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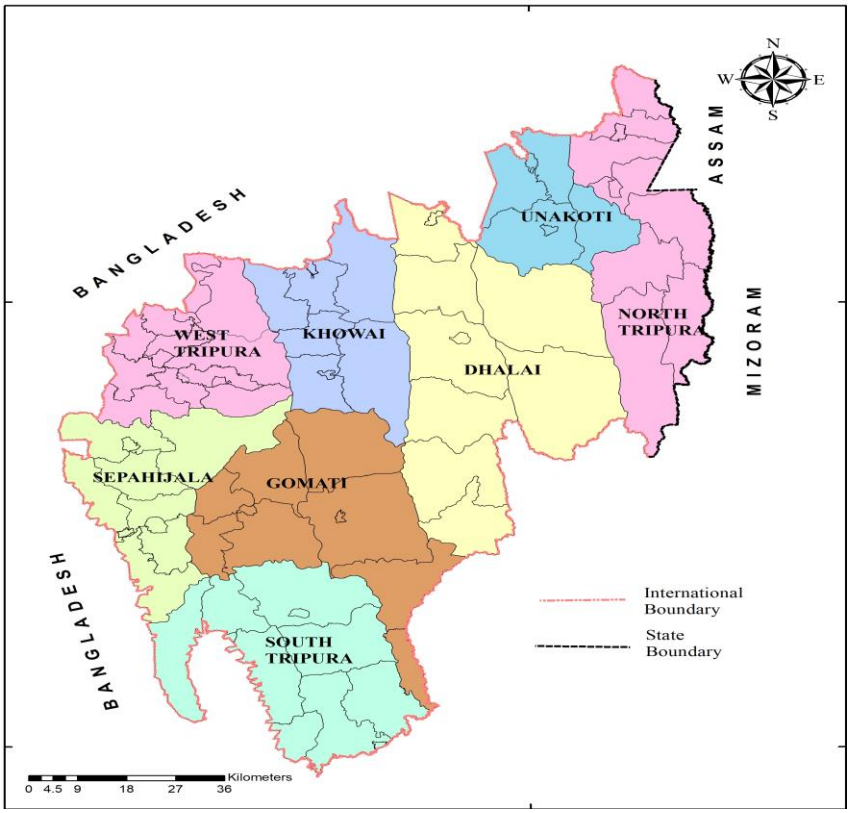
DYNAMIC GROUND WATER RESOURCES OF TRIPURA

(As on March, 2020)



CENTRAL GROUND WATER BOARD

NORTH EASTERN REGION

GUWAHATI

September 2021

केंद्रीय भूमिजल बोर्ड

पूर्वोत्तर क्षेत्र

गुवाहाटी

सितम्बर २०२१

DYNAMIC GROUND WATER RESOURCES OF TRIPURA

(As on March, 2020)

Prepared by

PWD (WATER RESOURCES) DEPARTMENT

GOVERNMENT OF TRIPURA

&

CENTRAL GROUND WATER BOARD

NORTH EASTERN REGION, GUWAHATI

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PREFACE

Tripura is a picturesque state in the northern region of the country. The state is acceded to the Indian Union in 1949 and is bounded on the north, west, south & southeast by the international boundary of Bangladesh. Shallow tube wells with small command area is most suitable in the state.

For a scientific planning and judicious development of dynamic ground water resource potential of the state, 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 estimation of groundwater resource has been done on block wise basis.

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 Tripura is 1.47 BCM. The Annual Extractable Ground Water Resources of the state is 1.24 BCM after deducting the natural discharge. Present Ground Water Extraction is 0.1 BCM out of which 0.02 BCM extraction is on account of irrigation and the annual domestic extraction is 0.08 BCM. The annual allocation for Domestic and Industrial uses has been made as 0.08 BCM based upon the population data projected up to year 2025. The over-all stage of ground water development of the state is 8%.

I strongly believe that the report with its technical data will help in understanding present ground water scenario in Tripura 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)

CONTENTS

CONTRIBUTORS

Estimation of ground water resources of Tripura is based on the data provided by the Nodal Officer, Shri Biswajit Saha, EE, WR Investigation Division Public Works Department (Water Resources), Govt. of Tripura from various Departments such as Public Works Department (Drinking Water and Sanitation), Govt. of Tripura, Agriculture Department, Govt. of Tripura, Directorate of Economics and Statistics, Govt. of Tripura, The computation of the resource estimation is done through INGRES software and the report is prepared by Smt. Ritu K Oraon (Scientist-B) and Ms. H Veikhone Sophia Kay (Scientist-B).

1. INTRODUCTION

Tripura is a picturesque state in the northeastern region of the country. The state is acceded to the Indian Union in 1949 and is bounded on the north, west, south & southeast by the international boundary of Bangladesh. In the east, it has a common boundary with Assam & Mizoram. The state lies between North latitudes $22^0 51^/$ and $24^0 32^/$ and East longitudes $90^0 10^/$ and $92^0 21^/$. The total geographical area of the state is 10491 sq.km. The state has been divided into 8 districts and 58 blocks and Agartala MC. The state head quarter Agartala does not come under any block.

As per 2011 Census, the total population of the State is 35,04,990 as against 31,99,203 in 2001 Census. Total area of Tripura is 10491 sq. km. Population Density of Tripura is 350 persons per sq km which is lower than national average 382 per sq km.

Tripura is basically an Agricultural State with about 64 % of its total population depending entirely on Agriculture for their livelihood.

The previous assessment of groundwater resources of Tripura was carried out during 2016-17. 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 2019-20. Census figures for population as per 2011 Census are available and whatever data for the year 2019-20 provided by Public Works Department (Water Resources), Govt. of Tripura, Public Works Department (Drinking Water and Sanitation), Govt. of Tripura, Agriculture Department, Govt. of Tripura, Directorate of Economics and Statistics, Govt. of Tripura have been used to update and revise the assessment of groundwater resources of Tripura.

To estimate ground water resources of Tripura for the assessment year 2020, a State Level Committee under the Chairmanship of Principal Secretary, PWD , Govt. of Tripura has been constituted on 30/06/2020 (Appendix-I). Meeting of the first State Level Committee was conducted on 12.03.2021 for assessment of the dynamic groundwater Resources (2020) for the state of Tripura.

2. HYDROGEOLGICAL SETUP OF TRIPURA

2.1 Description of rock types with area coverage.

Geologically, Quaternary and Upper Tertiary groups occupy the state. Mobile trough geosynclinal deposition of Barail group followed by flysch type of Surma & Tipam sediments is noticed in the state.

The Surma group of rocks is the oldest group rocks in the state and is represented by Upper Bhuban and Bokabil formations. The rocks of Bhuban formation constituting compact sandstones and shales are exposed in the core of the anticlines viz, Atharamura, Longtarai and Jampui hills of Khowai, Dhalai and North Tripura districts. The Bhuban formation is overlain by Bokabil formation consists mainly of shale.

The Tipam formations are conformable and transitional to the underlying Bokabil formation. These formations are consisting mainly of sandstone with occasional shale. Tipam formations occur in the eight districts of the state. The maximum thickness of this formation is estimated to be around 1400 m and the minimum thickness being 400 m.

The Dupitila formation consisting of earthy brown to buff sandy clay, clayey sandstone and coarse to gritty ferruginous sandstone unconformably overlie the Tipam formation and are well developed in the central portion of the synclinal valleys, specially west of Baramura anticline. The thickness of this formation varies from 10 to 30m.

Most of the longitudinal synclinal valleys of the state are the basins of deposition of recent formation. Recent alluvium occurs along the streams and the flood plains of major rivers. It consists of coarse sand, sandy clay, silt and clay.

2.2 Hydrometeorological condition

The climate of the state is characterized by moderate temperature and high humid atmosphere. Winter sets in November and lasts till the end of February. Summer season starts from March and lasts upto May and is followed by Southwest monsoon lasting till September. Generally the maximum summer temperature ranges from 35^0C to 40^0C and average minimum temperature in winter nights is recorded at 6^0C.

The state receives rainfall from Southwest Monsoon. The average annual rainfall over the state is 2279 mm. The intensity of rainfall increases from SW to NE in the state. In West Tripura district the normal monsoon rainfall is 1411 mm and normal annual rainfall is 2010 mm. In South Tripura district normal monsoon rainfall is 1904 mm and normal annual rainfall is 2513 mm. In North Tripura district normal monsoon rainfall is 1645 mm and

normal annual rainfall is 2486 mm. In Dhalai district normal monsoon rainfall is 1615 mm and normal annual rainfall is 2417 mm. In Khowai district normal monsoon rainfall is 1453 mm and normal annual rainfall is 2121 mm. In Unakoti district normal monsoon rainfall is 1604 mm and normal annual rainfall is 2386 mm. In Gomati district normal monsoon rainfall is 1522 mm and normal annual rainfall is 2185 mm. In Sepahijala district normal monsoon rainfall is 1522 mm and normal annual rainfall is 2119 mm.

2.3 Description of hydrogeological units, aquifer parameters.

Hydrogeological surveys, aided by exploratory drilling and deposit well programmes carried out by Central Ground Water Board, N.E. Region since 1972 have revealed that there are 3 to 4 major aquifers encountered within 250m depth in the synclinal valleys of the State, and the thickness of the aquifers varies from valley to valley and it decreases considerably in the northern valleys of the State, namely, Kamalpur, Kailasahar & Dharmanagar valleys. The Tipam formation comprising of medium to fine grained, semi-consolidated & friable sandstones, form the aquifer system of the State. The ground water worthiness of the aquifer vary from valley to valley, while in western part of the State the aquifers are of good potential in comparison to northeastern parts towards Dharmanagar, where it is moderately potential. On the basis of drilling, the aquifer zones down to the explored depth of 250m, can be divided into two groups, viz., (1) a shallow aquifer zone within 40m depth from surface & (2) a deeper aquifer zone below 40m depth. The study of sub-surface geology through lithological logs has revealed that the aquifers are discontinuous in nature even within the same valley.

In Tripura, ground water occurs under unconfined condition in Dupitila formation, Recent formation & in Tipam formation. Besides it also occur under confined to semi-confined conditions in Tipam formation at considerable depth. Recharge areas for the deeper aquifer lies in the adjacent anticlinal hills. Wherever a good thickness of impermeable clay beds underlie & overlie the saturated granular zones, autoflow artesian conditions have been found in the valleys, which are the discharge area. In fact, the geology as well as geomorphology of the State is favourable for such artesian conditions within synclinal valleys. The artesian flowing conditions occur in patches both at shallow depth and at deeper depth. The auto discharge of the flowing wells in the State ranges from 100 to 6000 lph, the maximum auto discharge from deep tube well to the extent of 54000 lph has been found in Khowai valley near Khowai town, where the piezometric head rose up to 7m above ground

level. The depth to water level in dug wells varies from 0.50 to 9.76 m bgl during pre-monsoon period and 0.16 to 9.18 m bgl during post-monsoon period.

Analysis of aquifer performance tests on exploratory/ deposit deep tubewells in the state have shown transmissivity range from 4.5 to 1577 m^2/day and permeability range from 0.1 to 28.4 m/day. The storage co-efficient ranges from 2.25 X 10^{-5} to 2.20 X 10^{-3} showing confined nature of the aquifer.

Table 1: Hydrogeology of Tripura

Age		Group	Formation	Lithology	Aquifer Disposition	Ground Water Potential
Quater-nary	**Un- consoli-dated**	Recent	Recent Alluvium	Clay, Silt and Sand	Limited thickness along river valleys	Yield Prospects very limited due to superficial thickness
Upper Tertiary	**Semi Consolidated**	Dupitila	Dupitila	Coarse to gritty Sandstone with dominated Clay layers	Forms Unconfined aquifer in dug well zones near surface. Maximum thickness : 30 m	Limited yield prospect due to poor permeability
		Tipam	Champaknagar/ Manu Bazar	Fine to coarse Sandstone with intercalations of Shale layers	Forms major aquifer system for shallow and deep tube wells up to 300 m depth at favourable locations.	Moderate yield prospect, yields varies from 20 to 150 m^3/hr for drawdown upto 30 m
		Surma	Bokabil/ Bhuban	Thinly bedded Sandstone, Siltstone and shale	Occurs on anticlinal hill ranges	Not potential for ground water development, due to argillaceous nature of formations

2.4 Ground water level conditions

Ground water regime of Tripura is being monitored through a netWorks of 82 permanent observation stations (GWMS) four times in a year. The depth to water level during pre-monsoon period (March' 19) generally lies between 0.45 to 9.76 m bgl and during post-monsoon period (November' 19) depth to water level lies between 0.16 to 9.18 m bgl. The fluctuation of water level varies between 0.06 m to 2.98 m. The analysis of long-term water level trend (both pre-monsoon and post-monsoon period) of ground water monitoring stations

indicates that there is no significant falling trend of water level in the state so far.

