occurs in limited extent in the north western part of the state. The alluvial deposits comprising silt, clay and sands occur in the valley fill area with very limited thickness.

2.b Hydrometeorology

Climate

The state of Mizoram enjoys sub-tropical humid climate. It is generally cool in summer and not very cold in winter. During winter the temperature varies from 11°C to 24°C and in summer it varies between 20°C to 29°C.

Rainfall Distribution

Mizoram experiences the phenomenal influence of the South West Tropical monsoon which persists from May to October, with occasional winter showers. The average annual rainfall of the state is recorded to be 2794 mm with little variation within the state. The average monsoon rainfall is 1761 mm (63%) and non-monsoon rainfall is 1033 mm (37 %).

Relative humidity

The Relative humidity is high throughout the year but it reaches more than 85 percent during the months of January, March, April, May, June, July, October, November and December.

2.c Description of Hydrogeological Units

Hydrogeologically the various rock types found in Mizoram can be grouped into two categories i.e. semi-consolidated formations and unconsolidated formations.

The unconsolidated formations with limited alluvial thickness are restricted along streams and rivers. Semi-consolidated formations are developed secondary porosity due to tectonic disturbances. As the state is entirely occupied by hills with slopes mostly more than 20%, most of the rainwater flows out as surface runoff. In this type of terrain, the scope for ground water storage is limited to mostly secondary porosity and structural control in the higher elevation aquifers. Ground water is confined only to valley filled areas. These aquifers are the main source for springs. Ground water stored in the hill slopes emanates in the form of springs, which are being used as a source for water supply.

Ground water exploration carried out by CGWB indicates that yield potential of deep tubewells within the depth range of 200 m tapping Tertiary sandstone ranges from 120 to 330 liters per minute for drawdown of 13 to 20 m. The transmissivity ranges from 11 to 46 m²/day. Specific Capacity and Storativity of the Exploratory Well constructed at Bungthum and Zawlnuam in Lakichera valley is 25.61 lpm/mdd and 4.28×10^{-4} respectively.

SPRINGS

During field investigation it was found that only springs are easily accessible source for water. A large number of springs are noticed which are found in all places and altitude.

2.d Ground Water Level Conditions

Central Ground Water Board is not monitoring the depth to water level in the state due to non-availability of representative dug wells. Ground water management studies carried out in state indicates depth to water levels are highly varies from hilly areas to plain areas.

2.e Ground Water Quality

The chemical analysis of water samples collected from springs indicates that the water is slightly alkaline with pH values ranging from 6.9-8.3. In general, Electrical Conductivity of the ground water varies from 31-249 Micromhos/cm at 25° C. The carbonate is nil and the concentration of bicarbonate ranges from 12-158 ppm. The range of concentrations of calcium and magnesium varies between 4 and 22 ppm respectively. The concentration of iron ranges from 0.02 to 0.3 ppm. In general ground water is fresh and potable and is suitable for domestic, irrigation and industrial purposes.

3. GROUND WATER RESOURCES ESTIMATION METHODOLOGY-GEC'2015

Brief Description

The present methodology used for resources assessment is known as Ground Water Resource Estimation Methodology – 2015 (GEC'2015). The revised methodology GEC 2015 recommends aquifer wise ground water resource assessment. Ground water resources have two components – Replenishable ground water resources or Dynamic ground water resources and In-storage resources or Static resources. GEC 2015 recommends estimation of Replenishable and in-storage ground water resources for both unconfined and confined aquifers. In GEC'2015, two approaches are recommended – water level fluctuation method and norms of rainfall infiltration method. The water level fluctuation method is based on the concept of storage change due to difference between various input and output components. Input refers to recharge from rainfall and other sources and subsurface inflow into the unit of assessment. Output refers to ground water draft, ground water evaporation, transpiration, base flow to streams and subsurface outflow from the unit. Since the data on subsurface inflow/ outflow are not readily available, it is advantageous to adopt the unit for ground water assessment as basin/ sub basin/ watershed, as the inflow / outflow across these boundaries may be taken as negligible.

Thus the ground water resources assessment unit is in general watershed particularly in hard rock areas. In case of alluvial areas, administrative block can also be the assessment unit. In each assessment unit, hilly areas having slope more than 20% are deleted from the total area to get the area suitable for recharge. Further, areas where the quality of ground water is beyond the usable limits should be identified and handled separately. The remaining area after deleting the hilly area and separating the area with poor ground water quality is to be delineated into command and non-command areas. Ground water assessment in command and non-command areas are done separately for monsoon and non-monsoon seasons.

3.1 Ground water Recharge

Monsoon season

Recharge from rainfall is estimated by using the following relationship -

$$\mathbf{Rrf = RFIF * A * (R - a)/1000}$$

Where,

Rrf= Rainfall recharge in ham

A = Area in Hectares

RFIF = Rainfall Infiltration Factor

R = Rainfall in mm

a = Minimum threshold value above which rainfall induces ground water recharge
in mm

The threshold limit of minimum and maximum rainfall event which can induce recharge to the aquifer is to be considered while estimating ground water recharge using rainfall infiltration factor method. The minimum threshold limit is in accordance with the relation shown in above equation and the maximum threshold limit is based on the premise that after a certain limit, the rate of storm rain is too high to contribute to infiltration and they will only contribute to surface runoff. It is suggested that 10% of Normal annual rainfall may be taken as minimum rainfall threshold and 3000 mm as maximum rainfall limit.

The resources assessment during monsoon season is estimated as the sum total of the change in storage and gross draft. The change in storage is computed by multiplying water level fluctuation between pre and post monsoon periods with the area of assessment and specific yield. Monsoon recharge can be expressed as –

$$R_{RF} = h \times Sy \times A - R_{OS} \pm VF \pm LF + GE + T + E + B$$

Where,

h = rise in water level in the monsoon season, A = area for computation of recharge, Sy = specific yield, D_G = gross ground water draft, R_{OS} = Other sources of ground water recharge during monsoon season include R_c , R_{sw} , R_t , R_{gw} , R_{wc} which are recharge from seepage from canals, surface water irrigation, tanks and ponds, ground water irrigation, water conservation structures respectively; LF = Recharge through Lateral flow/ Through flow across assessment unit boundary in the monsoon season for the i^{th} particular year, VF – Vertical inter aquifer flow in the monsoon season for the i^{th} particular year, T- Transpiration in the monsoon season for the i^{th} particular year, E- Evaporation in the monsoon season for the i^{th} particular year, GE = Ground water extraction in monsoon season for the i^{th} particular year, B = Base flow the monsoon season for the i^{th} particular year

B = Base flow the monsoon season for the i^{th} particular year

The monsoon ground water recharge has two components – rainfall recharge and recharge from other sources. Mathematically it can be represented as –

$$R(\text{Normal}) = R_{RF}(\text{normal}) + R_{OS}$$

Where,

R_{rf} is the normal monsoon rainfall recharge. R_{OS} is the other sources of ground water recharge during monsoon season include R_c , R_{sw} , R_t , R_{gw} , R_{wc} which are recharge from seepage from canals, surface water irrigation, tanks and ponds, ground water irrigation, water conservation structures respectively

The rainfall recharge during monsoon season computed by Water Level Fluctuation (WLF) method is compared with recharge figures from Rainfall Infiltration Factor (RIF) method. In case the difference between the two sets of data are more than 20%, then RIF figure is considered, otherwise monsoon recharge from WLF is adopted. While adopting the rainfall recharge figures, weightage is to be given to WLF method over adhoc norms method of RIF. Hence, wherever the difference between RIF & WLF is more than 20%, data have to be scrutinized and corrected accordingly.

Non-Monsoon season

During non-Monsoon season, rainfall recharge is computed by using Rainfall Infiltration Factor (RIF) method. Recharge from other sources is then added to get total non-Monsoon recharge. In case of areas receiving less than 10% of the annual rainfall during non-monsoon season, the rainfall recharge is ignored.

