

# Distribution and Availability of Rural Water Supply in Champhai District of Mizoram, India

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## ABSTRACT

Champhai District is dependent on agriculture since time immemorial apart from border trade. Being an agrarian society, lots of plantations, farming, and animal husbandry were practiced within the district in which water is a key role in this field. Water plays a very important role in everyday life, especially where the main occupation of people is agriculture. The infrastructure needed to collect, transmit, treat, store, and distribute water is known as the water supply system. This system may also include storage facilities. The following components are often included in a water supply system: a drainage basis, a point at which raw water is collected, water purification facilities, water storage facilities such as reservoirs, a pipe network for water distribution, connections to sewers, etc.

*Key words:* Water supply, Drainage, Water storage, Population, Drill water, Spring water, Public water point

## Introduction

Freshwater is a key resource for human health, prosperity, and security. Water security is much more than physical resource scarcity. As defined by Grey and Sadoff (2007), water security is "the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production, coupled with an acceptable level of water-related risks to people, environments, and economies." Water security is considered to be a necessity of sustainable development for its importance in the quality of life of the people in a region.

The water supply system focuses on the positive and negative outcomes, rather than the processes, for people, the economy, and the environment, which are influenced by the many water manage-

ment components. These results can be both beneficial and detrimental. Frequently, a convergence of environmental, societal, technological, and governance elements leads to water insecurity. Nations with severe hydrological conditions, poor institutions, and chronic underinvestment in water infrastructure suffer the most from a lack of reliable access to water. Even in settings where there is an abundant water supply and a stable hydrological system, water insecurity can occur from poor management practices (such as incorrect resource distribution or lax pollution regulation) or inadequate infrastructure investment.

As a result, no one integrative index can provide a sufficient evaluation of the water delivery system. Water security frequently affects other security issues, such as food security, energy security, climate

change, and national security of the water supply. Water security is one of humanity's greatest issues since it is the essential link between the climate, human society, and the natural environment. The 21st century faces a defining global challenge: water security. Due to growing water scarcity and unpredictability, along with the effects on the water for people, energy, food, and ecosystems, water security is a concern on a worldwide scale for governments.

One of the most compelling arguments for investigating rural water distribution networks is that doing so shifts the research's emphasis from the processes themselves to the effects on people, the economy, and the environment. Social outcomes include, but are not limited to, those affected by water-related disasters, children with water-borne diseases, disputes over water access, and recreational activities that use water. Possible environmental consequences include the state of ecosystems, the number of wetlands and estuaries, the quality of freshwater, and the variety of aquatic life.

The significance of the research into water distribution networks is made abundantly evident by the remarks made above. On the other hand, an inadequate quantity of water retards growth, which in turn hinders both development and human welfare. It results in economic costs on a global scale in a variety of dimensions, including damage to property caused by floods and droughts, losses of food, and threats to water security.

### Study Area

The study area, which is the Champhai district of Mizoram, is located in the state's eastern and north-eastern regions. It is bordered on the north by Manipur, on the south and east by Myanmar, and the west by the Mizoram districts of Aizawl, Kolasib, and Serchhip. The district encompasses 3,185.8 square kilometers and has been divided into four blocks.

The entire district of Champhai is comprised of hill ranges with slopes above 20 percent. According to the Global Environment Centre (GEC, 1997), these hilly regions are not factored into resource calculations. Due to a paucity of data, particularly on population, number of groundwater structures, discharge, and other vital watershed factors.

The gross annual dynamic groundwater resource is predicted to be 8.10 million cubic metres, while the net annual groundwater withdrawal is 0.05 mil-

lion cubic metres. The level of groundwater development is low, 0.76 percent of natural discharge occurs outside of the monsoon season. The future allocation for domestic and industrial usage is 0.09 mcm, while the allocation for irrigation is 7.19 mcm. Although the district receives more than 2,000 millimetres of rainfall annually, there is severe water scarcity during the summer since the majority of rainfall is lost as surface runoff.

Groundwater is primarily used for drinking. The use of groundwater for irrigation may be deemed negligible. People employ Jhum farming due to the mountainous terrain, spatial variation of rainfall, nature of the soil, and lack of irrigation systems.

### Objectives

1. To analyse the distribution and availability of water supply.
2. To study the number of villages provided with piped water supply.