2.5 Ground water quality

Results of chemical quality of ground water show that ground water in all parts of the State is good for domestic, irrigational & industrial uses. Iron content in ground water, however, is high, which warrants proper treatment before use. The water is encrusting in nature throughout the state. Hence, it is recommended that well screens should be cleaned periodically. Range of chemical contents of Ground Water in Tripura is given in the table below:

Table 2: Range of chemical contents of Ground Water in Tripura

Sl. no	Chemical constituents	Phreatic Aquifer		
			Min	**Max**
1	pH		7.01	8.6
2	EC (µS/cm) at 25°C		43.39	2107
3	Turbidity(NTU)	mg/l	BDL	0.5
4	TDS		21.45	1035
5	**CO_3**		BDL	15
6	**HCO_3**		6.10	1330
7	**TA (as $CaCO_3$)**		24.41	219.7
8	Cl-		7.09	145.3
9	**SO_4**		2.9	103.8
10	**NO_3**		BDL	10.25
11	F-		BDL	1.3
12	**Ca**		4	42
13	Mg		2.41	40
14	TH (as **$CaCO_3$**)		25	205
15	Na		3.05	447.72
16	K		0.82	33
17	Fe		0	10.6
18	U	µg/l	0	0.4
19	As		BDL	4.57

Ground water in the state is neutral to alkaline with pH values ranging from 7.01 to 8.6. The electrical conductivity values for ground water in phreatic aquifer in Tripura range from 43.39 to 2107 µs/cm at 25ºC indicating the quality of ground water to be of low salinity and the water is potable. Total hardness (Ca+Mg) expressed as $CaCO_3$ in ppm is small indicating that the water is soft in quality. The other chemical constituents of ground water namely HCO_3, Cl, Ca, Mg, Fe etc. all are within permissible limit according to Bureau of Indian Standard (IS: 10500-2012**).** The chemical analysis of ground water samples from phreatic aquifer reveals that the ground water of Tripura is generally suitable for drinking purposes. Almost all the chemical constituents are within the permissible limits of drinking water standards except for Iron, which is high in isolated locations. Higher concentration of iron above permissible limit in ground water in phreatic aquifer in Tripura is observed in places like Tarapur (10.00 mg/l), Purba Takka (7.5 mg/l), Poangbari (7.2 mg/l), Gaurnagar (3.6 mg/l), Kumarghat (2.9 mg/l) , Gorjee bazaar (2.4 mg/l), Kakraban (2.3 mg/l), Chawmanu (2.1 mg/l) etc.

3. GROUND WATER RESOURCES ESTIMATION METHODOLOGY-GEC'2015

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 -

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

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

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

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 Development is defined by,

Stage of Ground water = Existing Gross Ground water extraction for all uses **X** 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
≤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

Categorisation of Assessment Units

As emphasised 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.

Categorisation of Assessment Units Based on Quantity

The categorisation based on status of ground water quantity is defined by Stage of Ground Water Extractions given below:

Stage of Ground Water Extraction	**Category**
≤70%	Safe
>70%and ≤90%	Semi-Critical
>90%and ≤100%	Critical
> 100%	Over Exploited

Categorisation of Assessment Units Based on Quality

The committee recommends that each assessment unit, in addition to the quantity based categorisation (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 -

Potential ground water recharge = (5-D) x A x 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.

4 PROCEDURE FOLLOWED IN THE PRESENT ASSESSMENT INCLUDING ASSUMPTIONS

4.1 Data source for each of the data element and how the data was used in the computation (constraint in the data base, if any)

In the present report, block has been taken as the smallest administrative unit for resources computation.

The following sub-units have been considered for computation of various figures as per GEC-2015 methodology.

The total geographical area of the blocks and block-wise population of 2011 were taken from 2011 Census report. The population data of 2011 is projected for population of 2020 and 2025. Ground water draft for drinking and domestic purposes was calculated as per population. The monthly rainfall data was collected from Agriculture department and used for recharge from rainfall. Block-wise number of ground water abstraction structures for drinking and domestic purposes were provided by PWD (DWS) and used for calculating draft as per structures. Block-wise number of ground water abstraction structures for irrigation purposes were provided by PWD (WR) and used for calculating draft for irrigation. Deep tube wells and artesian wells were considered to calculate the area under ground water irrigation. But only shallow tube wells were considered for calculating draft for irrigation from phreatic aquifer. Draft for Industrial extraction has been calculated as per unit draft provided by the firm for issuance of NOC approvals to Central Groundwater Authority. Water level data of CGWB has been utilized for calculating recharge by WLFM and long term water level trend used for categorization of blocks.

Constraints in database- season-wise and block-wise water spread area / area under water bodies, rivers etc. are not available, unit draft of ground water structures were assumed, block-wise area irrigated by different structures were not available. Data regarding ground water structures is not complete because there are thousands of private shallow tube wells which have not come under present ground water structure / spot sources survey.

4.2 Changes, if any, applied in the original methodology proposed by GEC along with justification

Return flow from ground water has not been considered for monsoon season, as there is enough rainfall during monsoon and ground water irrigation is not practiced. There is no major or medium irrigation scheme in Tripura. Entire area has been considered as non-command area.

Water spread area, days of water availability (monsoon & non-monsoon) and seepage from ponds & tanks given in the methodology have been used to determine the seepage from ponds & tanks for monsoon & non-monsoon separately. Since the aquifer remains fully saturated during the periods of intensive rainfall, additional recharge from ponds & tanks during this period is negligible. Recharge from ponds and tanks during non-monsoon period are considered for 212 days. Computation factor for seepage from ponds & tanks is taken as 0.00144 m/day as per GEC-2015 methodology.

Categorization was done based on stage of groundwater extraction and validation. Validation was done for almost all assessment unit except Raishyabari, Silachari, Damcherra and Jampui Hills block as these blocks have very scanty water level data hence long term trends couldn't utilized for validation purpose.

4.3 Various norms used in the computation

The unit of computation proposed in the methodology is "watershed". However, it also recommends blocks/ tehsil as the unit for the first few years since there can be non-availability of data. In the present report block- the smallest administrative unit is taken as the unit of computation. This is mainly due to lack of data especially on number of ground water structures, draft, population and other vital figures on watershed basis.

The rainfall infiltration factor recommended by GEC 2015 for sandstone is 0.12. For calculating recharge from return flow from irrigation, an average water requirement of 1m & 0.1m for paddy & non-paddy has been taken from Agriculture department, Govt. of Tripura. Computation factor for return flow from ground water irrigation is taken as 0.25 – 0.45 and from surface water irrigation is taken as 0.30 – 0.50 as per GEC'97 methodology.

Ground water drafts for various uses in the different subunits have been estimated and according to the recommended methodology. Ground water draft for domestic use has been estimated based on the number of different types of ground water abstraction structures and their unit draft per year and also as per population of 2011. The unit draft of dug well is 0.2 ham and unit draft of shallow tubewell (fitted with hand pumps) is 0.2 ham. Amongst these two values, ultimately the higher figure has been considered for further ground water resource assessment.

Block-wise ground water draft for irrigation was estimated based on the number of structures of shallow tubewell and the unit draft of shallow tubewell fitted with pump set is 3 ham. Ground water in the state is mostly used for domestic & irrigational purposes. Ground

water for industrial draft is negligible and has not been considered while assessing the ground water draft.

The major potential aquifer in the state is Tipam sandstone and the specific yield value for Tipam sandstone is taken as 0.08 (from GEC'97 Methodology).

4.4 Any documented field studies

No field study has carried out so far to measure unit draft of different structures, rainfall infiltration etc.

4. COMPUTATION OF GROUND WATER RESOURCES IN TRIPURA STATE

Ground water resources of Tripura state have been computed according to the methodology and norms described above. The block-wise details have been provided in Annexures.

a. Salient features of the dynamic ground water resources assessments.

The smallest administrative unit 'block' is taken as the unit of computation. Total number of assessment units in Tripura is 59. The resource computations presented in this report is for the ground water year 2019 – 2020 (1st June, 2019 to 31st May, 2020). Population data of 2011 collected from Census report 2011 and projected population of 2020 and 2025 were worked out. Rainfall data collected for 2015-2019. Ground water abstraction structure for irrigation was provided by PWD (WR), Govt. of Tripura. Ground water abstraction structures for drinking and domestic structures were provided by PWD (DWS), Govt. of Tripura.

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

Recharge from Rainfall has been computed separately for monsoon and non-monsoon periods for the entire state. The recharge from rainfall during monsoon season has been computed using both water level fluctuation method (WLFM) and rainfall infiltration method (RIFM). The results from the above two methods (WLFM & RIFM) have been compared using Percent Deviation (PD). After the computation of the percent deviation (PD) it is found that in out of 59 assessment units, 52 units were considered by RIF method and 7 units by WLF method.

c. Total resources of the state, existing development, balance available for future development etc.

Total ground water recharge is estimated after deducting resultant flow from evaporation and transpiration, and it is 1.47 BCM. Annual extractable groundwater resources are estimated after deducting natural discharge, and it is 1.24 BCM. Ground water extraction for various uses has been estimated for all the assessment units of Tripura. Gross annual ground water draft for all uses in Tripura is 0.10 BCM and allocation for domestic up to year 2025 is 0.09 BCM. Balance groundwater resources available for future development are 1.14

BCM. The stage of development of Tripura is 8 % and all the 59 blocks / assessment units (including 1 non-block, Agartala) in Tripura state falls under **SAFE** category.

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

Annual Extractable ground water resources in the state are of the order of 1.24 BCM. Maximum annual extractable ground water resource of 0.22 BCM is found in Gomati district while the minimum of 0.10 BCM is in Unakoti district.

Ground water extraction is done mainly through dug wells and shallow tubewells from unconfined aquifer in the state. The stage of ground water extraction in Tripura is 8%. Agartala MC is having the highest stage of ground water extraction of 52.70% while the minimum is 2.19%, in Karbook block.

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

A comparison is made between the previous estimate as on March 2017 and present estimate based on GEC'15 as on 2020, and presented in tabular statement given below.

Comparison between ground water resources estimation for Tripura for previous (2016-2017) and present (2019-2020)

Sl. No.	ITEM	Year, 2016-17	Year, 2019-20	COMPARISON
	Estimation	Manual	INGRES	
1	Total Annual Ground Water Recharge (BCM)	1.34	1.47	+ 0.13
2	Annual Extractable Ground Water Resources (BCM)	1.24	1.24	No change
3	Irrigation Draft (BCM)	0.02	0.02	No change
4	Domestic Draft (BCM)	0.08	0.08	No change
5	Stage of GW Extraction (%)	7.88%	8 %	+ 0.12
6	Provision for Domestic (BCM)	0.09	0.086	- 0.004
7	GW availability for future development	1.11	1.13	+0.02
8	No. of **SAFE** Units	59	59	No change
9	No. of O.E. Units	0	0	No change
10	No. of Dark/ Critical units	0	0	No change

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

As there is no poor quality zone in Tripura so annual ground water recharge is not assessed.

g. Additional annual potential recharge.

Additional potential recharge is computed for shallow water table areas. Area under shallow water table is calculated from water level maps prepared by CGWB. Additional annual potential recharge in the state is 0.30 BCM.

