District Survey Report

Of

MINOR MINERALS IN

KOLASIB DISTRICT

MIZORAM

DIRECTORATE OF GEOLOGY & MINERAL RESOURCES

GOVERNMENT OF MIZORAM

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DISTRICT SURVEY REPORT

DISTRICT KOLASIB

With reference to Gazette notification of 15th January 2016 of Ministry of Environment, Forest and Climate Change, the District Environment Impact Assessment Authority (DEIAA) and District Environment Assessment Committee (DEAC) are to be constituted by the Divisional Commissioner for prior environment clearance of Mining of Minor Minerals. The DEIAA and DEAC will scrutinize and recommend the prior environmental clearance of mining of minor minerals on the basis of District Survey Report. This is a model and guiding document which is a compendium of available mineral resources, geographical set up, environmental and ecological set up of the District and is based on data of various Department, Published Reports, Journals and Websites.

1. INTRODUCTION

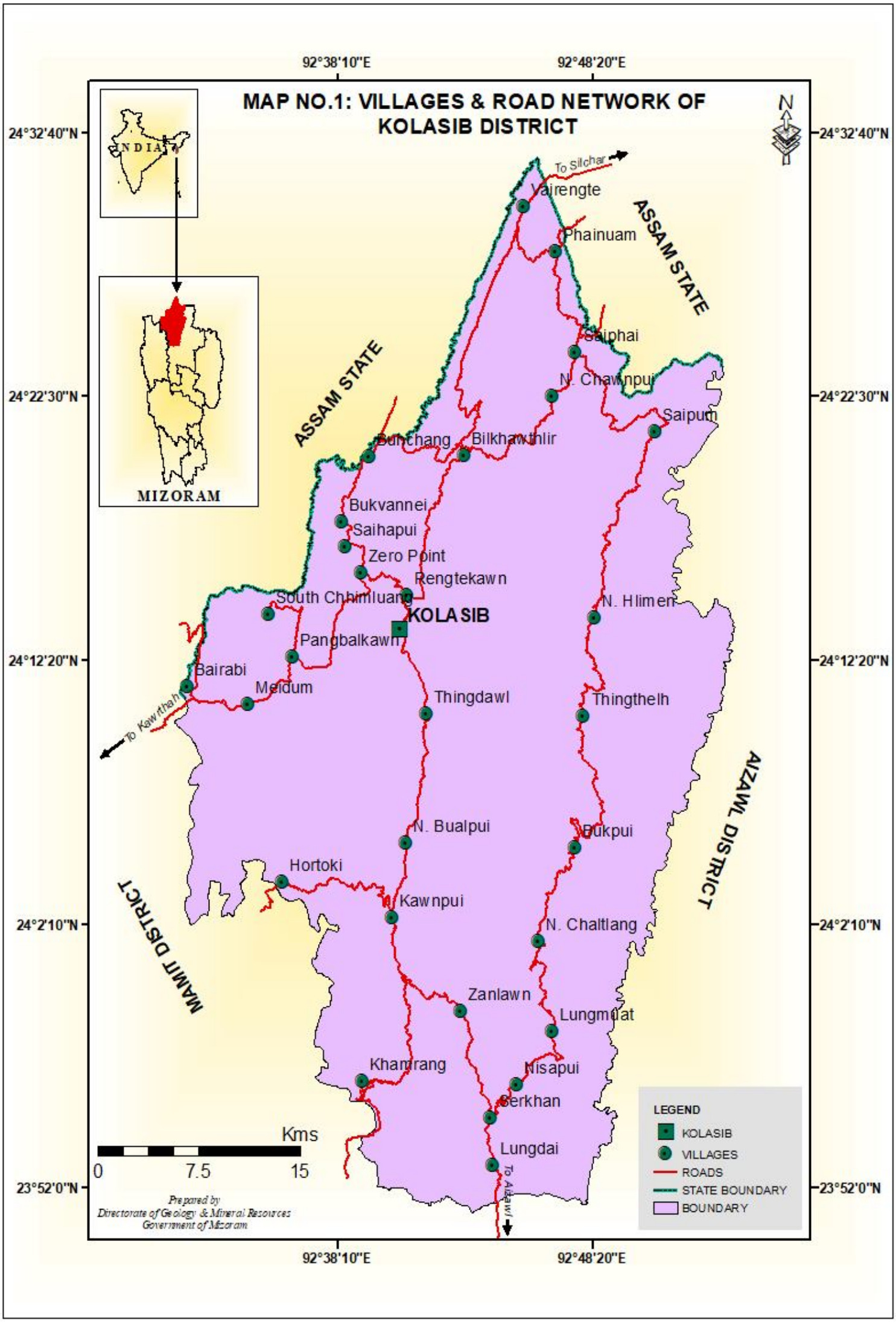
This District Survey Report has been prepared for mining of minor minerals as per the guidelines of the Gazettes of India Notification No. S.O. 141(E) New Delhi dated 15/01/2016 of Ministry of Environment, Forest and Climate Change (MoEF&CC) mentioned in Appendix-X.

As per the Hon'ble Supreme Court instructions and National Green Tribunal orders, Environmental Clearance for all mining is the prior requirement, and Government of India delegated power for granting environmental clearance for Mining Leases of minor minerals up to 5 hectares and 25 hectares in cluster mining to the District Environmental Impact Assessment Authority (DEIAA) headed by District Collector. For the purpose of assisting District Environmental Impact Assessment Authority (DEIAA), the District Level Expert Appraisal Committee (DEAC) for all District of Mizoram had also been constituted by Government of Mizoram (Notification No.B.11015/5/2015-FST dated-23/08/2016) who will recommend the projects and its activities.

In order to activate District Environmental Impact Assessment Authority (DEIAA) and District Level Expert Appraisal Committee (DEAC) for all Districts, it is mandatory to have District survey reports on river sand and other mineral deposits for which mineral resource mapping is a must. And the Department is conducted field survey for potential stone and river sand deposits of Kolasib district during March – May 2020.

2.LOCATION, BOUNDARY AND GEOGRAPHICAL AREA

Kolasib District is located in the northern part of Mizoram, in north-east India. The district is located between 92^{o} 31′ 55" to 92^{o}54′ 08" E longitudes and 23^{o} 51′ 17" to 24^{o} 31′ 14" N latitudes. It falls under Survey of India topo-sheet No. 83D/11, 83D/12, 83D/14, 83D/15, 83D/16, 84A/9 and 84A/13. Location map of the district is shown in Map no. 1. Its altitude ranges from 85m to 1,500m Mean Sea Level (MSL) with hills and valleys.It isbounded by Cachar and Hailakandi districts of Assam in the north and northwestrespectively; in the south and east by Aizawl district and in the south-westby Mamit district. The district is connected only by road with the State Head Quarters i.e. Aizawl. Its district head quarter is known as Kolasib which is situated in the central part of the district, which is 100 Km away from Silchar (Assam) connected by NH No. 54. There is no air connectivity in the district. The nearest railway connectivity and only in Mizoram is at Bairabiwhich is 30 Km away from the district capital (Kolasib).The geographical area of the district is 1382.51Sq.Kms. This is 6.56% of the state total geographical area.


MAP NO.1: VILLAGES & ROAD NETWORK OF KOLASIB DISTRICT
92°38'10"E
92°48'20"E
24°32'40"N
24°22'30"N
24°12'20"N
24°2'10"N
23°52'0"N
INDIA
MIZORAM
N
To Silchar
Vairengte
Phainuam
ASSAM STATE
Saiphai
N. Chawnpui
Saipum
Bilkhawthlir
Bunchang
Bukvannei
Saihapui
Zero Point
Rengtekawn
South Chhimluang
KOLASIB
N. Hlimen
Pangbalkawn
Bairabi
Meidum
To Kawrthah
Thingdawl
Thingthelh
AIZAWL DISTRICT
N. Bualpui
Bukpui
Hortoki
MAMIT DISTRICT
Kawnpui
N. Chaltlang
Zanlawn
Lungmuat
Khamrang
Nisapui
Serkhan
Lungdai
To Aizawl
Kms
0
7.5
15
Prepared by
Directorate of Geology & Mineral Resources
Government of Mizoram
LEGEND
KOLASIB
VILLAGES
ROADS
STATE BOUNDARY
BOUNDARY

3.HISTORY

In the absence of any written or any other form of authentic records, as is the case of all other districts of Mizoram nothing is authentically known about the ancient or medieval ages of the history of the place. Written or authentic records were kept only after the State/District came under the occupation of the British rulers in the 2nd half of nineteenth century. It can however be stated that during last 4 centuries and even after the occupation of this area by the British Administrators, the systems of Chieftainship was wide spread in the region. Accordingly one such chief named Kawla was ruling the village now known as Kolasib. As such whenever this village was referred to, "Kawla Chief Village" was most popularly mentioned. Thus from Kawla Chief the name Kolasib was given by the Britishers and till date there has not been change of this name.

Kolasib was initially created as the centre of Tribal Development Block on the day of the birth anniversary of the Father of the Nation i.e. on 2nd October in 1957 and was manned by Project Executive Officer. It was later upgraded to be administered by the Area Administrative Officer. When Mizoram elevated to a Union Territory in 1972, Kolasib was upgraded as the headquarters of Sub-Division manned by Sub-Divisional Officer (Civil) on 5th May 1975. Being the seat of administration for more than three long decades, its present status of district was created by the Government of Mizoram by splitting the existing Aizawl district into three Districts such as Kolasib, Aizawl and Mamit district in the year 1998.

4.POPULATION

As of 2011 India census, Kolasib district had a total population of 83,955 of which maleswere 42,918 and females were 41,037 respectively. Males constitute 51.12% of the population and females 48.88%. Population growth rate of Kolasib district was 27.28 percent during the decade.The Average Sex Ratio of Kolasib district is 956.The population density in the district is 60.10 per Sq. Km respectively. The variation in the density as well as the distribution of population is related to the physical, social and economic factors, which are responsible for the characteristics of the population in the district.

4.1 Urban Population 2011

The total population of Kolasib district, 55.84% people lived in urban regions. The total figure of population of urban population was 46,878 out of which 23,821 were males

while remaining 23,057 were females. The average sex ratio in urban regions of Kolasib district was 968 females per 1,000 males. Also the Child (0-6 age) sex ratio of urban areas in Kolasibdistrict was 987 girls per 1,000 boys. Thus the total children (0-6 age) living in urban areas of Kolasibdistrict were 6,801 which is 14.51% of total urban population. Also the Sex Ratio of Urban areas in Kolasib district is 968.

4.2 Rural Population 2011

As per 2011 census, 44.16 % population of Kolasib districts lives in rural areas of villages. The total district population living in rural areas is 37,077 of which males and females are 19,097 and 17,980 respectively. In rural areas of Kolasib district, sex ratio is 942 females per 1,000 males. If child sex ratio data of Kolasibdistrict is considered, figure is 973 girls per 1000 boys. Child population in the age 0-6 is 6,681 in rural areas of which males were 3,387 and females were 3,294. The child population comprises 17.74 % of total rural population of Kolasib district. The percentage of rural population is much higher than theurban population.