### Methodology

For the present study, both primary and secondary sources were used. Chiefly, the study is based on primary data collected during November 2022 regarding water storage facilities, pipelines, and water distribution. Secondary data was collected from Public Health Engineering Department (PHED), Champhai.

Data collected are worked in an excel sheet, tabulated, and finally, make a table for analysis of the data collected.

### Distribution of Population of rural areas within Champhai District

Champhai Block has a total of 10 villages. As per the 2011 census, the total population listing male and female population and household information within rural areas of the Champhai district were represented in the table below.

### Distribution of Population

The Champhai district covers 3,185 sq km in total. This district comprises 90 villages and 4 towns. The anticipated population of Champhai in 2023 is 174,786. According to the 2011 Indian census, Champhai has a population of 125,745 people, 63,388 of whom are men and 62,357 of whom are women.

Comparing the population of the Champhai dis-

**Table 1.** Distribution of population of rural areas listing male and female population and households within Champhai district

Villages	Population 2011	Male	Female	Households
Vaikhawtlang	938	475	463	168
Murlen	510	271	239	86
Tualcheng	770	384	386	157
Lungphunlian	384	204	180	81
Khuangphah	728	372	356	129
Hnahlan	3,157	1,602	1,555	569
N.E.Diltlang	379	196	183	68
Vapar	891	481	410	184
Ngur	1,674	826	848	335
N.Khawbung	875	439	436	178

Source: 2011 Population Census Data

district population 2001-2011 clearly states that the population of Champhai is rapidly increasing yearly which accelerates the growth of the population of Champhai district. The literacy rate is also increasing from 91.15 % in 2001 to 95.91% in 2011 which marks the development of the educational system within the Champhai district. As the population is increasing, a projection of the future population is necessary. It can be seen in the below table.

#### Champhai District Urban/ Rural 2011

38.59% of the entire Champhai population, as determined by the 2011 Census, resides in urban areas. In total, 48,529 individuals live in urban areas, including 24,278 males and 24,251 females. According to the 2011 census, there are 999 females for every 1000 males in the urban area of the Champhai district. As

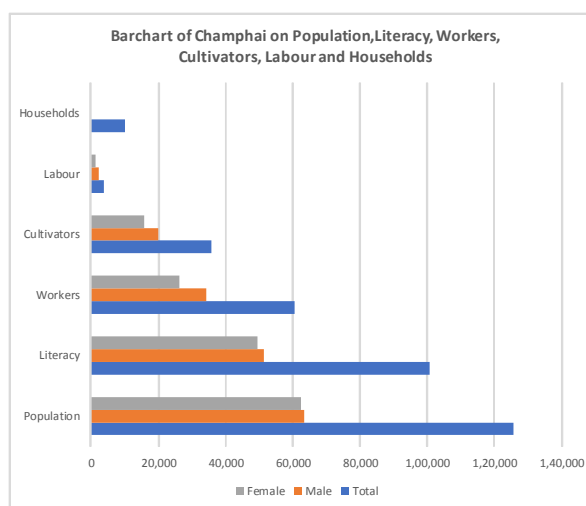
per the 2011 census, 61.41 percent of the people in the Champhai districts reside in rural areas. Of the 77,216 people that live in rural areas, 39,110 are men and 38,106 are women.

As per the 2011 Indian census, Champhai had a population of 125,745 people, 63,888 of whom were men and 62,357 of whom were women. In 2023, Champhai is anticipated to have 165,984 residents. A total of 100,802 persons in the population are literate, with 51,440 men and 49,362 women. There are 60,342 workers in total, of which 34,129 are men and 26,213 are women. There are 35,868 cultivators in total, of which 20,080 are men and 15,788 are women. Men made up 2,368 of the total 3698 labourers, while women made up 1,330 of the total. There are 10,068 urban households and 15,452 rural households.