Total annual ground water recharge

The total annual ground water recharge of the area is the sum-total of monsoon and non-monsoon recharge. An allowance is kept for natural discharge in the non-monsoon season by deducting 5% of total annual ground water recharge, if WLF method is employed to compute rainfall recharge during monsoon season and 10% of total annual ground water recharge if RIF method is employed. The balance ground water available accounts for existing ground water withdrawal for various uses and potential for future development. This quantity is termed as Annual Extractable Ground Water Resources.

Annual Extractable Ground Water Resources (AEGR) = Annual Ground Water Recharge –
Natural discharge during non-monsoon season

Norms for estimation of recharge

GEC'2015 methodology has recommended norms for various parameters being used in ground water recharge estimation. These norms vary depending upon water bearing formations and agroclimatic conditions. While norms for specific yield and recharge from rainfall values are to be adopted within the guidelines of GEC'2015, in case of other parameters like seepage from canals, return flow from irrigation, recharge from tanks & ponds, water conservation structures, results of specific case studies may replace the adhoc norms.

3.2 Ground Water Extraction

The gross yearly ground water extraction is to be calculated for Irrigation, Domestic and Industrial uses. The gross ground water extraction would include the ground water extraction from all existing ground water structures during monsoon as well as during non-monsoon period. While the number of ground water structures should preferably be based on latest well census, the average unit draft from different types of structures should be based on specific studies or ad-hoc norms given in GEC2015 report.

3.3 Stage of ground water Extraction & Categorization of units

The stage of Ground water extraction is defined by,

Stage of Ground water = $\frac{\text{Existing Gross Ground water extraction for all uses}}{\text{AEGR}} \times 100$

Extraction (%) AEGR

Validation of Stage of Ground Water Extraction

The assessment based on the stage of ground water extraction has inherent uncertainties. It is desirable to validate the 'Stage of Ground Water Extraction' with long term trend of ground water levels.

If the ground water resource assessment and the trend of long term water levels contradict each other, this anomalous situation requires a review of the ground water resource computation, as well as the reliability of water level data. The mismatch conditions are enumerated below.

SOGWE	Ground Water Level Trend	Remarks
$\leq 70\%$	Significant decline in trend in both pre-monsoon and post-monsoon	Not acceptable and needs reassessment
$> 100\%$	No significant decline in both pre-monsoon and post-monsoon long term trend	Not acceptable and needs reassessment

Categorization of Assessment Units

As emphasized in the National Water Policy, 2012, a convergence of Quantity and Quality of ground water resources is required while assessing the ground water status in an assessment unit. Therefore, it is recommended to separate estimation of resources where water quality is beyond permissible limits for the parameter salinity.

Categorization of Assessment Units Based on Quantity: The categorization based on status of ground water quantity is defined by Stage of Ground Water Extraction as given below:

Stage of Ground Water Extraction	Category
$\leq 70\%$	Safe
$> 70\%$ and $\leq 90\%$	Semi-Critical
$> 90\%$ and $\leq 100\%$	Critical
$> 100\%$	Over Exploited

Categorization of Assessment Units Based on Quality

The committee recommends that each assessment unit, in addition to the quantity based categorization (safe, semi-critical, critical and over-exploited) should bear a quality hazard identifier. Such quality hazards are to be based on available ground water monitoring data of State Ground Water Departments and/or Central Ground Water Board. If any of the three quality hazards in terms of Arsenic, Fluoride and Salinity are encountered in the assessment sub unit in mappable units, the assessment sub unit may be tagged with the particular quality hazard.

3.4 Allocation of ground water resource for utilization

The net annual ground water availability is to be apportioned between domestic, industrial and irrigation uses. Among these, as per the National Water Policy, 2002, requirement for domestic water supply is to be accorded priority. The requirement for domestic and industrial water supply is to be kept based on population as projected to the year 2025. The water available for irrigation use is obtained by deducting the allocation for domestic and industrial use, from the net annual ground water availability.

3.5 Poor quality ground water

Computation of ground water recharge in poor quality ground water is to be done on the same line as described above. However, in saline areas, there may be practical difficulty due to non-availability of data, as there will usually be no observation wells in such areas. Recharge assessment in such cases may be done based on rainfall infiltration factor method.

3.6 Apportioning of ground water assessment from watershed to development unit

Where the assessment unit is a watershed, the ground water assessment is converted in terms of an administrative unit such as block/ taluka/ mandal. This is done by converting the volumetric resource into depth unit and then multiplying this depth with the corresponding area of the block.

3.7 Additional Potential Recharge

In shallow water table areas, particularly in discharge areas, rejected recharge would be considerable and water level fluctuation are subdued resulting in under-estimation of recharge component. In the area where the ground water level is less than 5m below ground level or in waterlogged areas, ground water resources have to be estimated upto 5m bgl only based on the following equation -

$$\text{Potential ground water recharge} = (5-D) \times A \times \text{Sp. Yield}$$

Where,

D = Depth to water table below ground surface in pre-monsoon season in shallow aquifers;

A = Area of shallow water table zone.

The potential recharge from flood plain is estimated based on the same norms as for ponds, tanks and lakes.

Potential Resource Due to Spring Discharge: Spring discharge constitutes an additional source of ground water in hilly areas which emerges at the places where ground water level cuts the surface topography. The spring discharge is equal to the ground water recharge minus the outflow through evaporation and evapotranspiration and vertical and lateral sub-surface flow.

4. **PROCEDURE FOLLOWED IN THE PRESENT ASSESSMENT INCLUDING ASSUMPTIONS**

- **Data source for each of the data element and how the data was used in the computation (Constraints in the data base if any).**

The major source for various data elements are:

- a. The assessment made for ground water resources for the year 2004, 2008-09, 2010-11, 2012-13, 2016-17, 2019-20 & 2021-22
- b. Hilly Area demarcation (having slope more than 20%) by MIRSAC.
- c. Statistical hand book of Mizoram.
- d. Data collected during 2022-23.
- e. Report on hydrogeological surveys in parts of Aizawl and Champai districts.
- f. District Ground Water Management Studies in parts of Aizawl (erstwhile north and west) districts of Mizoram.
- g. Report on pilot project studies under technology mission on drinking water and related water management in central and eastern parts of erstwhile Aizawl district of Mizoram.
- h. Basic Data Report of Exploratory well drilled at Bungthuam, Aizawl district of Mizoram.

- **Constraints in the data base**

- a. Non availability of representative depth to water level data- CGWB does not have National Hydrograph Network Stations for monitoring the water levels in the state of Mizoram.
- b. Irrigation data – season-wise and crop-wise coverage.

- **Changes if any applied in the original methodology proposed by GEC along with justifications.**

- a) No changes have been applied in the original methodology proposed by GEC in the case of computation of resource, draft etc.
- b) **Change of methodology applied for Categorization of blocks** – Categorization was done based on stage of development only, instead of stage of groundwater extraction and validation.

c) Since there is no monitoring well in the state, long term trends couldn't utilized for validation purpose.

▪ **Various norms used in the computation:**

- a. Hilly area : more than 20% slope
- b. Command area threshold limit : 100 hectares.
- c. Rainfall infiltration factor : 0.04 (4%).
- d. Recharge from Ground water irrigation : Nil.
- e. Recharge from surface water irrigation : Nil
(Since entire falls under Non-command)
- f. Recharge from Ponds and Tanks : Negligible
- g. Recharge from Check dams and Nallas : Negligible.
- h. Per capita requirement of water : 55 liters/day
for domestic use.
- i. Unaccounted Natural Discharge : 10%
- j. Ground Water Draft- STW (Domestic) : 0.05 ham (source PHE, Mizoram)
- k. Ground Water Draft (Irrigation) : Nil
- l. Ground Water Draft (Industry) : Nil
- m. Water level trend :NA (No monitoring stations)

▪ **Any documented field studies**

No documented field studies were carried out.

5. COMPUTATION OF GROUND WATER RESOURCE ESTIMATION IN MIZORAM

a. Salient features of the dynamic ground water resources assessments including the type assessment units, total number of assessment units in the state, base-year of collection of data, year of projection of data.