5.ADMINISTRATION

The administrative headquarters of the district is Kolasib town.It is headed by Deputy Commissioner (DC) who is in charge of the administration in the district. He has to perform triple functions as the holds three positions as the Deputy Commissioner, the District Magistrate and the District Collector. As a Deputy Commissioner he/she is the executive head of the district order situation in the district. The District Magistrate is responsible for maintaining the law and order situation in the district. The Collector is the Chief Revenue Officer of the district and is responsible for revenue collection. Police administration of each district is controlled by a Superintendent of Police.

For the purpose of general and development administration, the district has been divided into 03 (three) Sub-Divisions which name as Kolasib (Sadar),Vairengte andKawnpui.Below this level there are 04 Revenue Circle (Tehsils) namely Kolasib, vairengte,Kawnpui andLungdai.

Furthermore from the development angle the district is divided into two(02) R.D Blocks –Bilkhawthlir andThingdawl. Below the Block level set up there are 46 numbers of Villages Council headed by Village Council President (VCP).The district has 3 assembly constituencies viz, Tuirial, Kolasib and Serlui.

6. SOCIAL LIFE

People of Mizoram primarily include several tribal communities that have inhabited the hilly terrains for several decades. The Mizos are of the Mongoloid racial stock with well builtfeatures. The people of Mizoram are known to be skillful in various handicrafts. Mizo tribes are also found in Assam, Manipur and Nagaland. The Inner Line Permit (ILP) System introduced by British still continues. ILP allows restricted entry of people in Mizoram from other partsof the country.

The social life of the Mizos since the advent of Christianity experienced a constructive change. The society is decorated by the church which has an imminent influence on the life of the people. Before the advent of Christianity, the Mizos considered themselves as a militant group who took pride in subduing their rival tribes and the people of the neighbouring plain areas. Christianity has influenced the life of the Mizos in a comprehensive way. No activities of social life escape the religious attention of the people of Mizoram. An individual, a family and the community becomes so involved in the activities that the church indeed occupies a pivotal role in the society. Church activities do not confine only to preaching the gospel, butalso organise various social services. The church offers shelter to orphans and a home to the poor and destitute.The social lives of Mizos are deeply influenced by Christianity. They are a close knit community, hospitable and sociable. The tribes in Mizoram converted from Animist religions (a belief that non-human entities animals, plants, and inanimate objects or phenomena possess a spiritual essence) to Christianity over the first half of 20^{th} century.The dedicated services of the missionaries proved to be influential in the field of education. Education has had a huge impact on the daily life of the people, their thinking and progress. The Mizos are a patriarchal people and descent is in the male or the father's line. Mizos are a close knit society with no class distinction and no discrimination. The entire society is knitted together by a peculiar code of ethics “Tlawmngaihna”, an untranslatable term meaning on the part of everyone to be hospitable, kind, unselfish and helpful to others. Tlawmngaihna to Mizo stands for the compelling moral force which finds expression in self sacrifice for the service of the others.

The state is now dominated by Christianity with 87% of the population being Christian. Its people belong to various denominations. The church forms an important part of Mizo culture. Hindus form a small minority (2.75%). About 8.51% people, mostly Chakmas are Buddhists. Muslim population constitutes of about 1.35% of the population. All the churches are concerned with the spiritual and physical well- being

of their members, they all played an important role for the betterment of rural areas in their own ways in the form of projects and missions.

In the survey area, as per 2011 census, 0.17% of the population belongs to Scheduled Castes (SC) and 91.54% to Scheduled Tribes (ST). Overall the data of social stratification reveals that the SC and ST % to population is more than 91.7%, The SC and ST community are marginalized and they are at considered at low level of social strata and calls for a special attention in Social Impact Management Plan for improving their socio-economic status apart from preservation and protection of their art, culture and traditional rights of livelihood.

7.ECONOMY

Kolasib district is an important and potential district of Mizoram for agricultureproduction.Majority of the population in Kolasibdistrict are mostly shiftingcultivators. Rice cultivation in lowland and traditional shifting cultivation in hillslopes is the main livelihood of the villagers. In general, the economic conditionof the rural people is low. The crop productivity per unit area is low due to poortechnical-know-how and biophysical causes associated with the land. Tenancyarrangements are becoming more common in Kolasib district, usually inrespect of terrace and valley land, although at present they probably represent less than 10 per cent of the land area. All tenancies are governedby customary practices and are usually on a crop share basis with rents fixed at33-50 per cent of the production. Most of such tenants are coming from theneighbouring of state of Assam and earn their livelihood at the cost of the localpopulation.

The occupational structure of residents of work participation ratein the survey area is studied with reference to main workers, marginal workers and non-workers. The main workers include 10 categories of workers defined by the Census Department consisting of cultivators, agricultural labourers, those engaged in live-stock, forestry, fishing, mining and quarrying; manufacturing, processing and repairs in household industry; and other than household industry, construction, trade and commerce, transport and communication and other services.

The economy of the district is pre-dominantly agrarian with more than 60- 65% of the total work force engaged either directly or indirectly in agriculture. However,agriculture still remains under-developed and the primitive practice of Jhumming(shifting cultivation) predominates. Both production and productivity are relatively lowin rainfedjhum areas in comparison to the WRC areas with irrigation

facilities.Kolasibdistrict can be categorized under two agro-climatic zones namely, as Humid mild tropical zone, Humid sub-tropical hill zone. Both the agro-climatic zoneshave good production potential. There are wide variations in climatic condition, a distinct micro climatic variation exist depending upon the altitude, which sharply differs from place to place. Considering the agro-climatic conditions, the district has feasibility and scope for cultivation of wide variety of field crops like paddy, maize,potato, etc. The staple food crop is paddy, maize is secondary. Wide range of fruits,vegetables, Spices, Oilseeds and Pulses are grown. There are plenty of grasslands,wherein livestock rearing is possible due to naturally available fodder. Water harvestingis conveniently done in valleys and lower ridges, which are ideal for Pisci-culture. Manysuch areas are seen practicing fisheries. Irrigation facilities in the forms of both riverdiversion schemes and river lift schemes are found helping in increasing production of various agricultural and horticultural commodities.

The population entirely depends upon agriculture and allied activities. The district itself seems to be self sufficient from the product of WRC and shifting cultivation as the District covers low lying areas which is highly potential area of Agriculture in Mizoram. Soil emotion is found suitable for varieties of crops.Both terraced cultivation and jhum (shifting) & tillage (in which tracts are cleared by burning and sown with mixed crops) are practiced. Mizoram is famous for fibreless gingers. Paddy, maize, mustard, sugarcane, sesame and potato are the other prominent crops grown in the district. Small-scale irrigation projects are being developed to increase the crop yield. There are no major industries in the district. Small-scale industries include sericulture, handloom and handicrafts industries, sawmills and furniture workshops, oil refining, grain milling, and ginger processing.

Kolasib district is the only district, which have a railway connection and interstate road link. The assumption is that accessibility will play a crucial role in the socio-economic development of the district and levels of exploitation of natural resources. Twelve villages out of forty villages were stratified in to three category base on bus frequency and nearness to the market. The life pattern and economy of the people are influenced by the agricultural activities. Jhuming on the spur of the hills and traces of wet agriculture in the valleys is a common feature in this district.One of the biggest hydro-electricity projects in Mizoram is being set up in Serlui B River.

8. EDUCATION

Formal education in Mizoram started with the arrival of Christian missionaries, who opened schools in few villages in the year of 1901. However, the educational progress

in the post independent period was quite remarkable owing to the joint efforts of the Government and active participation of the community.

In Kolasib district, for administrative control and convenience, the School Education Department is having District Education Offices in the District Capitals. These Offices are looked after and manned by District Education Officers who look after Secondary Education in the District. The Department is having 2*(two)* Sub Divisional Education offices which are placed under the charge of Sub-Divisional Education Officers. i.e, KolasibandKawnpui.

The average literacy rate in urban areas is 96.4% while that in the rural areas is 89.72%. The male literacy rate is 79.56% and the female literacy rate is 77.36% in Kolasib district. The total literacy rate of Kolasib district was 93.58% in 2011 which is greater than average literacy rate 91.33% of Mizoram. Population-wise, out of total 65,895 literates, males were 34,147 while females were 31,748. Also the male literacy rate was 94.57% and the female literacy rate was 92.38% in Kolasib district. The district ranks 4th position in literacy the state.

The total no. of school/college (including Adhoc/Council aided/Society/Church, etc.) are listed in the table 1.

Sl.No.	Stage of Education	Total
1	Primary Schools	143
2	Middle Schools	127
3	High Schools	45
4	Higher Secondary Schools	8
5	College	1

Source: Directorate of School Education

9. HEALTH

The Health & Family Welfare Department of Mizoram look after the District Hospitals, PHCs and Sub-Centres in the District.The District hospitals (DHs) with bed strengths is 60 number of beds are an essential component of the District health system and

function as a secondary level of health care which provides curative, preventive and promotive healthcare services to the people in the district. Kolasib district is expected to have a district hospital linked with the public hospitals/health centres down below the district such as Sub-district/Sub divisional hospitals, Community Health Centres, Primary Health Centres and Sub-centres. Here is the list of health care facility centres in the district are the following table 2.

Sl.No.	Name of Hospitals/Health Centres	No. of Hospitals/Health Centres
1	Hospital	2
2	Community Health Centre	1
3	Primary Health Centre	5
4	Sub-Centre	26
5	Sub-Centre Clinic	7

Source: Directorate of Health & Family Welfare

10.CLIMATE

Climate is the aggregate of all atmospheric or meteorological influences such asmoisture, wind pressure, temperature and evaporation. Climate is one of the most important factors of the geographical environment to which man is subjected and his man's activities like agriculture, forestry, supply of water, industry etc.

Mizoram has a pleasant climate. The upper part of the hills are predictably cold, cool during the summer, while the lower reaches are relatively warm and humid. The climate of Mizoram is controlled by its location, physiographic, pressure regime in the North West India and Bay of Bengal, warm and moist maritime tropical air masses from the Bay of Bengal, local mountains and valley winds. Overall its climate is tropical monsoon type.

As Kolasib district lies in the North part of the state, it enjoys a moderate climate owing to its tropical climate. It falls under the direct influence of the South West Monsoon. As such, the area receives an adequate amount of rainfall which is responsible for a humid tropical climate characterized by short winter and long summer with heavy rainfall. The climate of the district is characterized by tropical humid climate with cool summers and cold winters. In general, Kolasib district enjoy

moderate climate due to their tropical location. The weather is neither very hot nor too cold throughout the year.

11.TEMPERATURE

The salient thermo-characteristics of Kolasibdistrict is that temperature do not fluctuate much throughout the year, except in low lying valley. Mostly the entire area is under the direct influence of the South West monsoon. The highest temperature observed during past decade was 36^{o}C in the months of May and June. The warmest months with mean daily maximum at about 26^{o}C and mean daily minimum at about 23^{o}C was observed during June and July. The temperature started to fall down from the month of November and it is minimize in December and January without snow.

12. RELATIVE HUMIDITY

Relative humidity is the ratio of moisture content in the air to the moisture holding capacity of the same air and it is directly related to the rate of evaporation. Of the various components of atmosphere, moisture constitutes from nearly zero to about 4 percent by volume. Humidity plays a very important role in the heat budget as well as day to day weather changes.