**Table 2.** Champhai Population 2001-2011

Description	2001	2011
Population	1.08 Lakhs	1.26 Lakhs
Actual population	108,392	125,745
Male	55,756	63,388
Female	52,636	62,357
Population Growth	29.84%	16.01%
Area sq.km	3,185	3,185
Density/km <sup>2</sup>	34	39
Proportion to Mizoram	12.20%	11.46%
Population		
Sex Ratio( per 1000)	944	984
Child Sex Ratio(0-6 Age)	972	971
Average literacy	91.15	95.91
Female Literacy	93.12	97.21
Total Child Population(0-6 Age)	89.06	94.59
Child Proportion (0-6 Age)	18,433	20,645

Source: 2011 Population Census Data



## Types of rural water supply system

### Spring water

The entire district of Champhai is comprised of semi-consolidated tertiary rock hills. The predominant constituents of the rock type are siltstone, claystone, and compact sandstone. Although the district receives more than 2,000 millimetres of rainfall annually, there is severe water scarcity during the summer since the majority of rainfall is lost as surface runoff. Groundwater storage is primarily restricted to secondary porosities governed by structures. This Aquifer is the primary spring source. Efforts are being made to utilise spring water as a water supply source. Under the rural water delivery system, the rural parts of the district of Champhai were supplied with various spring waters, as detailed in the table below

**Table 3.** Projection of Champhai Population 2011-2031

Year	Actual Population	Projected Population
2011	125,745	1.26 Lakhs
2021	142,800	1.43 Lakhs
2022	144,500	1.45 Lakhs
2023	145,900	1.46 Lakhs
2024	147,100	1.47 Lakhs
2025	148,100	1.48 Lakhs
2026	149,000	1.49 Lakhs
2027	149,800	1.50 Lakhs
2028	150,500	1.51 Lakhs
2029	151,000	1.51 Lakhs
2030	151,500	1.52 Lakhs
2031	151,900	1.52 Lakhs

Source: 2011 Population Census Data

### Public water point

Public water point plays a very important role, especially in rural areas in which they were often referred to as *improved water points*. It also acts as a system of public water supply in rural portable water which includes public water foundations and Public water foundations. The monthly report of the rural water supply scheme in some rural areas of the Champhai district is as under.

### Drill Water

Drill water commonly known as groundwater plays a very important role in rural water supply systems. They were used for irrigation with the help of tube wells. It is also found that requirements for expensive and environmentally damaging dams for un-

derground waters were not needed. Though there are certain advantages of underground water, there are also limitations. Groundwaters are not always suitable for drinking, pollutants have long residence time, groundwater pollution, water logging, salinity, etc. Despite the limitations, groundwater still acts as an important source of water supply.

Most of the households surveyed bear slighter from psychological distress, anger, shame, interruptions, etc mainly because they have enough water to maintain their livelihood. This is found in the number of families who reside in one household was minimum, mainly from 2-3 persons residing in one household. This indicates that the number of people using water is reduced.

**Table 4.** Champhai District Population Rural and Urban, 2011

Description	Rural	Urban
Population (%)	61.41%	38.59%
Total Population	77,216	48,529
Male Population	39,110	24,278
Female Population	38,106	24,251
Sex Ratio	974	999
Child Sex Ratio (0-6)	968	976
Child Population (0-6)	13,256	7,389
Male Child (0-6)	6,735	3,739
Female Child (0-6)	6,521	3,650
Child Percentage (0-6)	17.17%	15.23%
Male Child Percentage	17.22%	15.40%
Female Child Percentage	17.11%	15.05%
Literates	61,022	39,7870
Female Literates	29,642	19,720
Average Literacy	95.41%	96.69%
Male Literacy	96.93%	97.67%
Female Literacy	93.85%	95.72%

Source: 2011 Population Census Data

One of the other cases from free of problems is because the households have stored the rainfall or any other types of water supply in their Tanks/ Barrels. Having large Barrels/Tanks or 2-3 Barrels benefitted in which the water is stored even during the dry season or for at least 2 months. Another case may include households who have a connection to PHE water supply and also use Groundwater as their secondary source of water supply.

Some of the households that endure much mental distress, anger, shame, interruptions, etc may include certain problems from the surveyed households. This problem is found in households that consist of a lot of persons in the family members resid-

**Table 5.** Monthly report of Rural Water Supply Scheme for the month of November,2022 ( Spring water)

Habitation	District	Year of Commissioning (Scheme wise)	Present Lpcd (as per 2011 census)	Total (9+10)	Whether gavity/ pumping/ RWHS/HP etc.
Dilkawn (JJM)	Champhai	2001,2005,2019-20	55	187	Gravity
Hnahlan	Champhai	2003,2005,2019-20	55	635	Pump
Kelkang (JJM)	Champhai	1997,1999,2008,2015,2019-20	55	251	Gravity
Khuangphah	Champhai	1996,2000,2008	19	134	Pump
Lungphunlian	Champhai	1998,2006,2019-20	55	76	Gravity
Melbuk (Khawnuam)	Champhai	2004,2015	40	158	Gravity