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

The computation of the resource estimation of Tripura for the year 2019-20 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 block/Assessment unit based on the categorization

Appendix I : Government order on constitution of Committee

GOVERNMENT OF TRIPURA
OFFICE OF THE ADDITIONAL CHIEF ENGINEER
PLANNING & DESIGN UNIT, PWD(WR)
KUNJABAN : AGARTALA.

NO.F.15(76)/SE/WRPC/ 431-40 Date - 30/06/2020

MEMORANDUM

In accordance with the approval of the Government, a **"State Level Committee"** is hereby constituted for assessment of Dynamic Ground Water Resources in Tripura for the assessment year 2020 with the following Members, -

1.	Principal Secretary, PWD, Tripura	**Chairman.**
2.	Regional Director, CGWB, NE Region	**Member Secretary.**
3.	Chief Engineer, PWD(WR), Tripura	Member.
4.	Chief Engineer, PWD(DWS), Tripura	Member.
5.	Chief Engineer, Agriculture, Tripura	Member.
6.	Chief Engineer, RD, Tripura	Member.
7.	Director Industries, Tripura	Member.
8.	General Manager, NABARD, Tripura	Member.
9.	Officer-in-Charge, State Unit, CGWB, Tripura	Member.
10.	Executive Engineer, WR Investigation Division, PWD(WR), Tripura	**Nodal Officer cum Member.**

The broad terms of reference of the Committee would be as follows,-

(i) To estimate annual replenishable ground water resources of the state in accordance with the Ground Water Resources Estimation Methodology.

(ii) To estimate the status of utilization of the annual replenishable ground water resources.

29.06.2020
DEPUTY SECRETARY
PWD(Water Resources)
Kunjaban, Tripura

Forwarded to –

1. The Principal Secretary, PWD, Tripura New Secretariat Building.
2. The Regional Director, CGWB, NER, Bhujal Bhawan, opp. of ISBT, Guwahati- 035.
3. The Chief Engineer, PWD(WR), Tripura, Kunjaban, Agartala.
4. The Chief Engineer, PWD(DWS), Tripura, PN Complex, Gurkhabasti.
5. The Chief Engineer, Agriculture, Tripura, Krishi Bhawan, Agartala.
6. The Chief Engineer, RD, Tripura, PN Complex, Gurkhabasti.
7. The Director Industries, Tripura, PN Complex, Gurkhabasti.
8. The General Manager, NABARD, Tripura, Khejur Bagan, Agartala.
9. The Officer-in-Charge, State Unit, CGWB, Tripura, Ashram Chowmohni, Agartala.
10. The Executive Engineer, WR. Investigation Division, Kunjaban, Agartala.

29.06.2020
DEPUTY SECRETARY
PWD(Water Resources)
Kunjaban, Tripura.

Appendix 2: Minutes of the First meeting of the State Level Committee held on 12th March, 2021.

MINUTES OF THE FIRST MEETING OF THE STATE LEVEL COMMITTEE HELD ON 12TH MARCH, 2021 IN THE CONFERENCE HALL NO. I, SECRETARIAT, AGARTALA FOR ASSESSMENT OF THE DYNAMIC GROUND WATER RESOURCES (2020) FOR THE STATE OF TRIPURA

The meeting of the State Level Committee (SLC) for Assessment of Dynamic Ground Water Resources of Tripura was held on 12.03.2021 in the Conference Hall No I, Secretariat, Agartala under the Chairmanship of Shri Kiran Gitte (IAS), Secretary, PWD Department, Govt. of Tripura.

The list of Members attended the meetings are:

1. Shri Kiran Gitte, IAS, Secretary, PWD, Govt. of Tripura.
2. Shri. Mahitosh Das, Chief Engineer, PWD (WR) Department, Govt of Tripura.
3. Shri. Rajib Debbarma, Chief Engineer, PWD (DWS) Department, Govt of Tripura.
4. Er. Swapan Kumar Das, Chief Engineer, RD Dept. Govt. of Tripura.
5. Shri. M. R. Gopal, General Manager/OIC, NABARD, Tripura.
6. Smt. Sutirtha Paul, Geologist, Industries and Commerce, Tripura.
7. Shri. Biswajit Saha, EE, PWD (WR) Department, Govt of Tripura.
8. Shri. Binay Debbarma, AE, Agriculture Department, Govt. of Tripura
9. Smt. Ritu K Oraon, Scientist –B, CGWB, SUO-Agartala
10. Ms. H Veikhone Sophia Kay, Scientist-B, CGWB SUO-Agartala

Shri. Kiran Gitte, IAS, Secretary , PWD, Govt of Tripura welcomed the committee and directed Smt. Ritu Oraon, Scientist-B, representative of the Regional Director, NER Guwahati and Member Secretary SLC to start the presentation.

At first, Smt. Ritu Oraon has briefed the committee members about dynamic ground water resource estimation in Tripura for 2019-20. She said that dynamic groundwater resources in Tripura are estimated jointly by CGWB and the State Govt. Departments. She also informed that earlier this dynamic groundwater resource estimation work was done manually. Later it was observed that some minor computational error might have occurred in calculating the resource, as the process of dynamic groundwater resource estimation is a complicated and lengthy. So to overcome this human error, Ministry of Jal Shakti in collaboration with IIT Hyderabad developed the software IN-GRES (INDIA GROUNDWATER RESOURCE ESTIMATION SOFTWARE) and started the presentation with introducing the INGRES software. She also said that the data provided by the state is compiled into the INGRES input datasheet format and uploaded in the software. She also mentioned that the manual calculation has also been done and it matches with the result of INGRES.

The Secretary (PWD), enquired about the sources of the data uploaded in INGRES. She mentioned that the various data inputs have been collected from various departments like, PWD (WR), PWD (DWS), Agriculture Department, etc.

The Secretary (PWD), asked whether the estimation is for shallow aquifer or deeper aquifer. Smt. Ritu Oraon replied that it is for the unconfined aquifer. He stressed that the estimation should also be done for the deeper aquifer. Smt. Ritu Oraon replied as there is no data available for piezometric head in most of the blocks for deeper aquifer so only the unconfined aquifer has been considered for the current resource estimation. She also said that in Tripura most of the extraction is from deeper aquifer, so in the next assessment the extraction from DTW will also be considered into the Dynamic Groundwater Estimation work with the permission of the committee.

The Secretary (PWD) has proposed that the state department should monitor the piezometric head in the month of March 2021 and include in the current assessment. Smt. Ritu Oraon cited constraints and said that in this assessment, we cannot include it for computation as we need at least pre monsoon and post monsoon data for a year. She mentioned that it can be included in the next ground water assessment.

The secretary (PWD), said that a training for state engineers/ staff is required to monitor the piezometric head and also uploading the data in INGRES and directed the CE, PWD (DWS) to start monitoring for the pre-monsoon water level.

Smt. Ritu Oraon gave a detailed outlined on the data uploaded in INGRES. All the data uploaded in INGRES was shown to the committee one by one. The computed result in MIS view was also shown to the committee.

Chief Engineer PWD (DWS) asked the extent of the depth of shallow aquifer and deeper aquifer, In reply Smt. Ritu K Oraon showed the panel sections of Agartala Valley, Sabroom- Udaipur valley to the committee and explained that there is no clear cut boundary to demarcate the shallow aquifer and deeper aquifer in these valleys but in Khowai valley there are confining layers which separates unconfined and semi-confined aquifers. She also said that, as most of the extraction in Tripura is from deeper aquifer and the resource estimation is for unconfined aquifer so the real picture is not coming out. Also there is no clear cut boundary so the extraction from deeper aquifer may influence the unconfined aquifer.

Smt. Ritu Oraon informed that because of the time constraints the data compilation in the data input sheet as per INGRES format has been prepared by the CGWB SUO Agartala but next time onwards State has to do it.

Chief Engineer PWD (DWS) said that a training is needed on how to monitor piezometic head and also a hands on training on INGRES. Smt. Ritu Oraon said that CGWB SUO Agartala will provide the hands on training on how to monitor the piezometric head and also on uploading the datasheet into the INGRES as per the format.

After thorough deliberation by various members of the committee, the Dynamic Groundwater Resource Estimation of Tripura using INGRES was finally approved by the committee. It has also been decided that in the next resource estimation the draft from deeper aquifer will be considered in the Dynamic Groundwater Resource Estimation work.

(Shri Kiran Gitte)
Secretary, PWD
Government of Tripura &
Chairman
State Level Committee (SLC)

17/03/2021
(Shi Mahitosh Das)
Chief Engineer, PWD (WR)
Govt of Tripura

17/03/2021
(Shri. Rajib Debbarma)
Chief Engineer, PWD (DWS)
Govt of Tripura

17/03/2021
(Er. Swapan Kumar Das)
Chief Engineer, (RD Dept.)
Govt of Tripura

20/3/2021
(Shri. M. R. Gopal)
General Manager/OIC,
NABARD

20/3/21
Director
Industries and Commerce Dept
Govt of Tripura

17/3/2021
(Shri. Biswajit Saha)
Nodal Officer cum Member, SL
EE, WR Investigation Divisior
PWD (WR),Govt of Tripura,

17/03/2021
(Smt. Ritu K Oraon)
Scientist –B,
CGWB, SUO-Agartala

19-03-2021
(Shri. S.S. Debnath)
CE, Agriculture Dept.
Govt. of Tripura

(Ms. H Veikhone Sophia Kay)
Scientist-B,
CGWB SUO-Agartala

Annexure 1(A) : General description of the Ground Water Assessment Unit of Tripura State (2019-20)

Type of Ground Water Assessment Unit (Watershed/ Block/ Taluka/ Mandal) : **Block**

Sl.No.	Ground Water Assessment Unit(Block)	Type of rock formation	Areal extent (in hectares)						
			Total geographical area	Hilly area	Ground Water Recharge worthy area			Water logged and shallow water Table	Flood Prone Area
					Command area	Non command area	Poor ground water quality area		
1	AMBASA	Semi-consolidated Tertiary Sandstone	30556	17277	0	13279	0	0	0
2	CHAWMANU	-Do-	45829	29646	0	16183	0	3492.28	0
3	DUMBURNAGAR	-Do-	28157	15850	0	12307	0	2160	0
4	DURGACHOWMOHANI	-Do-	14587	8685	0	5902	0	657.2	0
5	GANGANAGAR	-Do-	25624	21086	0	4538	0	0	0
6	MANU	-Do-	46331	20000	0	26331	0	1954.54	0
7	RAISHYABARI	-Do-	16958	9050	0	7908	0	840	0
8	SALEMA	-Do-	23447	10314	0	13133	0	363.1	0
	DHALAI		**231489**	**131908**		**99581**		**9467.12**	
9	AMARPUR	-Do-	41046	14255	0	26791	0	1749.44	0
10	KAKRABAN	-Do-	10378	3000	0	7378	0	0	0
11	KARBOOK	-Do-	21468	6083	0	15385	0	98.88	0
12	KILLA	-Do-	19372	3075	0	16297	0	504.74	0
13	MATABARI	-Do-	22880	5022	0	17858	0	1706.22	0
14	OMPI	-Do-	30511	15045	0	15466	0	743.56	0

Sl.No.	Ground Water Assessment Unit(Block)	Type of rock formation	Areal extent (in hectares)						
			Total geographical area	Hilly area	Ground Water Recharge worthy area			Water logged and shallow water Table	Flood Prone Area
					Command area	Non command area	Poor ground water quality area		
15	SILACHHARI	-Do-	7394	2919	0	4475	0	23.3	0
16	TEPANIA	-Do-	8656	2478	0	6178	0	501.6	0
	GOMATI		**161705**	**51877**		**109828**		**5327.74**	
17	KALYANPUR	-Do-	10153	2900	0	7253	0	9.96	0
18	KHOWAI	-Do-	10173	188	0	9985	0	520.02	0
19	MUNGIAKAMI	-Do-	29292	18109	0	11183	0	0	0
20	PADMABIL	-Do-	11904	5375	0	6529	0	0	0
21	TELIAMURA	-Do-	13262	7113	0	6149	0	0	0
22	TULASIKHAR	-Do-	26461	18000	0	8461	0	98.16	0
	KHOWAI		**101245**	**51685**		**49560**		**628.14**	
23	DAMCHHERA	-Do-	18510	17100	0	1410	0	0	0
24	DASDA	-Do-	37545	27146	0	10399	0	2491.74	0
25	JAMPUI HILL	-Do-	18889	14434	0	4455	0	0	0
26	JUBARAJNAGAR	-Do-	14386	5635	0	8751	0	1148.02	0
27	KADAMTALA	-Do-	9578	80	0	9498	0	1563.8	0
28	KALACHERRA	-Do-	7768	124	0	7644	0	719.74	0
29	LALJURI	-Do-	19950	12806	0	7144	0	363.54	0
30	PANISAGAR	-Do-	9166	4085	0	5081	0	258.54	0
	NORTH TRIPURA		**135792**	**81410**		**54382**		**6545.38**	
31	BISHALGARH	-Do-	14998	1266	0	13732	0	69.98	0