The ground water assessment year is 2022-23. The smallest administrative unit, i.e. the block, has been taken as the unit of computation. This is mainly because of the lack of data especially on population, number of ground water structures, draft and other important parameters on watershed basis. The following sub-units have been considered for computation of the ground water resource as per the methodology recommended by GEC2015.

- **Hilly Area and Recharge Worthy Areas:**

Hilly areas are those with more than 20% slope. The state of Mizoram has about 15% of hilly area. Block-wise data on areas having slope more than 20% and less than 20% is collected from Mizoram Remote Sensing Application Centre (MIRSAC), Govt. of Mizoram, Aizawl. In the earlier studies the recharge worthy areas have been calculated from the topo sheet of Mizoram available on 1:50000 scale. For the parts for which the topo sheet was not available, the recharge worthy areas have been calculated taking into account the area suitable for Wet Rice Cultivation (W.R.C. Statistics) as furnished in the Agricultural abstract of the Department of Agriculture and Minor Irrigation of the Government of Mizoram.

In the present study, recharge worthy area is considered as 314941 ha.

- **Poor Water Quality Area:**

There is no such reported area in the state of Mizoram, hence they have not been considered.

- **Command And Non-Command Area:**

In Mizoram there is no command area as per the GEC 2015 Methodology since no Irrigation Project is having command area over the threshold limit of 100 hectares. The entire state has thus been considered as non-command area.

- **Type of assessment unit:** Administrative.
- **Total number of assessment units in the state:** 26 blocks

b. Assessment sub-unit wise method adopted for computing rainfall recharge during monsoon season (WLF/RIF).

Rainfall Infiltration Factor (RIF) method adopted for computing rainfall recharge during monsoon season in the absence of availability of water level data.

c. The total resources of the state, existing development, balance available for future development, stage of development, categorization of assessment units and other relevant salient features of the resources assessment in the state.

The total resources of the state	: 0.20 BCM
Gross ground water draft (annual)	: 0.007 BCM
Balance available for future development	: 0.19 BCM
Stage of development	: 3.7 %
Categorization of assessment units	: Safe (All units)
Ground water recharge in Poor quality zone	: Nil

d. Spatial variation of the Ground water recharge and development scenario in the state.

Annual Extractable ground water resources in the state are of the order of 0.19 BCM. Maximum annual extractable ground water resource of 0.05 BCM is found in Mamit district while the minimum of 0.007 BCM is in Saiha district. The stage of ground water extraction is the maximum in Aizawl district with 13.13 % while the lowest is found in Kolasib district with 1.22 %.

e. Comparison with the earlier ground water resources estimate and reasons for significant departure from earlier estimates.

A comparison is made between the previous estimate as on March 2022 and present estimate based on GEC'15 as on 2023, and presented in tabular statement given below.

Table showing comparison of Ground Water Resource estimates between 2019-20 and 2021-22

Sl. No.	ITEM	Year 2021-2022	Year 2022-2023	COMPARISON
	Estimation	INGRES	INGRES	
1	Total Annual Ground Water Recharge (BCM)	0.22	0.22	No change
2	Annual Extractable Ground Water Resources (BCM)	0.19	0.19	No change
3	Irrigation Draft (BCM)	0	0	0
4	Domestic Draft (BCM)	0.0079	0.0073	Decrease by 0.000528
5	Stage of GW Extraction (%)	3.96 %	3.70 %	Decrease by 0.26 %
6	Annual allocation of ground water for domestic water supply as on 2025 (BCM)	0.0087	0.0081	Decrease by 0.001
7	GW availability for future development	0.19	0.19	Increase by 0.001
9	No. of O.E. Units	0	0	0
10	No. of Dark/ Critical units	0	0	0

The comparison depicts that there is no change in the Total Annual Ground Water Recharge and Annual Extractable Ground Water Resources in the 2022-23 estimate. However, there is a decrease in the Current annual gross Ground Water extraction by 52.80 Ham and Annual allocation of ground water for domestic water supply as on 2025 by 73 Ham. Stage of GW Extraction has decreased from 3.96 % in 2022 to 3.70 % 2023.

f. Ground water recharge in poor ground water quality zone.

There is no poor ground water quality area in the state.

g. Additional annual potential recharges.

Govt. of Mizoram has provided with block-wise number of springs and accordingly annual potential recharge from those springs were estimated. It was considered that during

monsoon season discharge of a spring ranges from 2.0 - 168.0 litre per second and during non-monsoon season the discharge ranges from 1.0 - 84.0 litre per second.

6. AUTOMATION OF ESTIMATION OF DYNAMIC GROUND WATER RESOURCES USING GEC-2015 THROUGH IN-GRES

The computation of the resource estimation of Meghalaya for the year 2022-23 is done through IN-GRES software (India Ground Water Resource Estimation System). IN-GRES is the common portal to input, estimate, analyze, and access static and dynamic groundwater resources. India GEC system will take Data Input through Excel as well as through Forms, compute various Ground water components (recharge, draft, flux, etc.), classify assessment unit into appropriate categories, and develop visibility dashboards for each of the components. System allows user to view the data in both MIS as well as GIS view. User can also download the reports in formats like CGWB, etc.

India GEC system is divided into 3 modules – Input, Computation and Output.

i. Input module – Input Module refers to the Data Entry module at an Assessment Unit level.

Data Input is done via 2 methods i.e.

a. Excel based input – In this, the user needs to download District level data sheet template where he/she can fill the data at an Assessment Unit level. User now needs to upload their fully filled excel sheet into the system.

b. Form based input – In this, the user is shown a form and he/she can fill/edit the data in data sheet in an online mode. Once user is done with editing online, he/she can submit the data file.

ii. Computation module – Computation Module refers to the ground water calculations for an assessment unit. These computations are based on GEC 2015 methodology and are used to calculate Annual Extractable Ground Water Resource, Total Current Annual Ground Water Extraction (utilization) and the percentage of ground water utilization with respect to recharge (stage of Ground Water Extraction) for an assessment unit. Based on these percentages an assessment unit is categorized into SAFE, SEMI-CRITICAL, CRITICAL AND OVEREXPLOITED categories.

iii. Output module once categorized the data is shown in two views:

a. MIS Dashboard – MIS dashboard shows the results of the assessment for the entire India, and also State wise in tabular form. The MIS dashboard shows all type of recharges, extractions, inflows and outflows computed for both monsoon and non-monsoon periods of the year and then reflect the overall stage of extraction at the selected Geo-Zoom Level.

b. GIS Dashboard – GIS dashboard shows the data in Web Geo-Server format, implemented in interactive GIS platform allowing user to all GEC related information in the map itself. GIS view represents the data on India map and color codes each District/Assessment unit based on the categorization.

Appendix – I: Government order on re-constitution of Committee Mizoram in 2022



**GOVERNMENT OF MIZORAM
PUBLIC HEALTH ENGINEERING DEPARTMENT**

NOTIFICATION

Dated Aizawl, the 12th April, 2022.

No. Q.11013/1/2018-PHE/pt : In the interest of public service, the Governor of Mizoram is pleased to Re-Constitute the **State Level Committee (SLC) on Ground Water Resources Assessment of Mizoram** as below with immediate effect and until further order :

Chairman : Secretary, PHE, Govt. of Mizoram
Member Secretary : Regional Director – NER, CGWB

Members :-

1. PCCF, Environment, Forest & Climate Change Department
2. Engineer-in-Chief, PHE Department.
3. Chief Engineer, Zone-I, PHE Department.
4. Chief Engineer, Zone-II, PHE Department
5. Chief Engineer, Hqrs & WR, PHE Department.
6. Director, PMU (JJM), PHED
7. Chief Engineer, Irrigation & Water Resources Department
8. Director, Agriculture Department
9. Director, Directorate of Geology and Mining, Commerce & Industries Department
10. Director, Land Resources, Soil & Water Conservation Department
11. General Manager, NABARD

Co-opted Members :-

1. Chief Scientific Officer, Directorate of Science & Technology
2. Hydrogeologist, PHED, Co-opted member

This supersedes the previous Notification No. B.16018/1/2009-PHE dt. 29.12.2017.