Source: Office of the Sub-Divisional Office, PHED

**Table 6.** Monthly report of Rural Water Supply Scheme for the month of November, 2022 (Public water point)

Habitants	District	No. of Public water point
Dilkawn (JJM)	Champhai	9
Hnahlan	Champhai	41
Kelkang(JJM)	Champhai	12
Khuangphah	Champhai	21
Lungphunlian	Champhai	2
Melbuk(Khawnuam)	Champhai	10

Source: Office of the Sub-Divisional Office, PHED

ing in one household mainly from 7-8 family members. This indicates that if the number of people who used water is more in numbers, then the amount used is reduced in course of time compared to a minimum number of family members. Another problem also includes those households that don't have enough reservoirs, barrels, or tanks to store the water supply or rainfall.

### Distribution of Rural Water supply (2020-21)

According to the above table, it can be seen that there are a total number of 83 habitats covered in which, 68 habitants were partially covered with <40 litres per capita per day, 24 habitants were fully covered with  $\geq 40$  litres per capita per day, 59 habitants with potentially covered of <55 litres per capita per day, 15 habitants with fully covered  $\geq 55$  litres per capita per day.

### Rural Water Supply Facilities (2019-20):

The above table depicts that there are a total number of 85 villages provided with Piped Water Supply (PWS), 645 House Water Connections (HWC) provided, and a total number of 31 school toilets constructed during the year (2019-20).

### Rural Water Supply Facilities ( 2020-21)

Within Champhai District during the year (2020-21), there are no villages provided with piped water supply, and no handpump tube was installed during the year. There are no rainwater harvesting tanks constructed, no village springs improved and no impounding reservoirs were constructed during the year. Additionally, no rural schools were provided with drinking water facilities during the year.

### Achievement under Urban Water Supply (2020-21)

Under the Urban Water Supply scheme, there are a total number of 187 house water connections provided during the year (2020-21).

**Method of water treatment:** Conventional treatment –

1. Sedimentation cum Coagulation Tank.
2. Rapid Sand Filtration (2 units).
3. Disinfection by chlorination.

### Reservoir

Reservoir simply indicates a natural and artificial place where water is stored for further use, commonly used for supplying water to the community, irrigation of land, and generation of power. Within the Champhai district, the main reservoir of water supply is at Darthlalang Tlang which is located at Vengsang Champhai.

### Tap water supply

Under Functional Tap Water Supply Connection Scheme, almost every inhabitant inside the rural areas was provided with tap water with Champhai district.