Sl.No.	Ground Water Assessment Unit(Block)	Type of rock formation	Areal extent (in hectares)						
			Total geographical area	Hilly area	Ground Water Recharge worthy area			Water logged and shallow water Table	Flood Prone Area
					Command area	Non command area	Poor ground water quality area		
32	BOXANAGAR	-Do-	11806	754	0	11052	0	904.42	0
33	CHARILAM	-Do-	12675	1202	0	11473	0	362.32	0
34	JAMPUIJALA	-Do-	30652	5075	0	25577	0	292.32	0
35	KANTHALIA	-Do-	15580	3750	0	11830	0	1080.92	0
36	MOHANBHOG	-Do-	8716	2593	0	6123	0	305.9	0
37	NALCHAR	-Do-	9965	2582	0	7383	0	629.16	0
	SEPAHIJALA		**104392**	**17222**		**87170**		**3645.02**	
38	BAGAFA	-Do-	30219	11209	0	19010	0	1589.94	0
39	BHARAT CH NAGAR	-Do-	12209	3682	0	8527	0	1835.66	0
40	HRISHYAMUKH	-Do-	18260	6250	0	12010	0	49.42	0
41	JOLAIBARI	-Do-	23601	10941	0	12660	0	100.92	0
42	POANGBARI	-Do-	7415	3150	0	4265	0	18.22	0
43	RAJNAGAR	-Do-	20822	4640	0	16182	0	0	0
44	RUPAICHARI	-Do-	18485	10125	0	8360	0	30.2	0
45	SATCHAND	-Do-	20190	3101	0	17089	0	211.74	0
	SEPAHIJALA		**151201**	**53098**		**98103**		**3836.1**	
46	CHANDIPUR	-Do-	12845	4619	0	8226	0	559.22	0
47	GOURNAGAR	-Do-	12195	3431	0	8764	0	0	0
48	KUMARGHAT	-Do-	24697	7175	0	17522	0	116.22	0
49	PENCHARTHAL	-Do-	15966	7600	0	8366	0	0	0
	UNAKOTI		**65703**	**22825**		**42878**		**675.44**	

Sl.No.	Ground Water Assessment Unit(Block)	Type of rock formation	Areal extent (in hectares)						
			Total geographical area	Hilly area	Ground Water Recharge worthy area			Water logged and shallow water Table	Flood Prone Area
					Command area	Non command area	Poor ground water quality area		
50	AMC	-Do-	7650	0	0	7650	0	0	0
51	BAMUTIA	-Do-	5471	0	0	5471	0	0	0
52	BELBARI	-Do-	9655	2744	0	6911	0	0	0
53	DUKLI	-Do-	10445	497	0	9948	0	1.14	0
54	HEZAMARA	-Do-	18366	7500	0	10866	0	0	0
55	JIRANIA	-Do-	5630	953	0	4677	0	0	0
56	LEFUNGA	-Do-	4942	1416	0	3526	0	4.98	0
57	MANDWI	-Do-	18073	6250	0	11823	0	0	0
58	MOHANPUR	-Do-	10886	0	0	10886	0	146.6	0
59	OLD AGARTALA	-Do-	6524	0	0	6524	0	6.1	0
	WEST TRIPURA		**97642**	**19360**		**78282**		**158.82**	
TOTAL	**TRIPURA**		1049169	429385	0	619784	0	30283.76	0

Annexure 1(B): Data variables used in Dynamic Ground Water Resources of the Tripura State (2019-20)

Sl.No.	District	Assessment Unit	Command/ Non-command/ Poor GW Quality	Normal Annual Rainfall (mm)	Average Pre-monsoon Water level (mgbl)	Average Post-monsoon Water Level (mgbl)	Average Fluctuation (m)
1	DHALAI	AMBASA	Non command	2670.81	4.26	2.642	1.618
2	DHALAI	CHAWMANU	- Do -	2336.45	4.446	2.62	1.826
3	DHALAI	DUMBURNAGAR	- Do -	2216.92	4.26	2.642	1.618
4	DHALAI	DURGACHOWMOHANI	- Do -	2670.81	4.17	2.604	1.566
5	DHALAI	GANGANAGAR	- Do -	2216.92	4.26	2.642	1.618
6	DHALAI	MANU	- Do -	2336.45	4.446	2.62	1.826
7	DHALAI	RAISHYABARI	- Do -	2216.92	-	-	-
8	DHALAI	SALEMA	- Do -	2670.81	4.26	2.642	1.618
9	GOMATI	AMARPUR	- Do -	2104.54	3.036	1.944	1.092
10	GOMATI	KAKRABAN	- Do -	2265.51	10.08	9.036	1.044
11	GOMATI	KARBOOK	- Do -	2104.54	3.036	1.944	1.092
12	GOMATI	KILLA	- Do -	2265.51	3.67	2.22	1.45
13	GOMATI	MATABARI	- Do -	2265.51	3.218	1.26	1.958
14	GOMATI	OMPI	- Do -	2104.54	4.012	2.864	1.148
15	GOMATI	SILACHHARI	- Do -	2104.54	-	-	-
16	GOMATI	TEPANIA	- Do -	2265.51	3.67	2.22	1.45
17	KHOWAI	KALYANPUR	- Do -	2149.13	3.522	2.596	0.926
18	KHOWAI	KHOWAI	- Do -	2149.13	3.522	2.596	0.926
19	KHOWAI	MUNGIAKAMI	- Do -	2064.84	4.166	2.304	1.862
20	KHOWAI	PADMABIL	- Do -	2149.13	7.94	5.676	2.264

Sl.No.	District	Assessment Unit	Command/ Non-command/ Poor GW Quality	Normal Annual Rainfall (mm)	Average Pre-monsoon Water level (mgbl)	Average Post-monsoon Water Level (mgbl)	Average Fluctuation (m)
21	KHOWAI	TELIAMURA	- Do -	2064.84	3.434	2.43	1.004
22	KHOWAI	TULASIKHAR	- Do -	2149.13	4.166	2.304	1.862
23	NORTH TRIPURA	DAMCHHERA	- Do -	2450.78			
24	NORTH TRIPURA	DASDA	- Do -	2450.78	4.754	3.43	1.324
25	NORTH TRIPURA	JAMPUI HILL	- Do -	2450.78	-	-	-
26	NORTH TRIPURA	JUBARAJNAGAR	- Do -	2521.22	3.078	1.74	1.338
27	NORTH TRIPURA	KADAMTALA	- Do -	2521.22	2.474	1.412	1.062
28	NORTH TRIPURA	KALACHERRA	- Do -	2521.22	3.078	2.184	0.894
29	NORTH TRIPURA	LALJURI	- Do -	2450.78	4.754	3.43	1.324
30	NORTH TRIPURA	PANISAGAR	- Do -	2521.22	4.218	2.762	1.456
31	SEPAHIJALA	BISHALGARH	- Do -	2073.71	3.904	2.7	1.204
32	SEPAHIJALA	BOXANAGAR	- Do -	2152.35	3.68	1.892	1.788
33	SEPAHIJALA	CHARILAM	- Do -	2073.71	3.904	2.7	1.204
34	SEPAHIJALA	JAMPUIJALA	- Do -	2073.71	4.14	2.544	1.596
35	SEPAHIJALA	KANTHALIA	- Do -	2152.35	3.68	1.892	1.788
36	SEPAHIJALA	MOHANBHOG	- Do -	2152.35	3.67	2.22	1.45
37	SEPAHIJALA	NALCHAR	- Do -	2152.35	3.67	2.22	1.45
38	SOUTH TRIPURA	BAGAFA	- Do -	2233.59	4.852	3.756	1.096

Sl.No.	District	Assessment Unit	Command/ Non-command/ Poor GW Quality	Normal Annual Rainfall (mm)	Average Pre-monsoon Water level (mgbl)	Average Post-monsoon Water Level (mgbl)	Average Fluctuation (m)
39	SOUTH TRIPURA	BHARAT CH NAGAR	- Do -	2233.59	4.834	3.738	1.096
40	SOUTH TRIPURA	HRISHYAMUKH	- Do -	2211.91	4.834	3.738	1.096
41	SOUTH TRIPURA	JOLAIBARI	- Do -	2233.59	4.852	3.756	1.096
42	SOUTH TRIPURA	POANGBARI	- Do -	2992.44	4.834	3.738	1.096
43	SOUTH TRIPURA	RAJNAGAR	- Do -	2211.91	3.872	3.086	0.786
44	SOUTH TRIPURA	RUPAICHARI	- Do -	2992.44	4.852	3.756	1.096
45	SOUTH TRIPURA	SATCHAND	- Do -	2992.44	4.852	3.756	1.096
46	UNAKOTI	CHANDIPUR	- Do -	2386.83	4.45	3.028	1.422
47	UNAKOTI	GOURNAGAR	- Do -	2386.83	4.936	2.812	2.124
48	UNAKOTI	KUMARGHAT	- Do -	2386.83	5.01	3.232	1.778
49	UNAKOTI	PENCHARTHAL	- Do -	2386.83	5.844	3.29	2.554
50	WEST TRIPURA	AMC	- Do -	2060.51	6.686	4.184	2.502
51	WEST TRIPURA	BAMUTIA	- Do -	2060.51	4.186	2.918	1.268
52	WEST TRIPURA	BELBARI	- Do -	1935.43	3.6	2.5	1.1
53	WEST TRIPURA	DUKLI	- Do -	2060.51	4.988	4.024	0.964
54	WEST TRIPURA	HEZAMARA	- Do -	2060.51	7.94	5.676	2.264
55	WEST TRIPURA	JIRANIA	- Do -	1935.43	4.03	3.386	0.644
56	WEST TRIPURA	LEFUNGA	- Do -	2060.51	4.186	2.918	1.268

Sl.No.	District	Assessment Unit	Command/ Non-command/ Poor GW Quality	Normal Annual Rainfall (mm)	Average Pre-monsoon Water level (mgbl)	Average Post-monsoon Water Level (mgbl)	Average Fluctuation (m)
57	WEST TRIPURA	MANDWI	- Do -	1935.43	5.04	3.042	1.998
58	WEST TRIPURA	MOHANPUR	- Do -	2060.51	4.186	2.918	1.268
59	WEST TRIPURA	OLD AGARTALA	- Do -	1935.43	4.03	3.386	0.644
TOTAL	TRIPURA			2265.99			

Annexure 2 (A): ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES OF THE TRIPURA STATE (2016-2017)