In Kolasib district, the mean Relative Humidity (RH %) increases from May to August reaches maximum humidity with on-set of North East monsoon and the RH is lowest during dry period of January to March.

13. WIND

The monsoon wind is the most important wind that prevails in Mizoram. During summer, the sub-tropical high pressure belt and the thermal equator are displaced northward in response to the changing pattern of solar heating of the earth. From the ocean, particularly from the north Indian Ocean or Bay of Bengal, they move towardsthe land mass and blow over the Asian continent. This south-west monsoon reaches Mizoram during second half of May and prevails up to the first half of October. The summer monsoon is characterized by highly variable weather with frequent spells of drought and heavy rains. Besides this, winter monsoon also prevails which is a gentle drift of air in which the winds generally blow from the north east. This retreating monsoon cause sporadic rainfall especially in Mizoram and other north

eastern states producing sometimes heavy cyclonic rains.This wind generally discusses the wide-area hourly average wind vector (speed and direction) at 10m above the ground. The wind experience at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in Kolasib district experiences mild seasonal variation over the course of the year. The windier part of the months from December to May, with average wind speeds of more than 2.5 miles per hour while the windiest month of the year is March, with an average hourly wind speed of 3.3 miles per hour. Generally, light to moderate winds prevails throughout the year. Winds were light and moderate particularly during the morning hours. While during the afternoon hours the winds were stronger.

14. RAINFALL

Rainfall is highly variable in time and space. The rainfall statistics is computed based on the receipt of rainfall data from different stations spread over the entire state.Mizoram comes under the direct influence of the South-West Monsoon, as such it generally receives an adequate amount of rainfall. The rainy season (summer monsoon) generally start from the month of April, it then rains heavily from May to September and lasted till late October. The winter seasonis generally dry, this season receives very little rainfall.

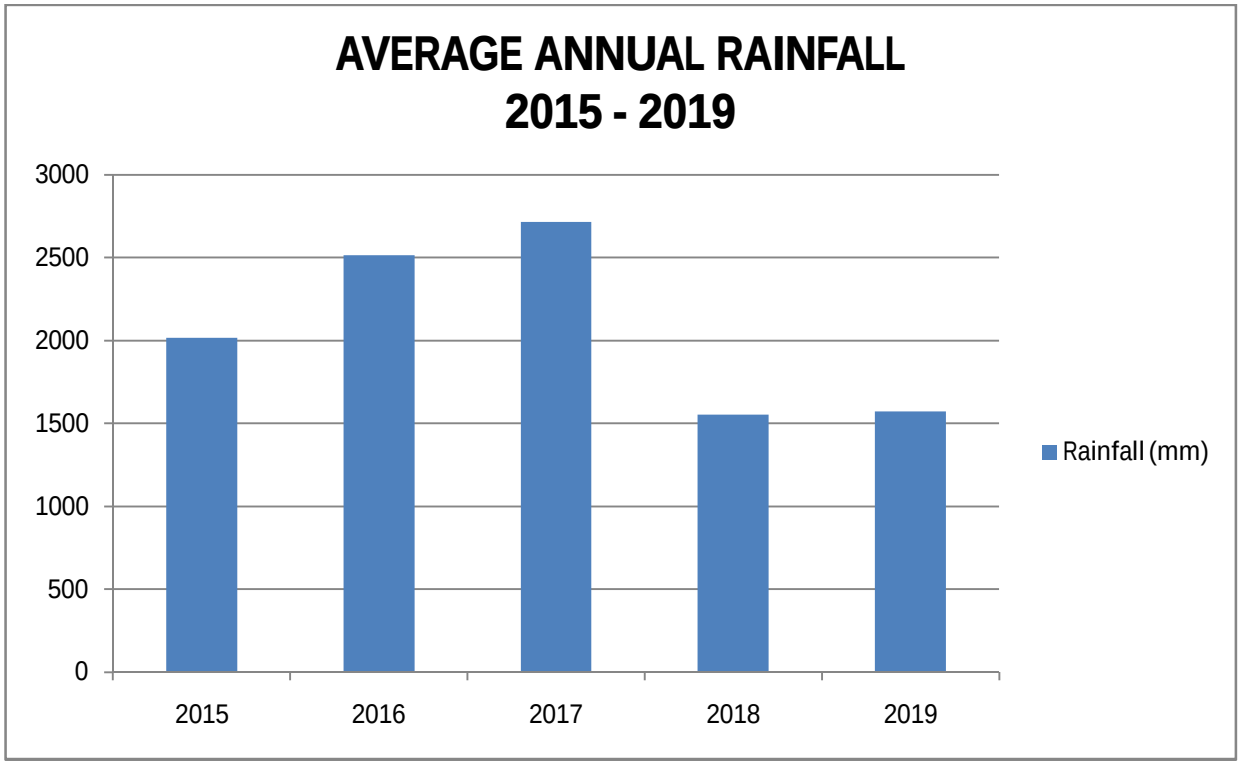
The district fall under the direct influence of the south west monsoon that receives an adequate amount of rainfall during the monsoon season.The average annual rainfall based on the 5 yeardata, was observed to be 2,076.33 mm. The monsoon sets in the month of June and continues till September and sometime extends up to mid October. The maximum amount of rainfall(525.50 mm) occurs in the month of August 2017. Monthly variations in the rainfall are given in table 3.

The rainfall of Kolasib district is well distributed, with a span of almost 6 months from May to October. Although pre-monsoon rains break in from the early part of March with occasional thunder-storms, the Monsoon period really starts from the middle part of April. The average annual rainfall is around 2076.33 mm, the peak period being June- August. The rainfall declines gradually and ceases during November. Dry spell occurs during Nov-Dec occurs. Occasional showers of low to medium intensity also occur during the period from January to February due to the influence of the retreating N.E. Monsoon.

RAINFALL: MONTH-WISE IN KOLASIB DISTRICT (mm) FOR THE LAST 5 YEARS (2015-2019)

Sl. No.	MONTH	AVERAGE RAINFALL (in mm)				
		2015	2016	2017	2018	2019
1	January	5.80	0.10	0.00	0.70	0.00
2	February	14.80	55.00	1.90	8.50	52.90
3	March	32.40	107.00	166.60	14.90	38.60
4	April	271.20	200.40	358.90	107.70	64.50
5	May	261.10	370.80	263.50	241.20	116.40
6	June	319.40	377.70	411.40	371.40	147.30
7	July	367.60	255.10	385.60	318.30	353.30
8	August	357.90	374.30	525.50	339.40	346.30
9	September	213.40	543.00	256.70	79.90	256.50
10	October	152.80	170.30	243.20	54.40	112.20
11	November	16.30	62.60	0.00	15.80	58.60
12	December	7.13	0.00	103.10	3.30	27.00
	ANNUAL TOTAL	**2019.83**	**2516.30**	**2716.40**	**1555.50**	**1573.60**
	ANNUAL AVERAGE	**168.32**	**209.69**	**226.37**	**129.63**	**131.10**

Sources: India Meteorological Department, Directorate of Science & Technology



15. SEASON

Based on the variation in temperature, rainfall, humidity and other general weather conditions, four different types of seasons are observed for the district. They are as follows:

15.1 Cold or Winter season (Thlasik)

Winter season starts from the month of December to first half of February. This is the coldest season of the year. During this period rainfall is much less as compare to other seasons, and whatever amount rainfall received is originated from North East Monsoon, generally known as the retreating monsoon. This season is very pleasant with clear blue sky with the absence cover and all the people of Mizoram are in festive mood since the most celebrated festival 'Christmas' occurs during this season.

15.2 Spring season (Thal)

Spring season is the shortest season of the year. It starts from the second half of the February to the first half of March. Temperature is mild during this period and the sky is clear and the Mizo people accustomed to build new houses during this season as there are no weather disturbances during the period.

15.3 Summer season/Rainy season (Nipui/Fur)

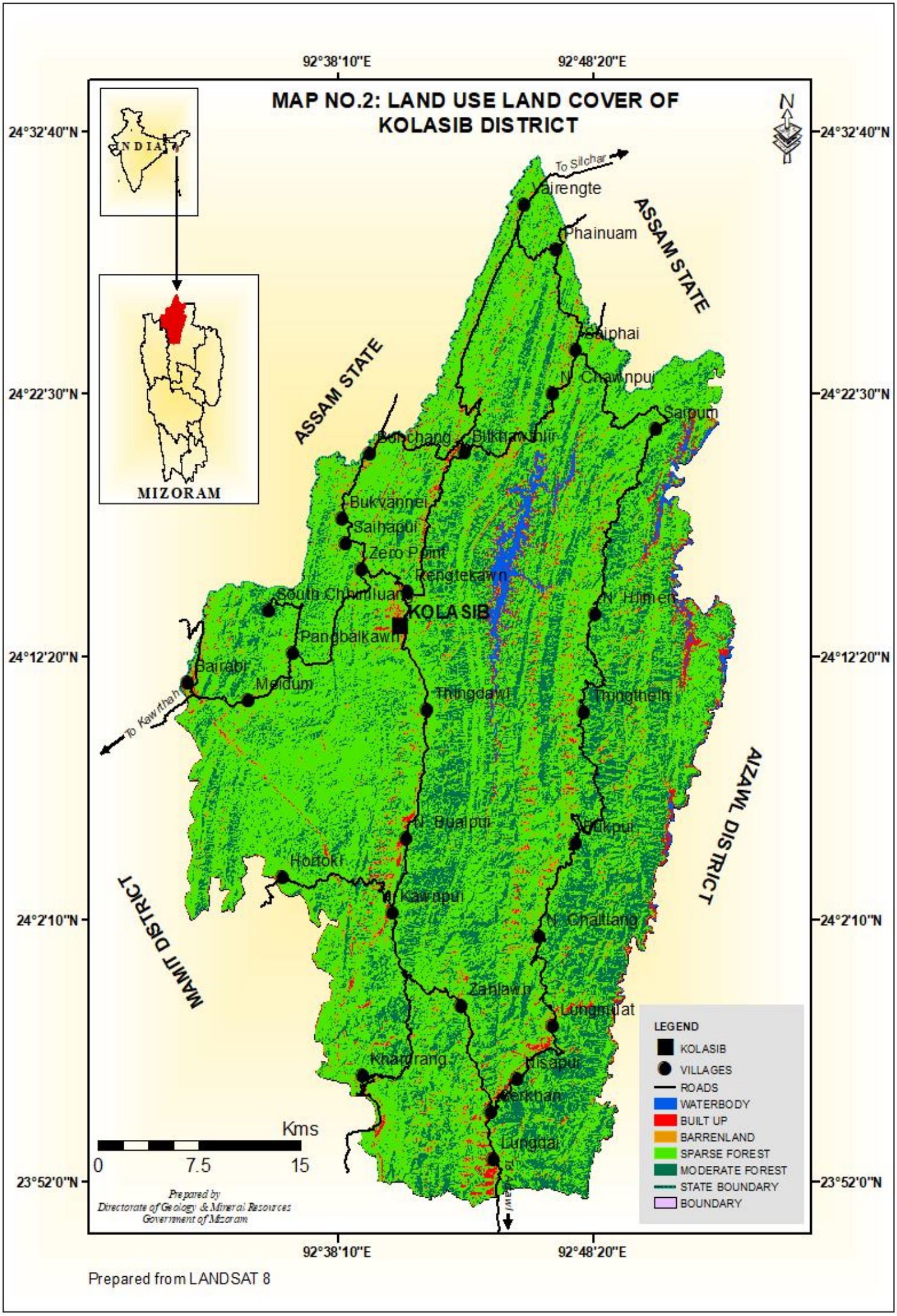
Summer season or rainy season is the longest season covering about seven months starting from the second half of March till the first half of October. The early part of this season from second half of March till First half of May is characterized by bright sunshine and clear sky with little or no cloud till it is disrupted by the coming of Monsoon showers. The warmest months, June and July, prevails during this period and maximum insolation is received during the early part of this season. A study from daily rainfall records reveals that the heavy outpour generally starts from the second quarter of May and this heavy outpour usually subsides in the first quarter of October. Rainfall during May, June, July, August & September i.e. 5 months alone contributed 76% of the total annual rainfall. This is the season when the cyclonic rains are often felt. The temperature remains high, but is kept down to a considerable extent by the usual rains.