Sd/- LALMUANZOVA
Secretary to the Govt. of Mizoram
Public Health Engineering Department

Memo No. Q.11013/1/2018-PHE/pt : Dated Aizawl, the 12th April, 2022

Copy to :-

1. Secretary to the Governor, Govt. of Mizoram
2. P.S to Deputy Chief Minister, Mizoram
3. P.S to Secretary, PHED
4. All Administrative Department
5. All Head of Departments
6. All members concerned
7. Guard File

(HELEN SAIBUANGI)

Under Secretary (T) to the Govt. of Mizoram
Public Health Engineering Department

Appendix – II: Minutes of the first meeting of the State Level Committee Mizoram

MINUTES OF THE 1ST SITTING OF SLC ON GROUND WATER RESOURCES ASSESSMENT OF MIZORAM FOR THE ASSESSMENT YEAR 2022-23 AS ON MARCH 2023 DATED 20TH JUNE 2023 AT 12.00 HRS THROUGH ONLINE.

The first sitting of State Level Committee (SLC) on Ground Water Resources Assessment of Mizoram as on March 2023 was convened on 20th June 2023 at 12.00 hrs through Virtual mode. The meeting was chaired by Er. C. Lalremsiama, Secretary, PHED to the Govt. of Mizoram & Chairman, SLC.

The list of Members who attended the meeting is enclosed as annexure I.

The Chairman of SLC welcomed all the representative members of the SLC-2023, Mizoram who have attended in the meeting. He highlighted that Ground Water Resources of Mizoram has been carried out jointly by Central Ground Water Board, NER, Guwahati, and PHED, Mizoram (State Nodal Department) in coordination with other state members/departments of SLC, Mizoram.

With due permission of the Chair, Dr. S S Singh, Scientist-D(HG) & OIC, GWRA, B gave a detail power point presentation on agenda items like consideration of block as an assessment unit, timeline of assessment, IN-GRES software, data requirement for calculating Dynamic Ground Water Resource as on 2023. He pointed out that for more accuracy of estimation of ground water resource of the state, the concerned departments should provide all the required data as per GEC 2015.

Dr. DJ Khound, Scientist D, CGWB, NER requested to provide updated block level data of command and non-command areas for all the assessment units. He also emphasised for providing updated block wise dependency data/report of groundwater for drinking water/domestic supply data by PHED Mizoram

A detailed discussion on Dynamic GWRE was done where various queries were addressed. The assessment of Dynamic Ground Water Resources of Mizoram as on March 2023 is to be completed by September 2023 as per the timeline of GWRE-2023. Committee members discussed in detail on the methodology GEC 2015 and constraints of non-availability of various field data etc.

After thorough discussion all the members of SLC agreed and accepted that

- i. The existing 26 nos. of assessment units of 8 districts used in the GWRA 2022 will remain the same in the GWRA of 2023.
- ii. Firming up of assessment units as per latest data (administrative boundary of districts/blocks) and providing “shape file” of the same will remain same
- iii. Data collection and sharing by SLC members to the Chairman & Member Secretary, SLC

- iv. Initiation of the manual and Software based INGRES assessment with the available data and completion of the assessment by September 2023 as per the Timeline provided by CLEC
- v. All the concerned state government departments should provide all the requisite data to CGWB and PHED, Mizoram (State Nodal Department) as per the required format within 15th July 2023. The required data format will be prepared by CGWB and share it to all the concerned Head of Departments.
- vi. The details of block wise / district wise Spring data (geo-coordinates, type of spring, pre-monsoon & post-monsoon discharge etc.) is to be provided by PHED, Mizoram
- vii. Domestic ground water extraction data to be provided by PHED, Mizoram
- viii. All the detail surface and ground water irrigation data, Crop water requirement is to be provided by Irrigation & Water Resources Department, Mizoram.
- ix. Data of water conservation structures, tanks and ponds to be provided by Directorate of Land Resource, Soil & Water Conservation, Mizoram
- x. Creation of District level cell and deployment of district level Nodal officers of GWRA-2023, Mizoram for smooth functioning of the SLC
- xi. Committee members should attend the time-to-time workshop and training programmes on IN-GRES, Data management etc. that are to be organised by IIT, Hyderabad for better interaction about the software & assessment

The meeting ended with thanks to the Chair

Annexure I

LIST OF MEMBERS ATTENDED

1. Er C. Lalremsiama, Secretary, PHED to the Govt. of Mizoram & Chairman SLC
2. Er Zodinthari, Chief Engineer, HQTRs & WR, PHED, Khatla (Opposite Tennis Court), Aizawl, Mizoram - 796001
3. R. Lalthazuala, Director, Directorate of Geology & Mining, Mizoram, Aizawl 796009
4. Diganjay Ravan, Deputy General Manager, NABARD, Mizoram, New Capital Complex Rd, Khatla, Aizawl, Mizoram 796001
5. RS Sinha, Addl. PCCF, Environment, Forest & Climate Change Department, Mizoram, Tuikhuahtlang Rd, Aizawl, Mizoram 796001
6. Vanlalmuanpuia Chhange, Jt. Director, Land Resources, Soil & Water Conservation, Deptt., Mizoram, Khatla, Aizawl, Mizoram-796001
7. Er H. Lalsawmliana, Chief Scientific Officer, Directorate of Science & Technology, Mizoram, Khatla, Aizawl, Mizoram 796001
8. R. Lalruatkima, Hydrogeologist, PHED -State Nodal Officer of GWRA(Mizoram), PHED, Khatla (Opposite Tennis Court), Aizawl, Mizoram – 796001
9. Dr. F Lalbiakmawia, Asstt. Hydrogeologist, GWRA Cell, PHED, Mizoram, Aizawl
10. Dr. S S Singh, Scientist-D(HG) & OIC, GWRA, CGWB, NER, Guwahati
11. Dr. D J Khound, Scientist-D(HG), CGWB, NER, Guwahati
12. Ms Dakhina Rabha, Scientist-D (HG) & OIC, CGWB,SUO, Shillong
13. Sri Arijit Mitra, Scientist-C (HG), CGWB, NER, Guwahati

Appendix – III: Minutes of the second meeting of the State Level Committee Mizoram

MINUTES OF THE MEETING OF THE STATE LEVEL COMMITTEE (SLC) ON DYNAMIC GROUND WATER RESOURCES OF MIZORAM FOR THE ASSESSMENT YEAR 2022-2023 AS ON MARCH 2023

Date: 16th August 2023

Time: 12.00 hrs.

(Meeting Platform: Online through Google Meet/ Virtual Mode)

The meeting of State Level Committee (SLC) on Ground Water Resources of Mizoram as on March 2023 was convened on 16th August 2023 at 12.00 hrs through Online mode.

The meeting was chaired by Pu C. Lalremsiama, Secretary to the Govt. of Mizoram, PHE Department. The Chairman of the SLC welcomed all the members of SLC present in the meeting. List of members attended in the meeting is enclosed as Annexure-I.

Sri Biplab Ray, Regional Director/HOO & Member Secretary, SLC welcomed all the representative members of the SLC-2023 Mizoram. He highlighted that Ground Water Resources of Mizoram has been carried out jointly by Central Ground Water Board, NER, Guwahati and PHED, Mizoram (State Nodal Department)-Mizoram in coordination with other members/departments of SLC, Mizoram.

He informed that automation of Ground Water Assessment has been started through IN-GRES software. Groundwater Resources Estimation System (IN-GRES) is a software/web-based application developed by CGWB in collaboration with Vassar Lab, IIT-Hyderabad.

With due permission of the Chair, presentation of the Dynamic Groundwater resources of Mizoram as on March 2023 was made by Dr. S S Singh, Scientist-D & OIC GWRA Cell, NER, Guwahati.