Sl. No	Assessment Unit Name (Block)	Monsoon		Non Monsoon		Total Annual Ground Water Recharge	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Current Annual Groundwater Extraction				Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)
		Recharge from Rainfall	Recharge from Other Sources	Recharge from Rainfall	Recharge from Other Sources				Irrigation	Industrial	Domestic	Total			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	AMBASA	1798.14	121.5	1157.03	500.09	3576.76	357.67	3217.55	6	1.4454	91.09	98.53	103.44	3106.67	3.06
2	CHAWMANU	2061.81	27.36	1052.57	130.35	3272.09	327.21	1932.46	0	0	79.17	79.16	89.9	1842.57	4.10
3	DUMBURNAGAR	1614.97	48.06	600.51	588.62	2852.16	285.21	1653.66	0	0	87.25	87.25	99.08	1554.58	5.28
4	DURGA CHOWMOHANI	799.2	178	514.25	616.51	2107.96	210.8	1632.9	34.8	1.4553	117.53	153.77	133.46	1463.2	9.42
5	GANGANAGAR	595.49	0	221.43	49.81	866.73	86.67	780.06	0	0	76.38	76.39	86.74	693.31	9.79
6	MANU	3354.73	125.28	1712.62	437.91	5630.54	563.05	4625.72	0	0	198.11	198.1	224.96	4400.77	4.28
7	RAISHYABARI	1297.15	4.59	385.87	113.29	1800.9	180.09	1088.06	0	0	52.55	52.55	59.67	1028.39	4.83
8	SALEMA	1778.37	123.12	1144.3	477.26	3523.05	352.31	3166.03	0	0	188.91	188.91	214.52	2951.51	5.97
9	AMARPUR	3375.46	279.86	1193.44	1037.24	5886	588.6	4843.97	0	0	126.10	126.1	137.12	4706.85	2.60
10	KAKRABAN	917.27	189.52	458.05	645.1	2209.94	221	1988.94	7.2	0	167.84	175.05	182.5	1799.23	8.80
11	KARBOOK	1938.39	111.49	685.34	370.49	3105.71	310.57	2739.56	0	0	60.08	60.08	65.33	2674.23	2.19
12	KILLA	2026.12	91.98	1011.76	328.91	3458.77	345.88	3101.05	60.6	0	91.20	151.8	99.16	2941.29	4.90
13	MATABARI	2651.71	182.14	1108.68	682.89	4625.42	231.27	4223.23	10.8	0.1188	227.54	238.46	247.41	3964.9	5.65
14	OMPI	1948.59	106.59	688.95	393.58	3137.71	313.77	2685.78	0	0	86.12	86.12	93.64	2592.14	3.21
15	SILACHHARI	704.77	9.09	199.34	35.7	948.9	94.89	854.01	0	0	41.01	41.01	44.59	809.42	4.80
16	TEPANIA	768.08	43.69	383.55	162.5	1357.82	135.78	1215.35	5.4	0	59.74	65.14	64.96	1144.99	5.36
17	KALYANPUR	881.89	169.49	394.06	556.35	2001.79	200.18	1801.61	111	0	102.19	213.2	109.85	1580.75	11.83
18	KHOWAI	1214.07	196.61	542.49	638.99	2592.16	259.22	2184.2	57.6	0	142.60	200.21	153.29	1973.3	9.17

Sl. No	Assessment Unit Name (Block)	Monsoon		Non Monsoon		Total Annual Ground Water Recharge	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Current Annual Groundwater Extraction				Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)
		Recharge from Rainfall	Recharge from Other Sources	Recharge from Rainfall	Recharge from Other Sources				Irrigation	Industrial	Domestic	Total			
19	MUNGIAKAMI	1562.77	58.88	618.89	242.18	2482.72	124.13	2358.59	13.2	0	63.99	77.19	68.79	2276.6	3.27
20	PADMABIL	1165.86	38.18	354.72	143.34	1702.1	85.1	1617	10.2	0	77.96	88.16	83.8	1523	5.45
21	TELIAMURA	702.87	144.84	340.3	510.49	1698.5	169.85	1528.65	103.2	2.376	149.78	255.35	161.01	1262.07	16.70
22	TULASIKHAR	1239.57	70.78	459.69	273.92	2043.96	102.2	1941.76	11.4	0	95.35	106.75	102.49	1827.87	5.50
23	DAMCHHERA	240.1	20.01	91.64	80.88	432.63	43.26	386.64	3	0	62.32	65.33	68.94	314.69	16.90
24	DASDA	1416.62	82.66	675.85	405.29	2580.42	258.04	1545.39	1.8	0	124.69	126.49	137.92	1405.67	8.18
25	JAMPUI HILL	758.61	0	289.54	18.36	1066.51	106.65	959.86	0	0	27.17	27.17	30.06	929.8	2.83
26	JUBARAJNAGAR	1155.36	117.72	673.87	425.1	2372.05	237.21	1796.28	0	1.4553	153.47	154.92	169.75	1625.08	8.62
27	KADAMTALA	1253.98	100.49	731.39	353.37	2439.23	243.93	1799.59	21.6	0.06	210.35	232	232.66	1545.28	12.89
28	KALACHERRA	1009.21	53.95	588.62	199.49	1851.27	185.13	1304.89	2.4	0.3564	162.71	165.48	179.97	1122.15	12.68
29	LALJURI	973.2	17.41	464.3	93.39	1548.3	154.83	1295.71	0	0	106.16	106.16	117.42	1178.29	8.19
30	PANISAGAR	670.82	155.12	391.26	522.27	1739.47	173.94	1462.66	3.6	0	101.61	105.21	112.39	1346.67	7.19
31	BISHALGARH	1673.07	228.26	642.38	785.16	3328.87	332.88	2980.72	241.2	0.4752	174.64	416.31	187.73	2551.32	13.97
32	BOXANAGAR	1422.51	55.41	505.49	199.76	2183.17	218.32	1606.4	66.6	0	113.44	180.04	121.95	1417.85	11.21
33	CHARILAM	1397.84	74.84	536.7	262.39	2271.77	227.18	2024.41	66.6	1.0395	190.11	257.75	204.36	1752.41	12.73
34	JAMPUIJALA	3116.24	96.84	1196.48	364.52	4774.08	477.41	4243.65	27	0	100.23	127.22	107.74	4108.92	3.00
35	KANTHALIA	1522.65	132.25	541.07	458.65	2654.62	265.46	2329.34	297.6	0	137.10	434.7	147.37	1884.37	18.66
36	MOHANBHOG	788.1	146.29	280.05	492.71	1707.15	170.72	1532	1.2	0	104.59	105.79	112.42	1418.38	6.91
37	NALCHAR	950.27	134.51	337.68	557.6	1980.06	198.01	1782.05	3.6	0	161.92	165.52	174.06	1604.39	9.29
38	BAGAFA	2518	134.18	928.71	509.93	4090.82	409.08	3266.47	22.2	0	165.06	187.26	179.48	3064.79	5.73
39	BHARAT CH NAGAR	1129.46	81.54	416.58	279.43	1907.01	190.7	790.6	0	0.9504	73.44	74.4	79.86	709.78	9.41
40	HRISHYAMUKH	1672.1	129.04	460.13	440.58	2701.85	270.18	2431.67	9	0	117.55	126.56	127.82	2294.84	5.20

Sl. No	Assessment Unit Name (Block)	Monsoon		Non Monsoon		Total Annual Ground Water Recharge	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Current Annual Groundwater Extraction				Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)
		Recharge from Rainfall	Recharge from Other Sources	Recharge from Rainfall	Recharge from Other Sources				Irrigation	Industrial	Domestic	Total			
41	JOLAIBARI	1676.9	197.28	618.49	665.78	3158.45	315.85	2791.63	27	0	114.59	141.59	124.6	2640.03	5.07
42	POANGBARI	843.67	0.27	170.63	15.39	1029.96	102.99	921.59	3	0	59.40	62.4	64.58	854.01	6.77
43	RAJNAGAR	2252.94	33.8	619.97	191.77	3098.48	309.84	2658.29	105	0	136.56	241.56	148.49	2404.8	9.09
44	RUPAICHARI	1653.72	66.71	334.46	245.34	2300.23	230.02	2028.7	4.8	0	106.88	111.68	116.21	1907.69	5.51
45	SATCHAND	3380.44	210.76	683.69	739.48	5014.37	501.44	4502.27	0.6	0	135.32	135.93	147.14	4354.52	3.02
46	CHANDIPUR	1078.28	112.46	537.02	402.6	2130.36	213.03	1717.05	0	0	146.71	146.71	162.28	1554.77	8.54
47	GOURNAGAR	1501.24	92.5	572.14	361.42	2527.3	126.37	2365.03	4.8	0.0495	152.70	157.55	168.9	2191.28	6.66
48	KUMARGHAT	2296.83	234.99	1143.89	880.96	4556.67	455.67	3978.81	0	0	233.54	233.55	258.31	3720.49	5.87
49	PENCHARTHAL	1411.88	91.8	546.16	303.4	2353.24	117.66	2203.17	0	0	99.47	99.46	110.02	2093.16	4.51
50	AMC	1355.42	49.38	383.73	184.61	1973.14	197.31	1775.83	0	0.42	935.49	935.91	1017.19	758.22	52.70
51	BAMUTIA	646.23	36.94	274.43	138.03	1095.63	109.57	986.06	20.4	0.2376	103.22	123.86	110.96	854.46	12.56
52	BELBARI	782.58	100.08	305.85	351.52	1540.03	154.01	1386.02	3	1.2177	168.59	172.8	181.23	1200.58	12.47
53	DUKLI	1175.05	134.95	498.99	474.81	2283.8	228.38	2055.42	240	2.3007	207.30	449.61	222.84	1590.27	21.87
54	HEZAMARA	1925.23	71.77	545.04	260.88	2802.92	280.29	2521.3	2.4	0	78.17	80.57	84.03	2434.87	3.20
55	JIRANIA	529.61	76.97	206.98	267.98	1081.54	108.16	973.38	103.2	0.06	82.00	185.26	88.15	781.97	19.03
56	LEFUNGA	416.49	42.07	176.87	151.16	786.59	78.66	707.93	0	0	103.22	103.22	110.96	596.97	14.58
57	MANDWI	1823.41	125.18	523.23	462.85	2934.67	146.73	2787.94	0	0	98.01	98	105.35	2682.6	3.52
58	MOHANPUR	1285.85	131.65	546.05	462.81	2426.36	242.64	2164.96	166.8	1.4553	152.58	320.83	164.01	1832.7	14.82
59	OLD AGARTALA	738.76	69.68	288.72	247.92	1345.08	134.5	1210.58	88.2	0	115.07	203.26	123.69	998.7	16.79
	Total	84839.95	5960.81	33955.92	22193.11	146949.79	13761.50	124454.43	1968.00	15.47	7897.90	9881.34	8626.55	113844.41	8.00

Annexure 2(B): Comparison of Ground Water Resources (2019-2020) and (2016-2017)

COMPARISION OF GROUND WATER RESOURCE (2019-2020)

S.No	District	Total Annual Ground Water Recharge			Annual Extractable Ground Water Recsource			Total Current Annual Ground Water Extraction			Stage of Ground Water Extraction (%)		
		2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff
1	AMBASA	3576.76	3629.72	-52.96	3217.55	1530.17	1687.38	98.53	92.671	5.859	3.06	6.06	-3.00
2	CHAWMANU	3272.09	3082.12	189.97	1932.46	2555.28	-622.82	79.16	75.327	3.833	4.10	2.95	1.15
3	DUMBURNAGAR	2852.16	2780.8	71.36	1653.66	2492.6	-838.94	87.25	83.022	4.228	5.28	3.33	1.95
4	DURGA CHOWMOHANI	2107.96	2502.83	-394.87	1632.9	1544.44	88.46	153.77	146.629	7.141	9.42	9.49	-0.07
5	GANGANAGAR	866.73	1030.24	-163.51	780.06	448.88	331.18	76.39	72.681	3.709	9.79	16.19	-6.40
6	MANU	5630.54	5406.42	224.12	4625.72	4480.25	145.47	198.1	188.498	9.602	4.28	4.21	0.07
7	RAISHYABARI	1800.9	1435.55	365.35	1088.06	1292	-203.94	52.55	50.001	2.549	4.83	3.87	0.96
8	SALEMA	3523.05	3642.75	-119.7	3166.03	3241	-74.97	188.91	179.752	9.158	5.97	5.55	0.42
9	AMARPUR	5886	5767.92	118.08	4843.97	4878.97	-35	126.1	121.599	4.501	2.60	2.49	0.11
10	KAKRABAN	2209.94	2092.07	117.87	1988.94	1882.86	106.08	175.05	169.253	5.797	8.80	8.99	-0.19
11	KARBOOK	3105.71	2863.56	242.15	2739.56	2720.38	19.18	60.08	57.936	2.144	2.19	2.13	0.06
12	KILLA	3458.77	2948.11	510.66	3101.05	2507.51	593.54	151.8	148.668	3.132	4.90	5.93	-1.03
13	MATABARI	4625.42	4479.74	145.68	4223.23	3849.26	373.97	238.46	230.43	8.03	5.65	5.99	-0.34
14	OMPI	3137.71	2790.81	346.9	2685.78	2467.62	218.16	86.12	83.044	3.076	3.21	3.37	-0.16
15	SILACHHARI	948.9	890.23	58.67	854.01	801.21	52.8	41.01	39.542	1.468	4.80	4.94	-0.14
16	TEPANIA	1357.82	1161.93	195.89	1215.35	1040.56	174.79	65.14	63.115	2.025	5.36	6.07	-0.71
17	KALYANPUR	2001.79	2153.03	-151.24	1801.61	1800.18	1.43	213.2	209.953	3.247	11.83	11.66	0.17
18	KHOWAI	2592.16	3193.65	-601.49	2184.2	2285.18	-100.98	200.21	195.682	4.528	9.17	8.56	0.61
19	MUNGIAKAMI	2482.72	2720.79	-238.07	2358.59	2448.55	-89.96	77.19	75.162	2.028	3.27	3.07	0.20