15.4 Autumn season (Favang)

Autumn season covers for a period generally starting from the second part of October to November. The season is very pleasant and the summer rain already diminished. This is the season the Mizos are longing for since they have no undone jobs in their jhum fields, just waiting for the ripening of their paddy. People are in festive moods. During this time one of Mizo festivals called 'MimKut' was used to be celebrated. But now what we called 'ThalfavangKut' takes the name instead and is celebrated with joy.

16. LAND USE LAND COVER

The term land use land cover is a general term for the human modification of Earth's terrestrial surface. It can be broadly understand as the alteration and the manner in which human being employ the land and its resources and also implies changes in physical or natural state of the earth surface. While land cover and land use are often assumed to be identical, they are rather quite different. Land cover may be defined as the biophysical earth surface, while land use is often shaped by human, socio-economic and political influences on the land. Though humans have been modifying land resources to obtain food and other essentials for thousands of years, current rates, extents and intensities of land use land cover changes (LULC) are far greater than ever in history, driving unprecedented changes in ecosystems and environmental processes at local, regional and global scales.



Prepared from LANDSAT 8

Since LULC is a dynamic process which changes frequently with time due to climate change and anthropogenic interference hence the updated land cover information is reported in the form of LULC map in this report. The Land use land cover analysis of the entire district was carried out using Geospatial Technology on LANDSAT 8 imagery acquired on February 2020. Based on Supervised classification method in ERDAS imagine and visual interpretation, the study area has been classified into five classes such as Water body, Built-up (Settlements), Barren land, Sparse forest, and Moderate forest. The statistics of the land cover information is presented here in the table below. It is found that Water body covers about 24.54 square kilometres which is1.54% of the total area, Built-up (Settlements)covers about 46.92 square kilometres which is 2.95% of the total area, Barren land covers about 67.48 square kilometres which is 4.24% of the total area, Sparse forest covers about 1066.23 square kilometres which is 67.03% of the total area and Moderateforest covers about 385.51 square kilometres which is 24.24% of the total area.

SL.NO.	CLASS	AREA COVER (in Sq. Km)	AREA COVER IN PERCENTAGE
1	WATER BODY	24.54	1.54
2	BUILT-UP	46.92	2.95
3	BARREN LAND	67.48	4.24
4	SPARSE FOREST	1066.23	67.03
5	MODERATE FOREST	385.51	24.24

17. SOILS

The soils of Kolasib district are dominated by sedimentary formation. These are generally young, immature, mostly developed from parent materials such as ferruginous sandstones and shale. The soils in the foot hills are colluvium deposit and in plain areas alluvial deposits are predominant. Three soil orders such as ultisols, inceptisols and entisols are found in the project area. The soils as a whole are well drained except in few valley flat lands. The soils in general have low inherent fertility viz. bases and mineral reserves. The soils in the hills are strongly acidic in reaction, whereas, the soils in alluvial deposits are less acidic in nature. The surface soils of the hilly terrains are dark, highly leached and poor in bases, rich in iron and have pH values ranging from 4.5 to 5.5 (highly acidic). They are well drained, deep to very deep,

rich in organic carbon, low in available phosphorus content and high in available potash. The surface soil textures are loam to clay loam with clay content increasing with depth. The percentages of clay, silt and sand within 50cm of the surface in most cases are 20-30% and 25-45% respectively. The pH and organic carbon contents decrease and clay increases with depth. The base saturation above a lithic or paralithic contact is mostly low (below 35%). They are capable of providing substantial oxygen supply for plant growth and have capability to retain moisture and maintain supply through the growing seasons of most crops. Soils of the valley flat lands are brown to dark brown, poor in bases, moderately acidic with pH ranging from 5.5 to 6.0, medium to high in organic carbon content, low available phosphate and medium to high available potash. These are deep to very deep but moderately to poorly drained. The texture of the soil is mostly sandy loam to sandy clay loams. The percentage of clay, silt and sand in the upper 50cm ranges 15-35%, 5-34% and 40-75% respectively. Clay contents do not increase with depth.

18. FOREST

Forest covers more than 70% of the total District area. Out of the forest covers, 187Sq.kms with moderate dense forest and 1,027Sq.kms with open forest and there is one protective area name Pualreng Wildlife Sanctuary, established in 2004, area cover 50 sq.kms. The hilly areas of the district ranging from north to south.Forest is crucial resource on which depends the livelihood of the majority of the population of the district. Tropical moist deciduous forest and bamboo forests are the commonest form of vegetation. Numerous other trees, shrubs and herbs provide vegetables, fruits, fuel (fire wood), dyes, medicines and fibres.

Kolasib district falls under the Tropical Wet Evergreen Forests. The common tree species found here are *Acrocarpusfraxinifolius, Adina cordifolia,Albizzialebbek, Areca catechu, Artocarpuschaplasa, Bauhniavariegata,Bombaxceiba, Buteaparviflora, Callicarpaarborea, Duabangagrandiflora,Erythrinastricta, Emblicaofficinalis, Ficushirsuta, Garugapinnata, Gmelinaarborea, Lagerstroemia parviflora, Parkiarouxburghii, Sapiumbaccatum,Schimawallichi, Sterculiavillosa*and *Tectonagrandis.* The dominant herb species growing around the experimental plot are *Mikaniamicrantha,Euphatoriumodoratum, Saccharumspontaneum*and *Imperatacylindrica*. *Thysanolaenamaxima* is also found in abundance.

The forest cover type of Kolasib district is mainly tropical wet evergreen forest and tropical semi evergreen forest associated with moist deciduous forests. Moist deciduous forests are commonly found in small pockets on the hill slopes. The

vegetation consists of a mixture of several species. Depending on the density of the canopy cover the forest have been divided into dense/closed, medium dense and less dense forest.

18.1 Dense forest

This class includes natural forests, which are not disturbed by any biotic factors like shifting cultivation and other human activities. Evergreen and semi evergreen forest covers major portion of this area.

18.2 Medium dense forest

The forests that have a crown cover neither too thick nor too thin are classed under this category. It is distributed throughout the whole district in small patches.

18.3 Open forest

This type of forest includes forest, which were once disturbed and affected by biotic factors like shifting cultivation and human activities. This forest are categorised by those lands where shifting cultivation had been practiced and then left fallow for over a year, the resultant new vegetation of which, regenerated to form new forests.

19. DRAINAGE SYSTEMS

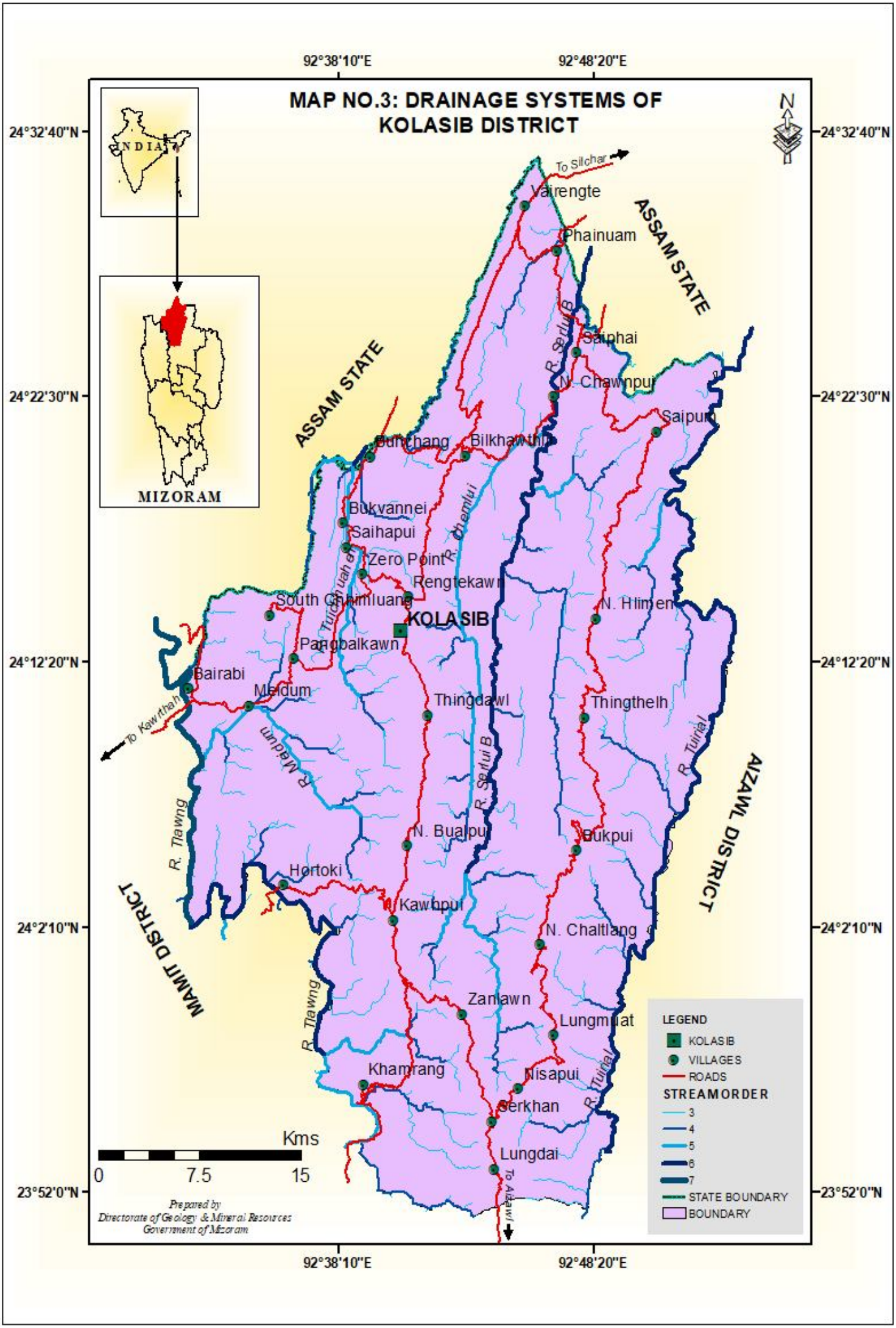
Drainage Systems refers to the origin and development of streams through time.The whole district of Kolasib is divided into two sub-catchments according to the Watershed atlas of India.