With due permission of the Chair, committee members of SLC discussed in detail on the methodology of resource estimation, various factors utilized / considered as per norm or otherwise, constrains of non-availability of various field data, source of various field data utilized for resource calculation etc.

Chairman, SLC has suggested for updating and inclusion of newly constituted districts of Mizoram from the next assessment year 2023-24, for which all line departments/members of SLC needs to provide necessary data/information to CGWB.

After thorough discussion all the members of the State Level Committee (SLC) has agreed and accepted upon the figures in the draft report of Dynamic Ground Water Resources of Mizoram for the Assessment Year 2022-2023 as on March 2023.

(Biplab Ray)
Regional Director/HOO
& Member Secretary, SLC

(C. Lalremsiama)
Secretary to the Govt. of Mizoram, PHE Department
& Chairman, State Level Committee for
Ground Resources Assessment (Mizoram)

ANNEXURE I

LIST OF MEMBERS ATTENDED

1. Pu C. Lalremsiama, Secretary, PHED to the Govt. of Mizoram & Chairman SLC, Mizoram
2. Sri Biplab Ray, Regional Director/HOO, CGWB, NER & Member Secretary, SLC, Mizoram
3. Er Zodinthari, Chief Engineer, HQTRs & WR, PHED, Khatla (Opposite Tennis Court), Aizawl, Mizoram - 796001
4. Anjay Kumar Maher, AGM, NABARD, Mizoram, New Capital Complex Rd, Khatla, Aizawl, Mizoram 796001
5. Arti Chaudary, Chief Conservator of Forest (Monitoring), Representative of PCCF, Environment, Forest & Climate Change Department, Mizoram, Aizawl, Mizoram 796001
6. Laltlanhlua, Conservator of Forest (Planning), PCCF, Aizawl, Mizoram 796001
7. Lallawmawmi Ralte, ASCE, Land Resources, Soil & Water Conservation, Deptt., Mizoram, Khatla, Aizawl, Mizoram-796001
8. ZD Laltanpuia, Sr. Scientist, Directorate of Science & Technology, Mizoram, Khatla, Aizawl, Mizoram 796001
9. Pu K Lalrammuana, Senior Scientific Officer, Directorate of Science & Technology, Mizoram, Khatla, Aizawl, Mizoram 796001
10. R. Lalruatkima, Hydrogeologist, PHED -State Nodal Officer of GWRA(Mizoram), PHED, Khatla (Opposite Tennis Court), Aizawl, Mizoram - 796001
11. Dr. S S Singh, Scientist-D(HG) & OIC, GWRA, CGWB, NER, Guwahati

Annexure I
General Description of Administrative Unit/Assessment Unit of Mizoram (As on March 2023)

Sr. No.	DISTRICT	BLOCK	Total Geographical Area (ha)					Rainfall (mm)	Rainfall Recharge	
			Recharge Worthy Area (ha)				Hilly Area			Total Area
			C	NC	PQ	Total				
1	AIZAWL	AIBAWK	0	131	0	131	54933	55064	2352	9.86
2	KOLASIB	BILKHAWTHLIR	0	18978	0	18978	32128	51106	2199.1	1335.52
3	LAWNGTLAI	BUNGTLANG SOUTH	0	14659	0	14659	35542	50201	1949	914.25
4	CHAMPHAI	CHAMPHAI	0	8096	0	8096	50984	59080	1863	482.65
5	LAWNGTLAI	CHAWNGTE	0	24542	0	24542	45406	69948	1949	1530.63
6	AIZAWL	DARLAWN	0	7623	0	7623	97420	105043	2352	573.74
7	SERCHHIP	E LUNG DAR	0	3846	0	3846	40595	44441	1743	214.52
8	LUNGLEI	HNAHTHIAL	0	5275	0	5275	89322	94597	2299	388.07
9	CHAMPHAI	KHAWBUNG	0	5495	0	5495	61040	66535	1863	327.59
10	CHAMPHAI	KHAWZAWL	0	9486	0	9486	103801	113287	1863	565.52
11	LAWNGTLAI	LAWNGTLAI	0	11093	0	11093	77200	88293	1949	691.85
12	LUNGLEI	LUNGLEI	0	9850	0	9850	99043	108893	2299	724.65
13	LUNGLEI	LUNGEN	0	34645	0	34645	102595	137240	2299	2548.76
14	CHAMPHAI	NGOPA	0	5596	0	5596	74002	79598	1863	333.61
15	KOLASIB	NORTH THINGDAWL	0	20537	0	20537	66557	87094	2199	1445.14
16	AIZAWL	PHULLEN	0	3343	0	3343	52547	55890	2352	251.61
17	MAMIT	REIEK	0	11650	0	11650	71977	83627	2447	912.24
18	SAIHA	SAIHA	0	2266	0	2266	40882	43148	2371	171.93
19	LAWNGTLAI	SANGAU	0	1781	0	1781	45477	47258	1949	111.08
20	SERCHHIP	SERCHHIP	0	12320	0	12320	85339	97659	1743	687.16
21	AIZAWL	THINGSULTHLIAH	0	4161	0	4161	68939	73100	2352	313.17
22	AIZAWL	TLANGNUAM	0	6476	0	6476	62027	68503	2352	487.41
23	SAIHA	TUIPANG	0	8394	0	8394	88358	96752	2371	636.87
24	LUNGLEI	WEST BUNGHMUN	0	24717	0	24717	90253	114970	2299	1818.38
25	MAMIT	WEST PHAILENG	0	20459	0	20459	79119	99578	2447	1602.03
26	MAMIT	ZAWLNUAM	0	39522	0	39522	77673	117195	2447	3094.74
TOTAL			0	314941	0	314941	1793159	2108100	2200.109	22172.98

Annexure II

Assessment of Dynamic Ground Water Resources of Mizoram (As on March 2023) in Ham