S.No	District	Total Annual Ground Water Recharge			Annual Extractable Ground Water Recsource			Total Current Annual Ground Water Extraction			Stage of Ground Water Extraction (%)		
		2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff
20	PADMABIL	1702.1	1664.15	37.95	1617	1384.48	232.52	88.16	85.689	2.471	5.45	6.19	-0.74
21	TELIAMURA	1698.5	1807.1	-108.6	1528.65	1602.04	-73.39	255.35	248.231	7.119	16.70	15.49	1.21
22	TULASIKHAR	2043.96	2279.03	-235.07	1941.76	1294.04	647.72	106.75	103.724	3.026	5.50	8.02	-2.52
23	DAMCHHERA	432.63	377.89	54.74	386.64	333.69	52.95	65.33	62.758	2.572	16.90	18.81	-1.91
24	DASDA	2580.42	2617.72	-37.3	1545.39	1525.05	20.34	126.49	121.359	5.131	8.18	7.96	0.22
25	JAMPUI HILL	1066.51	876.61	189.9	959.86	757.07	202.79	27.17	26.056	1.114	2.83	3.44	-0.61
26	JUBARAJNAGAR	2372.05	2450.94	-78.89	1796.28	1920.56	-124.28	154.92	147.154	7.766	8.62	7.66	0.96
27	KADAMTALA	2439.23	2761.99	-322.76	1799.59	2144.01	-344.42	232	223.346	8.654	12.89	10.42	2.47
28	KALACHERRA	1851.27	1650.1	201.17	1304.89	1130.2	174.69	165.48	158.413	7.067	12.68	14.02	-1.34
29	LALJURI	1548.3	1510.74	37.56	1295.71	1325.72	-30.01	106.16	101.79	4.37	8.19	7.68	0.51
30	PANISAGAR	1739.47	1883.8	-144.33	1462.66	1682.56	-219.9	105.21	101.029	4.181	7.19	6	1.19
31	BISHALGARH	3328.87	3881.53	-552.66	2980.72	3336.76	-356.04	416.31	410.302	6.008	13.97	12.3	1.67
32	BOXANAGAR	2183.17	2243.17	-60	1606.4	1569.93	36.47	180.04	176.447	3.593	11.21	11.24	-0.03
33	CHARILAM	2271.77	2647.89	-376.12	2024.41	1997.23	27.18	257.75	250.686	7.064	12.73	12.55	0.18
34	JAMPUIJALA	4774.08	5100.3	-326.22	4243.65	3970.67	272.98	127.22	124.047	3.173	3.00	3.12	-0.12
35	KANTHALIA	2654.62	2803.16	-148.54	2329.34	2373.04	-43.7	434.7	430.352	4.348	18.66	18.14	0.52
36	MOHANBHOG	1707.15	1771.13	-63.98	1532	1628.85	-96.85	105.79	102.722	3.068	6.91	6.31	0.60
37	NALCHAR	1980.06	2162	-181.94	1782.05	1915.27	-133.22	165.52	160.388	5.132	9.29	8.37	0.92
38	BAGAFA	4090.82	4319.61	-228.79	3266.47	3183.81	82.66	187.26	181.581	5.679	5.73	5.7	0.03
39	BHARAT CH NAGAR	1907.01	1481.37	425.64	790.6	605.25	185.35	74.4	70.819	3.581	9.41	11.7	-2.29
40	HRISHYAMUKH	2701.85	3019.18	-317.33	2431.67	2464.23	-32.56	126.56	122.353	4.207	5.20	4.97	0.23

S.No	District	Total Annual Ground Water Recharge			Annual Extractable Ground Water Recsource			Total Current Annual Ground Water Extraction			Stage of Ground Water Extraction (%)		
		2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff	2019-2020	2016-2017	Diff
41	JOLAIBARI	3158.45	2604.06	554.39	2791.63	2293.44	498.19	141.59	137.748	3.842	5.07	6.01	-0.94
42	POANGBARI	1029.96	688.42	341.54	921.59	619.58	302.01	62.4	60.276	2.124	6.77	9.73	-2.96
43	RAJNAGAR	3098.48	3814.01	-715.53	2658.29	3228.39	-570.1	241.56	236.683	4.877	9.09	7.33	1.76
44	RUPAICHARI	2300.23	1996.13	304.1	2028.7	1796.52	232.18	111.68	107.858	3.822	5.51	6	-0.49
45	SATCHAND	5014.37	4341.84	672.53	4502.27	3907.65	594.62	135.93	131.089	4.841	3.02	3.35	-0.33
46	CHANDIPUR	2130.36	2771.13	-640.77	1717.05	2306.81	-589.76	146.71	140.673	6.037	8.54	6.1	2.44
47	GOURNAGAR	2527.3	2918.56	-391.26	2365.03	2608.17	-243.14	157.55	151.222	6.328	6.66	5.8	0.86
48	KUMARGHAT	4556.67	5719.12	-1162.45	3978.81	5371.07	-1392.26	233.55	223.923	9.627	5.87	4.17	1.70
49	PENCHARTHAL	2353.24	2786.44	-433.2	2203.17	2382.33	-179.16	99.46	95.371	4.089	4.51	4	0.51
50	AMC	1973.14	2226.38	-253.24	1775.83	1962.37	-186.54	935.91	1084.835	-148.925	52.70	55.28	-2.58
51	BAMUTIA	1095.63	1203.22	-107.59	986.06	957.14	28.92	123.86	120.498	3.362	12.56	12.59	-0.03
52	BELBARI	1540.03	1712.45	-172.42	1386.02	1157.45	228.57	172.8	166.248	6.552	12.47	14.36	-1.89
53	DUKLI	2283.8	2626.72	-342.92	2055.42	2440.65	-385.23	449.61	440.856	8.754	21.87	18.06	3.81
54	HEZAMARA	2802.92	2929.76	-126.84	2521.3	2688.74	-167.44	80.57	78.088	2.482	3.20	2.9	0.30
55	JIRANIA	1081.54	1997.51	-915.97	973.38	1507.74	-534.36	185.26	182.662	2.598	19.03	12.11	6.92
56	LEFUNGA	786.59	1088.44	-301.85	707.93	705.84	2.09	103.22	99.948	3.272	14.58	14.16	0.42
57	MANDWI	2934.67	2812.16	122.51	2787.94	2051.7	736.24	98	94.897	3.103	3.52	4.63	-1.11
58	MOHANPUR	2426.36	2992.08	-565.72	2164.96	2400.73	-235.77	320.83	314.54	6.29	14.82	13.1	1.72
59	OLD AGARTALA	1345.08	1458.26	-113.18	1210.58	1093.56	117.02	203.26	199.617	3.643	16.79	18.25	-1.46
	TRIPURA	146949.79	152568.4	-5618.58	124454.43	123891.2	563.19	9881.34	9759.243	122.097	8.00	7.88	0.12

Annexure 3A

CATEGORIZATION OF BLOCKS/ MANDALS/ TALUKAS IN INDIA (2019-2020)												
S.No	**District**	**Total No. of Assessed Units**	**Safe**		**Semi-Critical**		**Critical**		**Over-Exploited**		**Saline**	
			Nos.	**%**	**Nos.**	**%**	**Nos.**	**%**	**Nos.**	**%**	**Nos.**	**%**
1	DHALAI	8	8	100	-	-	-	-	-	-	-	-
2	GOMATI	8	8	100	-	-	-	-	-	-	-	-
3	KHOWAI	6	6	100	-	-	-	-	-	-	-	-
4	NORTH TRIPURA	8	8	100	-	-	-	-	-	-	-	-
5	SEPAHIJALA	7	7	100	-	-	-	-	-	-	-	-
6	SOUTH TRIPURA	8	8	100	-	-	-	-	-	-	-	-
7	UNAKOTI	4	4	100	-	-	-	-	-	-	-	-
8	WEST TRIPURA	10	10	100	-	-	-	-	-	-	-	-
	Total States	59	59	100	-	-	-	-	-	-	-	-
	Grand Total	59	59	100	-	-	-	-	-	-	-	-

Annexure 3B

CATEGORIZATION OF BLOCKS/ MANDALS/ TALUKAS IN INDIA (2019-2020)													
S.No	States / Union Territories	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	**DHALAI**	2.31489	0.99581	0.99581	100	-	-	-	-	-	-	-	-
2	**GOMATI**	1.61705	1.09828	1.09828	100	-	-	-	-	-	-	-	-
3	**KHOWAI**	1.01245	0.4956	0.4956	100	-	-	-	-	-	-	-	-
4	**NORTH TRIPURA**	1.35792	0.54382	0.54382	100	-	-	-	-	-	-	-	-
5	**SEPAHIJALA**	1.04392	0.8717	0.8717	100	-	-	-	-	-	-	-	-
6	**SOUTH TRIPURA**	1.51201	0.98103	0.98103	100	-	-	-	-	-	-	-	-
7	**UNAKOTI**	0.65703	0.42878	0.42878	100	-	-	-	-	-	-	-	-
8	**WEST TRIPURA**	0.97642	0.78282	0.78282	100	-	-	-	-	-	-	-	-
	Total States	10.49169	6.19784	6.19784	100	-	-	-	-	-	-	-	-
	Grand Total	10.49169	6.19784	6.19784	100	-	-	-	-	-	-	-	-

Annexure 3C

CATEGORIZATION OF BLOCKS/ MANDALS/ TALUKAS IN INDIA (2019-2020)												
S.No	States / Union Territories	Annual extractable ground water resource in mcm	Safe		Semi-Critical		Critical		Over-Exploited		Saline	
			Annual extractable ground water resource in mcm	%	Annual extractable ground water resource in mcm	%	Annual extractable ground water resource in mcm	%	Annual extractable ground water resource in mcm	%	Annual extractable ground water resource in mcm	%
1	**DHALAI**	180.9644	180.9644	100	-	-	-	-	-	-	-	-
2	**GOMATI**	216.5189	216.5189	100	-	-	-	-	-	-	-	-
3	**KHOWAI**	114.3181	114.3181	100	-	-	-	-	-	-	-	-
4	**NORTH TRIPURA**	105.5102	105.5102	100	-	-	-	-	-	-	-	-
5	**SEPAHIJALA**	164.9857	164.9857	100	-	-	-	-	-	-	-	-
6	**SOUTH TRIPURA**	193.9122	193.9122	100	-	-	-	-	-	-	-	-
7	**UNAKOTI**	102.6406	102.6406	100	-	-	-	-	-	-	-	-
8	**WEST TRIPURA**	165.6942	165.6942	100	-	-	-	-	-	-	-	-
	Total States	1244.544	1244.544	100	-	-	-	-	-	-	-	-
	Grand Total	1244.544	1244.544	100	-	-	-	-	-	-	-	-