19.1 Eastern Drainage Systems

The drainage lines falling in the eastern side of this are termed as eastern drainage systems. These include Tuirial drainage system and Serlui drainage system.

19.1.1 TuirialDraiange System

Tuirialriver originates from north Chawilung hill in Aizawl district and flows northward till it enters Cachar district of Assam. It also formed the district boundary between Kolasib and Aizawl district in the eastern side. Important parennial streams like LungdaiLui, TuisenLui, KeitumLui, TuirialLui and HachheLui join Tuirial river before it confluent to Barak river in Cachar district of Assam.


MAP NO.3: DRAINAGE SYSTEMS OF KOLASIB DISTRICT
INDIA
MIZORAM
N
92°38'10"E
92°48'20"E
24°32'40"N
24°22'30"N
24°12'20"N
24°2'10"N
23°52'0"N
To Silchar
Vairengte
Phainuam
ASSAM STATE
R. Serlui B
Saiphai
N. Chawnpui
Saipum
Bunthang
Bilkhawthlir
Bukvannei
Saihapui
R. Chemlui
Zero Point
Rengtekawn
South Chhimluang
KOLASIB
N. Hlimen
Pangbalkawn
Bairabi
Meldum
To Kawrthah
R. Meldum
Thingdawl
Thingthelh
R. Tuirial
R. Tlawng
R. Serlui B
AIZAWL DISTRICT
N. Bualpui
Bukpui
Hortoki
MAMIT DISTRICT
N. Kawnpui
N. Chaltlang
Zanlawn
Lungmuat
Khamrang
Nisapui
Serkhan
Lungdai
To Aizawl
Kms
0
7.5
15
Prepared by
Directorate of Geology & Mineral Resources
Government of Mizoram
LEGEND
KOLASIB
VILLAGES
ROADS
STREAMORDER
3
4
5
6
7
STATE BOUNDARY
BOUNDARY

19.1.2 Serlui Drainage System

Serluiriveroriginates from Serkhan village in the southern part of the district and flow northward till it meets Tuirial river in Cachar district of Assam. It has many incoming tributaries of which the important ones are ChemLui, SaihapuiLui, BuilumLui and PualtawkLui. PualtawkLui is feed by smaller tributaries like TeiduzawlLui, Teudunglui and RamriLui. SaihapuiLui originates near Bilkhawthlir town in the northern most part of the district and flows northwards. ChemLui is an important tributary of Serlui which confined to the northern part of the district. It originates from Khawserhsangtlang near North Bualpui village in the central part of the district and flows northwards parallel to Serlui till it confluents to it near Chawnpui village in the north. Builum is another important tributary of Serlui originating from Zobawktlang near Bukpui village.

19.2 Western Drainage System

The drainage systems falling in the western side of the sub-catchments of the district are termed as western drainage systems. These include Tlawng drainage system, Meidum drainage system, Tuichhuahen drainage system and Chhimluang Drainage System.

19.2.1 Tlawng Drainage System

Tlawngriver is one of the most important rivers of Mizoram and is the longest river in Mizoram. It passes through five districts of the state forming districts boundary lines while running along its course. Here also it formed a district boundary line between Kolasib and Mamit districts in the western side of the study area. Tlawng river, forming district boundary, enters the district from the south-west portion of district continue to flow up to the Bairabi village in the western part of the district. A number of streams and rivulets join along this course and the important ones are DurLui, KhuaiLui, TuitunLui and DamdiaithlangtaLui.

19.2.2 MeidumLui Drainage System

MeidumLui drainage system which extends in the western part of the study area is characterized by dendritic to sub dendritic drainage patterns. The MeidumLui originates from Khawserhsangtlang near North Kawnpuitownship. Initially it flows westwards and then noth-west and again turned south-west direction till it meets the main river Tlawng. It has several tributaries which are ephemeral in nature; the important ones are DumkhelLui, KawnpuiLui, SaibualLui and RasdaliLui.

19.2.3 TuichhuahenLui Drainage System

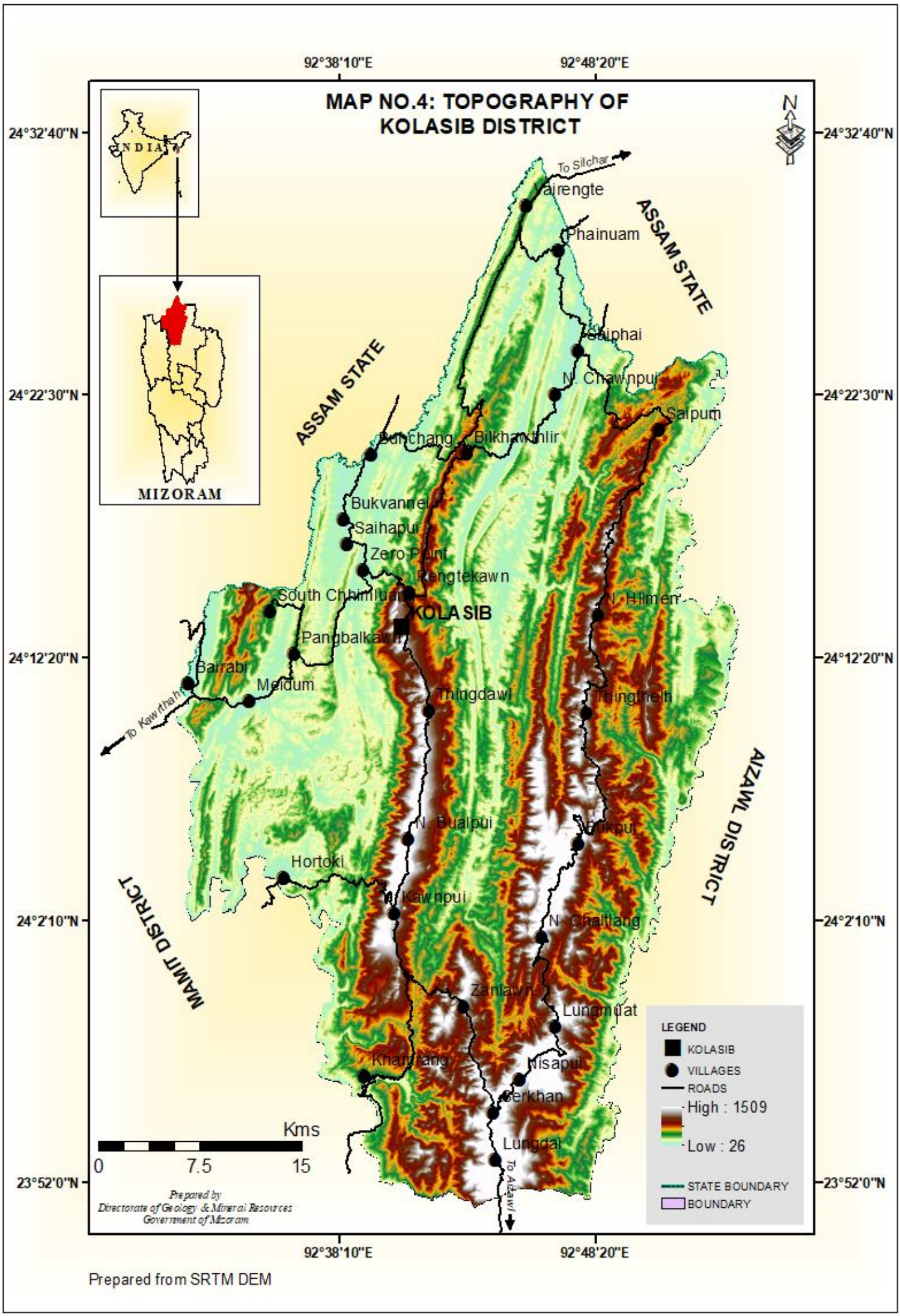
Tuichhuahenlui drainage system is confined to the northwestern portion of the district and exhibits various drainage patterns such as angulated, dendritic to sub-dendritic and sub-parallel drainage patterns. It is an important source of water supply in the western plain areas facilitating irrigation for the flood plain it has created along its course. Important tributaries are SaihapuiLui, SesihLui, RengteLui and TuilutLui.

19.3.4 Chhimluang Drainage System

ChhimluangLui originating near Chhimluangvillge in the northern most part of the district is another important stream and it forms the state boundary between Mizoram and neighbouring state of Assam.

20. TOPOGRAPHY

The area of Kolasib district is represented mainly by two main ridge lines and intervening valleys and less prominent linear ridges. The most prominent ridge runs in almost North-South direction from Mualvum near Kawnpui village, almost through the entire area except for few saddles which breaks the range. The entire length of the ridge is about 39.5 Km. which can be divided as Mualvum - Kolasib (25Km) Rengtetlang– Bilkhawthlir upto ThingdelhLui (12Km) and Phainuam ridge (12.5Km). The average height of the ridge gradually decreases as we go from south to north. The average heights of the ridge near Kawnpui, Kolasib and Bilkhawthlir are 750m, 600m and 450m respectively, while at the northern end near Phainuam, the ridge attain an average height of 150m. On the eastern side of this main ridge runs a parallel ridge from Nisapuitlang towards LungmuattlanguptoBukpui which is about 22 Km in length. The ridge line is terminated near Bukpui and runs about 13 Km from Hmunchungtlang towards Thingthelh and ends at Lungpherlui. On a slightly eastern side, the ridge runs from Kangmual to 'N'Hlimen with a length of 13.7 Km and continues all the way to Parsenchhip and joins Telchattlang and continues towards Saipum village. The north western extremity of this range is bounded by Saichangtlang which joins with Teidungtlang on the south with a combined length of about 8.31 Km. Like the ridge on the western side, the height of this ridge decreases towards north. Nisapuitlang reaches a height of 1285 metres, whereas Kangmual attains a maximum height of 650 metres. The height of Parsenchhiptlang is about 700metres. Towards the eastern side of this ridge line flows Tuirialriver, and most of the spurs run from the ridge towards this river.



Prepared from SRTM DEM

In between these two main ridges run two rivers, viz., Serlui and Chemlui separated by a ridge line Chemtlang which is almost 26 Km length, this ridge is terminated by Pualtawklui and continues towards north up to Sesihlui. The length of the ridge is about 7.6 Km. The two limbs of this ridge are characterized by a subdued hillocks and fluvial valley fills.

21. GEOLOGY

Geologically Mizoram depositional basin is a part of the larger Assam - Arakan basin. Argillaceous and arenaceous sediments occur here in alternation and forms N-S trending and longitudinally plunging anticlines and synclines. The strata generally trend NS with dipping 20° to 50°either eastward or westward and comprise interbedded sandstone with local lenses of conglomerate, siltstone, shale, mudstone with a few pockets of shell limestones, calcareous sandstone and intraformational conglomerate with occasional coaly stringer in basal part, while appearance of fossiliferous calcareous lenses in the upper part is noted.

Generalised stratigraphic succession in Mizoram (after Karunakaran, 1974 and Ganju, 1975).