State	District	Assessment Unit Name	Assessment Unit Type	Total Area of Assessment Unit (Ha)	Recharge Worthy Area(Ha)	Recharge from Rainfall-Monsoon Season	Recharge from Other Sources-Monsoon Season	Recharge from Rainfall-Non Monsoon Season	Recharge from Other Sources-Non Monsoon Season	Total Annual Ground Water (Ham) Recharge	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Ground Water Extraction for Irrigation Use (Ham)	Ground Water Extraction for Industrial Use (Ham)	Ground Water Extraction for Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)	Categorization (Over-Exploited/Critical/)
MIZORAM	AIZAWL	AIBAWK	N C	55064	131	7.81	0	2.05	0	9.86	0.99	8.88	0	0	5.76	5.76	6.26	2.62	64.86	safe
	AIZAWL	DARLAWN	N C	105043	7623	454.27	0	119.47	0	573.74	57.37	516.36	0	0	18.87	18.87	20.52	495.84	3.65	safe
	AIZAWL	PHULLEN	N C	55890	3343	199.22	0	52.39	0	251.61	25.16	226.45	0	0	12.73	12.73	13.85	212.59	5.63	safe
	AIZAWL	THINGSULTHLIAH	N C	73100	4161	247.96	0	65.21	0	313.17	31.32	281.85	0	0	16.36	16.36	17.79	264.06	5.8	safe
	AIZAWL	TLANGNUAM	N C	68503	6476	385.92	0	101.49	0	487.41	48.74	438.67	0	0	139.59	139.59	151.79	286.88	31.82	safe
		TOTAL		357600	21734	1295.18	0	340.61	0	1635.79	163.58	1472.21	0	0	193.31	193.31	210.21	1261.99	13.13	safe
	CHAMPHAI	CHAMPHAI	N C	59080	8096	408.91	0	73.74	0	482.65	48.26	434.39	0	0	27.89	27.89	29.39	405	6.42	safe
	CHAMPHAI	KHAWBUNG	N C	66535	5495	277.54	0	50.05	0	327.59	32.75	294.84	0	0	1.41	1.41	1.48	293.36	0.48	safe
	CHAMPHAI	KHAWZAWL	N C	113287	9486	479.12	0	86.4	0	565.52	56.55	508.97	0	0	6.9	6.9	7.27	501.7	1.36	safe
	CHAMPHAI	NGOPA	N C	79598	5596	282.64	0	50.97	0	333.61	33.36	300.25	0	0	7.2	7.2	7.58	292.66	2.4	safe
		TOTAL		318500	28673	1448.21	0	261.16	0	1709.37	170.92	1538.45	0	0	43.4	43.4	45.72	1492.72	2.82	safe
	KOLASIB	BILKHAWTHLIR	N C	51106	18978	1093.21	0	242.24	0	1335.45	133.55	1201.97	0	0	21.55	21.55	23.63	1178.34	1.79	safe
	KOLASIB	NORTH THINGDAWL	N C	87094	20537	1183.01	0	262.13	0	1445.14	144.51	1300.63	0	0	8.88	8.88	9.73	1290.9	0.68	safe
		TOTAL		138200	39515	2276.22	0	504.37	0	2780.59	278.06	2502.6	0	0	30.43	30.43	33.36	2469.24	1.22	safe
	LAWNGTLAI	BUNGTLANG SOUTH	N C	50201	14659	832.69	0	81.56	0	914.25	91.43	822.82	0	0	4.36	4.36	4.97	817.85	0.53	safe
	LAWNGTLAI	CHAWNGTE	N C	69948	24542	1394.08	0	136.55	0	1530.63	153.07	1377.56	0	0	29.48	29.48	33.6	1343.95	2.14	safe
	LAWNGTLAI	LAWNGTLAI	N C	88293	11093	630.13	0	61.72	0	691.85	69.18	622.67	0	0	58.05	58.05	66.17	556.5	9.32	safe
	LAWNGTLAI	SANGAU	N C	47258	1781	101.17	0	9.91	0	111.08	11.11	99.97	0	0	7.58	7.58	8.63	91.34	7.58	safe
		TOTAL		255700	52075	2958.07	0	289.74	0	3247.81	324.79	2923.02	0	0	99.47	99.47	113.37	2809.64	3.4	safe
	LUNGLEI	HNAHTHIAL	N C	94597	5275	354.92	0	33.15	0	388.07	38.8	349.27	0	0	57.14	57.14	59.36	289.92	16.36	safe
	LUNGLEI	LUNGLEI	N C	108893	9850	662.75	0	61.9	0	724.65	72.47	652.18	0	0	58.9	58.9	61.18	591	9.03	safe
LUNGLEI	LUNGEN	N C	137240	34645	2331.05	0	217.91	0	2548.76	254.88	2293.88	0	0	45.85	45.85	47.62	2246.25	2	safe	
LUNGLEI	WEST BUNGHMUN	N C	114970	24717	1663.06	0	155.32	0	1818.38	181.84	1636.54	0	0	25.57	25.57	26.56	1609.98	1.56	safe	
	TOTAL		455700	74487	5011.78	0	468.28	0	5479.86	547.99	4931.87	0	0	187.46	187.46	194.72	4737.15	3.8	safe	
MAMIT	REIEK	N C	83627	11650	710.32	0	201.92	0	912.24	91.22	821.02	0	0	27.87	27.87	32.18	788.84	3.39	safe	
MAMIT	WEST PHAILENG	N C	99578	20459	1247.43	0	354.6	0	1602.03	160.2	1441.83	0	0	34.47	34.47	39.8	1402.03	2.39	safe	
MAMIT	ZAWLNUAM	N C	117195	39522	2409.74	0	685	0	3094.74	309.47	2785.27	0	0	35.45	35.45	40.92	2744.34	1.27	safe	
	TOTAL		300400	71631	4367.49	0	1241.52	0	5609.01	560.89	5048.12	0	0	97.79	97.79	112.9	4935.21	7.05	safe	
SAIHA	SAIHA	N C	43148	2266	153.9	0	18.03	0	171.93	17.19	154.74	0	0	28.22	28.22	30.13	124.61	18.24	safe	
SAIHA	TUIPANG	N C	96752	8394	570.09	0	66.78	0	636.87	63.69	573.18	0	0	10.97	10.97	11.71	561.47	1.91	safe	
	TOTAL		139900	10660	723.99	0	84.81	0	808.8	80.88	727.92	0	0	39.19	39.19	41.84	686.08	5.38	safe	
SERCHHIP	E LUNGDAW	N C	44441	3846	186.87	0	27.65	0	214.52	21.46	193.06	0	0	26.7	26.7	28.44	164.62	13.83	safe	
SERCHHIP	SERCHHIP	N C	97659	12320	598.6	0	88.56	0	687.16	68.72	618.44	0	0	20.08	20.08	21.39	597.05	3.25	safe	
	TOTAL		142100	16166	785.47	0	116.21	0	901.68	90.18	811.5	0	0	46.78	46.78	49.83	761.67	5.76	safe	
	Total Mizoram (Ham)		2108100	314941	18866.41	0	3306.5	0	22172.98	2217.29	19955.69	0	0	737.82	737.82	801.95	19153.7	3.7	SAFE	
	Total Mizoram (Bcm)		21.08	3.15	0.19	0.00	0.03	0.00	0.22	0.02	0.20	0.00	0.00	0.01	0.01	0.01	0.19	3.7	SAFE	

Annexure III
District Wise Comparison of Ground Water Resource (As on March 2023)

SrNo.	District	Total Annual Ground Water (Ham) Recharge			Annual Extractable Ground Water Resource (Ham)			Total Extraction (Ham)			Stage of Ground Water Extraction (%)		
		2022-23	2021-22	Difference	2022-23	2021-22	Difference	2022-23	2021-22	Difference	2022-23	2021-22	Difference
1	AIZAWL	1635.79	1635.79	0	1472.21	1472.21	0	193.31	283.71	-90.4	13.13	14.06	-0.93
2	CHAMPHAI	1709.37	1709.37	0	1538.45	1538.45	0	43.4	110.71	-67.31	2.82	3.03	-0.21
3	KOLASIB	2780.59	2780.59	0	2502.6	2502.6	0	30.43	69.67	-39.24	1.22	1.3	-0.08
4	LAWNGTLAI	3247.81	3247.81	0	2923.02	2923.02	0	99.47	84.21	15.26	3.4	3.62	-0.22
5	LUNGLEI	5479.86	5479.86	0	4931.87	4931.87	0	187.46	116.58	70.88	3.8	4.1	-0.3
6	MAMIT	5609.01	5609.01	0	5048.12	5048.12	0	97.79	55.85	41.94	7.05	2.06	4.99
7	SAIHA	808.8	808.8	0	727.92	727.92	0	39.19	39.12	0.07	5.38	5.78	-0.4
8	SERCHHIP	901.68	901.68	0	811.5	811.5	0	46.78	30.78	16	5.76	6.19	-0.43
	Total	22172.9	22172.9	0	19955.69	19955.69	0	737.82	790.63	-52.81	3.7	3.96	-0.26

Annexure IV
Categorization of Blocks/Mandals/Talukas (As on March 2023)

S.No	DISTRICT	ASSESSMENT UNIT	ASSESSMENT TYPE	No. of assessed units	Categorization of Assessment Unit									
					Safe		Semi critical		Critical		Over exploited		Saline	
					No.	%	No.	%	No.	%	No.	%	No.	%
1	AIZAWL	AIBAWK	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
2	KOLASIB	BILKHAWTHLIR	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
3	LAWNGTLAI	BUNGLANG SOUTH	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
4	CHAMPHAI	CHAMPHAI	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
5	LAWNGTLAI	CHAWNGTE	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
6	AIZAWL	DARLAWN	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
7	SERCHHIP	E LUNG DAR	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
8	LUNGLEI	HNAHTHIAL	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
9	CHAMPHAI	KHAWBUNG	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
10	CHAMPHAI	KHAWZAWL	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
11	LAWNGTLAI	LAWNGTLAI	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
12	LUNGLEI	LUNGLEI	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
13	LUNGLEI	LUNGEN	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
14	CHAMPHAI	NGOPA	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
15	KOLASIB	NORTH THINGDAWL	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
16	AIZAWL	PHULLEN	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
17	MAMIT	REIEK	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
18	SAIHA	SAIHA	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
19	LAWNGTLAI	SANGAU	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
20	SERCHHIP	SERCHHIP	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
21	AIZAWL	THINGSULTHLIAH	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
22	AIZAWL	TLANGNUAM	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
23	SAIHA	TUIPANG	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
24	LUNGLEI	WEST BUNGHMUN	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
25	MAMIT	WEST PHAILENG	BLOCK	1	1	100%	-	-	-	-	-	-	-	-
26	MAMIT	ZAWLNUAM	BLOCK	1	1	100%	-	-	-	-	-	-	-	-