Annexure 4

CATEGORIZATION OF BLOCKS/ MANDALS/ TALUKAS IN TRIPURA (2019-2020)																			
S.No	States / Union Territories	Total 2016-2017	Total 2019-2020	Diff	Safe			Semi-Critical			Critical			Over-Exploited			Saline		
					2016-2017	2019-2020	Diff	2016-2017	2019-2020	Diff	2016-2017	2019-2020	Diff	2016-2017	2019-2020	Diff	2016-2017	2019-2020	Diff
1	DHALAI	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
2	GOMATI	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
3	KHOWAI	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
4	NORTH TRIPURA	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
5	SEPAHIJALA	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
6	SOUTH TRIPURA	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
7	UNAKOTI	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
8	WEST TRIPURA	1	1	0	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-
	TRIPURA	8	8	1	8	8	1	-	-	-	-	-	-	-	-	-	-	-	-

Annexure 4A

CATEGORISATION OF ASSESSMENT UNIT, 2019-2020							
TRIPURA							
S.NO	**District**	**S.NO**	**Semi-Critical**	**S.NO**	**Critical**	**S.NO**	**Over-Exploited**
1	**DHALAI**		-		-		-
2	**GOMATI**		-		-		-
3	**KHOWAI**		-		-		-
4	**NORTH TRIPURA**		-		-		-
5	**SEPAHIJALA**		-		-		-
6	**SOUTH TRIPURA**		-		-		-
7	**UNAKOTI**		-		-		-
8	**WEST TRIPURA**		-		-		-
ABSTRACT							
Total No. of Assessed Units		**Number of Semi critical Assessment Unit**		**Number of Critical Assessment Unit**		**Number of Over Exploited Assessment Unit**	

Annexure 4B

QUALITY PROBLEMS IN ASSESSMENT UNITS, 2019-2020							
TRIPURA							
S.NO	District	S.NO	Fluoride	S.NO	Arsenic	S.NO	Salinity
1	DHALAI		-		-		-
2	GOMATI		-		-		-
3	KHOWAI		-		-		-
4	NORTH TRIPURA		-		-		-
5	SEPAHIJALA		-		-		-
6	SOUTH TRIPURA		-		-		-
7	UNAKOTI		-		-		-
8	WEST TRIPURA		-		-		-
			-				

Annexure 4C

CATEGORISATION OF ASSESSMENT UNIT, 2019-2020													
TRIPURA													
S.NO	**District**	**S.NO**	**Semi-Critical**	**S.NO**	**Critical**	**S.NO**	**Over-Exploited**	**S.NO**	**Fluoride**	**S.NO**	**Arsenic**	**S.NO**	**Salinity**
1	**DHALAI**		-		-		-		-		-		-
2	**GOMATI**		-		-		-		-		-		-
3	**KHOWAI**		-		-		-		-		-		-
4	**NORTH TRIPURA**		-		-		-		-		-		-
5	**SEPAHIJALA**		-		-		-		-		-		-
6	**SOUTH TRIPURA**		-		-		-		-		-		-
7	**UNAKOTI**		-		-		-		-		-		-
8	**WEST TRIPURA**		-		-		-		-		-		-

ATTRIBUTES

Sl. No	State	District	Assessment Unit Name	Assessment Unit Type	Recharge from Rainfall -MON	Recharge from Other Sources -MON	Recharge from Rainfall -NM	Recharge from Other Sources -NM	Total Annual Ground Water (Ham) Recharge	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Irrigation Use (Ham)	Industrial Use (Ham)	Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)	Categorization (OE/Critical /Semicritical /Safe)
1	Tripura	West Tripura	Old Agartala	BLOCK	738.76	69.68	288.72	247.92	1345.08	134.5	1210.58	88.2	88.2	0	115.07	203.26	123.69	998.70	16.79
2	Tripura	West Tripura	Mohanpur	BLOCK	1285.85	131.65	546.05	462.81	2426.36	242.64	2164.96	166.8	166.8	1.4553	152.58	320.83	164.01	1832.70	14.82
3	Tripura	West Tripura	Bamutia	BLOCK	646.23	36.94	274.43	138.03	1095.63	109.57	986.06	20.4	20.4	0.2376	103.22	123.86	110.96	854.46	12.56
4	Tripura	West Tripura	Jirania	BLOCK	529.61	76.97	206.98	267.98	1081.54	108.16	973.38	103.2	103.2	0.06	82.00	185.26	88.15	781.97	19.03
5	Tripura	West Tripura	Dukli	BLOCK	1175.05	134.95	498.99	474.81	2283.8	228.38	2055.42	240	240	2.3007	207.30	449.61	222.84	1590.27	21.87
6	Tripura	West Tripura	Lefunga	BLOCK	416.49	42.07	176.87	151.16	786.59	78.66	707.93	0	0	0	103.22	103.22	110.96	596.97	14.58
7	Tripura	West Tripura	Mandwi	BLOCK	1823.41	125.18	523.23	462.85	2934.67	146.73	2787.94	0	0	0	98.01	98.00	105.35	2682.60	3.52
8	Tripura	West Tripura	Amc	BLOCK	1355.42	49.38	383.73	184.61	1973.14	197.31	1775.83	0	0	0.42	935.49	935.91	1017.19	758.22	52.70
9	Tripura	West Tripura	Belbari	BLOCK	782.58	100.08	305.85	351.52	1540.03	154.01	1386.02	3	3	1.2177	168.59	172.80	181.23	1200.58	12.47
10	Tripura	West Tripura	Hezamara	BLOCK	1925.23	71.77	545.04	260.88	2802.92	280.29	2521.3	2.4	2.4	0	78.17	80.57	84.03	2434.87	3.20
11	Tripura	Khowai	Khowai	BLOCK	1214.07	196.61	542.49	638.99	2592.16	259.22	2184.2	57.6	57.6	0	142.60	200.21	153.29	1973.30	9.17
12	Tripura	Khowai	Padmabil	BLOCK	1165.86	38.18	354.72	143.34	1702.1	85.1	1617	10.2	10.2	0	77.96	88.16	83.80	1523.00	5.45
13	Tripura	Khowai	Tulasikhar	BLOCK	1239.57	70.78	459.69	273.92	2043.96	102.2	1941.76	11.4	11.4	0	95.35	106.75	102.49	1827.87	5.50
14	Tripura	Khowai	Kalyanpur	BLOCK	881.89	169.49	394.06	556.35	2001.79	200.18	1801.61	111	111	0	102.19	213.20	109.85	1580.75	11.83
15	Tripura	Khowai	Mungiakami	BLOCK	1562.77	58.88	618.89	242.18	2482.72	124.13	2358.59	13.2	13.2	0	63.99	77.19	68.79	2276.60	3.27
16	Tripura	Khowai	Teliamura	BLOCK	702.87	144.84	340.3	510.49	1698.5	169.85	1528.65	103.2	103.2	2.376	149.78	255.35	161.01	1262.07	16.70
17	Tripura	Gomati	Amarpur	BLOCK	3375.46	279.86	1193.44	1037.24	5886	588.6	4843.97	0	0	0	126.10	126.10	137.12	4706.85	2.60
18	Tripura	Gomati	Kakraban	BLOCK	917.27	189.52	458.05	645.1	2209.94	221	1988.94	7.2	7.2	0	167.84	175.05	182.50	1799.23	8.80
19	Tripura	Gomati	Matabari	BLOCK	2651.71	182.14	1108.68	682.89	4625.42	231.27	4223.23	10.8	10.8	0.1188	227.54	238.46	247.41	3964.90	5.65
20	Tripura	Gomati	Silachhari	BLOCK	704.77	9.09	199.34	35.7	948.9	94.89	854.01	0	0	0	41.01	41.01	44.59	809.42	4.80

Sl. No	State	District	Assessment Unit Name	Assessment Unit Type	Recharge from Rainfall -MON	Recharge from Other Sources -MON	Recharge from Rainfall -NM	Recharge from Other Sources -NM	Total Annual Ground Water (Ham) Recharge	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Irrigation Use (Ham)	Industrial Use (Ham)	Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)	Categorization (OE/Critical /Semicritical /Safe)
21	Tripura	Gomati	Tepania	BLOCK	768.08	43.69	383.55	162.5	1357.82	135.78	1215.35	5.4	5.4	0	59.74	65.14	64.96	1144.99	5.36
22	Tripura	Gomati	Ompi	BLOCK	1948.59	106.59	688.95	393.58	3137.71	313.77	2685.78	0	0	0	86.12	86.12	93.64	2592.14	3.21
23	Tripura	Gomati	Killa	BLOCK	2026.12	91.98	1011.76	328.91	3458.77	345.88	3101.05	60.6	60.6	0	91.20	151.80	99.16	2941.29	4.90
24	Tripura	Gomati	Karbook	BLOCK	1938.39	111.49	685.34	370.49	3105.71	310.57	2739.56	0	0	0	60.08	60.08	65.33	2674.23	2.19
25	Tripura	Sepahijala	Jampuijala	BLOCK	3116.24	96.84	1196.48	364.52	4774.08	477.41	4243.65	27	27	0	100.23	127.22	107.74	4108.92	3.00
26	Tripura	Sepahijala	Mohanbhog	BLOCK	788.1	146.29	280.05	492.71	1707.15	170.72	1532	1.2	1.2	0	104.59	105.79	112.42	1418.38	6.91
27	Tripura	Sepahijala	Boxanagar	BLOCK	1422.51	55.41	505.49	199.76	2183.17	218.32	1606.4	66.6	66.6	0	113.44	180.04	121.95	1417.85	11.21
28	Tripura	Sepahijala	Kanthalia	BLOCK	1522.65	132.25	541.07	458.65	2654.62	265.46	2329.34	297.6	297.6	0	137.10	434.70	147.37	1884.37	18.66
29	Tripura	Sepahijala	Charilam	BLOCK	1397.84	74.84	536.7	262.39	2271.77	227.18	2024.41	66.6	66.6	1.0395	190.11	257.75	204.36	1752.41	12.73
30	Tripura	Sepahijala	Bishalgarh	BLOCK	1673.07	228.26	642.38	785.16	3328.87	332.88	2980.72	241.2	241.2	0.4752	174.64	416.31	187.73	2551.32	13.97
31	Tripura	Sepahijala	Nalchar	BLOCK	950.27	134.51	337.68	557.6	1980.06	198.01	1782.05	3.6	3.6	0	161.92	165.52	174.06	1604.39	9.29
32	Tripura	Dhalai	Manu	BLOCK	3354.73	125.28	1712.62	437.91	5630.54	563.05	4625.72	0	0	0	198.11	198.10	224.96	4400.77	4.28
33	Tripura	Dhalai	Chawmanu	BLOCK	2061.81	27.36	1052.57	130.35	3272.09	327.21	1932.46	0	0	0	79.17	79.16	89.90	1842.57	4.10
34	Tripura	Dhalai	Salema	BLOCK	1778.37	123.12	1144.3	477.26	3523.05	352.31	3166.03	0	0	0	188.91	188.91	214.52	2951.51	5.97
35	Tripura	Dhalai	Dumburnagar	BLOCK	1614.97	48.06	600.51	588.62	2852.16	285.21	1653.66	0	0	0	87.25	87.25	99.08	1554.58	5.28
36	Tripura	Dhalai	Ganganagar	BLOCK	595.49	0	221.43	49.81	866.73	86.67	780.06	0	0	0	76.38	76.39	86.74	693.31	9.79
37	Tripura	Dhalai	Ambasa	BLOCK	1798.14	121.5	1157.03	500.09	3576.76	357.67	3217.55	6	6	1.4454	91.09	98.53	103.44	3106.67	3.06
38	Tripura	Dhalai	Raishyabari	BLOCK	1297.15	4.59	385.87	113.29	1800.9	180.09	1088.06	0	0	0	52.55	52.55	59.67	1028.39	4.83
39	Tripura	Dhalai	Durgachowmohani	BLOCK	799.2	178	514.25	616.51	2107.96	210.8	1632.9	34.8	34.8	1.4553	117.53	153.77	133.46	1463.20	9.42
40	Tripura	Unakoti	Kumarghat	BLOCK	2296.83	234.99	1143.89	880.96	4556.67	455.67	3978.81	0	0	0	233.54	233.55	258.31	3720.49	5.87
41	Tripura	Unakoti	Gournagar	BLOCK	1501.24	92.5	572.14	361.42	2527.3	126.37	2365.03	4.8	4.8	0.0495	152.70	157.55	168.90	2191.28	6.66
42	Tripura	Unakoti	Pencharthal	BLOCK	1411.88	91.8	546.16	303.4	2353.24	117.66	2203.17	0	0	0	99.47	99.46	110.02	2093.16	4.51
43	Tripura	Unakoti	Chandipur	BLOCK	1078.28	112.46	537.02	402.6	2130.36	213.03	1717.05	0	0	0	146.71	146.71	162.28	1554.77	8.54
44	Tripura	North Tripura	Kalacherra	BLOCK	1009.21	53.95	588.62	199.49	1851.27	185.13	1304.89	2.4	2.4	0.3564	162.71	165.48	179.97	1122.15	12.68