Age	Group	Formation	Unit	Thickness (in m)	Generalised lithology	Depositional Environment
Recent Alluvium					Silt, clay and gravel	River deposits
Early Pliocene - Late Pliocene	Tipam			+900	Friable sandstone with occasional clay bands	Stream deposits
Miocene to Upper Oligocene	Surma	Bokabil		+950	Shales with siltstones and sandstones	Shallow marine
		Bhuban	Upper Bhuban	+1100	Arenaceous with sandstones, shales and siltstones	Shallow marine, near shore to lagoonal
			Middle Bhuban	+3000	Argillaceous with shales, siltstones	Deltaic complex
			Lower Bhuban	+900	Arenaceous with sandstones and silty shales	Shallow marine
Oligocene	Barail			+3000	Shales, siltstones and sandstones	Shallow marine
Data source	Modified after Karunakaran, 1974; Ganju, 1975					Tiwari and Kachhara, 2003; Mandaokar, 2000

21.1 BARAIL GROUP

Barail Group occupies the entire eastern part of the state. Barail Group is lithologically dissimilar from those of the Bhuban Formation (Subgroup) lying to the west. Further they exhibit different structural alignments. The Barails comprise monotonous sequence of weathered shale, interbedded and laminated with siltstone exhibiting different colourations on weathering like pink, violet, greenish grey, white etc. Locally, they enclose bands of weathered micaceous, feldspathic, soft, medium grained sandstone (greywacke) with a few dark grey, hard, compact, medium to fined grained sandstone bands. Rarely the sandstone contains thin stringers and streaks of carbonaceous matter. Unlike the Bhubans, the Barails contain few sedimentary structures like flute casts and oscillatory ripples, etc. The rocks have low (3^{o}-15^{o}) rolling dips and have been folded into a broad anticline with the axis trending approximately E-W.

21.2 SURMA GROUP

The major litho unit exposed in the Mizoram state is the rocks of Surma Group and is represented by BhubanandBokabil Formations. Based on the lithological characters, physical characteristics and order of superposition, Bhuban Formations are further subdivided into Lower, Middle and Upper.

21.2.1 Lower Bhuban Formation

Lower Bhuban is the oldest exposed formation in Mizoram. The formation comprises of alternation of shale and sandstone. The shales are bluish - grey to greenish grey, laminated and exhibit spheroidal weathering, lenticular bedding is characteristic of sequence. Silts are thin bedded and microcross laminated. Ichnofossils are fairly common. The sandstone is grey, fine grained, silty with medium scale cross - stratification. Channel lag conglomerates with molluscan shells are fairly common and the sands display fining upwards sequence. The maximum thickness exposed on the eastern limb of Teidukhan anticline is 900 m.

21.2.2 Middle Bhuban Formation

It is predominantly an argillaceous sequence with subordinate, sandstones which occur as intercalations. The shales are grey to dark grey in colour, show spheroidal concretions. The sandstones are thin bedded to massive, ill sorted, silty, and are fine

grained. Ripple laminations, lenticular bedding and flaser bedding are commonly observed in the sandstones. Small scale cross - stratification, current and interference ripples, and sandstone dykes have also been observed in the siltstone. The sedimentary structure indicates a west to south- westerly palaeocurrent direction for lower Bhuban. The maximum thickness of this formation measured on the eastern limb of Lunglei anticline is 2840m.

21.2.3 Upper Bhuban Formation

The Upper Bhuban Formation is an alternating sequence of arenaceous and argillaceous elastics is almost equal proportions. The sandstones are thin bedded to massive grey, fine grained silty and ill sorted, clay pellets and lignite lenses are observed along bedding. Channel lag conglomerate wherever present certain fragments of claystones, shale and siltstone set in silty matrix. Some of these conglomerate bands also contain broken shells of mollusks. The sandstones mega ripples with wave lengths of several feet have been observed at places along with small to medium scale cross -stratification. The shales are bluish grey, thinly laminated splintery; fissile, micaceous with lenticular bedding formed of ripple laminated siltstone or very fine grained sandstone. The massive bedded siltstones show evidences of bioturbation now occurring in the form of sand filled tabular bodies. The thickness of this formation is 1080 m exposed in western limb of Lungsen anticline.

21.3 Bokabil Formation

This unit conformably overlies Upper Bhuban Formation and their contact is also gradational. It mainly occurs on either flank on the anticlinal ridges or in the core of the synclines. It is predominantly argillaceous comprising shale, siltstone and thinly bedded sandstone alteration with sub-ordinate friable, buff-coloured, medium to fine grained, micaceous sandstone. The shale is khaki, brown, purple-coloured, micaceous and breaks into splintery fragments.

21.4 Tipam Group

Tipam Group conformably overlies Bokabil Formation with a gradational contact. It is a dominantly arenaceous unit and occurs in northern and western parts of Mizoram. It comprises buff coloured, medium to coarse grained, massive loose, micaceous sandstone with subordinate laminated grey siltstone/shale intercalations. In the lower horizon, the sandstone become bluish grey in colour and comparatively hard. Fossil wood (drifted) has been recorded from this formation.

The entire area of Kolasib district is occupied by semi-consolidated formations of denudostructural hills belonging to Barail Group of Oligocene age and Surma and Tipam Groups of Upper Oligocene to Miocene age and Pliocene age. The low linear ridges are characterized by low permeability and infiltration capacity. It is underlain by rocks of Middle Bhuban, Upper Bhuban and Bokabil Formations of Surma Group of Tertiary age. Middle Bhuban and Bokabil formations consist mainly of argillaceous rocks while Upper Bhuban formation comprises mainly of arenaceous rocks. Four litho-units have been established for the study area purely based on the exposed rock types. These are named as Sandstone unit, Shale-siltstone unit, clayey unit and Gravel, sand & silt unit.

Based on ONGC imagery and SRTM DEM various geological structures were delineated like anticlines, synclines, faults, lithology, etc. It was observed that, the rocks exposed within the Kolasib district area were traversed by several faults and fractures of varying magnitude and length. The general geological map of the study area is given in Map no. 5.

22. PROCESS OF DEPOSITION OF SEDIMENTS IN THE RIVER OF THE DISTRICT

Sediments are the small pieces of material that come from rocks or other living things like bones, shells, leaves, stems that are broken down into small parts. The four main processes that responsible for generation of sediments are –mechanical breakdown of rocks due to weathering, Erosion by precipitation, transportation by fluvial action of drainage networks, and finally deposition on the river bank as the velocity of the transporting medium decreases called sedimentation.

Geologically, Mizoram has a huge succession belonging to the Tertiary group of rocks. This Tertiary succession has been divided into the Barail, the Surma and the Tipam Groups. It is considered to be the southern extension of Surma basin. The sedimentological aspects carried out in the Tipams are still very meagre, and are not at par with the other group of rocks like the Surmas. In 2009, Chenkual*et al* had also made an attempted to study the provenance of the sediments by heavy mineral approach from the Tertiary rocks. They have suggested that, the source of the sediment were complex comprising igneous rock and pegmatite to high rank metamorphic rocks and reworked sediment supply. Mizoram are inferred to prevalence of warm and humid climate during the time of deposition of these sediments.

Sedimentological evidence indicates that the lower part of the Bhuban Formation is probably conformable transitional forms an underlying top sets sequence of a river dominant delta at the top of the Bhuban Formation to an inner neritic environments. The middle part of the formation could represent an open shelf environments and the upper part a near shore deposit. It is predominantly arenaceous and includes fine to very fine grained, compact, bluish ash. Evidence from the middle Bhuban Formation is interpreted as an outer shelf deposit, containing abundant of planktons whereas the upper alternating shale and siltstone contain fewer marine microfossils and could represent near shore deposits. The base of the Bhuban Formation is closed to the Oligocene / Miocene boundary. Immediately above this boundary there is the first appearance of a typical warm.

Generally the deposition of sediment is very high in this hilly terrain due to heavy rainfall during monsoon season, highly jointed rocks and the lithology is mostly sandstones, siltstones and shale with high proportion of organic matter.

The passage of numbers of rivers in the district is initially through sandy, silty and clayey rich terrain, where erosion of country rocks and transportation may be high but may result in the sand/gravel formation. As the area is tectonically active which accelerate the weathering processes that produces bulk quantity of sand/gravel and associated aggregates along the river bed. Thus, geology plays a major role. They coupled with mineral composition sandstone; comprises essentially greyish and buff fine to medium grained hard compact sandstone with silt and clay within the sandstone. Climatic conditions, water-load and velocity of river and rainfall have a vital role in the entire process of transportation and deposition of sand/gravel and associated aggregates. Here too, abrasion is the most important action which involves wearing away of the bank and the bedrock by stream water with the help of sand grains (floating, dragging pebbles and gravels and all such small particles) that are being carried in it. The floating, dragging and rolling depends upon the size and shape of the grains.

Energy, environment and time are the three factors which determine the process of deposition by streams. Thus, when energy decreases to transport the load (by reduction in velocity or volume of water), a part of material can no longer be transported and hence deposited. Similarly, the factor of environment influences the deposition through configuration or shape of the channel. Uneven surface of the channel check the velocity and hence cause deposition. As a river goes around a bend most of the water is pushed towards the bank of the river causing lateral erosion and widening of the river channel. The river is now eroding sideways into its banks rather than downwards into its bed, a process called lateral erosion.