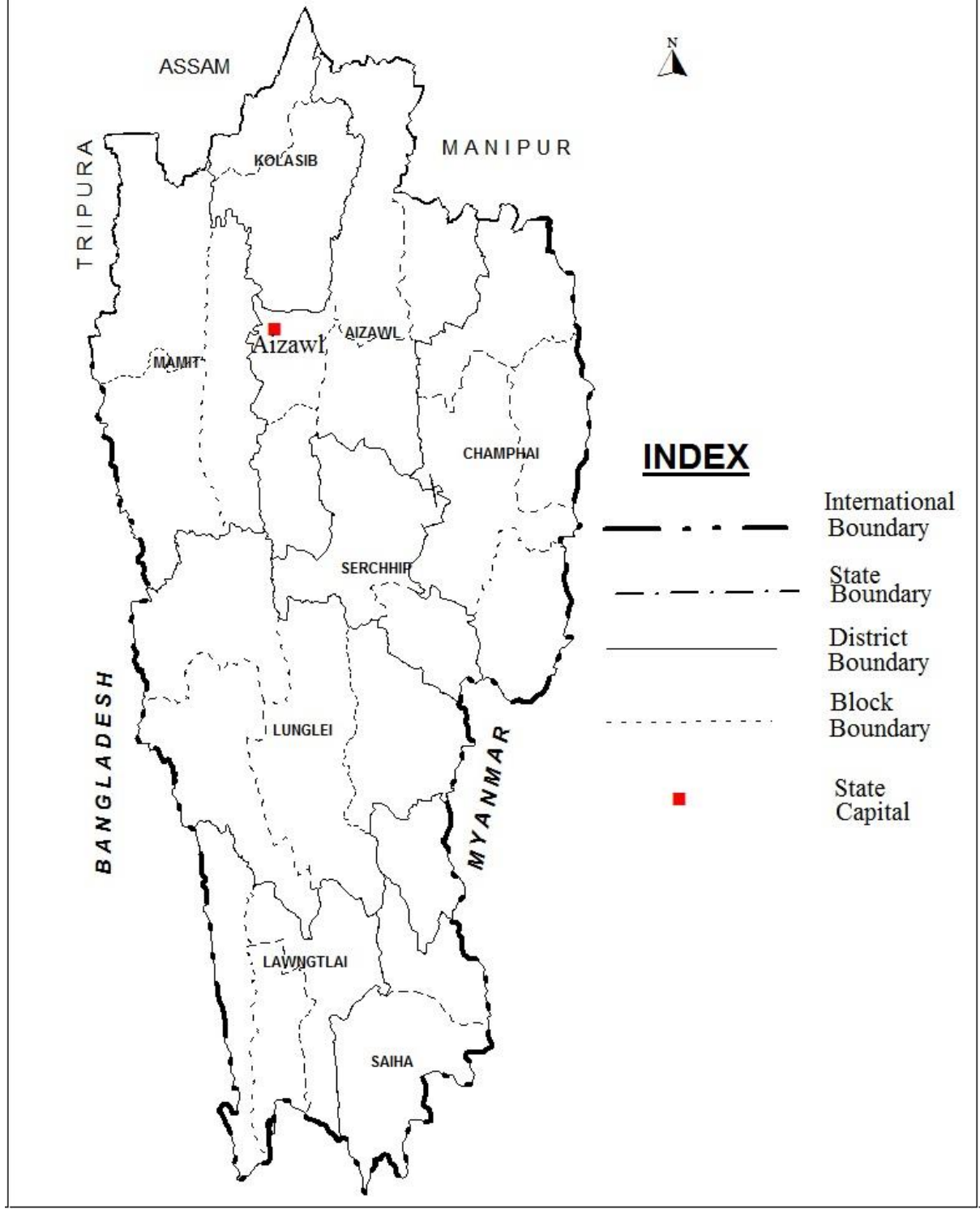
Annexure V-A
District Wise Categorization (As on March 2023)

S.No.	District	Total Geographical Area in 1000 sq km	Recharge Worthy Area in 1000 sq km	Safe		Semi Critical		Critical		Over exploited		Saline	
				Recharge Worthy Area in 1000 sq km	%	Recharge Worthy Area in 1000 sq km	%	Recharge Worthy Area in 1000 sq km	%	Recharge Worthy Area in 1000 sq km	%	Recharge Worthy Area in 1000 sq km	%
1	AIZAWL	4	0	0	100	-	-	-	-	-	-	-	-
2	CHAMPHAI	3	0	0	100	-	-	-	-	-	-	-	-
3	KOLASIB	1	0	0	100	-	-	-	-	-	-	-	-
4	LAWNGTLAI	3	1	1	100	-	-	-	-	-	-	-	-
5	LUNGLEI	5	1	1	100	-	-	-	-	-	-	-	-
6	MAMIT	3	1	1	100	-	-	-	-	-	-	-	-
7	SAIHA	1	0	0	100	-	-	-	-	-	-	-	-
8	SERCHHIP	1	0	0	100	-	-	-	-	-	-	-	-
	Total States	21	3	3	100	-	-	-	-	-	-	-	-
	Grand Total	21	3	3	100	-	-	-	-	-	-	-	-

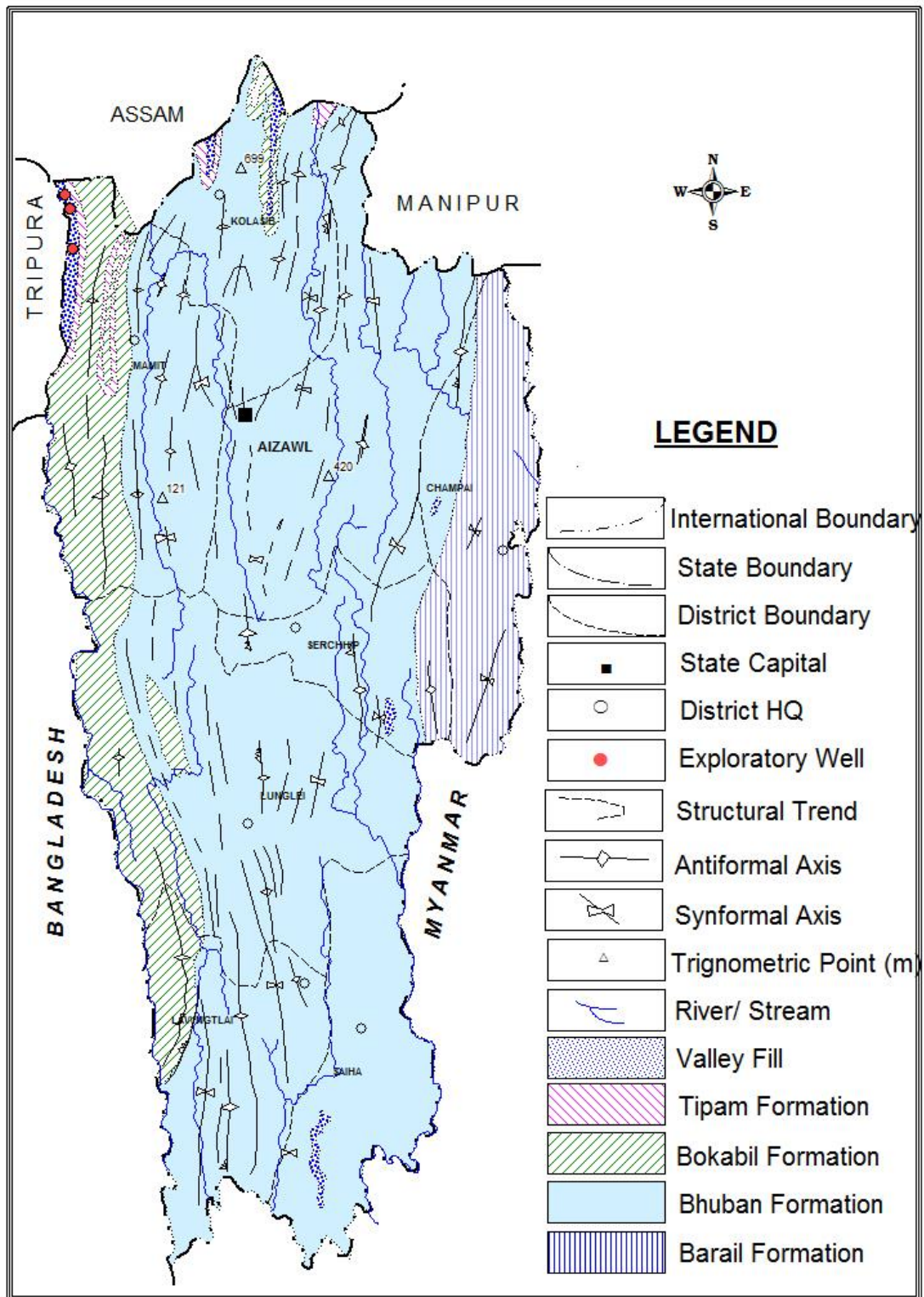
Annexure V-B
District Wise Categorization (As on March 2023)