### Conclusion

In the Champhai district, it is possible to see a vari-

**Table 7.** Monthly progress report of Hand pump tube well & Submersible pump for the month of December, 2022

Sl. No	Location	Town/Village	Type (IM-II/IM-III)	Function/Non-function	Remarks
1.	Near H.Lalkima's house	Vengang	IM-III	Function	Location is no more convenient
2.	Near Chhangphut field	Vengthlang North	IM-III	Non-function	Only lower portion available
3.	Near G.M.High school	Vengsang	IM-III	Non-function	Handle not available
4.	Near K.Lalvela's house	Venglai	IM-II	Non-function	Depletion of source
5.	Roman Complex	Vengthar	IM-III	Non-function	Depletion of source
6.	Near V.C House	Hmunhmeltha	IM-III	Non-function	Required proper check
7.	Near Horticulture office	New Champhai	IM-III	Non-function	Removed
8.	Near Rinsanga's house	New Champhai	IM-III	Function	
9.	Lalpa Grape Huan	New Champhai	IM-III	Function	
10.	Grace home	New Champhai	IM-III	Non-function	Required proper check
11.	Golgotha	New Champhai	IM-III	Non-function	Required proper check
12.	Golgotha	New Champhai	IM-II	Non-function	Non availability of Lever
13.	R.D Oil pump	New Champhai	IM-III	Non-function	Removed
14.	Near Siliana's house	Tlamsam	IM-III	Non-function	Required proper check
15.	Near Lalthanzuala's house	Tlamsam	IM-III	Non-function	Required proper check
16.	Near Lalramchhuana's house	Tlamsam	IM-II	Non-function	Removed
17.	Omega	Tlamsam	IM-III	Non-function	Required proper check
18.	Near Lalhmachhuana's house	Tlamsam	IM-II	Non-function	Required proper check
19.	Near Tlangkunga's house	Zote	IM-III	Function	
20.	Near Vankhuma's house	Zote	IM-III	Function	
21.	Near Presbyterian Church	Zote	IM-II	Non-function	Handle is difficult to operate
22.	Near Rothuama's house	Zote	IM-III	Non-function	Only lower portion available
23.	Near Lalramliana's house	Bethel	IM-III	Non-function	Required proper check of pump
24.	Bethel kawn	Bethel	IM-III	Remove	Due to widening of road
25.	Near T.K.Khaia's house	Bethel	IM-III	Remove	Due to widening of road
26.	Near Hringliana's house	Zion veng	IM-III	Remove	Due to widening of road
27.	Chhura Hmun	Bethel	IM-III	Remove	Due to widening of road
28.	Near Lalramchhuana's house	Bethel	IM-III	Remove	Due to widening of road
29.	Near R.Biakthuama's house	Electric	IM-II	Remove	Due to construction of waiting shed
30.	Near R.Thanliana's house	Zion veng	IM-III	Remove	Due to widening of road
31.	Near field	Zotlang	IM-III	Non-function	Repairable
32.	Near Vanlalthuanga's house	Zotlang	IM-III	Remove	Due to widening of road
33.	Near Kapkhuma's house	Ruantlang	IM-III	Non-function	Repairable
34.	Near Vanlalvena's house	Ruantlang	IM-III	Non-function	Repairable
35.	Near Rivunga's house	Ruantlang	IM-II	Remove	Due to widening of road
36.	Near H.Roseia's house	Ruantlang	IM-II	Non-function	Repairable
37.	Near T&C Checked gate	Melbuk	IM-II	Non-function	Repairable
38.	Trade & Commerce	Melbuk	IM-II	Function	
39.	Near Hmingzuala's house	Dilkawn	IM-II	Non-function	Repairable
40.	Near Hmingthana's house	Dilkawn	IM-III	Function	
41.	Near Neihkima's house	Dilkawn	IM-II	Remove	Due to widening of road
42.	Near Lenkuaia's house	Mualkawi	IM-III	Non-function	Not repairable
43.	Near Thangmura's house	Mualkawi	IM-III	Non-function	Not repairable
44.	Tiau road	Mualkawi	IM-III	Remove	Due to widening of highway
45.	Near MHIP house	Hnahlan	IM-III	Non-function	Repairable

Source: Office of the Sub-Divisional Office, PHED

**Table 8.** Number of Habitants covered during the year (2020-21)

Year	Total No. of Habitants	PC with <40 LPCD	FC with >=40 LPCD	PC with <55 LPCD	FC with >=55 LPCD	NC with 0 LPCD
2020-21	83	68	24	59	15	0

NC = Non covered, PC= Potentially covered, FC= Fully covered, LPCD= Litre per capita per day

Source: Office of the Engineer-in-Chief, Public Health Engineering

**Table 9.** Facilities of Rural Water Supply (2019-20)

Year	No. of villages provided with Piped Water Supply (PWS)	No. of House Water Connection (HWC) provided	No. of school toilets construction during the year
2019-20	85	645	31

Source: Office of the Engineer-in-Chief, Public Health Engineering

**Table 10.** Urban Water Supply achievement during the year (2020-21)

Year	No. of completed projects	No. of ongoing projects	Fund utilized	No. of house water connections provided during the year
2020-21	0	0	0	187

Source: Office of the Engineering-in-Chief, Public Health Engineering

ety of distinct features right from the start of the survey. It has been discovered that the majority of the individuals whose households were surveyed live in the same physiography of the land, and as a result, they experience weather, rainfall, settlement, and ways of life that are not too unlike one another. There are, however, variations in how various households utilise water, as well as variations in the sources of their water supplies, how they store water, and so on. Various households are plagued by a variety of issues. Our water supplies, which are haphazardly dispersed in space and time, are coming under increasing strain as a result of significant population shifts and a rise in demand. Because of this, it is abundantly obvious that the demand for water by humans is growing; in particular, water is necessary to irrigate crops to provide food for the quickly increasing human population.

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