23. MINOR MINERALS IN THE DISTRICT

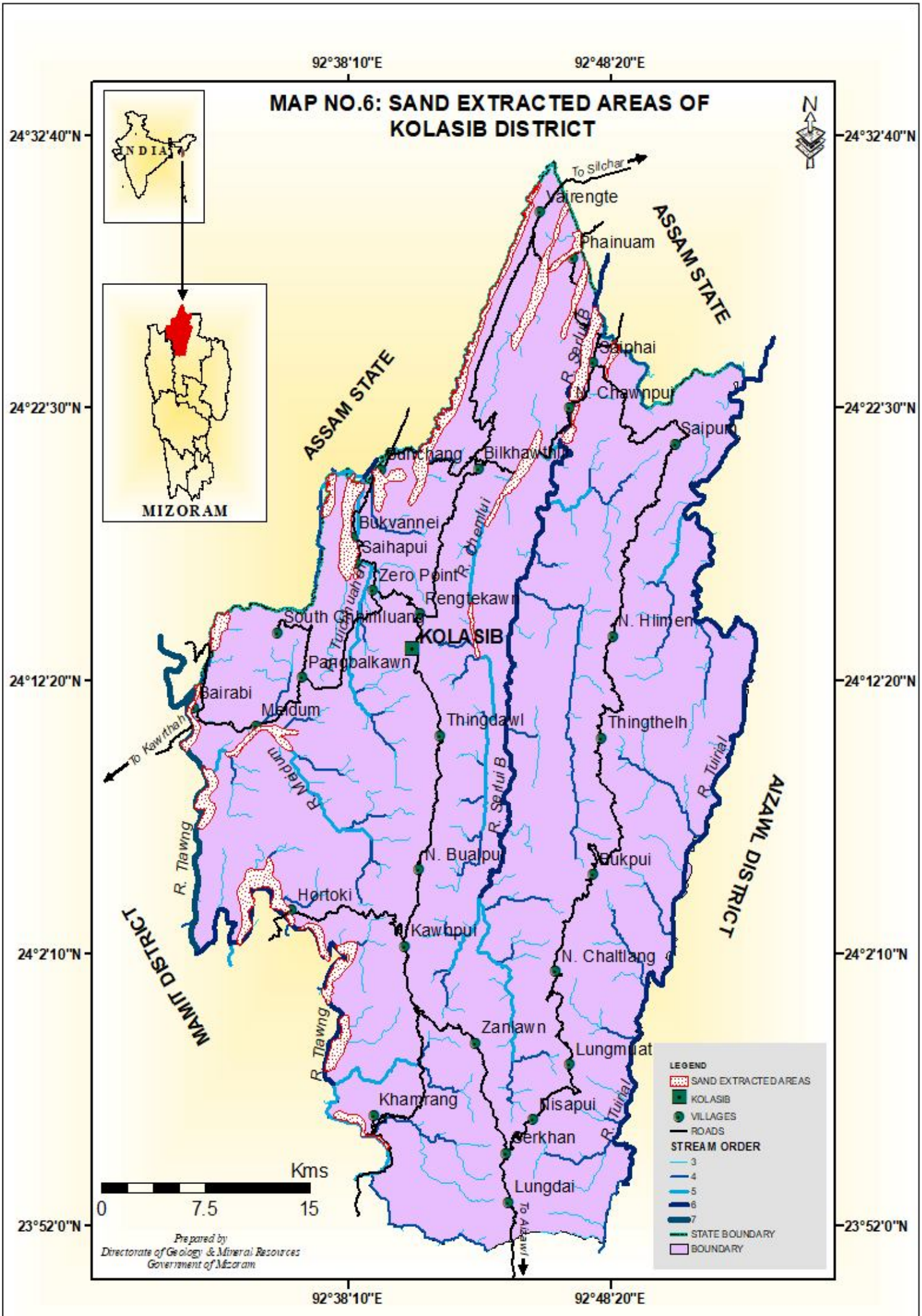
Mizoram is devoid of major minerals but there are reports of patches of coal at isolated places in the state which are not economically viable. It is, however, believed that there exists a good reserve of china clay in the Doyang river valley. Due to rugged topography and high transportation cost, the same is difficult to be exploited. Similarly traces of petroleum have been found but test drills near Kolasibdistrict have been found uneconomical for exploration. The mining activity is mostly limited to stone quarrying in urban centres and their surroundings as they provide ready market for the stone bricks and chips needed mostly in construction and development in Roads and Highways. Other minor minerals available are River Sand, Granular Sub Base (GSB), Gravels, Boulders, etc. which are found in this district.

23.1 RIVER SAND

Geologically the rock deposits in and around Kolasib district are Tipam sandstones which are fluvial deposits and has a characteristics of coarser dimension than the marine sediments of Bhuban formation. It is also observed that the sand deposits along the rivers course of Chhimluang, Tuichhuahen, Saihapuilui, Sesih and Dumkhallui are white in colour which is totally different colour than the rest of the river sand in the state. This peculiar phenomenon attracts the people passing by these river sides.

In Kolasib district, river sediments are deposited alongside of the rivers and the occurrences are of limited extent and are extracted by manually or by small scale methods. The local body or the local miners of this district generally uses small water pump for taking out sand from the river bed. With increasing trend of population and infrastructure development in the district, demand of sand for construction works is very high. River sands are the preferred source of building materials but sustainable source of supply is critical. Mining of sand/gravel is being done since long time therefore no specific method of exploration is required as the sand/gravel, deposited all along the bed is very well exposed on surface. Moreover, the excavated minerals are accumulated / replenished every year during rainy season by flow of water depending on intensity of rains on the upstream side.

The process of sand deposition in highly dependent upon the rainfall received in the catchment areas of the rivers and their tributaries and the velocity of the river as it is a dynamic process. Thus it is difficult to predict what quantity of sand may be deposited by the river. If there is less rainfall in the particular year, less water in the river resulting to less erosion and minimal deposition of sand in the river. All the rivers in the state are generally flowing through narrow valleys (V-shaped valley) due to highly


MAP NO.6: SAND EXTRACTED AREAS OF KOLASIB DISTRICT
92°38'10"E
92°48'20"E
24°32'40"N
24°22'30"N
24°12'20"N
24°2'10"N
23°52'0"N
INDIA
MIZORAM
N
To Silchar
Vairengte
Phainuam
ASSAM STATE
R. Sonlui B
Saiphai
N. Chawnpui
Saipum
Bilkhawthlir
Bunchang
ASSAM STATE
Bukvannei
Saihapui
R. Chemlui
Zero Point
R. Tuidiahen
Rengtekawn
South Chhimluang
KOLASIB
N. Hlimen
Pangbalkawn
Bairabi
Meidum
To Kawrthah
R. Meidum
Thingdawl
R. Sonlui B
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R. Tuirial
AIZAWL DISTRICT
R. Tlawng
N. Bualpui
Bukpui
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mountainous terrain and the bed rocks are mostly exposed along the course of the stream/rivers. Thus deposition of sediments take place only in specific places depending upon the gradient of the river bed i.e., wherever the slope of the river bed is gentle or flat the deposition of sediment will take place in those places. As the sand mining activity is on a small scale so there is no harm to the hydrologic cycle by the mining activity. But it is, suggested that Environmental Clearances may be issued to the eligible people/applicants who are ready to following the Sand Mining Procedure of the state, without harming the environment, so that revenue from the minor mineral can be realized properly by the state.

Geographical location of sand mining areas and the expected exploitable of sand along the various rivers within Kolasibdistrict are as follows.

Sl. No.	**Name of River**	**Area**	**Location of sand mining**	**Length in km. within the district (approx.)**	**Sand expected exploitable reserved/year (in cubic metres)**
1	Tlawng River	B2	Bairabi	64.2	15,000
2	Meidumlui	B2	Meidum	25.6	6,000
3	Saihapuilui	B2	SaihapuiK	8.9	8,000
4	Tuichhuahen	B2	Bukvannei	11.7	7,000
5	Chhimluang	B2	Buhchangphai	10.1	10,000
6	Dumkhallui	B2	Phaisen Road	16.5	9,000
7	Sesih	B2	Balikhal	14.3	1,000
8	Tlawng River	B2	Hortoki	64.2	1,200
9	Chemlui	B2	Chemphai	40.4	5,00
10	Serlui	B2	Chawnpui ‘N”	71.2	1,000

As the tribal community is dependent on the forest product for their livelihood, Directorate of Geology and Mineral Resources, Government of Mizoram allotted a limited number of permits to the local people to carry out the sand mining in small scale at selected sites without harming the environment. By doing so the Government is earning some revenue for the state and it also generates some employment for the local people who are engaged as daily wages worker in the mining site

The following are the data of impounded revenue collected by the Directorate of Geology and Mineral Resources for the year 2010 - 2020.

STATEMENT OF ROYALTY RECEIVED FROM MINOR MINERALS WITHIN KOLASIB DISTRICT FOR THE LAST TEN YEARS		
SL.NO.	**YEAR**	**ROYALTY RECEIVED IN RUPEES**
1	APRIL 2010 – MARCH 2011	5,65,610.00
2	APRIL 2011 – MARCH 2012	10,08,915.00
3	APRIL 2012 – MARCH 2013	14,05,100.00
4	APRIL 2013 – MARCH 2014	10,87,210.00
5	APRIL 2014 – MARCH 2015	4,91,625.00
6	APRIL 2015 – MARCH 2016	8,051,80.00
7	APRIL 2016 – MARCH 2017	10,74,510.00
8	APRIL 2017 – MARCH 2018	14,02,515.00
9	APRIL 2018 – MARCH 2019	1,44,865.00
10	APRIL 2019 – MARCH 2020	20,020.00
	TOTAL 80,05,550.00	

Figure 1:River sand deposited at R. Tuichhuahen& R. Saihapui

Figure 2: Showing R. Chemlui at 'N' Chawnpui Village

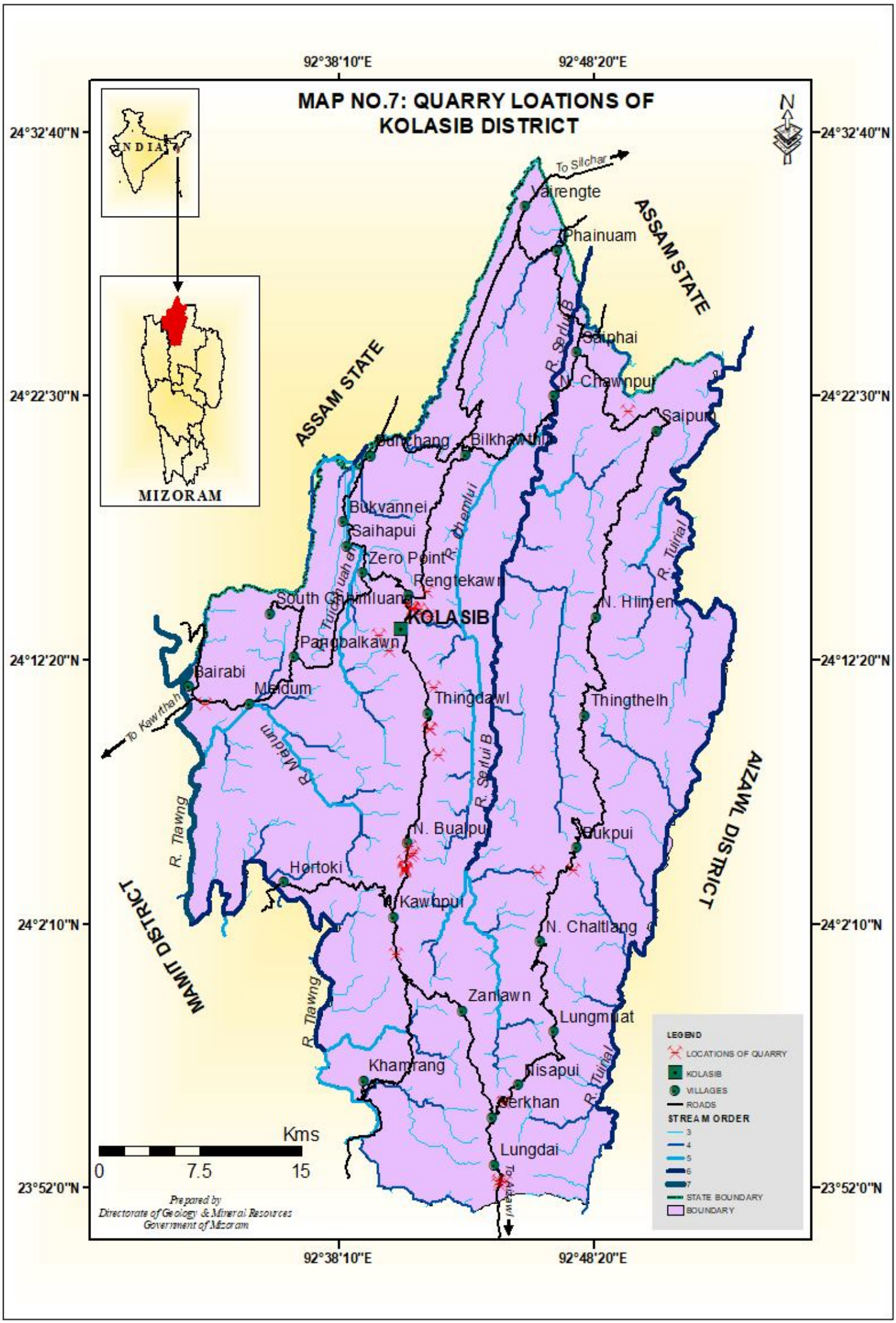
23.2STONE

At present main mineral of Mizoram is a hard rock of tertiary period. These massive, hard, upper and lower Bhuban sandstones are mainly utilized as building material and for road construction work. Mining area is generally situated at different region in the district depend on the availability of the rocks. In Kolasib district, the lease area comprises of private land only. The process of mining is to be carried out by manual method of open cast mining. The Mining is usually carried out with the help of tools such as drills, jack hummer, air compressors, hand shovel, picks, excavators etc. Drilling and blasting is also involved in certain permitted areas under the provision of the concerned department.