District	Total Area of Assessment Unit (Ha)	Recharge Worthy Area(Ha)	Recharge from Rainfall - Monsoon Season	Recharge from Other Sources - Monsoon Season	Recharge from Rainfall -Non Monsoon Season	Recharge from Other Sources - Non Monsoon Season	Total Annual Ground Water Recharge (Ham)	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Ground Water Extraction for Irrigation Use (Ham)	Ground Water Extraction for Industrial Use (Ham)	Ground Water Extraction for Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)	Categorization (Over-Exploited/Critical/)
AIZAWL	357600	21734	1295.18	0	340.61	0	1635.79	163.58	1472.21	0	0	193.31	193.31	210.21	1261.99	13.13	safe
CHAMPHAI	318500	28673	1448.21	0	261.16	0	1709.37	170.92	1538.45	0	0	43.4	43.4	45.72	1492.72	2.82	safe
KOLASIB	138200	39515	2276.22	0	504.37	0	2780.59	278.06	2502.6	0	0	30.43	30.43	33.36	2469.24	1.22	safe
LAWNGTLAI	255700	52075	2958.07	0	289.74	0	3247.81	324.79	2923.02	0	0	99.47	99.47	113.37	2809.64	3.4	safe
LUNGLEI	455700	74487	5011.78	0	468.28	0	5479.86	547.99	4931.87	0	0	187.46	187.46	194.72	4737.15	3.8	safe
MAMIT	300400	71631	4367.49	0	1241.52	0	5609.01	560.89	5048.12	0	0	97.79	97.79	112.9	4935.21	7.05	safe
SAIHA	139900	10660	723.99	0	84.81	0	808.8	80.88	727.92	0	0	39.19	39.19	41.84	686.08	5.38	safe
SERCHHIP	142100	16166	785.47	0	116.21	0	901.68	90.18	811.5	0	0	46.78	46.78	49.83	761.67	5.76	safe
Total	2108100	314941	18866.41	0	3306.5	0	22172.98	2217.29	19955.69	0	0	737.82	737.82	801.95	19153.7	3.7	SAFE

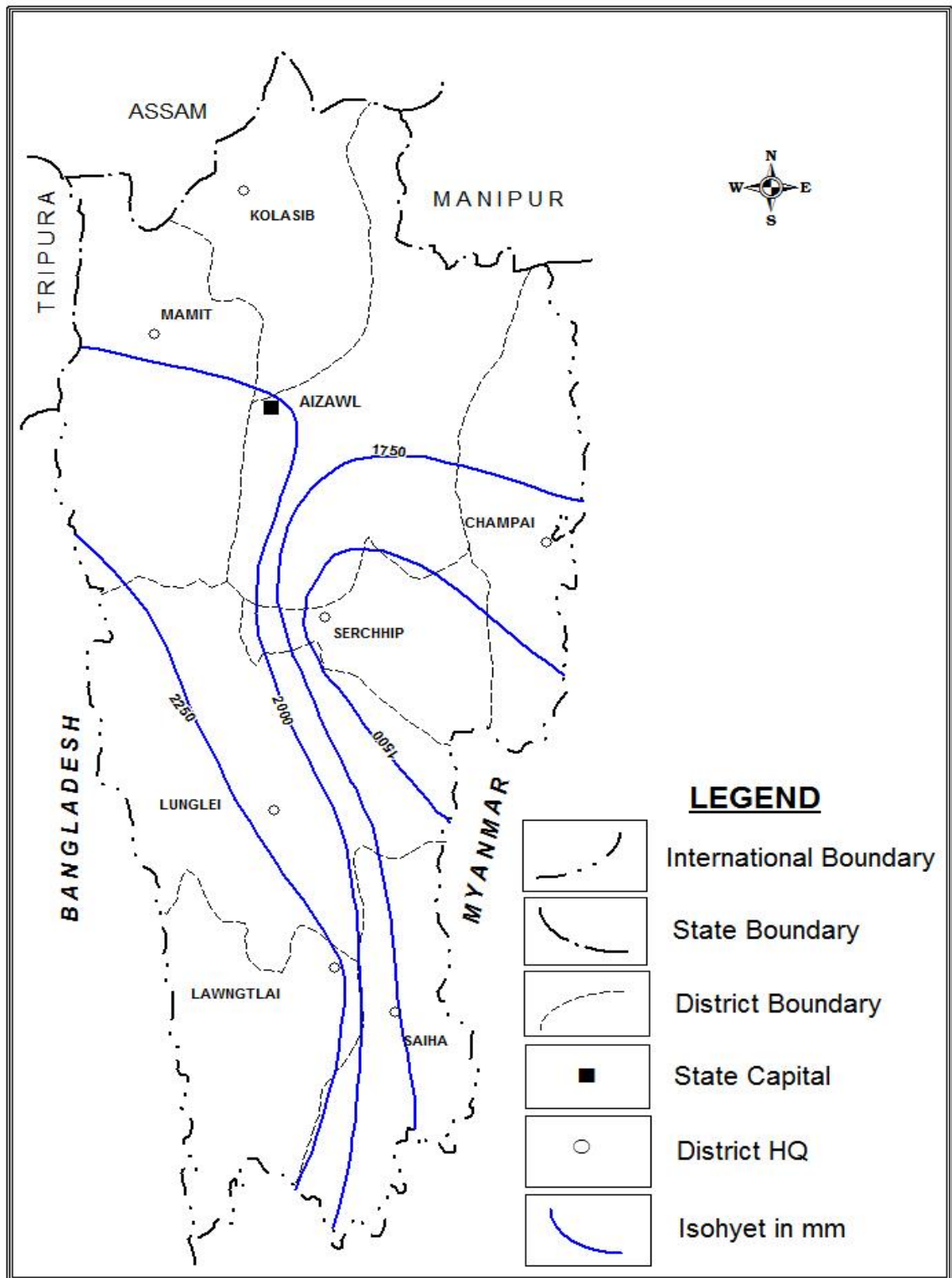
ADMINISTRATIVE MAP MIZORAM



HYDROGEOLOGICAL MAP OF MIZORAM



ISOHYETAL MAP OF MIZORAM



CATEGORISATION OF GROUND WATER DEVELOPMENT MIZORAM-2022-23