Sl. No	State	District	Assessment Unit Name	Assessment Unit Type	Recharge from Rainfall -MON	Recharge from Other Sources -MON	Recharge from Rainfall -NM	Recharge from Other Sources -NM	Total Annual Ground Water (Ham) Recharge	Total Natural Discharges (Ham)	Annual Extractable Ground Water Resource (Ham)	Irrigation Use (Ham)	Industrial Use (Ham)	Domestic Use (Ham)	Total Extraction (Ham)	Annual GW Allocation for for Domestic Use as on 2025 (Ham)	Net Ground Water Availability for future use (Ham)	Stage of Ground Water Extraction (%)	Categorization (OE/Critical /Semicritical /Safe)
45	Tripura	North Tripura	Damchhera	BLOCK	240.1	20.01	91.64	80.88	432.63	43.26	386.64	3	3	0	62.32	65.33	68.94	314.69	16.90
46	Tripura	North Tripura	Jampui Hill	BLOCK	758.61	0	289.54	18.36	1066.51	106.65	959.86	0	0	0	27.17	27.17	30.06	929.80	2.83
47	Tripura	North Tripura	Jubarajnagar	BLOCK	1155.36	117.72	673.87	425.1	2372.05	237.21	1796.28	0	0	1.4553	153.47	154.92	169.75	1625.08	8.62
48	Tripura	North Tripura	Kadamtala	BLOCK	1253.98	100.49	731.39	353.37	2439.23	243.93	1799.59	21.6	21.6	0.06	210.35	232.00	232.66	1545.28	12.89
49	Tripura	North Tripura	Dasda	BLOCK	1416.62	82.66	675.85	405.29	2580.42	258.04	1545.39	1.8	1.8	0	124.69	126.49	137.92	1405.67	8.18
50	Tripura	North Tripura	Panisagar	BLOCK	670.82	155.12	391.26	522.27	1739.47	173.94	1462.66	3.6	3.6	0	101.61	105.21	112.39	1346.67	7.19
51	Tripura	North Tripura	Laljuri	BLOCK	973.2	17.41	464.3	93.39	1548.3	154.83	1295.71	0	0	0	106.16	106.16	117.42	1178.29	8.19
52	Tripura	South Tripura	Jolaibari	BLOCK	1676.9	197.28	618.49	665.78	3158.45	315.85	2791.63	27	27	0	114.59	141.59	124.60	2640.03	5.07
53	Tripura	South Tripura	Bharat Ch Nagar	BLOCK	1129.46	81.54	416.58	279.43	1907.01	190.7	790.6	0	0	0.9504	73.44	74.40	79.86	709.78	9.41
54	Tripura	South Tripura	Bagafa	BLOCK	2518	134.18	928.71	509.93	4090.82	409.08	3266.47	22.2	22.2	0	165.06	187.26	179.48	3064.79	5.73
55	Tripura	South Tripura	Hrishyamukh	BLOCK	1672.1	129.04	460.13	440.58	2701.85	270.18	2431.67	9	9	0	117.55	126.56	127.82	2294.84	5.20
56	Tripura	South Tripura	Rupaichari	BLOCK	1653.72	66.71	334.46	245.34	2300.23	230.02	2028.7	4.8	4.8	0	106.88	111.68	116.21	1907.69	5.51
57	Tripura	South Tripura	Rajnagar	BLOCK	2252.94	33.8	619.97	191.77	3098.48	309.84	2658.29	105	105	0	136.56	241.56	148.49	2404.80	9.09
58	Tripura	South Tripura	Satchand	BLOCK	3380.44	210.76	683.69	739.48	5014.37	501.44	4502.27	0.6	0.6	0	135.32	135.93	147.14	4354.52	3.02
59	Tripura	South Tripura	Poangbari	BLOCK	843.67	0.27	170.63	15.39	1029.96	102.99	921.59	3	3	0	59.40	62.40	64.58	854.01	6.77

Figure 1: Ground Water Categorization Map of Tripura

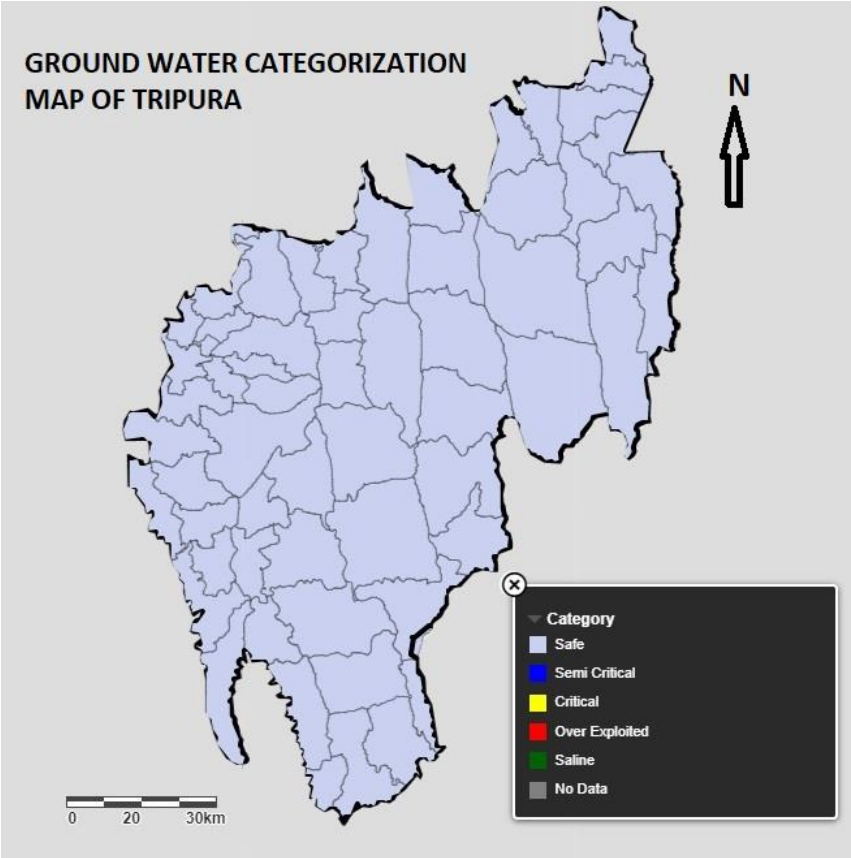

Figure 2: Ground Water Draft Map of Tripura

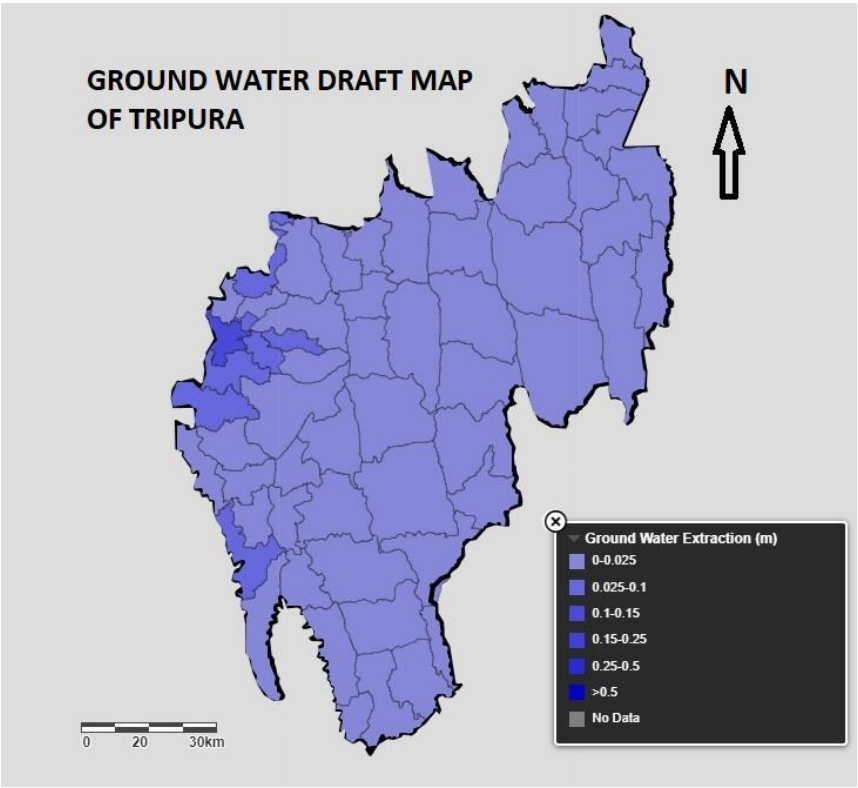

Figure 3: Annual Normal Rainfall Map of Tripura

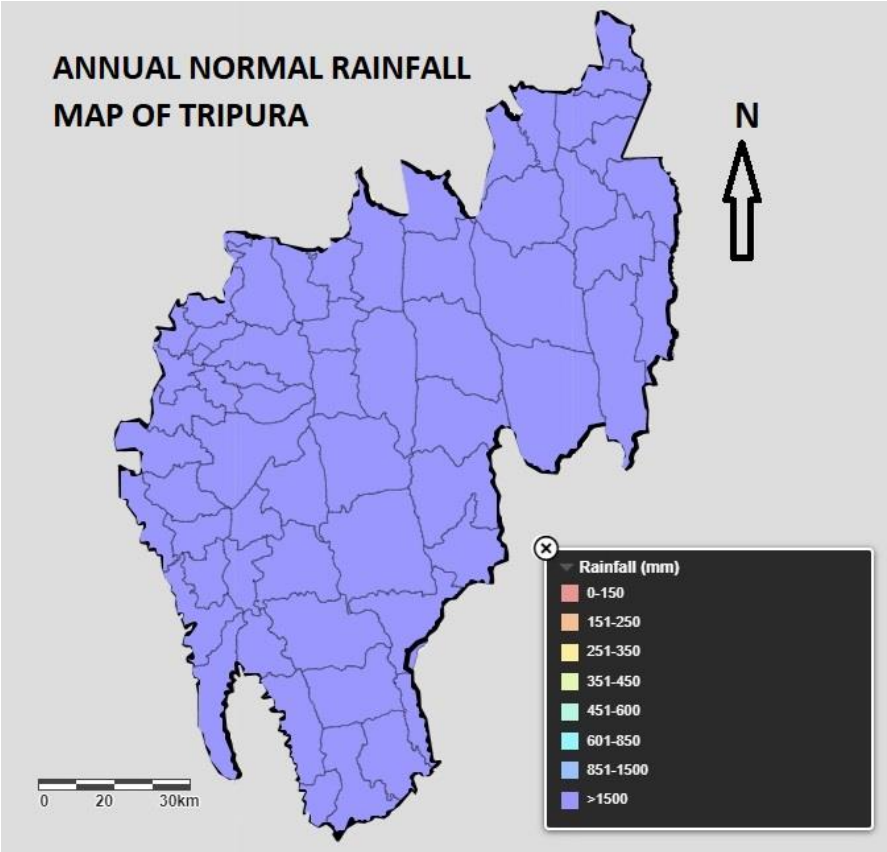

Figure 4: Annual Ground Water Recharge Map of Tripura