At first topsoil is removed before the mining operations. Excavators (JCB/Hitachi) are usually used for the removal of overburden. Power is not required for the mining operations. The excavation of mineral/stone is carried out by excavators such as JCB. In certain areas the mineral is fractured and easily exploitable by rock breakers and excavators. The hard strata are usually excavated after drilling and blasting.

Road of Quarry Mines is generally made by the owner of lands or contribution of permits holder. And the rock fragments are used as a construction material to repair the quarry roads. Loading of stones are done by excavator or labours and sent to the crushing unit or to the place where they want to use for different purposes. Pick-Up/407 Trucks/Tippers of vehicles are used for transportation of mineral from mine site.

The cost of the Stone is directly dependent on the size of the material mined. Kolasib district stone quarry mines area generally consist of Sandstone, Siltstone and Shale of Tertiary age. In terms of safety and environmental impact on mining, the mine sites and the mining operations are eco-friendly and environmentally safe with less hazards. But efforts are always there for more production in an effective way so that both the mine owners and the labourers can earn maximum benefits out of it.


MAP NO.7: QUARRY LOATIONS OF KOLASIB DISTRICT
INDIA
MIZORAM
92°38'10"E
92°48'20"E
24°32'40"N
24°22'30"N
24°12'20"N
24°2'10"N
23°52'0"N
N
To Silchar
Vairengte
Phainuam
ASSAM STATE
ASSAM STATE
R. Sertui B
Saiphai
N. Chawnpui
Saipum
Bilkhawthlir
Bukvannei
Saihapui
Zero Point
R. Chemlui
Rengtekawn
South Chhimluang
KOLASIB
Panngpalkawn
R. Tuirial
N. Hlimen
Bairabi
Meidum
To Kawrthah
R. Maidum
Thingdawl
Thingthelh
R. Tlawng
R. Sertui B
AZAWL DISTRICT
N. Bualpui
Vukpui
Hortoki
N. Kawnpui
N. Chaltlang
MAMIT DISTRICT
R. Tlawng
Zanlawn
Lungmuat
Khamrang
Nisapui
R. Tuirial
Serkhan
Lungdai
To Aizawl
Kms
0
7.5
15
LEGEND
LOCATIONS OF QUARRY
KOLASIB
VILLAGES
ROADS
STREAM ORDER
3
4
5
6
7
STATE BOUNDARY
BOUNDARY
Prepared by
Directorate of Geology & Mineral Resources
Government of Mizoram

As of now from 2010 the revenue collected for mineral/stone mining from various check gates within the district are as follows in the table below.

STATEMENT OF ROYALTY RECEIVED FROM MINOR MINERALS WITHIN KOLASIB DISTRICT FOR THE LAST TEN YEARS		
SL.NO.	**YEAR**	**ROYALTY RECEIVED IN RUPEES**
1	APRIL 2010 – MARCH 2011	4,73,296.00
2	APRIL 2011 – MARCH 2012	17,56,280.00
3	APRIL 2012 – MARCH 2013	12,76,140.00
4	APRIL 2013 – MARCH 2014	20,76,820.00
5	APRIL 2014 – MARCH 2015	13,64,320.00
6	APRIL 2015 – MARCH 2016	12,71,380.00
7	APRIL 2016 – MARCH 2017	23,95,885.00
8	APRIL 2017 – MARCH 2018	28,74,095.00
9	APRIL 2018 – MARCH 2019	29,76,067.00
10	APRIL 2019 – MARCH 2020	6,70,070.00
	TOTAL 171,34,353.00	

Generally open castmining causes drastic impact on environment such as water pollution, land degradation, loss of biodiversity, air pollution, increases in health related problems, occupational noise pollution, vibrations, land subsidences and landslides. Being Mizoram is one of the most biodiversity rich states, in oder to maintain the sustainability of environment. Therefore, Government of Mizoram had issued only 42 mining permits for minor minerals within Kolasib district which are listed below.

LISTS OF QUARRY PERMIT HOLDERSWITHINKOLASIB DISTRICT, MIZORAM			
Sl.No.	**Name**	**Address**	**Location**
01	F. Lianhlira	Venglai, Kolasib	Bualpui 'N' – Kawnpuiinkar
02	Ch. Saphuapa	Hmar Veng, Kolasib	Kolasib – Silchar Road, PHE Pump House chung
03	Chawnghlira	Tuithaveng, Kolasib	Quarry No.1 (Industrial Estate hnuai), TuithaVeng
04	Rosangzuali	Bualpui 'N'	Bualpui 'N'
05	Pahnuna	Kolasib	KolasibVenglai
06	Vanlalthlengi	Kawnpui	Kawnpui ram, BRTF Quarry Chhim lam
07	Manga	Banglakawn, Kolasib	Tipaimuk Road, Builum
08	R. Lalbiaktluanga	B.T Stone Quarry, Zarkawt	Bairabi
09	Zothansanga	Mission Veng, Aizawl	Hmar Chaltlang, Kolasib District
10	Ramthianghlima	Mualkhang	Mualkhang Hmar lam ram, Nomawiite Lo hlui
11	LaltlanzovaKhiangte	Mualkhang	Mualkhangtlak lam ram

12	Lalmuanpuii	Venglai, Kawnpui	Hortoki Road, Zawngektuithlangkawrte
13	Lalramlawma	ChhimVeng, Lungdai	Lungdai Ram, Silchar Road thlang
14	R. Tlangkhuma	Venglai, Kawnpui	Lawmlungrualzau, kawnpui – I
15	Lalfamkima	College Veng, Kolasib	RengteKawnpuichhuahlam
16	H. Lalfakzuala	Vengthar, Kawnpui	Chawke Kham, Kawnpui
17	K. Rosawmliana	Vaivakawn, Aizawl	Zau Au, (VC-I), Kawnpui
18	C. Lalchhuanmawia	ChhimVeng, Kolasib	TuikualZau (Darnam Ram), Kawnpui VC-II area
19	C. Sanghnunkhuma	'N' Chaltlang	Bamboo Link Road, Hmar Chaltlang
20	SitaChetri	Bualpui	Kawnpui Quarry pui
21	R. Lalremruata	Kawnpui	Thinglian Ram, Kawnpui VC-II area
22	Vanlalhlira	Kolasib	Bakpu, Tuilut, Kolasib District
23	Zokungi	RamhlunVenglai	Mualkhang, Kolasib District
24	Ralkapthanga	DawrVeng, Khamrang	KhawhluiZau, Khamrang
25	TC Lalbiakthanga	Venglai, Nisapui	NisapuiTawngpam ram
26	Laltlankima	Hmar Veng, Kolasib	TuithaVeng, Kolasib
27	Laldinpuii	Durtlang, Aizawl	ChengkawlLuikam

28	GovindChhetri	Rengtekawn, Kolasib	Kawnpui Hmar Veng
29	LalnuntluangaFanai	Venglai, Kolasib	Thing lubul, Bairabi Road
30	PC Lalthakimi	Kolasib	Bangla kawr, Kolasib
31	David Lalhmingmawia	Project Veng, Kolasib	Project Liam ram, Kolasib
32	R. Sangliana	Diakkawn, Kolasib	Kolasibhmawngkhawthlirkhamhnuai
33	Lalrinchhana	Venglai, Kolasib	Bangla Luikawr, Kolasib
34	HK Ngurtuahchhunga	ChhimVeng, Thingdawl	Saizawlkawngphei
35	Tialhleisuma	College Veng, Kolasib	Sairaw bawl ram, Kolasib
36	R. Lalramliana	Thingdawl	KawrthindengLuizau
37	LalchanhluaPachuau	Thingdawl	Thingdawl, Hmar Veng
38	RS Lalthakima	Thingdawl	LungsumlehDarnamLuiinkar, Thingdawl
39	H. Lalnunzira	Chanmari West-I, Aizawl	Kawnpui, Hmar Veng
40	Vanlalhruaii	Diakkawn, Kolasib	Rungleikawn (LungdawhLuilehChengkawlLui in finna)
41	LalsangpuiiSailo	Chawnpui, Aizawl	Saileikhawthlirhnuai, LungdawhLuihnar
42	Dr R. Lalthlamuana	New Diakkawn, Kolasib	DamdiaiLuikam, Kolasib

Figure 3: Showing Mining Quarry at Tipaimukh Road, Kolasib District

Figure 4: Extracted at Quarry between Sihphir&Lungdai, Kolasib District

24. LABORATORY TEST RESULT

Laboratory test was conducted under Directorate of Geology and Mineral Resources on selected samples collected from the fields/quarries within Kolasib district and the result is shown in the below.

Sample Test Result Sheet

Collected By: Zarzoliana, TO, DG&MR | Date of Submission: 14/04/2020

Sample Collection date: 13/03/2020 | Sample ID: M/KLB/20-21/01

Date of Testing : 27/04/2020 | Location: Tipaimukh Road,Kolasib Dist

Sample Depth: Sub-Surface | Sample Condition: Dry

Type of Test	Inference	Standard
Slake Durability Index	98.07% (Extremely High)	IS:10050-1981
Porosity	12.80	IS:2386 Part III-1963
Specific Gravity	2.68	IS:2386 Part III-1963
Void Ratio	0.147	IS:2386 Part III-1963
Water Absorption	5.47	IS:2386 Part III-1963
NMC	1.75	IS:2386 Part III-1963
Density	2.34	IS:2386 Part III-1963
Point Load	NA	IS:1864-1998
Abrasion	NA	IS:2386 Part IV-1963
Aggregate Impact Value	NA	IS:2386 Part IV-1963

Comments:

Sample Test Result Sheet

Collected By: Zarzoliana, TO, DG&MR | Date of Submission: 14/04/2020

Sample Collection date: 13/03/2020 | Sample ID: M/KLB/20-21/02

Date of Testing : 27/04/2020 | Location: Lungdai-Sihphir, Kolasib Dist

Sample Depth: Sub-Surface | Sample Condition: Dry

Type of Test	Inference	Standard
Slake Durability Index	97.93% (Extremely High)	IS:10050-1981
Porosity	10.41	IS:2386 Part III-1963
Specific Gravity	2.65	IS:2386 Part III-1963
Void Ratio	0.116	IS:2386 Part III-1963
Water Absorption	4.39	IS:2386 Part III-1963
NMC	1.75	IS:2386 Part III-1963
Density	2.37	IS:2386 Part III-1963
Point Load	NA	IS:1864-1998
Abrasion	NA	IS:2386 Part IV-1963
Aggregate Impact Value	NA	IS:2386 Part IV-1963

Comments:

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